

## TRAVIS WILLIAM SAWYER

<b>EDUCATION</b>	<b>PhD</b> in Optical Sciences, University of Arizona	2021
	<ul style="list-style-type: none"> <li>• Dissertation: Multimodal Optical Imaging for Tissue Characterization and Disease Diagnosis</li> <li>• Director: Dr. Jennifer K. Barton</li> </ul>	
	<b>MS</b> in Optical Sciences, University of Arizona	2019
	<b>MPhil</b> in Physics, University of Cambridge	2018
	<ul style="list-style-type: none"> <li>• Thesis: A Multimodal Imaging System for Tissue Analysis</li> <li>• Director: Dr. Sarah E. Bohndiek</li> </ul>	
	<b>BS</b> in Optical Sciences and Engineering, University of Arizona	2016
<b>EMPLOYMENT</b>	<b>University of Arizona</b> , Tucson, Arizona	
	Assistant Professor, Electrical and Computer Engineering	2023 – Present
	Assistant Professor, Optical Sciences	2021 – Present
	Assistant Professor, Biomedical Engineering	2021 – Present
	Assistant Professor, Health Sciences Design	2021 – Present
	Assistant Research Professor, Medicine	2021 – Present
	Faculty Affiliate, Applied Mathematics	2021 – Present
	Member, Cancer Prevention and Control Program, UA Cancer Center	2021 – Present
Member, BIO5 Institute	2021 – Present	
<b>HONORS AND AWARDS</b>	<b>FACULTY</b>	
	Award for Excellence at the Student Interface, College of Engineering	2023
	NIH Early Career Reviewer	2023
	NIH/NCI Early Investigator Advancement Program (EIAP) Scholar	2023
	Geographical Management of Cancer Health Disparities (GMaP) Travel Award (\$2175)	2023
	Geographical Management of Cancer Health Disparities (GMaP) Travel Award (\$2000)	2022
	<b>GRADUATE TRAINEE (INCLUDING GRANTS)</b>	
	Valedictorian	2021
	ARCS Scholarship (\$10,500 per year)	2019 – 2021
	*NSF Graduate Research Fellowship (\$48,961 per year for 3 years)	2017 – 2021
University of Arizona Cancer Center CRTEC Grant (\$575)	2021	
Student Interface Award for Teaching (TA) in Optical Sciences	2020	
*NSF Graduate Research Opportunities Worldwide Grant (Korea) (approx. \$17,000)	2019	
*Edmund Optics Educational Award (\$7,500)	2019	
*ASLMS Student Research Grant (\$5,000)	2019	
SPIE Education Scholarship (\$4,000)	2019	
*Paul A. Bonenfant Memorial Scholarship (\$8,000)	2019	
Outstanding Research Assistant Award (\$500)	2019	
GPSC Research and Project Grant (\$991.04)	2019	
NSF GRFP Travel Grant (\$500)	2018,2019	
University Fellows Travel Grant (\$500)	2018	
Southwest Regional Grad Slam 1st Prize (\$3,000)	2018	
University of Arizona Grad Slam 2nd Prize (\$2,000)	2018	
University of Arizona Student Showcase First Prize, Graduate Research (\$750)	2018	
GPSC Travel Grant (\$750, \$1,000)	2017,2018	
University Fellowship (\$46,348)	2017	
*John Kiel Scholarship (\$10,000)	2017	
Shell Research Prize (approx. \$3,900)	2017	

University of Cambridge Winton Programme Pump Prime Grant (approx. \$32,500)	2017
Churchill Scholar Special Research Grant (\$2,000)	2016
SPIE Student Travel Scholarship (\$2,000)	2016
*Churchill Scholarship (approx. \$48,000)	2016
*Nationally competitive award	

**UNDERGRADUATE TRAINEE (INCLUDING GRANTS)**

Valedictorian	2016
Robie Gold Medal Award (\$1000)	2016
Honors College Outstanding Senior Award (\$500)	2016
*Astronaut Scholarship (\$10,000 per year)	2014, 2015
*Barry Goldwater Scholarship (\$7,500)	2015
Robert S. Hilbert Memorial Optical Design Competition (\$800)	2015
John E. Greivenkamp Endowed Scholarship (\$750)	2015
Pillars of Excellence Award	2015
Honors College Research Grant (\$2,000)	2014
Jack D. Gaskill Scholarship in Optical Sciences (\$3,000)	2014
SPIE Optics and Photonics Education Scholarship (\$2,000)	2014
Departmental Honors in Optical Sciences	2013, 2015
John E. Tipton Scholarship in Optical Sciences (\$3,000)	2013
*Nationally competitive award	

**SERVICE AND  
OUTREACH**

**LOCAL AND STATE OUTREACH**

**Vertically-Integrated Projects (VIP) Team Lead** 2022 – Present

The Vertically Integrated Projects (VIP) Program is a transformative approach to enhancing higher education by engaging undergraduate and graduate students in ambitious, long-term, large-scale, multidisciplinary project teams that are led by faculty. The program’s model has been rigorously evaluated and refined over more than two decades.

**ENGAGED / REAL Work Mentor, UA College of Engineering** 2022 – 2023

ENGAGED (ENGINEERING Access, Greater Equity, and Diversity) is committed to accelerating student success in their engineering careers. This effort focuses on promising students who are underrepresented in engineering, including those who are the first in their families to attend college, are from low-income households, or are from underrepresented groups such as women or minorities.

**STAR Lab Mentor, UA College of Science** 2022 – 2023

Students Taking Advantage of Research (STAR) Lab is a high school outreach collaboration at the University of Arizona between the Department of Molecular and Cellular Biology and Southern Arizona Research Science and Engineering Foundation (SARSEF).

**Steps 2 STEM Mentor, Southwest Environmental Health Sciences Center** 2022

The Steps 2 STEM Summer Research Internship is a 4-week research experience for high school students participating in Pima County Biotechnology or Health Care Foundations programs.

