SANTOSH KUMAR PAIDI

Technical Development Principal Scientist, Genentech, a Member of the Roche Group
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EDUCATION

Johns Hopkins University, Baltimore, MD **Aug '20**

Ph.D. in Mechanical Engineering
Thesis: Molecular analysis of cancer progression with label-free Raman spectroscopy
Advisor: Prof. Ishan Barman
Topics: Biomedical optics, Raman spectroscopy, Machine learning, Cancer

Indian Institute of Technology Bombay, India **Apr '14**

B.Tech. in Mechanical Engineering
Minor in Aerospace Engineering

PROFESSIONAL EXPERIENCE

Genentech, Inc, South San Francisco, CA **Present**

Technical Development Principal Scientist

University of California, Berkeley, CA **Jan '23**

Postdoctoral Scholar
Advisors: Prof. Na Ji and Prof. Xiaohua Gong
Topics: Multiphoton flourescence microscopy, Adaptive optics, In vivo ocular imaging, Lens biology, Stimulated Raman scattering microscopy

Johns Hopkins University, Baltimore, MD **May '21**

Postdoctoral Fellow in Mechanical Engineering
Advisor: Prof. Ishan Barman
Topics: Quantitative phase microscopy, Raman microscopy, Deep learning, Cancer phenotyping

GRANTS

SLAS Graduate Education Fellowship Grant **Sep '18 - Sep '20**

Project Title: Ultrasensitive detection with plasmon-enhanced Raman spectroscopy: From circulating tumor DNA analysis to cell surface glycation imaging
Budget: $100,000 *(1 awarded annually)*

HONORS AND AWARDS

10. **Frederick Bettelheim Award** by National Foundation for Eye Research **'22**
9. **AACR Scholar-in-Training Award** by American Association for Cancer Research **'22**
8. **Barbara Stull Graduate Student Award** by Society of Applied Spectroscopy **'19**
7. **Coblentz Student Award** by the Coblentz Society **'18**

6. **SPIE Optics and Photonics Education Scholarship** by SPIE **'18**
5. **Tomas A. Hirschfeld Scholar Award** by FACSS **'17**
4. **Tony B. Academic Travel Award** by SLAS **'19** and **'18**
3. **Molecular Medicine Tri-Conference Student Fellowship** **'15**
2. **Whiting School Doctoral Fellowship** by JHU **'14**
1. **Undergraduate Research Award** by IIT Bombay **'13**

PUBLICATIONS AND PRE-PRINTS

Google Scholar metrics: 878 citations, h-index=16

First-authored Publications

26. **Paidi SK**, Zhang Q, Yang Y, Xia CH, Ji N, Gong X. "Adaptive optical two-photon fluorescence microscopy probes cellular organization of ocular lenses in vivo", **Investigative Ophthalmology and Visual Science**, 64(20), **2023**.
25. **Paidi SK**, Troncoso JR, Harper MG, Liu Z, Nguyen KG, Ravindranathan S, Rebello L, Lee DE, Ivers JD, Zaharoff DA, Rajaram N, Barman I. "Raman spectroscopy reveals phenotype switches in breast cancer metastasis", **Theranostics**, 12(12), 5351-63, **2022**. *(Journal back cover)*
24. **Paidi SK**, Troncoso JR, Raj P, Diaz PM, Ivers JD, Lee DE, Avaritt NL, Gies AJ, Quick CM, Byrum SD, Tackett AJ Rajaram N, Barman I. "Raman spectroscopy and machine learning reveals early tumor microenvironmental changes induced By immunotherapy", **Cancer Research**, 81(22), 5745–55, **2021**. *(See media section for related press coverage)*
23. **Paidi SK**, Shah V, Raj P, Glunde K, Pandey R, Barman I. "Coarse Raman and optical diffraction tomographic imaging enable label-free phenotyping of isogenic breast cancer cells of varying metastatic potential", **Biosensors and Bioelectronics**, 175, 112863, **2021**.
22. **Paidi SK**, Raj P, Bordett R, Zhang C, Karandikar SH, Pandey R, Barman I. "Raman and quantitative phase imaging allow morpho-molecular recognition of malignancy and stages of B-cell acute lymphoblastic leukemia", **Biosensors and Bioelectronics**, 190, 113403 **2021**.
21. **Paidi SK**, Diaz PM, Dadgar S, Jenkins SV, Quick CM, Griffin RJ, Dings RPM, Rajaram N, Barman I. "Label-free Raman spectroscopy reveals tumor microenvironmental signatures of radiation resistance", **Cancer Research**, 79(8), 2054-64, **2019**. *(See media section for press coverage)*
20. **Paidi SK**, Rizwan A, Zheng C, Cheng M, Glunde K, Barman I. "Label-free Raman spectroscopy detects stromal adaptations in pre-metastatic lungs primed by breast cancer", **Cancer Research**, 77(2), 247-56, **2017**.
19. **Paidi SK**, Siddhanta S, Strouse R, McGivney JB, Larkin C, Barman I."Rapid identification of biotherapeutics with label-free Raman spectroscopy", **Analytical Chemistry**, 88(8), 4361-8, **2016**.
18. **Paidi SK**, Bhavaraju A, Akram M, Kumar S. "Effect of N_2/CO_2 dilution on laminar burning velocity of H_2-Air mixtures at high temperatures", **International Journal of Hydrogen Energy**, 38(31), 13812-21, **2013**.

