

[Daniel S. Gareau, Ph.D., M.C.R.](#)

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**EDUCATION**

7/11-6/14 [Masters in Clinical & Translational Research,](#)  
[The Rockefeller University,](#) New York, New York  
1/00-12/06 Ph.D., [Oregon Health & Science University,](#) Portland, Oregon  
Thesis: "[In Vivo confocal microscopy in turbid media](#)" under  
[Steven J. Jacques](#)  
1/00-6/02 M.S., Electrical Engineering,  
[Oregon Graduate Institute of Science and Technology,](#)  
Beaverton, Oregon  
9/95-12/99 B.S., [Electrical Engineering,](#) [University of Vermont,](#)  
Burlington, Vermont

**POSTDOCTORAL TRAINING**

3/05-2/08 Postdoctoral Fellow under [Milind Rajadhyaksha,](#)  
[Memorial Sloan Kettering Cancer Center Dermatology Service,](#)  
New York, New York

**CADEMIC APPOINTMENTS**

1998-1999 Fiber Optic Technician. University of Vermont. Burlington, VT  
1999-2000 Lab. Teaching Assistant. University of Vermont. Burlington, VT  
2000-2002 Research Assistant. Oregon Medical Laser Center. Portland, OR  
2002-2005 PhD Student, Oregon Health & Science University. Portland, OR  
2005-2008 Postdoc. Research Assistant. Sloan Kettering Cancer Center, New York, NY  
2008-2011 Postdoctoral Fellow. Oregon Health & Science University. Portland, OR  
2011-present Instructor in Clinical Investigation, The Rockefeller University, New York, NY

**EXPERTISE AREAS:** Medical Imaging, Image Processing, Biomedical Optics, Numerical Modeling

**COMPUTER LANGUAGES:** Matlab, C++, Zemax, LabView, LaTeX, Xcode (for App coding)

**HONORS, AWARDS AND INVITED LECTURES**

2005	Student <b>Leadership</b> Award, Oregon Health & Science University
2005	Student <b>Achievement</b> Award, OGI School of Science and Engineering
2009	Cover of the British Journal of Dermatology <a href="#">Volume 160(6)</a>
2010	Postdoctoral Outstanding Paper of the Year Award, Oregon Health & Science University
2010	Research Innovation Award, Oregon Clinical & Translational Research Institute
2010	Cover of the Journal of Biomedical Optics <a href="#">Volume 15(6)</a>
2010	Invited Lecture <a href="#">INAOE</a>
2011	“Optics Superhero” <a href="#">award</a> by Edmund Optics
2012	<a href="#">Technology Innovation Award</a> , Oregon Health & Science University
2012	BiOS conference Section Chair: “Digital Pathology” at Photonics West, San Francisco, CA
2012	Clinical Directors Network <a href="#">invited lecture</a>
2013	Invited Lecture <a href="#">INAOE</a>
2014	NIH Common Fund <a href="#">Video Contest Runner Up</a> , 2014
2014	Sanders Award for Entrepreneurial Excellence, 2014
2014	<a href="#">TED speaker</a>
2015	<a href="#">Invited Lecture</a> , Translational Sciences Meeting
2016	<a href="#">SPIE Invited Speaker</a>
2017	<a href="#">ICORPS Training Completion</a>
2018	Featured in <a href="#">Rockefeller University Video</a>

**PATENTS**

[US 8,971,1609](#) “Automated Detection of Melanoma” (11)  
[US 20110116694](#) “Rapid Confocal Microscopy To Support Surgical Procedures” (16, 17)  
[US-20120219205](#) “Software for automatic noninvasive assessment of skin keratinocytes” (15)  
[US-2014051053](#) “System And Method For Optical Detection Of Skin Disease” (18)  
[US-20130079607](#) “Optical Fiber Spectroscopy Device for Noninvasively Measuring Chromophores in Biological Tissue” (13)  
[US15/503,608](#) [WO2016/025751](#) “Line-Scanning, Sample-Scanning, Multimodal Confocal Microscope” (23)