**KEYS Program Mentor, BIO5 Institute** 2022

The KEYS (Keeping Engaging Youth in Science) is a unique summer opportunity for promising Arizona high school students with a strong interest in bioscience, engineering, environmental health, data science and biostatistics to work with top University of Arizona faculty on research projects that address the world’s greatest challenges.

**DEPARTMENTAL AND COLLEGE COMMITTEES**

**Wyant College of Optical Sciences**

OPTI 502 Oral Exam Retake Committees (Chair) 2023

Undergraduate Curriculum Committee (Chair) 2022 – Present

Museum of Optics Committee 2022 – Present

Graduate Exam Committee 2021 –2022

**College of Engineering**

Engineering Faculty Design Committee 2022 – Present

## UNIVERSITY COMMITTEES

### University of Arizona Cancer Center

Diversity in Cancer Research Program Selection Committee 2023

### Office of Nationally Competitive Scholarships

Astronaut Scholarship Committee 2023

### University of Arizona Optical Imaging Core

Faculty Research Advisory Committee 2022 – Present

### Office for Responsible Outside Interests

Independent Monitor for Data and Integrity Oversight 2022 – Present

### University of Arizona Graduate College

Research & Grant Development Administrator Search Committee 2022

### University of Arizona Hearing Board

Faculty Representative 2021 – 2022

## OTHER COMMITTEES

### Conference Committees

### Optical Design and Fabrication (ODF)

ODF 2024 Steering Committee 2023 – 2024

### SPIE Photonics West BIOS Program Committees

Polarized Light and Optical Angular Momentum for Biomedical Diagnostics (PLBD) 2023 – Present

Label-free Biomedical Imaging and Sensing (LBIS) 2022 – Present

### AZ Photonics Days

Biomedical Technology Program Committee 2022 – Present

### Meeting Sessions Chaired

### SPIE Photonics West BIOS

LBIS Session Chair, Polarization and Sensors 2023

LBIS Session Chair, Fluorescence IV 2023

### AZ Photonics Days

Biomedical Technology Session Chair 2023

### Optica Imaging and Applied Optics Congress

3D Imaging and Microscopy Session Chair 2022

### Review and Editorial

### Frontiers in Photonics

Topic Coordinator, *Translational Clinical Intraluminal Imaging and Optical Sensing* 2022

### Journal Reviewer

2016 – Present

Full list of 50+ completed reviews available upon request. Journals include:

*Applied Optics, Journal of the Optical Society of America A, Optics Express, Journal of Applied Remote Sensing, Journal of Biophotonics, Scientific Reports, Biomedical Optics Express, Journal of Biomedical Optics, SPIE Press, Heliyon*

### Professional Society Membership

**The International Society for Optics and Photonics (SPIE)**, Lifetime Member

**Optica (Formerly OSA)**, Member

**American Gastroenterological Association**, Member

## PUBLICATIONS AND CREATIVE ACTIVITY

## REFEREED JOURNAL ARTICLES

\*Based on work as graduate student; ° co-authors who are advisees and mentees

[22] °Slomka B, Duan S, Knapp T, Lima N, Sontz R, Merchant JL, and **Sawyer TW**. Design, fabrication, and preclinical testing of a miniaturized, multispectral, chip-on-tip, imaging probe for intraluminal fluorescence imaging of the gastrointestinal tract. *Front. Biophotonics* 3 (2023).

[21] °Knapp T, Duan S, Merchant JL, and **Sawyer TW**. Quantitative Characterization of Duodenal Gastrinoma Autofluorescence using Multi-photon Microscopy *L. Surg. Med* 1-18 (2022).

