VINODKUMAR SARANATHAN

Contact Information

Division of Science
Yale-NUS College
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Research Interests

My *integrative* interests lie at the interface of evolutionary biology, soft matter physics, bio-materials science, and biomimetics, specifically, what I have termed "Evolutionary Photonics" – a precise, holistic understanding of the structure-function relationships and the morphogensesis of organismal self-assembled biophotonic nanostructures at the synthetically hard to achieve mesoscopic (visble optical) lengthscales in-between traditional molecular and cell biology – to inform the biomimetic, facile and eco-friendly synthesis of advanced functional materials.

Academic Appointments

Senior Research Fellow (∼ Research Assistant Professor) **July 2020 –**
Division of Science, Yale-NUS College, Singapore

Adjunct Principal Investigator **August 2015 –**
NUS Nanoscience and Nanotechnology Initiative (NUSNNI-Nanocore)
NUS, Singapore

Assistant Professor **July 2015 – June 2020**
Division of Science (Life Sciences), Yale-NUS College, Singapore

Assistant Professor, Joint Appointment **May 2016 – June 2020**
Department of Biological Sciences (DBS), NUS, Singapore

Research Affiliate **May 2016 – June 2020**
Lee Kong Chian Natural History Museum (LKCNHM), NUS, Singapore

Research Fellow **April 2014 – June 2015**
Division of Physics and Applied Physics
Nanyang Technical University (NTU), Singapore
Advisor: Professor Chong Yi Dong

Research Associate **Mar. 2013 – Mar. 2015**
Edward Grey Institute, Department of Zoology, University of Oxford

EPA Cephalosporin, Junior Research Fellow **Sep. 2011 – Sep. 2013**
Linacre College, University of Oxford

UK Royal Society Newton Fellow **Mar. 2011 – Mar. 2013**
Edward Grey Institute, Department of Zoology, University of Oxford
Host group: Professor Ben Sheldon

Sabbaticals/ Study Leaves

Fall 2019-20: Visiting Professor/Professeur Invité

Adolph Merkle Institute *University of Fribourg, Switzerland*

Host: *Professor Ulli Steiner*

Laboratoire Physique et Mécanique des Milieux Hétérogènes (PMMH) *École supérieure de physique et de chimie industrielles (ESPCI), Paris, France*

Host: *Professor Damien Vandembroucq*

Spring 2017-18: Visiting Professor

Institute for Collaborative Biotechnologies *University of California, Santa Barbara, USA*

Host: *Professor Daniel Morse*

Education

Yale University, New Haven, CT

Ph.D., Ecology and Evolutionary Biology **May 2011**

Dissertation title: *Evolutionary Photonics: Structure, function, development and evolution of organismal structural color*
Committee: Professors Richard O. Prum (*Chair*), Eric R. Dufresne, Hui Cao, Simon G. J. Mochrie, Günter Wagner, Antonia Monteiro

M.S., Ecology and Evolutionary Biology **May 2007**

Ohio Wesleyan University, Delaware, OH

B.A. *cum laude*, Physics (with a minor in Philosophy) **Dec. 2004**

Thesis title: *Spot topography of BD+22° 4409 (LO Peg) using Matrix Light-curve Inversion*
Advisor: Professor Robert O. Harmon

On-going Collaborations

- Bio-inspired amorphous photonics of nanostructures with correlated disorder (Rémi Carminati, Institut Langevin and Damien Vandembroucq, PMMH, ESPCI, Paris, France)
- Epitaxial relationship of weevil scale biophotonic crystals (with Professor Ulli Steiner and Dr. Bodo Wilts, Adolph Merkle Institute, University of Fribourg, Switzerland and Dr. Imke Greving, Deutsches Elektronen-Synchrotron (DESY), Hamburg)
- Intra-cellular self-assembly mechanism of tunable reflectin-based iridescent photonic crystals in squid iridocytes (with Professor Dan Morse, Department of Molecular, Cellular, and Developmental Biology (MCDB), UC Santa Barbara, USA)
- Novel photonic crystals in annelids (with William Wonderly, Herb Waite group, Department of Molecular, Cellular, and Developmental Biology (MCDB), UC Santa Barbara, USA)
- Comparative molecular structure of self-assembling β-keratins in *Aves* (with Dr. Youli Li, Cyrus Safinya group, Materials Research Laboratory (MRL), UC Santa Barbara, USA)
- Optics and evolution of 50 shades of blue in bees (with Dr. John Ascher, Department of Biological Sciences (DBS), National University of Singapore (NUS))