**HISTORY**

My early work showed for the first time identification of single pagetoid melanoma cells in a mouse model.<sup>[2]</sup> I then introduced automated computer-identification of the same phenotype in humans.<sup>[12]</sup> and automatically localized normal epidermal keratinocyte nuclei in the honeycomb-like matrix.<sup>[16]</sup> I pioneered a novel confocal pupil configuration<sup>[10]</sup> and began human subjects studies in my postdoctoral work, mapping tumor margins for staged cancer excisions of non-melanoma skin cancer.<sup>[4-9, 17-18]</sup>

Since 2011, as part of The [Rockefeller University Center for Clinical and Translational Sciences](#), I serve as director of the Biophotonics Unit for Investigative Dermatology. This background provides the context for the overall academic goal: complete micro-anatomical model of the skin organ as imaged non-destructively. I investigate biomedical diagnostic [imaging biomarkers](#), leading a [multicenter research study](#) under Abbreviated Investigational Device Exemption from the US FDA.



“My academic goal is complete micro-anatomical model of the skin organ as imaged non-destructively,”

\* Research exploits lasers and light in therapeutics and diagnostics.

\* Rooted in optics but includes biochemistry, data science and mechanical, electrical and software engineering, my multidisciplinary work develops noninvasive clinical diagnostic imaging. I detect and analyze pathology to develop diagnostics for cancer screening on the organ, cellular and protein-levels. I have [mentored](#) for >30 students from 2004 to the present.



**ENGINEERING & TRANSLATIONAL RESEARCH** As an NIH program director of a U18 cooperative agreement, I lead a team that investigates the use of imaging biomarkers in 3D printed synthetic skin organoids. This project implements a high-throughput confocal microscope I recently invented (23) to image as part of a novel in vitro therapeutics assay.

**ENTREPRENEURSHIP** As Founder and CEO of SurgiVance Inc. I am fully responsible for a promising startup company. Details can be found at <http://SurgiVance.com> with the user: SVguest and Password: PathStat!

## HOBBIES/HOME LIFE

I am a devoted husband and father of two, who enjoys making science-themed music with associated [YouTube channel](#) (>40K views) and [“Sound Science” Facebook Page](#) (>1K likes).

**SOCIETY INVOLVEMENT & EDETIROAL DUTIES**

- Member: [SPIE](#), the International Society for Optics and Photonics
- Member: [Society for Investigative Dermatology](#)
- Member: [Optical Society of America](#)
- Reviewer for Journals:
  - [Journal of Biomedical Optics](#)
  - [Optics Letters](#)
  - [Experimental Dermatology](#)

**ONGOING RESEARCH SUPPORT****U18 TR002312** NIH/NCATS

10/01/2017-09/30/2019

Title: Non-destructive, high throughput cytometry for drug discovery using trimodal confocal images of novel, 3D printed skin carcinoma construct

Goal: To develop imaging biomarkers to evaluate cellular responses to therapeutics.

Amount: \$800,000

Role: Program Director

**1R01CA193390-01** NIH/NCI

05/08/15 - 04/30/2018

Title: Clinical

translation of video assisted micrographic surgery for cancer resection

Goal: To develop, refine, and validate a trimodal confocal imaging device that will provide sensitive and specific diagnosis of surgical margins immediately following cancer resection.

Sub-Contract Amount: \$365,261

Role: PI for Sub-Contract

**Clinical Trial Support Grant**

8/1/15 - 3/31/2019

Paul and Irma Milstein Family Foundation and the American Skin Association

Equipment and monitoring to support for the hyperspectral dermatoscope multi-center clinical trial.

Award Amount: \$350,000

Role: PI

**CTSA Award (Center for Clinical and Translational Science)**

10/10/2017-10/9/2018

RUCCTS Pilot Award

Title: A Pilot Study In Augmented Mobile Phone Technology For Dermatology

The goal of this project is to develop dermatology mobile applications for skin disease diagnosis

Award Amount: \$25,000

Role: PI

**COMPLETED RESEARCH SUPPORT****Robertson Therapeutic Development Fund**

9/1/2016-8/31/2017

Equipment and Salary support

The goal of this project is to build a mobile phone hyperspectral imager for melanoma detection.

Award Amount: \$65,000

Role: PI

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**Robertson Therapeutic Development Fund**

9/1/2014-8/31/2015

Equipment and Salary support

The goal of this project is to build a video-assisted micrographic surgery device and method.