- [20] Taylor-Williams M, Mead S, **Sawyer TW**, Hacker L, Williams C, and Bohndiek S. Oxygenation imaging of nailfold capillaries using multispectral LED illumination *J. Biomed. Opt.* 27(12), 126002 (2022).
- [19] °Bonaventura J, °Morara K, °Carlson R, Comrie C, °Daigle N, Hutchinson E, and **Sawyer TW**. Backscattering Mueller Matrix polarimetry on whole brain specimens shows promise for minimally invasive mapping of microstructural orientation features. *Front. Photon.* 3, (2022).
- [18] Duan S, **Sawyer TW**, Sontz R, Wieland B, Diaz A, and Merchant JL. Men1 Deletion Exploits Glial Cell Plasticity in Favor of Neuroendocrine Reprogramming. *Cell. Mol. Gastro. Hepatol.* 14(5), P1025-1051 (2022).
- [17] **Sawyer TW**, Taylor-Williams M, Tao R, Xia R, Williams C, and Bohndiek S. Opti-MSFA: A toolbox for generalized design and optimization of multispectral filter arrays *Opt. Exp.* 30(5), 7591-7611 (2022).
- [16] Schwartz D, **Sawyer TW**, Thurston N, Barton J, and Ditzler G. \*In-vivo Ovarian Cancer Detection Using Optical Coherence Tomography and Deep Neural Networks. *Neural. Comput. Appl.* 26, (2022).
- [15] Kiekens K, Vega D, Thurgood H, Galvez D, McGregor D, **Sawyer TW**, and Barton J. \*Effect of an added mass on the vibrational characteristics for raster scanning of a cantilevered optical fiber. *ASME J. Med. Diagnostics.* 4(2), 021007 (2021).
- [14] Sawyer DM, **Sawyer TW**, Eshghi N, and Kuo P. \*Pilot Study: Texture analysis of PET imaging demonstrates changes in 18F-FDG uptake of the brain after prophylactic cranial irradiation. *J. Nuc. Med. Tech.* 48(4), (2020).
- [13] Fitzpatrick C, Wilson A, **Sawyer TW**, Wilkinson T, Bohndiek S, and Gordon G. \*Robustness to misalignment of low-cost, compact wide-field quantitative phase imaging architectures. *OSA Cont.* 3(10), 2660-2679 (2020).
- [12] Vega D, **Sawyer TW**, Pham N, and Barton J. \*Use of embedded and patterned dichroic surfaces with optical power to enable multiple optical paths in micro-endoscope systems. *App. Opt.* 59(22), G71-G78 (2020).
- [11] **Sawyer TW**, Koevary J, Howard C, Austin O, Rice P, Hutchens G, Chambers S, Connolly D, and Barton J. \*Fluorescence and Multiphoton Imaging For Characterization of a Model of Post-Menopausal, Spontaneous Ovarian Cancer *L. Surg. Med.* 52(10), 993-1009 (2020).
- [10] Blackman R, Fischer D, Jurgenson C, Sawyer D, McCracken T, Szymkowiak A, Petersburg R, Ong J, Brewer J, Zhao L, Leet C, Buchhave L, Tronsgaard R, Llama J, **Sawyer TW**, Shao M, Trahan R, Nemati B, Genoni M, Pariana G, Riva M, Fournier P, Pawluczyk R, Davis A, and Cabot S. Performance Verification of the Extreme Precision Spectrograph. *Astron. J.* 153(9), (2020).
- [9] Gordon G, Joseph J, Alcolea M, **Sawyer TW**, Williams C, Fitzpatrick C, Jones P, di Pietro M, Fitzgerald R, Wilkenson T, and Bohndiek S. \*Quantitative phase and polarisation imaging through an optical fibre applied to detection of early esophageal tumourigenesis. *J. Biomed. Opt.* 24(12), 126004 (2019).
- [8] **Sawyer TW**, Koevary J, Rice P, Howard C, Austin O, Connolly D, Cai Q, and Barton J. \*Quantification of multiphoton and fluorescence images of reproductive tissues from a mouse ovarian cancer model shows promise for early disease detection. *J. Biomed. Opt.* 24(9), 096010 (2019).
- [7] Gordon G, Joseph J, **Sawyer TW**, Macfaden A, Williams C, Wilkinson T, and Bohndiek S. \*Full-field quantitative phase and polarisation-resolved imaging through a flexible fibre bundle. *Opt. Exp.* 27(17), 23929-47 (2019).
- [6] **Sawyer TW**, Rice P, Sawyer D, Koevary J, and Barton J. \*Evaluation of segmentation algorithms for optical coherence tomography images of the ovaries. *J. Med. Imag.* 6(1), 014002 (2019).

- [5] **Sawyer TW**, Chandra S, Rice P, Koevary J, and Barton J. \*Three-dimensional texture analysis for optical coherence tomography images of ovarian tissue. *Phys. Med. Biol.* 63(23), 235020 (2018).
- [4] **Sawyer TW**. Alignment of sensor arrays in optical instruments using a geometric approach. *App. Opt.* 57(4), 794-801 (2018).
- [3] **Sawyer TW**, Hawkins K, and Damento M. Using confidence intervals to evaluate the focus alignment of spectrograph detector arrays. *App. Opt.* 56(18), 5295-5300 (2017).
- [2] **Sawyer TW**, Petersburg R, and Bohndiek S. Tolerancing the alignment of large-core optical fibers, fiber bundles and light guides using a Fourier approach. *App. Opt.* 56(12), 3303-10 (2017).
- [1] **Sawyer TW**, Siri Luthman A, and Bohndiek S. \*Evaluation of illumination systems for biomedical hyperspectral imaging. *J. Opt.* 19(4), 045301 (2017).

**OTHER  
SCHOLARSHIP**

**CONFERENCE PROCEEDINGS**

- [22] °Daigle N, °Knapp T, Duan S, Jones D, Azhdarinia A, Ghosh S, AghaAmiri S, Ikoma N, Estrella J, Schnermann M, Merchant JL, and **Sawyer TW**. Combined multiphoton microscopy and somatostatin receptor type 2 imaging of pancreatic neuroendocrine tumors. *Proc SPIE* 12371 (2023).
- [21] °Setiadi J, °Knapp T, °Bonaventura J, Duan S, Merchant JL, and **Sawyer TW**. Mueller matrix polarization imaging of gastrinoma shows promise for tumor localization. *Proc SPIE* 12391 (2023).
- [20] °Bonaventura J, °Carlson R, °Morara K, Comrie C, Hutchinson E, and **Sawyer TW**. Reflectance full Mueller matrix polarimetry for microstructural validation of diffusion magnetic resonance imaging. *Proc SPIE* 12382 (2023).
- [19] Duan S, Sontz R, Merchant JL, and **Sawyer TW**. Measuring variations in optical imaging markers in a glial cell-directed mouse model of human MEN1 syndrome. *Proc SPIE* 11972 (2022).
- [18] °Lima N and **Sawyer TW**. Design and validation of a high-resolution multispectral fluorescence imaging system for characterizing tissue fluorescence and reflectance properties. *Proc SPIE* 11944 (2022).
- [17] °Bonaventura J, °Knapp T, Koshel J, and **Sawyer TW**. Smartphone spectroscopy for melanoma detection. *Proc SPIE* 11950 (2022).
- [16] °Slomka B, Duan S, Sontz R, and **Sawyer TW**. Multi-band fluorescence imaging and cell collection device for in vivo tumor characterization and growth assessment in xenograft mouse models. *Proc SPIE* 11964 (2022).
- [15] °Knapp T, Duan S, Merchant JL, and **Sawyer TW**. Evaluation of tile artifact correction methods for multiphoton microscopy mosaics of whole-slide tissue sections. *Proc SPIE* 11966 (2022).
- [14] Montague J, Shir H, **Sawyer TW**, and Barton J. Feasibility of non-imaging, random-sampling second harmonic generation measurements to distinguish colon cancer. *Proc SPIE* 11972 (2022).
- [13] **Sawyer TW**, Salcin E, Diaz A, and Friedman J. \*Using principle component analysis to estimate geometric parameters from point cloud LIDAR data. *Proc SPIE* 1170403 (2021).
- [12] Salcin E, Diaz A, **Sawyer TW**, and Friedman J. \*Extraction of precise object orientation and position from LIDAR data using maximum-likelihood methods. *Proc SPIE* 1174404 (2021).
- [11] Santaniello S, Rice P, **Sawyer TW**, and Barton J. \*Multispectral fluorescence imaging of murine ovarian tissue for the characterization and classification of early-stage ovarian cancer. *Proc. SPIE* 11655 (2021).