- Structure, function and evolution of photonic crystals in fossil weevils (with Dr. Luke McDonald and Dr. Maria McNamara, School of Biological, Earth and Environmental Sciences (BEES) at University College Cork, Ireland)
- The bizarre occipital feathers of the King of Saxony Bird of Paradise (*Pteridophora alberti*) (Dr. Teresa Feo, Smithsonian Institution and Professor Rick Prum, Department of Ecology and Evolutionary Biology, Yale University)
- Self-assembly of amorphous biophotonic nanostructure via visco-elastic phase separation in nestling Blue Tit (*Cyanistes caeruleus*) feather germs (Professor Ben Sheldon, Edward Grey Institute, University of Oxford)
- Evolution of "super-white" plumage coloration in birds (Professor Rick Prum, Yale University)
- Multicomponent signal analyses of plumage color patches with interacting pigments and amorphous biophotonic nanostructure (Professor Rick Prum, Yale University and Professor Greg Grether, UC Los Angeles)

  using multiple trait evolution theory and tetrachromat avian vision analyses

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Past Research Experience

- **Graduate Research Assistant**
  Yale Institute for Biospheric Studies Ecosave Project (Spring 2006)
  Advisors: Professor Richard O. Prum

  Song learning in the three-wattled bellbird *Procnias tricarunculata*

- **Graduate Research Assistant**
  Molecular Systematics and Conservation Laboratory, Yale Institute of Biospheric Studies (Fall 2005)
  Advisors: Drs. Michael A. Rusello and Gisella Caccone

  Molecular assessment of invasion success of the invasive Monk parakeet.

- **Tropical Biology Association field course capstone project**
  Amani Nature Reserve, East Usambaras, Tanzania (Jun. 2006)
  Advisor: Dr. Trent Garner, ZSL

  Characterisation of the vocalisations of *Nectophrynoides tornieri* Roux 1906 (Anura: Bufonidae)

- **NSF-funded Research Fellow in Avian Microbiology**
  Ohio Wesleyan University (14 Mar. 2005 – 20 May 2005)
  Advisor: Professor Edward H. Burtt, Jr.

  Variation in plumage microflora among recaptures.

- **Undergraduate Capstone Project**
  Perkins Observatory, Ohio Wesleyan University (Spring 2004 – Fall 2004)
  Advisor: Professor Robert O. Harmon

  A differential photometric study of starspots in fast-rotating single K-dwarf star HIP106231 (LO Peg) using Matrix Light-curve Inversion (MLI) technique.

- **NSF Summer REU**
  Smithsonian Environmental Research Center, Kraus and Bohannan Preserves at Ohio Wesleyan University (10 May 2004 – 17 Jul. 2004)
  Advisor: Professor Edward H. Burtt, Jr.

  Variation in plumage microbial communities among resident and migratory songbirds.

- **OWU Summer Science Research Program**
  Ohio Wesleyan University (13 May 2003 – 19 Jul. 2003)
  Advisor: Professor Bradley R. Trees

  Frequency synchronization in Josephson junction ladders, and stacked ladders and the locally-coupled Kuramoto model.

- **UT–Oak Ridge National Laboratory Science Alliance Program**
  University of Tennessee, Knoxville (3 Jun. 2002 – 9 Aug. 2002)
  Advisor: Professor Michael W. Guidry

  Ephemeris Generation on Mobile Information Devices (MID) using Java Technology.

Theses

Saranathan, V. *Evolutionary Photonics: Structure, Function, Development and Evolution of Organismal Structural Color pp.*250 (Dissertation, Yale University, **2011**)
http://search.proquest.com/docview/884090968

No. of Citations (Google Scholar) – **1**

Book Chapters

[1] Seago, A. E., and **Saranathan, V.** *"Photonic crystals in beetles"* in Nature's Nanostructures (A. Barnard and H. Guo Eds.) *pp.*313-329 (Pan Stanford Publishing, Singapore, **2012**)
doi:10.4032/9789814364218

No. of Citations – **4**

[2] **Saranathan, V.** *"Topology of minimal surface biophotonic nanostructures in arthropods"* in Springer Series in Solid-State Sciences: The Role of Topology in Materials (S. Gupta and A. Saxena Eds.) *pp.*275-290 (Springer, Dordrecht, **2018**)
doi:10.1007/978-3-319-76596-9_11

No. of Citations – **2**

Refereed Journal Publications

Total Citations: **1801** (1131 since 2015); h-index – **16**, i10-index – **18** (source: Google Scholar Citations: http://tinyurl.com/birdman23, as of 2020-09-30)
orcid.org/0000-0003-4058-5093

2010 – present

[3] **Saranathan. V***, S. Narayanan, A. Sandy, E. R. Dufresne and R. O. Prum. **2020**. Single Gyroid and Inverse *b.c.c.* Photonic Crystals in Bird Feathers. *In Review*, **Nature Communications**. Preprint: **bioRxiv**
doi:10.1101/2020.08.27.271213

*Lead Corresponding Author

[4] Foley, S.*, **V. Saranathan***, and W. H. Piel. **2020**. The Evolution of colouration and opsins in tarantulas. **Proceedings of the Royal Society B** 287: 20201688.
doi:10.1098/rspb.2020.1688

*Co-First and Co-Corresponding Authors

Featured on the Cover of *Proceedings B*, Yale-NUS college press release, New York Times, Neue Zürcher Zeitung, CBC.ca, Natural History Magazine, International Business Times, CNET daily, Earth.com, Bioengineer, Phys.org, Science Daily.