Award Amount: \$150,000

Role: PI

**The Howard and Anna Milstein Foundation**

4/1/12-3/31/2015

Title: Equipment Grant

Optical imaging equipment grant to develop melanoma detection technologies

The goal of this project award is to establish a basic optics laboratory to service various projects.

Award Amount: \$200,000 (Optics Projects Equipment Support as part of larger Krueger PI support)

Role: PI (on optics projects)

**2UL1RR024143-06 (PI: Coller, Barry)**

4/1/11-3/31/2014

NIH/NCRR

Career Development award from the Rockefeller University Center for Clinical and Translational Science

Title: Spectral and Confocal Imaging for Early Melanoma Detection

The goal of this project is to develop novel optical techniques such as Raman spectroscopy and confocal microscopy for the characterization of the onset and progression of skin cancer.

Role: Clinical Instructor, 3 years salary support for Dr. Gareau's clinical scholar/instructor position

**CTSA Award (Center for Clinical and Translational Science)**

10/1/2011-9/30/2012

RUCCTS Pilot Award

Title: The Melanoma Advanced Imaging Dermatoscope

The goal of this project is to develop a multispectral skin imager with automatic pathology software that evaluates the degree of clinical dysplasia in pigmented lesions

Award Amount: \$25,000 [Equipment Support]

Role: PI

**CTSA Award (Center for Clinical and Translational Science)**

10/1/2011-9/30/2012

RUCCTS Pilot Award

Title: Noninvasive Bedside Confocal Video-Microscopy for Automated Melanoma Pathology

The goal of this project is to develop line-scanning confocal microscopy for whole-lesion, rapid cellular 3D image scanning of pigmented lesions.

Award Amount: \$12,500 [Equipment Support]

Role: PI

**Higher Education Grant**

10/1/2011-10/1/2012

Edmund Optics Inc.

"Biophotonics in Life Sciences"

Percent effort and role on project: 5%; Principal Investigator

Role: PI, general projects in biomedical optics.

Award Amount: \$7,500 [Equipment Support]

Role: PI

**Medical Research Foundation of Oregon**

9/1/2010 – 8/30/2011

"Optical fiber probe spectroscopy for monitoring tissue hemodynamics"

The goal of this Early Clinical Investigator Award is to predict postoperative failure of surgically modified

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tissues. Dr. Gareau served as principal investigator.

Award Amount: \$20,000 [Equipment Support]

Role: PI

**5 T32 CA106195 Kulesz-Martin (PI)**

5/1/2009-4/30/2011

NIH/NCI

"Training in Molecular Basis of Skin/Mucosa Pathobiology"

Project: Confocal Microscopy for Cancer Imaging, this was a competitive post-doctoral fellowship

Role: Postdoctoral trainee

**R01 EB006947 Rajadhyaksha (PI)**

8/1/2007-7/31/2010

"Confocal line-scanning versus point-scanning for imaging human skin *in vivo*"

Percent effort and role on project: 100%; Post-doc. The goal of this project is to develop line-scanning confocal microscopy as a rapid & simple alternative to the point scanning confocal configuration. Dr. Gareau developed the full-pupil optical design for line-scanning.