- [10] **Sawyer TW** and Barton J. \*Liquid Crystal Polarization Grating Spectroscopy for Measuring Tissue Autofluorescence. *L. Surg. Med.* 52(S32), S1-S82 (2020).
- [9] **Sawyer TW**, Williams C, and Bohndiek S. \*Spectral Band Selection and Tolerancing for Multispectral Filter Arrays. *OSA Technical Digest* (2019).
- [8] **Sawyer TW**, Koevary J, Rice P, and Barton J. \*In vivo optical coherence tomography of a mouse model of spontaneous ovarian cancer. *Proc. SPIE* 11073 (2019).
- [7] Barton J, Koevary J, Rice PS, and **Sawyer TW**. \*Endogenous and exogenous contrast mechanisms for detection of ovarian cancer. *OSA Technical Digest* (2019).
- [6] **Sawyer TW**, Koevary J, Rice P, and Barton J. \*Fluorescence and Multiphoton Imaging of a Mouse Model of Spontaneous Ovarian Cancer. *OSA Technical Digest* (2019).
- [5] **Sawyer TW**, Rice P, Koevary J, Connolly D, Cai Q, and Barton J. \*In vivo multiphoton imaging of an ovarian cancer mouse model. *Proc. SPIE* 10856 (2019).
- [4] **Sawyer TW**, Rice P, Sawyer D, Koevary J, and Barton J. \*Evaluation of segmentation algorithms for optical coherence tomography images of ovarian tissue. *Proc. SPIE* 10472 (2018).
- [3] Fitzpatrick C, **Sawyer TW**, and Bohndiek S. \*Wide-field phase imaging for the endoscopic detection of dysplasia and early-stage esophageal cancer. *Proc. SPIE* 10470 (2018).
- [2] **Sawyer TW** and Bohndiek S. \*Towards a software framework for maximizing the resolution of biomedical hyperspectral imaging. *European Conferences on Biomedical Optics. Proc. SPIE* 10412 (2017).
- [1] **Sawyer TW**, Luthman A, and Bohndiek S. \*Evaluation of illumination systems for wide-field hyperspectral imaging in biomedical applications. *Proc. SPIE* 9711 (2017).

#### CONFERENCE ABSTRACTS

(All conference proceedings above also include an abstract and are not repeated here)

- [15] °Carlson R, Comrie C, °Bonaventura J, °Morara K, °Daigle N, Hutchinson E, and **Sawyer TW**. Diattenuation and retardance metrics from complete polarimetry differentiate microscale and macroscale anisotropy. *ISMRM* (2023).
- [14] °Lima N, Alameri A, Banerjee B, Gavini H, and **Sawyer TW**. Measuring the Hyperspectral and Auto-fluorescent Signatures of Esophageal Cancer for Evaluating Diagnostic Optical Imaging Biomarkers using Ex Vivo Clinical Specimens. *DDW* (2023).
- [13] **Sawyer TW**, Spicer G, Mead S, di Pietro M, Sanduka A, °Kim T, Aitken M, Rice F, Banerjee B, Gavini H, Alameri A, Bohndiek S, and Barton J. Optical coherence elastography on clinical samples of gastric cancer shows promise for assessing alteration of mechanical properties with onset of disease. *Proc SPIE PC12391* (2023).
- [12] °Knapp T, Duan S, Merchant JL, and **Sawyer TW**. Spatial and spectral optimization of two-photon imaging data for optimal label-free texture-based tissue classification models. *Proc SPIE PC12391* (2023).
- [11] Taylor-Williams M, Tao R, **Sawyer TW**, Waterhouse D, Yoon J, and Bohndiek S. Optimization of Multispectral Filter Arrays for Detection of Cancers in the Gastrointestinal Tract. *Proc SPIE PC12387* (2023).
- [10] Barton J, Rocha A, **Sawyer TW**, and Bohndiek S. Multiscale imaging for early cancer detection. *Proc SPIE PC12363* (2023).
- [9] Williams C, **Sawyer TW**, and Bohndiek S. A biomedical multispectral image sensor. *Proc SPIE* 11943 (2022).
- [8] °Daigle N, Song H, Sontz R, Merchant JL, and **Sawyer TW**. Demonstrating whole-organ lineage tracing of fluorescent markers in intestinal stem cells using wide-field fluorescence imaging in a Zfp148CreERT2 mouse model. *Gastro.* 162(7):S-661-S-662 (2022).