No. of Citations (Google Scholar) – **0**; 2018 ISI Impact Factor – **4.304**

[5] McDonald*, L. T., S. Narayanan, A. Sandy, **V. Saranathan***, and M. E, McNamara. **2020**. Brilliant angle independent structural colours preserved in weevil scales from the Swiss Pleistocene. **Biology Letters** 16(4): 20200063. doi:10.1098/rsbl.2020.0063

*Lead Corresponding Authors

Featured in Yale-NUS College Press Release, Argonne National Laboratory Press Release, Discover Magazine, Yahoo News, Irish Mirror, The Conversation, Phys.org, Science Daily, IFLScience, Naked Science

No. of Citations (Google Scholar) – **1**; 2018 ISI Impact Factor – **3.323**

[6] Seago, A. E.*, R. Oberprieler and **V. Saranathan***. **2019**. Evolution of insect iridescence: origins of three-dimensional photonic crystals in weevils (Coleoptera: Curculionoidea). **Integrative and Comparative Biology** 59: 1664–1672 doi:10.1093/icb/icz040

*Lead Corresponding Authors

Featured in *Science News* (Pennisi, E. Diverse Crystals Account for Beetle Sheen. Science 341(6142): 120)

No. of Citations (Google Scholar) – **3**; 2018 ISI Impact Factor – **3.101**

[7] Wilts, B. D.*, and **V. Saranathan***. **2018**. A Literal Elytral Rainbow: Tunable Structural Colors Using Single Diamond Biophotonic Crystals in *Pachyrrhynchus congestus* Weevils. **Small** 14(46): 1802328. doi:10.1002/smll.201802328

*Lead Corresponding Authors

Featured on the Cover of *Small*, Yale-NUS college press release, Optical Society of America Optics and Photonics News, Ars Technica, Photonics.com, Phys.org, Singapore Tonight (Channel News Asia's live nightly TV show), Hindu Business Link (Weekend edition).

No. of Citations (Google Scholar) – **11**; 2018 ISI Impact Factor – **10.856**

[8] **Saranathan, V.***, A. E. Seago, A. Sandy, S. Narayanan, S. G. J. Mochrie, E. R. Dufresne, H. Cao, C. O. Osuji, and R. O. Prum*. **2015**. Structural Diversity of Self-Assembled Arthropod Biophotonic Nanostructures Spans Amphiphilic Phase-Space. **Nano Letters** 15(6): 3735–42 doi:10.1021/acs.nanolett.5b00201

*Lead Corresponding Authors

Featured in Yale News, Oxford Science Blog, Argonne National Laboratory APS Science Highlight, AAAS Science NOW, Microscopy and Analysis, Phys.org, Futurity.org, Cosmetics Design, Controlled Environments Magazine, 938LIVE (Singapore Radio).

No. of Citations (Google Scholar) – **62**; 2018 ISI Impact Factor – **12.279**

[9] McNamara, M. E.*, **V. Saranathan***, E. Locatelli, H. Noh, D. E. G. Briggs, P. J. Orr and H. Cao. **2014**. *Cryptic iridescence in a fossil weevil generated by single diamond photonic crystals.* **Journal of the Royal Society Interface** 11(100):20140736
doi:10.1098/rsif.2014.0736

*Lead Corresponding Authors

Featured in Yale Scientific.

No. of Citations (Google Scholar) – **16**; 2018 ISI Impact Factor – **3.224**

[10] **Saranathan, V.**, J. D. Forster, H. Noh, S. F. Liew, S. G. J. Mochrie, H. Cao, E. R. Dufresne, and R. O. Prum. **2012**. *Structure and Optical Function of Amorphous Photonic Nanostructures from Avian Feather Barbs: A Comparative Small Angle X-ray Scattering (SAXS) Analysis of 230 Bird Species.* **Journal of the Royal Society Interface** 9(75): 2563–80
doi:10.1098/rsif.2012.0191

Featured in Oxford Science Blog, Phys.org, Argonne Labs Science Highlights.