1. Gareau D. S., Bargo P. R., Horton W. A., Jacques S. L. Confocal fluorescence spectroscopy of subcutaneous cartilage expressing green fluorescent protein versus cutaneous collagen autofluorescence. *J Biomed Opt.* 2004;9(2):254-8. doi: 10.1117/1.1645798. PubMed PMID: 15065888.
2. Gareau D. S., Lagowski J., Rossi V. M., Viator J. A., Merlino G., Kulesz-Martin M., Jacques S. L. Imaging melanoma in a murine model using reflectance-mode confocal scanning laser microscopy and polarized light imaging. *J Investig Dermatol Symp Proc.* 2005;10(2):164-9. doi: 10.1111/j.1087-0024.2005.200408.x. PubMed PMID: 16363066.
3. Gareau D. S., Merlino G., Corless C., Kulesz-Martin M., Jacques S. L. Noninvasive imaging of melanoma with reflectance mode confocal scanning laser microscopy in a murine model. *J Invest Dermatol.* 2007;127(9):2184-90. doi: 10.1038/sj.jid.5700829. PubMed PMID: 17460734.
4. Gareau D. S., Li Y., Huang B., Eastman Z., Nehal K. S., Rajadhyaksha M. Confocal mosaicing microscopy in Mohs skin excisions: feasibility of rapid surgical pathology. *J Biomed Opt.* 2008;13(5):054001. doi: 10.1117/1.2981828. PubMed PMID: 19021381; PubMed Central PMCID: PMCPMC2662759.
5. Pan Y., Gareau D. S., Scope A., Rajadhyaksha M., Mullani N. A., Marghoob A. A. Polarized and nonpolarized dermoscopy: the explanation for the observed differences. *Arch Dermatol.* 2008;144(6):828-9. doi: 10.1001/archderm.144.6.828. PubMed PMID: 18559791.
6. Nehal K. S., Gareau D., Rajadhyaksha M. Skin imaging with reflectance confocal microscopy. *Semin Cutan Med Surg.* 2008;27(1):37-43. doi: 10.1016/j.sder.2008.01.006. PubMed PMID: 18486023.
7. Gareau D. S., Patel Y. G., Li Y., Aranda I., Halpern A. C., Nehal K. S., Rajadhyaksha M. Confocal mosaicing microscopy in skin excisions: a demonstration of rapid surgical pathology. *J Microsc.* 2009;233(1):149-59. doi: 10.1111/j.1365-2818.2008.03105.x. PubMed PMID: 19196421; PubMed Central PMCID: PMCPMC2662487.
8. Gareau D. S., Karen J. K., Dusza S. W., Tudisco M., Nehal K. S., Rajadhyaksha M. Sensitivity and specificity for detecting basal cell carcinomas in Mohs excisions with confocal fluorescence mosaicing microscopy. *J Biomed Opt.* 2009;14(3):034012. doi: 10.1117/1.3130331. PubMed PMID: 19566305; PubMed Central PMCID: PMCPMC2705883.
9. Karen J. K., Gareau D. S., Dusza S. W., Tudisco M., Rajadhyaksha M., Nehal K. S. Detection of basal cell carcinomas in Mohs excisions with fluorescence confocal mosaicing microscopy. *Br J Dermatol.* 2009;160(6):1242-50. doi: 10.1111/j.1365-2133.2009.09141.x. PubMed PMID: 19416248; PubMed Central PMCID: PMCPMC2693082.
10. Scope A., Mahmood U., Gareau D. S., Kenkre M., Lieb J. A., Nehal K. S., Rajadhyaksha M. In vivo reflectance confocal microscopy of shave biopsy wounds: feasibility of intraoperative mapping of cancer margins. *Br J Dermatol.* 2010;163(6):1218-28. doi: 10.1111/j.1365-2133.2010.10063.x. PubMed PMID:

20874785; PubMed Central PMCID: PMCPMC2988110.

11. Gareau D., Hennessy R., Wan E., Pellacani G., Jacques S. L. Automated detection of malignant features in confocal microscopy on superficial spreading melanoma versus nevi. *J Biomed Opt.* 2010;15(6):061713. doi: 10.1117/1.3524301. PubMed PMID: 21198161; PubMed Central PMCID: PMCPMC3036174.

12. Gareau D. S., Truffer F., Perry K. A., Pham T. H., Enestvedt C. K., Dolan J. P., Hunter J. G., Jacques S. L. Optical fiber probe spectroscopy for laparoscopic monitoring of tissue oxygenation during esophagectomies. *J Biomed Opt.* 2010;15(6):061712. doi: 10.1117/1.3512149. PubMed PMID: 21198160; PubMed Central PMCID: PMCPMC3000858.

13. Pham T. H., Perry K. A., Enestvedt C. K., Gareau D., Dolan J. P., Sheppard B. C., Jacques S. L., Hunter J. G. Decreased conduit perfusion measured by spectroscopy is associated with anastomotic complications. *Ann Thorac Surg.* 2011;91(2):380-5. doi: 10.1016/j.athoracsur.2010.10.006. PubMed PMID: 21256274.