- [7] °Knapp T, Duan S, Merchant JL, and **Sawyer TW**. Characterizing the optical fingerprint of duodenal gastrinoma using quantitative multiphoton autofluorescence microscopy. *Gastro.* 162(7):S-663 (2022).
- [6] Duan S, Sawyer TW, Sontz R, Wieland B, Diaz A, and Merchant JL. GFAP Directed Inactivation of MEN1 Promotes Neuroendocrine Differentiation by Exploiting Glial Cell Plasticity. *Gastro.* 162(7):S-37-S-38 (2022).
- [5] °Carlson R, Comrie C, Bonaventura J, Hutchinson E, and **Sawyer TW**. Backscattering Mueller Matrix polarimetry shows promise for validation of diffusion MRI microstructural features in thick tissue specimens. *ISMRM* (2022).
- [4] Shir H, Montague J, Galvez D, **Sawyer TW**, Nfonsam V, and Barton JK. Analysis of Quantitative Second Harmonic Generation Measurements to Distinguish Colon Cancer. *L. Surg. Med* 54(S34), S1-S112 (2022).
- [3] Taylor-Williams M, Mead S, **Sawyer TW**, Williams C, Berks M, Murray A, and Bohndiek S. A low-cost LED-based multispectral capillaroscopy system for oximetry of the nailfold. *Proc. SPIE* 11651 (2021).
- [2] **Sawyer TW** and Barton J. \*Enabling high-throughput autofluorescent spectroscopy of biomarkers with liquid crystal polarization gratings. *Proc SPIE* 11647 (2021).
- [1] Yoon J, Gordon G, **Sawyer TW**, and Bohndiek S. \*Development of a clinical multimodal imaging system for rapid characterisation of intrinsic optical properties of freshly excised tissues. *Proc. SPIE* 11232 (2020).

#### **PATENTS**

- [1] Bohndiek S, Waterhouse D, and **Sawyer TW**. \*Determination of spectral filters for spectral imaging. Patent GB2104680.0 (March 31 2021).

#### **CURRICULA**

- [2] OPTI 202R: Geometrical and Instrumentational Optics II. Integrated python programming into existing curriculum.
- [1] HSD 510: Device Design in the Health Sciences: Developing Tools for Health Care Solutions using Design Thinking. Complete curriculum developed.

#### **WORKS IN PROGRESS**

#### **PUBLICATIONS UNDER REVIEW OR NOT YET SUBMITTED**

- [6] °Knapp T, °Lima N, °Daigle N, Duan S, Merchant JL, **Sawyer TW**. Combined flat-field and frequency filter approach to correcting artifacts of multi-channel two-photon microscopy. Submitted May 2023, *Journal of Biomedical Optics*. [In Review]
- [5] °Lima N, °Stilson E, **Sawyer TW**. Roadmap to a multispectral fluorescence imaging system for whole-organ tissue fluorescence and reflectance properties. Submitted May 2023, *Journal of Biomedical Optics*. [In Review]
- [4] °Bonaventura J, °Morara K, °Carlson R, Comrie C, °A, Hutchinson E, **Sawyer TW**. Evaluation of backscattering polarized light imaging capabilities for bulk microstructural mapping and comparing to tissue phantom candidates. Submitted May 2023, *Journal of Biomedical Optics*. [In Review]
- [3] °Noelle D, Duan S, Song H, °Lima N, Sontz R, Merchant JL, **Sawyer TW**. Wide field-of-view fluorescence imaging for organ-level lineage tracing of rare intestinal stem cell populations. Submitted May 2023, *Physics in Medicine and Biology*. [In Review]
- [2] Comrie CJ, °Carlson R, Ahsan Z, **Sawyer TW**, Serrano GE, Beach TG and Hutchinson EB. Microstructural MRI Markers of Alzheimer’s Disease Pathology in Post-Mortem Human Temporal Lobe. Submitted May 2023, *Hippocampus*. [In Review]

- [1] Duan S, Sheriff S, Elvis-Offiah U, **Sawyer TW**, Sundaresan S, Cierpicki T, Grembecka J, and Merchant JL. Clinical mutations in MEN1 alter its tumor-suppressive function through increased menin turnover. Submitted 2022 Dec 20, Cancer Research Communications. [In Review]

#### PENDING PATENT APPLICATIONS

- [4] °Lima N and **Sawyer TW**. Polarimetric Endoscope. US 23-201 (Filed May 12, 2023).
- [3] °Knapp T, Duan S, and **Sawyer TW**. Method for label-free, non-destructive acquisition and spatial mapping of -omics data. US 63/483,473 (Filed February 6, 2023).
- [2] °Slomka B and **Sawyer TW**. Miniature Multispectral Fluorescence Imaging and Cell Collection Probe. Patent US 63/266,791 (Filed January 14, 2022).
- [1] °Bonaventura J, °Knapp T, Koshel J, and **Sawyer TW**. Self-Calibrating Spectrometer With Adjustable Spectral Resolution and Spectral Range. Patent US 63/243,038 Pending (Filed September 10 2021).