Book Chapters and Reviews

17. Tanwar S, **Paidi SK**, Prasad R, Pandey R, Barman I. "Advancing Raman Spectroscopy from Research to Clinic: Translational Potential and Challenges", **Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy**, 260, 1199572, **2021**.

16. **Paidi SK**, Pandey R, Barman I. "Chapter 18 - Emerging trends in biomedical imaging and disease diagnosis using Raman spectroscopy", **Molecular and Laser Spectroscopy Volume 2**, 623-52, **2020**.

15. **Paidi SK**, Pandey R, Barman I. "Medical applications of Raman spectroscopy", **Encyclopedia of Analytical Chemistry**, 1-21, **2020**.

14. Pandey R, **Paidi SK**, Valdez TA, Zhang C, Spegazzini N, Dasari RR, Barman I. "Noninvasive monitoring of blood glucose with Raman spectroscopy", **Accounts of Chemical Research**, 50(2), 264-72, **2017**.

Co-authored Publications

13. Zhang Q, Yang Y, Cao KJ, Chen W, **Paidi SK**, Xia CH, Kramer RH, Gong X, Ji N. "Retinal microvascular and neuronal pathologies probed in vivo by adaptive optical two-photon fluorescence microscopy", **eLife**, 12:e84853, **2023**.

12. Ahmed I, Ma V, Liu Y, Khan MS, Liu Z, Zhang C, **Paidi SK**, Manno FAM, Amjad N, Manno SHC, Ahmed R, Law, AWL, Ali A, Raza F, Zhang Y, Cho WCS, Barman I, Alda M, Bergink V, Lau C. "Lithium from breast-milk inhibits thyroid iodine uptake and hormone production, which are remedied by maternal iodine supplementation", **Bipolar Disorders**, 23(6), 615–25, **2021**.

11. Ahmed I, Khan MS, **Paidi SK**, Liu Z, Zhang C, Liu Y, Baloch GA, Law AWL, Zhang Y, Barman I, Lau C, "Laser induced breakdown spectroscopy with machine learning reveals lithium-induced electrolyte imbalance in the kidneys", **Journal of Pharmaceutical and Biomedical Analysis** 194, 113805, **2021**.

10. Ayyappan V, Chang A, Zhang C, **Paidi SK**, Bordett R, Liang T, Barman B, Pandey R. "Identification and staging of B-cell acute lymphoblastic leukemia using quantitative phase imaging and machine learning", **ACS Sensors**, 5(10), 3281–89, **2020**.

9. Ming Li, Lin H, **Paidi SK**, Mesyngier N, Preheim S, Barman I. "A fluorescent and surface-enhanced Raman spectroscopic dual-modal aptasensor for sensitive detection of cyanotoxins", **ACS Sensors**, 5(5), 1419-26, **2020**.

8. Xu W, **Paidi SK**, Qin Z, Huang Q, Yu CH, Pagaduan J, Buehler MJ, Barman I, Gracias DH. "Self-folding hybrid graphene skin for 3D biosensing", **Nano Letters**, 19(3), 1409-17, **2019**.