14. Qin J., Jiang J., An L., Gareau D., Wang R. K. In vivo volumetric imaging of microcirculation within human skin under psoriatic conditions using optical microangiography. *Lasers Surg Med.* 2011;43(2):122-9. doi: 10.1002/lsm.20977. PubMed PMID: 21384393; PubMed Central PMCID: PMCPMC3058589.

15. Gareau D. Automated identification of epidermal keratinocytes in reflectance confocal microscopy. *J Biomed Opt.* 2011;16(3):030502. doi: 10.1117/1.3552639. PubMed PMID: 21456857; PubMed Central PMCID: PMCPMC3077366.

16. Gareau D., Bar A., Snaveley N., Lee K., Chen N., Swanson N., Simpson E., Jacques S. Tri-modal confocal mosaics detect residual invasive squamous cell carcinoma in Mohs surgical excisions. *J Biomed Opt.* 2012;17(6):066018. doi: 10.1117/1.JBO.17.6.066018. PubMed PMID: 22734774; PubMed Central PMCID: PMCPMC3381035.

17. Gareau D. S., Jeon H., Nehal K. S., Rajadhyaksha M. Rapid screening of cancer margins in tissue with multimodal confocal microscopy. *J Surg Res.* 2012;178(2):533-8. doi: 10.1016/j.jss.2012.05.059. PubMed PMID: 22721570; PubMed Central PMCID: PMCPMC3458153.

18. Gareau D. S., Correa da Rosa J., Yagerman S., Carucci J. A., Gulati N., Hueto F., DeFazio J. L., Suarez-Farinas M., Marghoob A., Krueger J. G. Digital Imaging Biomarkers Feed Machine Learning For Melanoma Screening. *Exp Dermatol.* 2016. doi: 10.1111/exd.13250. PubMed PMID: 27783441.

19. Leachman S. A., Cassidy P. B., Chen S. C., Curiel C., Geller A., Gareau D., Pellacani G., Grichnik J. M., Malvey J., North J., Jacques S. L., Petrie T., Puig S., Swetter S. M., Tofte S., Weinstock M. A. Methods of Melanoma Detection. *Cancer Treat Res.* 2016;167:51-105. doi: 10.1007/978-3-319-22539-5\_3. PubMed PMID: 26601859.

20. Mu E. W., Lewin J. M., Stevenson M. L., Meehan S. A., Carucci J. A., Gareau D. S. Use of Digitally Stained Multimodal Confocal Mosaic Images to Screen for Nonmelanoma Skin Cancer. *JAMA Dermatol.* 2016;152(12):1335-41. doi: 10.1001/jamadermatol.2016.2997. PubMed PMID: 27603676.

21. Haka A. S., Sue E., Zhang C., Bhardwaj P., Sterling J., Carpenter C., Leonard M., Manzoor M., Walker J., Aleman J. O., Gareau D., Holt P. R., Breslow J. L., Zhou X. K., Giri D., Morrow M., Iyengar N., Barman I., Hudis C. A., Dannenberg A. J. Noninvasive Detection of Inflammatory Changes in White Adipose Tissue by Label-Free Raman Spectroscopy. *Anal Chem.* 2016;88(4):2140-8. doi: 10.1021/acs.analchem.5b03696. PubMed PMID: 26752499; PubMed Central PMCID: PMCPMC4799653.

22. Harden J. L., Lewis S. M., Lish S. R., Suarez-Farinas M., Gareau D., Lentini T., Johnson-Huang L. M., Krueger J. G., Lowes M. A. The tryptophan metabolism enzyme L-kynureninase is a novel inflammatory factor in psoriasis and other inflammatory diseases. *J Allergy Clin Immunol.* 2016;137(6):1830-40. doi: 10.1016/j.jaci.2015.09.055. PubMed PMID: 26725996; PubMed Central PMCID: PMCPMC4899291.

23. Gareau D. S., Krueger J. G., Hawkes J. E., Lish S. R., Dietz M. P., Mulberger A. G., Mu E. W., Stevenson M. L., Lewin J. M., Meehan S. A., Carucci J. A. Line scanning, stage scanning confocal microscope (LSSSCM). *Biomed Opt Express.* 2017;8(8):3807-15. doi: 10.1364/BOE.8.003807. PubMed PMID: 28856051; PubMed Central PMCID: PMCPMC5560842.