No. of Citations (Google Scholar) – **101**; 2018 ISI Impact Factor – **3.224**

[11] Liew, S. F., J. Forster, H. Noh, C. Schreck, **V. Saranathan**, X. Lu, L. Yang, R. O. Prum, C. S. O'Hern, E. R. Dufresne, and H. Cao. **2011**. *Short-range Order and Near- field Effects on Optical Scattering and Structural Coloration.* **Optics Express** 19(9): 8208–8217
doi:10.1364/OE.19.008208

No. of Citations (Google Scholar) – **62**; 2018 ISI Impact Factor – **3.561**

[12] D'Alba, L., **V. Saranathan**†, J. A. Clarke, J. Vinther, R. O. Prum and M. D. Shawkey†. **2011**. *Colour producing β-keratin nanofibres in Blue Penguin (Eudyptula minor) feathers.* **Biology Letters** 7(4): 543–6
doi:10.1098/rsbl.2010.1163

† indicates equal lead contribution

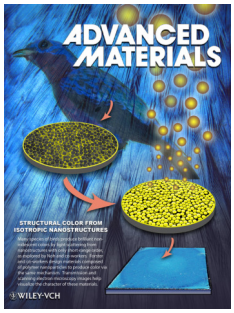
Featured in Daily Planet (Discovery Channel Canada), Nature, AAAS Science NOW, Nature Highlights, OSA Optics and Photonics Focus, Live Science, Phys.org, Rue 89.
No. of Citations (Google Scholar) – **47**; 2018 ISI Impact Factor – **3.323**

[13] **Saranathan, V.**, C. O. Osuji, S. G. J. Mochrie, H. Noh, S. Narayanan, A. Sandy, E. R. Dufresne, and R. O. Prum. **2010**. *Structure, Function and Self-Assembly of Single Network Gyroid ($I4_132$) Photonic Crystals In Butterfly Wing Scales.* **Proceedings of the National Academy of Sciences USA** 107(26): 11676–11681
doi:10.1073/pnas.0909616107

Featured in Yale News, CBC's As it Happens, NPR's All Things considered, National Geographic, New York Times, Los Angeles Times, AAAS Science, French Embassy's Electronic Bulletin, MIT Technology Review, ACS Chemical and Engineering News, Argonne Labs Science Highlights, Wired.com, Live Science, Science News, Inside Science, Phys.org.
No. of Citations (Google Scholar) – **359**; 2018 ISI Impact Factor – **9.58**

[14] Forster, J. D., H. Noh, S. F. Liew, **V. Saranathan**, C. F. Shreck, L. Yang, J.-G. Park, R. O. Prum, S. G. J. Mochrie, C. S. O'Hern, H. Cao and E. R.

Dufresne. **2010**. *Biomimetic isotropic nanostructures for structural coloration.* **Advanced Materials** 22(26-27):2939–44



doi:10.1002/adma.200903693

No. of Citations (Google Scholar) – **253**; 2018 ISI Impact Factor – **25.809**

[15] Noh, H., S. F. Liew, **V. Saranathan**, S. G. J. Mochrie, R. O. Prum, E. R. Dufresne, and H. Cao. **2010**. *How non-iridescent colors are generated by quasi-ordered structures of bird feathers.* **Advanced Materials** 22(26-27): 2871–80 doi:10.1002/adma.200903699

No. of Citations (Google Scholar) – **198**; 2018 ISI Impact Factor – **25.809**

[16] Noh, H., S. F. Liew, **V. Saranathan**, S. G. J. Mochrie, R. O. Prum, E. R. Dufresne, and H. Cao. **2010**. *Double scattering of light from biophotonic nanostructures with short-range order.* **Optics Express** 18(11): 11942–11948 doi:10.1364/OE.18.011942

No. of Citations (Google Scholar) – **34**; 2018 ISI Impact Factor – **3.561**

[17] Noh, H., S. F. Liew, **V. Saranathan**, R. O. Prum, S. G. J. Mochrie, E. R. Dufresne, and H. Cao. **2010**. *Contribution of double scattering to structural coloration in quasi- ordered nanostructures of bird feathers.* **Physical Review E** 81: 051923
doi:10.1103/PhysRevE.81.051923

No. of Citations (Google Scholar) – **22**; 2018 ISI Impact Factor – **2.353**

2005 – 2010

[18] Dufresne, E. R., H. Noh, **V. Saranathan**, S. Mochrie, H. Cao and R. O. Prum. **2009**. *Self-Assembly of Amorphous Biophotonic Nanostructures by Phase Separation.* **Soft Matter** 5: 1792–1795
doi:10.1039/b902775k

Featured in Yale News, Science Daily, RCS Highlights in Chemical Science, Phys.org, Nanotechwire.
No. of Citations (Google Scholar) – **195**; 2018 ISI Impact Factor – **3.399**

[19] Shawkey, M. D., **V. Saranathan**, H. Palsdottir, J. Crum, M. H. Ellisman, M. Auer and R. O. Prum. **2009**. *Electron tomography, three-dimensional Fourier analysis and colour prediction of a three-dimensional amorphous biophotonic nanostructure.* **Journal of the Royal Society Interface** 6: S213–S220
doi:10.1098/rsif.2008.0374.focus