7. Li M, **Paidi SK**, Sakowski E, Preheim S, Barman I. "Ultrasensitive detection of hepatotoxic microcystin production from cyanobacteria Using surface-enhanced Raman scattering (SERS) immunosensor", **ACS Sensors**, 4(5), 1203-10, **2019**.

6. Rizwan A, **Paidi SK**, Zheng C, Cheng M, Fan Z, Barman I, Glunde K. "Mapping the genetic basis of breast microcalcifications and their role in metastasis", **Scientific Reports**, 8:11067, **2018**.

5. Siddhanta S, **Paidi SK**, Bushley K, Prasad R, Barman I. "Exploring morphological and biochemical linkages in fungal growth with label-free light sheet microscopy and Raman spectroscopy", **ChemPhysChem**, 18(1), 72-8, **2017**. *(Journal back cover)*

4. Jin Q, Li M, Polat B, **Paidi SK**, Dai A, Zhang A, Padaguan J, Barman I, Gracias DH. "Mechanical trap surface enhanced Raman spectroscopy (MTSERS) for 3D surface molecular imaging of single

live cells.", **Angewandte Chemie International Edition**, 56(14), 3822-26, **2017**.

3. Myakalwar AK, Anubham SK, **Paidi SK**, Barman I, Gundawar MK."Real-time fingerprinting of structural isomers using laser induced breakdown spectroscopy", **Analyst**, 141(10), 3077-83, **2016**.

2. Zheng C, Shao W, **Paidi SK**, Han B, Fu T, Wu D, Bi L, Xu W, Fan Z, Barman I. "Pursuing shell-isolated nanoparticle-enhanced Raman spectroscopy (SHINERS) for concomitant detection of breast lesions and microcalcifications", **Nanoscale**, 7, 16960-8, **2015**.

1. Pandey R, **Paidi SK**, Kang JW, Spegazzini N, Dasari RR, Valdez TA, Barman I. "Discerning the differential molecular pathology of proliferative middle ear lesions using Raman spectroscopy", **Scientific Reports**, 5:13305, **2015**.

INVITED TALKS AND SELECTED CONFERENCE PRESENTATIONS

Invited Talks

24. "Optical Imaging and Spectroscopy for Personalized Medicine", *University of Texas*, Austin, **2023**.

23. "Synergistic application of label-free Raman spectroscopy and machine learning: biologics manufacturing and beyond", *Bristol Myers Squibb*, Virtual, **2021**.

22. "Molecular analysis of cancer progression with label-free Raman spectroscopy", *Singapore-MIT Alliance for Research and Technology*, Virtual, **2020**.

21. "Label-free Raman spectroscopy for rapid identification of biologics", *SLAS Ignite Academic Theater*, San Diego, USA, **2018**.

20. "Probing complex problems in cancer research with Raman spectroscopy", *Indian Institute of Technology Bombay*, Mumbai, India, **2018**.

Conference Presentations

19. **Paidi SK**. "Two photon microscopy and adaptive optics elucidates in vivo cellular organization of ocular lens", *BMES Annual Meeting*, Seattle, USA, **2023** *(Scheduled)*.

18. **Paidi SK**. "Raman spectroscopy reveals phenotype switches in breast cancer metastasis", *BMES Annual Meeting*, Seattle, USA, **2023** *(Scheduled)*.

17. **Paidi SK**. "Multi-attribute Raman spectroscopy for real time release testing in biologics manufacturing", *IFPAC Annual Meeting*, North Bethesda, USA, **2023**.

16. **Paidi SK**, Ji N, Gong X. "Illuminating cellular organization of ocular lenses in vivo using adaptive optical two photon fluorescence microscopy", *The International Conference on the Lens*, Kona, USA, **2022**.

15. **Paidi SK**, Barman I. "Elucidating early tumor microenvironmental changes due to immunotherapy with label-free Raman spectroscopy and machine learning", *AACR Annual Meeting*, New Orleans and Virtual, USA, **2022** *(Poster)*.

14. **Paidi SK**, Diaz PM, Dadgar S, Rajaram N, Barman I. "Towards label-free prediction of response to radiation therapy using Raman spectroscopy", *SLAS International Conference and Exhibition*, San Diego, USA, **2020** *(Poster)*.