#### CONFERENCES & SCHOLARLY PRESENTATIONS (IN CURRENT RANK)

#### CONFERENCES († DENOTES INVITED PRESENTATIONS)

- [20] °Lima N, Alameri A, Banerjee B, Gavini H, **Sawyer TW**. Measuring the hyperspectral and auto-fluorescent signature of esophageal cancer for evaluating diagnostic optical imaging biomarkers using ex vivo clinical specimens. Digestive Disease Week (May 6, 2023).
- [19<sup>†</sup>] **Sawyer TW**, Spicer G, Mead S, di Pietro M, Sanduka A, °Kim T, Aitken M, Rice F, Banerjee B, Gavini H, Alameri A, Bohndiek S, and Barton J. Optical coherence elastography on clinical samples of gastric cancer shows promise for assessing alteration of mechanical properties with onset of disease. Photonics West (January 31, 2023).
- [18] Taylor-Williams M, Tao R, **Sawyer TW**, Waterhouse D, Yoon J, and Bohndiek S. Optimization of Multispectral Filter Arrays for Detection of Cancers in the Gastrointestinal Tract. Photonics West (January 30, 2023).
- [17] °Setiadi J, °Knapp T, °Bonaventura J, Duan S, Merchant JL, and **Sawyer TW**. Assessing Mueller Matrix polarization for tumor localization of human gastrinoma. Photonics West (January 29, 2023).
- [16] °Daigle N, °Knapp T, Duan S, Jones D, Azhdarinia A, Ghosh S, AghaAmiri S, Ikoma N, Estrella J, Schnermann M, Merchant JL, and **Sawyer TW**. Combined multiphoton microscopy and somatostatin receptor type 2 imaging of pancreatic neuroendocrine tumors. Photonics West (January 29, 2023).
- [15] °Bonaventura J, °Carlson R, °Morara K, Comrie C, Hutchinson E, and **Sawyer TW**. Reflectance full Mueller matrix polarimetry for microstructural validation of diffusion magnetic resonance imaging. Photonics West (January 28, 2023).
- [14] °Knapp T, Duan S, Merchant JL, and **Sawyer TW**. Spatial and spectral optimization of two-photon imaging data for optimal label-free texture-based tissue classification models. Photonics West (January 28, 2023).
- [13] Barton J, Rocha A, **Sawyer TW**, and Bohndiek S. Multiscale imaging for early cancer detection. Photonics West (January 28 2023).
- [12<sup>†</sup>] **Sawyer TW**. Advancing *in vivo* biomedical sensing using 3D functional and microstructural imaging modalities. Imaging and Applied Optics Congress. (July 11, 2022).
- [11] °Knapp T, Duan S, Merchant JL, and **Sawyer TW**. Characterizing the optical fingerprint of duodenal gastrinoma using quantitative multiphoton autofluorescence microscopy. Digestive Disease Week 2022 (May 22, 2022).
- [10] °Daigle N, Song H, Sontz R, Merchant JL, and **Sawyer TW**. Demonstrating whole-organ lineage tracing of fluorescent markers in intestinal stem cells using wide-field fluorescence imaging in a Zfp148CreERT2 mouse model. Digestive Disease Week (May 22, 2022).



- [9] °Carlson R, Comrie C, Bonaventura J, Hutchinson E, and **Sawyer TW**. Backscattering Mueller Matrix polarimetry shows promise for validation of diffusion MRI microstructural features in thick tissue specimens. ISMRM 2022 (May 9 2022).
- [8] Shir H, Montague J, Galvez D, **Sawyer TW**, Nfonsam V, and Barton JK. Analysis of Quantitative Second Harmonic Generation Measurements to Distinguish Colon Cancer. ASLMS Annual Meeting (May 9 2022).
- [7<sup>†</sup>] Duan S, Sontz R, Merchant JL, and **Sawyer TW**. Measuring variations in optical imaging markers in a glial cell-directed mouse model of human MEN1 syndrome. Photonics West. (January 24, 2022).
- [6] Williams C, **Sawyer TW**, and Bohndiek S. A biomedical multispectral image sensor. Photonics West (2022).
- [5] °Lima N and **Sawyer TW**. Design and validation of a multispectral fluorescence imaging system for characterizing whole organ tissue fluorescence and reflectance properties Photonics West (2022).
- [4] °Slomka B, Duan S, Sontz R, and **Sawyer TW**. Multi-band fluorescence imaging and cell collection device for in vivo tumor characterization and growth assessment in xenograft mouse models. Photonics West (2022).
- [3] °Bonaventura J, °Knapp T, Koshel J, and **Sawyer TW**. Smartphone spectroscopy for melanoma detection. Photonics West (2022).
- [2] Montague J, Shir H, **Sawyer TW**, and Barton J. Feasibility of non-imaging, random-sampling second harmonic generation measurements to distinguish colon cancer. Photonics West (2022).
- [1] °Knapp T, °Lima N, Duan S, Merchant JL, and **Sawyer TW**. Evaluation of tile artifact correction methods for multiphoton microscopy mosaics of whole-slide tissue sections. Photonics West (2022).

#### COLLOQUIA

- [2] **Sawyer TW**. Advancing cancer imaging and diagnosis through mathematical modeling, optimization, and analysis. Applied Mathematics Departmental Colloquium (September 23, 2022).
- [1] **Sawyer TW**. Identifying the Spectral Fingerprint of Disease: Using Optical Imaging to Shed Light on Cancer. University of Arizona College of Optical Sciences Colloquium. (October 14, 2021).

#### SEMINARS

- [10] **Sawyer TW**. Developing multi-scale optical imaging techniques for intraoperative guidance. Cancer Center CRT-CTOP Incubator Meeting (April 25, 2023).
- [9] **Sawyer TW**. Advancing cancer prevention and control using optical imaging: disease screening and surgical localization. Cancer Biology GIDP Seminar (March 27, 2023).
- [8] **Sawyer TW**. Advancing Cancer Diagnostics and Other Medical Imaging with Biomarker-Specific Multispectral Imaging Sensors. Electrical and Computer Engineering Departmental Seminar (January 17, 2023).
- [7] **Sawyer TW**. Developing methods for intraoperative localization of gastrointestinal neuroendocrine tumors using optical imaging. University of Arizona Cancer Prevention and Control Seminar. (October 19, 2022).
- [6] **Sawyer TW**. Developing methods for intraoperative localization of gastrointestinal neuroendocrine tumors using optical imaging. University of Arizona Gut Group Seminar. (September 27, 2022).

- [5] **Sawyer TW.** Advanced Optical Imaging Techniques for Endoscopic Cancer Surveillance. University of Arizona Gut Group Seminar (November 25, 2020).
- [4] **Sawyer TW.** Advancing toward early detection and intraoperative localization of gastrointestinal cancer using multiphoton and polarization imaging. University of Arizona College of Optical Sciences Industrial Affiliates Workshop. (October 26, 2021).
- [3] **Sawyer TW.** Advancing cancer diagnostics and other medical imaging with biomarker-specific sensing using multispectral imaging. University of Arizona Biomedical Engineering Seminar. (September 20, 2021).
- [2] **Sawyer TW.** Developing a focused biopsy approach for esophageal cancer using multispectral and polarization-sensitive imaging. University of Arizona Cancer Center GI SPORE Retreat. (September 18, 2021).
- [1] **Sawyer TW.** Effective scientific communication. University of Arizona Cancer Center, Cancer Research Present and Future Conference. (August 4, 2021).