No. of Citations (Google Scholar) – **47**; 2018 ISI Impact Factor – **3.092**

[20] Vinther, J., D. E. G. Briggs, R. O. Prum and **V. Saranathan**. **2008**. *The colour of fossil feathers.* **Biology Letters** 4: 522–525
doi:10.1098/rsbl.2008.0302

Featured in Yale News, Yale Scientific, BBC News, Der Spiegel, The Economist, Live Science, Science Daily, ScienCentral.
No. of Citations (Google Scholar) – **199**; 2018 ISI Impact Factor – **3.323**

[21] **Saranathan, V.**, D. Hamilton, G. Powell, D. Kroodsma, and R. O. Prum. **2007**. *Genetic Evidence Supports Song Learning in the Three-wattled Bellbird Proc-*

nias tricarunculata (Cotingidae). **Molecular Ecology** 16(17): 3689–3702 doi:10.1111/j.1365-294X.2007.03415.x

No. of Citations (Google Scholar) – **81**; 2018 ISI Impact Factor – **5.855**

[22] Russello, M. A., **V. Saranathan**, S. Buhrman-Deever, J. Eberhard and A. Caccone. **2007**. *Characterization of polymorphic microsatellite loci for the invasive Monk Parakeet (Myiopsitta monachus)*. **Molecular Ecology Resources** (formerly M. E. Notes). 7:990–992 doi:10.1111/j.1471-8286.2007.01749.x

No. of Citations (Google Scholar) – **15**; 2018 ISI Impact Factor – **7.049**

[23] **Saranathan, V.** and E. H. Burtt, Jr. **2007**. *Sunlight on feathers inhibits feather-degrading bacteria*. **Wilson Journal of Ornithology** 119(2): 239–245 doi:10.1676/05- 123.1

No. of Citations (Google Scholar) – **26**; 2018 ISI Impact Factor – **0.483**

[24] Trees, B. R., **V. Saranathan**, and D. Stroud. **2005**. *Synchronization in disordered Josephson junction arrays: small-world connections and the Kuramoto model*. **Physical Review E** 71:16215 doi:10.1103/PhysRevE.71.016215

No. of Citations (Google Scholar) – **62**; 2018 ISI Impact Factor – **2.353**

Published Abstracts

[1] Feo, T., **V. Saranathan** and R. O. Prum. **2019**. *The bizarre occipital feathers of the King of Saxony Bird of Paradise (Pteridophora alberti)*. **Integrative and Comparative Biology** 59: E69

[2] **V. Saranathan**. **2015**. *Structural Diversity of Self-Assembled Arthropod Biophotonic Nanostructures*. **Bulletin of the American Physical Society** 60: #A50.6

[3] Cao, H., H. Noh, S. F. Liew, **V. Saranathan**, R. Prum, J. Forster, E. R. Dufresne, and S. Mochrie. **2013**. *Color Production by Isotropic Nanostructures with Short-range Order in Bird Feather Barbs*. **CLEO: QELS Fundamental Science** Optics of Random Media (QW3A.1)

[4] Forster, J. D., J. G. Park, M. Mittal, **V. Saranathan**, H. Noh, C. Schreck, R. Prum, C. O'Hern, H. Cao, E. Furst, and E. R. Dufresne. **2011**. *Nanodumbells pack densely to form birefringent photonic crystals*. **Bulletin of the American Physical Society** 56: #A13.015

[5] Liew, S. F., J. Forster, H. Noh, C. Schreck, **V. Saranathan**, X. Lu, L. Yang, C. S. O'Hern, E. R. Dufresne, and H. Cao. **2011**. *Light Scattering in Biomimetic Structures with Short-range Order*. **CLEO: Applications and Technology** Towards Applications Joint Poster Session (JWA102)

[6] Forster, J. D., H. Noh, **V. Saranathan**, H. Cao, S. Mochrie, C. Osuji, R. O. Prum, and E. R. Dufresne. **2009**. *Structural Color of Biological and Biomimetic Amorphous Nanostructures*. **Bulletin of the American Physical Society** 54: #H40.008

[7] Burtt, E. H., Jr., **V. Saranathan** and I.-A. Bisson. **2006**. *An ecosystem in feathers*. **Journal of Ornithology** 147: Suppl. 35

[8] R. O. Harmon, and **V. Saranathan**. **2004**. *Spot topography of BD+22° 4409 (LO Peg) using Matrix Light-curve Inversion*. **Bulletin of the American Astronomical Society** 36: 1361

[9] R. Budiardja, **V. Saranathan** and M. Guidry. **2002**. *Programming Wireless Handheld Devices for Applications in Teaching Astronomy.* **Bulletin of the American Astronomical Society** 34: 1251

Invited Symposia and Seminars

Topic: Evolutionary photonics

[1] Invited Workshop Speaker, SFB 986 Summer School 2020, Hamburg University of Technology, Hamburg, Germany (Mar. 2021)

[2] Invited Workshop Speaker, Molecular Biology Society Japan (MBSJ), Kobe, Japan (2 Dec. 2020)