13. **Paidi SK**, Diaz PM, Dadgar S, Rajaram N, Barman I. "Elucidating Biomolecular Response to Radiation Therapy Using Label-Free Raman Spectroscopy", *Eastern Analytical Symposium*, Plainsboro, USA, **2019**.

12. **Paidi SK**, Xu W, Huang Q, Pagaduan J, Gracias D, Barman I. "Self-folding Hybrid Graphene Skin for 3D SERS Imaging of Single Live Cells", *FACSS/SCIX*, Palm Springs, USA, **2019**.

11. **Paidi SK**, Rajaram N, Barman I. "Characterizing response and resistance to radiation therapy using label-free Raman spectroscopy", *SPIE Photonics West*, San Francisco, USA, **2019**.

10. **Paidi SK**, Barman I. "Mechanical Trap Surface-Enhanced Raman Spectroscopy for Live Three-Dimensional Molecular Imaging of Single Cells", *SLAS International Conference and Exhibition*, Washington DC, USA, **2019**.

9. **Paidi SK**, Barman I. "Label-Free Raman Spectroscopy Elucidates Biomolecular Response to Radiation Therapy and Identifies Intrinsic Resistance", *FACSS/SCIX*, Atlanta, USA, **2018**.

8. **Paidi SK**, Barman I. "Real-time, label-free tracking of monoclonal antibody aggregation with vibrational spectroscopy", *FACSS/SCIX*, Atlanta, USA, **2018**.

7. **Paidi SK**, Siddhanta S, Barman I. "Label-free Raman spectroscopy for rapid identification of biologics", *SLAS International Conference and Exhibition*, San Diego, USA, **2018**.

6. **Paidi SK**, Glunde K, Barman I. "Elucidating the evolution of the pre-metastatic niche: Fresh insights into the soil and seed hypothesis of cancer metastasis with Raman spectroscopy", *SPIE Photonics West (BiOS)*, San Francisco, USA, **2018**.

5. **Paidi SK**, Glunde K, Barman I. "Label-free Raman spectroscopy for detection of breast cancer-induced pre-metastatic changes in lungs", *Optics and Photonics Conference at Johns Hopkins University*, Baltimore, USA, **2017** *(Poster)*.

4. **Paidi SK**. "Mechanical trap surface-enhanced Raman spectroscopy for three-dimensional molecular imaging of single live cells", *FACSS/SCIX*, Reno, USA, **2017**.

3. **Paidi SK**, Rizwan A, Zheng C, Cheng M, Glunde K, Barman I. "Decoding breast cancer-induced stromal adaptations in pre-metastatic lungs with label-free Raman spectroscopy", *FACSS/SCIX*, Reno, USA, **2017**.

2. **Paidi SK**, Prasad R, Li M, Barman I. "Profiling the molecular pathology of ovarian cancer with plasmon-enhanced spectroscopy", 22^{nd} *Molecular Medicine Tri-conference*, San Francisco, USA, **2015** *(Poster)*.

1. **Paidi SK**, Bhavaraju A, Akram M, Kumar S. "Laminar Burning Velocity of H_2-N_2/CO_2-Air Mixtures at Elevated Temperatures", 24^{th} *International Colloquium on the Dynamics of Explosions and Reactive Systems*, Taipei, Taiwan, **2013**.

PROFESSIONAL ACTIVITIES

Session Chair: Case Examples of PAT - Real Time Release in Productionn and Rapid Testing, IFPAC Annual Meeting, **2023**; Aging conditions of the lens at the International Conference of the Lens, **2022**

Associate Editor: Journal of Emerging Investigators

Journal Reviewer: Cancer Research, Clinical Cancer Research, Light: Science & Applications, Journal of Biomedical Optics, Optical Engineering, Journal of Medical Imaging, Acta Biomaterialia, ACS

Chemical Neuroscience, ACS Sustainable Chemistry and Engineering, Journal of Raman Spectroscopy, Biomolecules, Nanomaterials, Sensors, International Journal of Molecular Sciences

TEACHING EXPERIENCE

6. Course Instructor for **Introduction to Biomedical Optics** at JHU, Fall **2019**
5. Course Instructor for **Quantitative Spectroscopy and Imaging in Biology and Medicine** at JHU, Fall **2018**
4. Guest speaker for **Engineering Innovation Special Lecture** at JHU, Summer **2019**
3. Completed the requirements of **Johns Hopkins Teaching Academy** program **2019**
2. Teaching Assistant for **Molecular Spectroscopy and Imaging** at JHU, Fall **2019 and 2017**
1. Teaching Assistant for **Introduction to Biophotonics** at JHU, Spring **2018 and 2016**