**AWARDED  
GRANTS AND  
CONTRACTS (IN  
CURRENT RANK)**

**ACTIVE**

**Title: Neuroendocrine tumor surgical localization**

Agency / Funder: Flinn Foundation

Mechanism: Seed Grant to Promote Translational Research (23-06545)

Role: PI

Project Period: Jun 2023 - Dec 2024

Percent Effort: 0% Annually

Funding: \$100,000 (My group and total)

**Title: Development of advanced stomach cancer screening technologies using optical coherence tomography and hyperspectral imaging**

Agency / Funder: University of Arizona (Internal)

Mechanism: International Research Grant

Role: PI (No other investigators)

Project Period: Jan 2023 - Dec 2023

Percent Effort: 0% Annually

Funding: \$50,000 (My group and total)

**Title: Reducing disparities in esophageal cancer screening for Mexican-Hispanic patients with targeted multispectral and polarization-sensitive imaging**

Agency / Funder: Department of Defense Peer Reviewed Cancer Research Program

Mechanism: Career Development Award (W81XWH2210211)

Role: PI (No other investigators)

Project Period: Jul 2022 - Jun 2025

Percent Effort: 25% Annually

Funding: \$594,014 (My group and total)

**COMPLETED**

**Title: Combined multiphoton imaging and labeled fluorescence for pancreatic neuroendocrine tumor localization**

Agency / Funder: University of Arizona (Internal)

Mechanism: Core Facilities Pilot Program

Role: PI (Co-Is: J. Merchant, UA, S. Duan, UA)

Project Period: May 2022 - May 2023

Percent Effort: 0% Annually

Funding: \$8,000 (My group and total)

**Title: Polarization-sensitive optical coherence tomography for tissue analysis and material assessment**

Agency / Funder: University of Arizona (Internal)  
Mechanism: Equipment Enhancement Fund  
Role: PI (No other investigators)  
Project Period: Dec 2021 - Jun 2022  
Percent Effort: 0%  
Funding: \$125,952 (My group and total)

**Title: Radiometric analysis and optical design for advanced camera systems**

Agency / Funder: Alphacore Inc.  
Mechanism: Industry Direct Contract  
Role: PI (No other investigators)  
Project Period: Sep 2021 - Aug 2022  
Percent Effort: 0.375% Annually  
Funding: \$12,780 (My group and total)

**Title: Development of a murine xenograft model for gastrinoma and a multispectral imaging probe for *in vivo* monitoring of tumor development**

Agency / Funder: American Cancer Society  
Mechanism: Institutional Research Grant (IRG-18-161-40)  
Role: Project PI; (Primary PI: J. Sweasy, UA)  
Project Period: Aug 2021 - Jul 2022  
Percent Effort: 0% Annually  
Funding: \$30,000 (My group and total)

**Title: Multiphoton imaging of gastrinoma and correlation with molecular and genetic markers**

Agency / Funder: University of Arizona (Internal)  
Mechanism: Core Facilities Pilot Program  
Role: PI (Co-Is: J. Merchant, UA, S. Duan, UA)  
Project Period: May 2021 - May 2022  
Percent Effort: 0% Annually  
Funding: \$8,875 (My group and total)

**Title: Compact on-chip single-shot hyperspectral focal plane array with dynamically tunable metalenses and spectral selection**

Agency / Funder: Department of Defense (Navy)  
Mechanism: SBIR Phase I (N211-007-1843)  
Role: PI, Subcontract (Primary PI: E. Salcin, Alphacore Inc.)  
Project Period: Jun 2021 - Dec 2021  
Percent Effort: 0.11% Annually  
Funding: \$28,761 (My group and total)

**Title: Development of smartphone spectrometer and app for point-of-care diagnosis and screening of melanoma**

Agency / Funder: Tech Launch Arizona (Internal)  
Mechanism: Impact Challenge  
Role: PI (No other investigators)  
Project Period: May 2021 - Dec 2021  
Percent Effort: 0%  
Funding: \$36,435 (My group and total)

**FELLOWSHIP STUDENT FUNDING**

**National Science Foundation Graduate Research Fellowship Program**

Agency / Funder: National Science Foundation  
Awarded to: Noelle Daigle (Optical Sciences)  
Role: Mentor

Aug 2023 - May 2028

**Cancer Engineering Fellowship**

Agency / Funder: University of Arizona Cancer Center (Internal)

Awarded to: Natzem Lima, PhD Candidate (Optical Sciences)

Role: Mentor

Jan 2022 - Dec 2023

**Computational and Mathematical Modeling of Biological Systems Training Grant**

Agency / Funder: NIH T32 (GM132008; PI: T. Secomb)

Awarded to: Justnia Bonaventura, PhD Student (Optical Sciences)

Awarded to: Thomas Knapp, PhD Candidate (Biomedical Engineering)

Role: Mentor

Jun 2023 - Present

Jun 2021 - Jun 2023

**SUBMITTED  
GRANTS AND  
CONTRACTS (IN  
CURRENT RANK)****PENDING****Title: Flexible Multimodal Imaging Endoscope - Spectral and Polarimetric Imaging**

Agency / Funder: NIH F31-Diversity

Role: Sponsor (PI: N. Lima)

Percent Effort: 0% Annually

Funding: \$88,084 (my group) of \$88,084 total

Submitted Apr 2023

**Title: Multimodal Laparoscope for Enhancing Surgical Localization and Margin Analysis of Pancreatic Neuroendocrine Tumors**