[3] Guest lecture for Junior Seminar on "Fakes", Tembusu College, NUS (13 Feb. 2020)

[4] Photonic Nanosystems and Soft Matter Physics Group Seminar, Universite de Fribourg, Switzerland (16 Dec. 2019)

[5] AMI Seminar, Adolph Merkle Institute (AMI), Universite de Fribourg, Switzerland (12 Dec. 2019)

[6] Institut Langevin, ESPCI, Paris, France (10 Dec. 2019)

[7] Invited Speaker (Declined due to logistics), Symposium 8: Polymers and the Environment, 16th Singapore Pacific Polymer Conference (8 – 12 Dec. 2019)

[8] PMMH Seminar, École supérieure de physique et de chimie industrielles (ESPCI), Paris, France (6 Dec. 2019)

[9] Invited Workshop Speaker, *Mondes Visuels*, L'Ecole Média Art, Chalon-sur-Saône, France (27 – 28 Nov. 2019)

[10] Surface du Verre et Interfaces (SVI) laboratory seminar, St. Gobain, Aubervilliers, France (7 Nov. 2019)

[11] "Synchrotron SAXS Studies of Self-assembled Biophotonic Nanostructures", Weekly Seminar, Deutsches Elektronen-Synchrotron (DESY), Hamburg (28 Aug. 2019)

[12] "Blue is the warmest color", Singapore Science Festival 2018, Department of Biological Sciences, National University of Singapore (1 Sep. 2018)

[13] Alon Gorodetsky Group for Biomolecular Electronics seminar, Department of Chemical Engineering and Materials Science, University of California, Irvine (11 Jun. 2018)

[14] Dan Morse group seminar, Department of Molecular, Cell and Developmental Biology, University of California, Santa Barbara (25 Apr. 2018)

[15] "Topology of self-assembled minimal surface biophotonic nanostructures," (Declined due to logistics) Talk at a workshop on "Applications of Topology", held at Western Kentucky University (17-20 Jul. 2018)

[16] "Chiral self-assembled biophotonic nanostructures," (Unable to attend due to visa issues) Invited oral presentation at the conference "Bioinspiration, Biomimetics, and Bioreplication VIII", part of the SPIE Smart Structures/NDE Symposium, Denver, Colorado (4-8 Mar. 2018)

[17] "Aesthetics and evolution of structural-color producing or biophotonic nanostructures in birds" as part of a transdisciplinary symposium, "Travels in Trans-Sensoriality" organised by LaSalle College of the Arts, City University of Hong Kong and the Zurich Academy of the Arts, Singapore (31 Oct. – 1 Nov. 2017)

[18] Co-author, "Are the spongy color-producing keratin nanostructures of bird feathers hyperuniform?" Talk presented by Richard Prum (Yale) at Princeton Center for Theoretical Science (PCTS) Workshop Hyperuniform State of Matter in Physics, Mathematics and Biology, Princeton, NJ, USA (14 Dec.–16 Dec. 2016)

[19] Symposium BM6 – Fabrication, Characterization and Applications of Bioinspired Nanostructured Materials, 2016 Materials Research Society (MRS) Fall meeting, Boston, MA, USA (27 Nov.–2 Dec. 2016)

[20] UCSB Center for BioEngineering Faculty Seminar, UC Santa Barbara (9 May 2016)

[21] 4^{th} Users Meeting, Singapore Synchrotron Light Source, NUS, Singapore (29 Feb. 2016)

[22] Rank Prize Funds symposium on The Perception of Iridescence, The Wordsworth Hotel, Grasmere, Cumbria, U.K. (20–23 Apr. 2015)

[23] NUS Nanoscience and Nanotechnology Initiative (NUSNNI) Seminar, National University of Singapore, Singapore (16 Apr. 2015)

[24] Yale-NUS College, Division of Science, Singapore (1 Dec. 2014)

[25] Nanyang Technical University, Department of Physics and Applied Physics (20 Jun. 2013)

[26] Georgia Institute of Technology, School of Biology (1 Apr. 2013)

[27] California Academy of Sciences, Department of Ornithology and Mammalogy (26 Mar. 2013)

[28] Clark Ornithology Lecture, Ohio Wesleyan University (26 Mar. 2012)

[29] Aperiodic Systems Seminar, Princeton Center for Theoretical Science, Princeton University (20 Mar. 2012)

[30] Madingley Seminar, Sub-department of Animal Behaviour, Department of Zoology, University of Cambridge (8 Feb. 2012)

[31] Nano Seminar, Department of Chemistry, University of Reading (17 Aug. 2011)

[32] Oxford Centre for Soft and Biological Matter, University of Oxford (19 May 2011)

[33] Workshop speaker, Workshop on Bio-Inspired Photonic Structures, DIPC, San Sebastian, Spain (9–15 Jul. 2009)