SELECTED MENTORING EXPERIENCE

5. Xinyang Su, **Ph.D. Student**, UC Berkeley **Sep '22 - Jan '23**
4. Piyush Raj, **Ph.D. Student**, JHU **Sep '19 - May '21**
3. Vinay Ayyappan, **Undergraduate Student**, JHU **Apr '19 - Oct '20**
2. Zhenhui Liu, **Ph.D. Student**, JHU **Mar '19 - May '20**
1. Vaani Shah, **Undergraduate Intern**, University of Maryland **May '18 - Oct '20**

SELECTED MEDIA COVERAGE

- Interviewed by SLAS on *New Matter* podcast, **2022**.
- "Raman spectroscopy shows how immunotherapy changes tumours", *Spectroscopy Europe*, **2021**.
- "Raman spectroscopy: new strategy of evaluating metastatic risk in breast cancer", *AzoOptics*, **2021**.
- "Researchers pioneer method to examine how immunotherapy changes tumors", *The Hub at Johns Hopkins*, **2021**.
- "Imaging tool helps doctors predict how cancer will respond to radiation", *Inside Science News Service*, **2019**.
- "Raman spectroscopy predicts radiation resistance", *Physics World*, **2019**.
- "Imaging technique finds differences between radiation-sensitive and resistant tumors", *Science Daily*, **2019**.
- "Shedding light on resistance to radiation therapy", *The Hub at Johns Hopkins*, **2019**.
- "Shedding light—literally—on resistance to radiation therapy", *Medical Xpress*, **2019**.
- "2018 SLAS Graduate Education Fellowship Grant recipient fosters SERS diagnostic assay concept", *SLAS Electronic Laboratory Neighborhood*, **2018**.

LEADERSHIP, VOLUNTEER AND OUTREACH

SLAS-NOBCCHE Scholarship, SLAS
Role: Mentor **Jun '22 - Aug '22**

- Served as a mentor for the SLAS-NOBCCHE Scholarship that is designed to support U.S.-based high school students of color and increase the diversity of the global STEM workforce.
- Mentored a high school student to help them develop their research project ideas into a full project proposal for the scholarship application.

Homewood Graduate Board, JHU
Role: Whiting School of Engineering Student Representative **Sep '18 - Apr '20**

- Collaborated with the Krieger School Student Representative to conduct a survey across JHU for understanding the quality of feedback graduate students obtain from their faculty advisors about their progress.
- Discussed the findings with Vice Provost for Graduate and Professional Education as well as Assistant Deans to improve the faculty-student interactions.
- Presented the need to standardize Graduate Board Oral examination across the university for discussion during the Homewood Graduate Board spring meeting.

Graduate Representative Organization, JHU
Role: Advocacy Chair **Feb '18 - Sep '18**

- Facilitated discussion between graduate student body and university administration about the potential formation of private police force at JHU.
- Collaborated with the Chairs to improve accommodations and facilities for students with disabilities at JHU.
- Surveyed methods to make the academic probation and dismissal procedures transparent and uniform across the university.

STEM Achievement in Baltimore Elementary Schools (SABES)
Role: Mentor **Oct '17 - May '19**

- Assisted third grade students to complete after-school STEM projects relevant to their community.
- Guided the students to devise a material selection strategy for mitigating bursting of water pipes in their school during winter.

Department of Mechanical Engineering, JHU
Role: Representative and Volunteer **Sep '15 - Apr '20**

- Represented mechanical engineering graduate students in the Whiting School's External Review Meeting.
- Represented Ph.D. students in the Mechanical Engineering Advisory Committee Meeting.
- Conducted lab tours and presented research for incoming undergraduate students and prospective graduate students.

National Photonics Initiative (NPI)
Role: Volunteer **Apr '18**

- Participated in NPI's Capitol Hill Day visits to advocate for science, optics and photonics and to educate members of Congress about the work happening in their districts in optics and photonics.
- Visited offices of the members of Congress and urged to maintain current funding levels, resist any spending cuts and support, at a minimum, 4 percent growth in funding for the nation's science research.