Agency / Funder: NIH R01

Role: PI

Percent Effort: 10% Annually

Funding: \$1,184,668 (my group) of \$2,345,015 total

Submitted Mar 2023

**Title: Joint Estimation Diffusion Imaging (JEDI) for Improved Tissue Characterization and Neural Connectivity in Aging and Alzheimer's Disease**

Agency / Funder: NIH R01 (scored in 9th percentile)

Role: Co-I (PI: L. Frank, UCSD)

Percent Effort: 6.25% Annually

Funding: \$146,396 (my group) of \$2,022,910 total

Submitted Jun 2022

**TEACHING****UNIVERSITY COURSES****OPTI 202R: Geometrical Optics and Instrumentation II**, Instructor

Spring 2023

**OPTI 502: Geometrical Optics and Instrumentation**, Co-Instructor (50%)

Fall 2022

**HSD 392/492/592: Optical Imaging to Advance Healthcare**, Instructor

Fall 2022

**HSD 410/510: Design of Devices for the Health Sciences**, Instructor

Fall 2022

**HSD 410/510: Design of Devices for the Health Sciences**, Instructor

Spring 2022

**GUEST LECTURES****SLHS 649: Survival Skills and Ethics**, Guest lecturer

Spring 2022

**SLHS 649: Survival Skills and Ethics**, Guest lecturer

Spring 2019

**GRAD 695: University Fellows Colloquium**, Guest lecturer

Spring 2019

**OTHER TEACHING EXPERIENCE****SLHS 649: Survival Skills and Ethics**, Co-instructor

Spring 2021

**OPTI 306: Radiometry, Sources and Detectors**, 0.25 FTE TA

Fall 2019

**Science Communication: Effective Presentations Digital Module**, Co-instructor

Spring 2019

**MSE 350: Numerical Methods in Science and Engineering**, 0.25 FTE TA

Spring 2014

**STUDENT  
MENTORSHIP****UNDERGRADUATE SUPERVISION****Mackenna Kropatsch**, Optical Sciences & Engineering

May 2023 - Present

**AnneLeigh Twer**, Molecular & Cellular Biology

Jan 2023 - Present

**Eliana Stilson**, Optical Sciences & Engineering

Aug 2022 - Present

<b>Sophia Ippolito</b> , Optical Sciences & Engineering	Aug 2022 - May 2023
<b>Julianne Setiadi</b> , Biomedical Engineering	Aug 2021 - May 2023
<b>Rhea Carlson</b> , Biomedical Engineering	Aug 2021 - May 2023
<b>Kellys Morara</b> , Biomedical Engineering	Aug 2021 - May 2023
<b>David Mazi</b> , Electrical & Computer Engineering	May 2021 - May 2022

**GRADUATE SUPERVISION**

<b>Yuanxin Guan</b> , Optical Sciences PhD Supervisor	May 2023 - Present
<b>Paige Sawyers</b> , Optical Sciences PhD Supervisor	May 2023 - Present
<b>Tae Hyeong Kim</b> , Electrical & Computer Engineering MS Thesis Advisor	Aug 2022 - Present
<b>Noelle Daigle</b> , Optical Sciences PhD Supervisor	Aug 2021 - Present
<b>Justina Bonaventura</b> , Optical Sciences PhD Supervisor	Aug 2021 - Present
<b>Natzem Lima</b> , Optical Sciences PhD Supervisor	Aug 2021 - Present
<b>Thomas Knapp</b> , Biomedical Engineering PhD Supervisor	Aug 2021 - Present
<b>Bridget Slomka</b> , Biomedical Engineering MS Thesis Advisor	Aug 2021 - May 2022

**COMPREHENSIVE EXAM COMMITTEES**

<b>Sanja Dmitrovic</b> , Optical Sciences (Chair)	2023
<b>Laura Sawyer</b> , Optical Sciences	2023
<b>Justina Bonaventura</b> , Optical Sciences (Advisor)	2023
<b>Andrew Rocha</b> , Optical Sciences	Mar 2023
<b>Natzem Lima</b> , Optical Sciences (Advisor)	Nov 2022
<b>Thomas Knapp</b> , Biomedical Engineering (Advisor)	Aug 2022

**MS THESIS COMMITTEES**

<b>Rafael Romero</b> , Biomedical Engineering	May 2023
<b>Makenna Aitken</b> , Biomedical Engineering	May 2023
<b>Alexander Samoy Alvarado</b> , Biomedical Engineering	Dec 2022
<b>Bridget Slomka</b> , Biomedical Engineering (Chair)	May 2022

**DOCTORAL DISSERTATION COMMITTEES**

<b>Ted Lee</b> , Optical Sciences	Jul 2023
<b>Eric Reichel</b> , Optical Sciences	May 2023
<b>Maryam Tanbal</b> , Optical Sciences	Nov 2022
<b>Elliot Kwan</b> , Optical Sciences	Nov 2022
<b>Jeremy Katz</b> , Optical Sciences	May 2022

**COLLABORATORS**

**Juanita Merchant, MD, PhD**, University of Arizona College of Medicine  
**Suzann Duan, PhD**, University of Arizona College of Medicine  
**Elizabeth Hutchinson, PhD**, University of Arizona Biomedical Engineering  
**Jennifer Barton, PhD**, University of Arizona Biomedical Engineering  
**Baskhar Banerjee, MD**, University of Arizona College of Medicine  
**Hemanth Gavini, MD**, University of Arizona College of Medicine  
**Alba Alfonso-Garcia, PhD**, University of California Davis  
**Sarah Bohndiek, PhD**, University of Cambridge  
**George Gordon, PhD**, University of Nottingham  
**Abigail Wilson, PhD**, University College London  
**Ali Azhdarinia PhD**, University of Texas Health Sciences Center at Houston  
**Naruhiko Ikoma, MD**, MD Anderson  
**Po Hien-Ear, PhD**, University of Iowa

## REFERENCES

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