[34] Centre for Ecological Sciences (CES), Indian Institute of Science, Bangalore, India (9 Sep. 2008)

[35] Symposium speaker, Rank Prize Funds symposium on Metamaterials in Nature and Technology, Lake Windermere, Lake District, U.K. (21–24 Aug. 2006)

Topic: Song learning in sub-oscine bellbirds

[36] Symposium speaker, Ernst Mayr Session, 2007 Evolution Society Meeting, Christchurch, New Zealand. (16–20 Jun. 2007)

[37] Centre for Ecological Sciences (CES), Indian Institute of Science, Bangalore, India (22 Sep. 2006)

Topic: Plumage microbe ecology

[38] Co-author on Keynote presentation, Symposium on Bird-microbe Interactions: Competition, Commensalism and Co-evolution, XXIV International Ornithological Congress, Hamburg, Germany. (13– 19 Aug. 2006)

Primary and Co-authored Meeting Contributions

* indicates undergraduate author(s)
† indicates postgraduate author(s)

[1] Saranathan, V. and R. O. Prum, Hyperuniform self-assembled bio-photonic nanostructures in avian feather barbs. Talk presented at the conference on "Bioinspired Materials: From Understanding, Through Processing, to Replication", Monte Verita, Switzerland (20–25 Oct. 2019)

[2] Saranathan, V. and R. O. Prum, Repeated evolutionarily independent quasi-order to order transitions in feather barb biophotonic nanostructures. Talk presented at the Australian Institute of Physics Congress, held at Perth, Western Australia (09–13 Dec. 2018)

[3] Seah, K. S.†, A. Monteiro, and V. Saranathan, Development of biophotonic nanostructures in brush-footed butterfly wing scales. Poster presented by K. S. Seah at the 2018 Biology of Butterflies meeting, held at National Centre for Biological Sciences (NCBS), Bangalore, India (11–14 Jun. 2018)

[4] Saranathan, V. and R. O. Prum, Parallel Evolution of Ordered Feather Barb Biophotonic Nanostructures. Talk presented at the 136$^{\text{th}}$ Stated Meeting of the American Ornithological Society, at Tucson, AZ (09–14 Apr. 2018)

[5] Saranathan, V. and A. H. Y. Goh*, On the fruit color preferences of the Southern Cassowary (*Casuarius casuarius*). Poster presented at the 136$^{\text{th}}$ Stated Meeting of the American Ornithological Society, at Tucson, AZ (09–14 Apr. 2018)

[6] Goh, A. H. Y.*, and V. Saranathan, 45 million years of structural color in the fruits of *Elaeocarpus* (Elaeocarpaceae). Talk presented by A. H. Y Goh at the 2018 Society for Integrative and Comparative Biology meeting, San Francisco, CA, USA (3–7 Jan. 2018)

[7] Feo, T., V. Saranathan and R. O. Prum, Insights into feather diversity from the King of Saxony Bird of Paradise and other bizarre feathers Poster presented by T. Feo at the 2017 Evolution Meeting, Portland, OR, USA (23–27 Jun. 2017)

[8] Saranathan, V. and R. O. Prum, Are spongy feather barb nanostructures "stealthy"? Poster presented at Princeton Center for Theoretical Science (PCTS) Workshop Hyperuniform State of Matter in Physics, Mathematics and Biology, Princeton, NJ, USA (14 Dec.–16 Dec. 2016)

[9] Saranathan, V. Self-assembly of Biophotonic Nanostructures in Arthropods and Birds. Paper presented at Animal, Vegetal, Mineral?, the 2016 Boden Research Conference, Yallingup, Western Australia. (19-23 Sep. 2016)

[10] Saranathan, V. Evolutionary Quasiorder-to-Order Transitions in Avian Biophotonic Nanostructures. Paper presented at Living Light International Conference 2016, Scripps Institution of Oceanography, UC San Diego, USA. (4-6 May 2016)

[11] Saranathan, V. Self-Assembly Of Amorphous Biophotonic Nanostructure In Nestling Blue Tit (*Cyanistes caeruleus*) Feather Germs, Assayed Using Small Angle X-ray Scattering (SAXS). Paper presented at Behaviour 2015, the 34th International Ethological Conference, Cairns, Queensland, Australia. (9-14 Aug. 2015)

[12] Saranathan, V., R. O. Prum. Structure, optical function and self-assembly of amorphous photonic nanostructures from avian feather barbs. Paper presented at the IPS (Institute of Physics Singapore) Meeting 2015. Nanyang Technological University, Singapore, Singapore. (4-6 Mar. 2015)

[13] Saranathan, V*. Structural Diversity of Self-Assembled Arthropod Biophotonic Nanostructures. Paper accepted for the APS March Meeting 2015 in the Soft Condensed Matter Focus Session 2.1.4: Beyond the gyroid: complex network phases in self-assembled soft materials. San Antonio, Texas, USA. (2-6 Mar. 2015) *Unable to attend

[14] Saranathan, V., I. Greving, E. L. O'Brien, B. Wilts, D. Stavenga and B. C. Sheldon. Hotshots and Hotspots: Local spatial heterogeneity in life-history variation and signal content of UV structural colours in a socially monogamous passerine. Paper presented at the XXVI International Ornithological Congress, Tokyo, Japan. (18–24 Aug. 2014)

[15] Saranathan, V., and R. O. Prum. Structure and Optical Function of Amorphous Photonic Nanostructures from Avian Feather Barbs: A Comparative Small Angle X-ray Scattering (SAXS) Analysis of 230 Bird Species. Poster presented at the XXVI International Ornithological Congress, Tokyo, Japan. (18–24 Aug. 2014)

[16] Saranathan, V., I. Greving, and B. C. Sheldon. Signal Content of Structural Colours: A Synchrotron Nanostructural Study of UV-Reflective Blue Tit Plumage. Paper presented at the V North American Ornithological Conference, Vancouver, Canada (14–18 Aug. 2012)

[17] Saranathan, V. Diversity of Insect Scale Photonic Nanostructures. Paper presented at the Geometry of Interfaces conference, at Primošten, Croatia (2–7 Oct. 2011)

[18] Saranathan, V. and R. O. Prum. Shape Of Colors To Come: What Has Soft Matter Physics Got To Do With Avian Structural Colors. Paper presented at the XXV International Ornithological Congress, Campos do Jordão, Brazil. (22–28 Aug. 2010)

[19] Saranathan, V. and R. O. Prum. Evolutionary Photonics Of Avian Amorphous Nanostructures. Paper presented at the 127$^{\text{th}}$ Stated Meeting of the American Ornithologists' Union, at Philadelphia, PA (12–15 Aug. 2009)

[20] Prum, R. O., and V. Saranathan. Self-Assembly of Color-Producing Avian Amorphous Nanostructures By Phase Separation. Paper presented by ROP at the 127$^{\text{th}}$ Stated Meeting of the American Ornithologists' Union, at Philadelphia, PA (12–15 Aug. 2009).

[21] Forster, J. D., H. Noh, V. Saranathan, H. Cao, S. Mochrie, C. Osuji, R. O. Prum and E. R. Dufresne. Structural Color of Biological and Biomimetic Amorphous Nanostructures. Paper presented by JDF at the 13$^{\text{th}}$ IACIS International Conference on Surface and Colloid Science and 83rd ACS Colloid and Surface Science Symposium (14–19 Jun. 2009).

[22] Saranathan, V., E. R. Dufresne, S. G. J. Mochrie, H. Cao and R. O. Prum. Small Angle X-ray Scattering (SAXS) Studies of Self-assembled Bio-photonic Nanostructures. Poster presented at the 18$^{\text{th}}$ Annual Connecticut Symposium on Microelectronics and Optoelectronics, New Haven, CT (11 Mar. 2009)

[23] Forster, J. D., H. Noh, V. Saranathan, H. Cao, S. Mochrie, C. Osuji, R. O. Prum, E. R. Dufresne. Structural Color of Biological and Biomimetic Amorphous Nanostructures. Poster presented by JDF at the 18$^{\text{th}}$ Annual Connecticut

Symposium on Microelectronics and Optoelectronics, New Haven, CT (11 Mar. 2009)

[24] Vinther, J., D. E. G. Briggs, R. O. Prum and V. Saranathan. The colour and preservation of fossil feathers. Paper presented by JV at the 2008 Geological Society of America Joint Meeting – Celebrating the International Year of Planet Earth, Houston, TX (5–9 Oct. 2008)

[25] Saranathan, V. and M. A. Russello. Molecular tools for elucidating the mechanisms of Monk Parakeet (*Myiopsitta monachus*) invasion success. Poster presented by MAR at Evolutionary Change in Human-altered Environments, an international summit organized by UCLA Institute of the Environment (8–10 Feb. 2007)

[26] Saranathan, V., D. Hamilton, G. Powell, D. Kroodsma, and R. O. Prum. Genetic continuity and vocal dialects in a Neotropical Suboscine, the Three-wattled Bellbird (Procnias tricarunculata). Paper presented at the IV North American Ornithological Conference, Veracruz, México. (3–7 Oct. 2006)

[27] Saranathan, V. and M. A. Russello. Molecular tools for elucidating the mechanisms of Monk Parakeet (*Myiopsitta monachus*) invasion success. Poster presented at Conserving Birds in Human-Dominated Landscapes symposium organized by American Museum of Natural History, New York, NY (27–28 Apr. 2006)

[28] Saranathan, V. and E. H. Burtt, Jr. Similarity of repeated samples of plumage microflora of short- and long-distance migrants. Paper presented at the 123rd Stated Meeting of the American Ornithologists' Union, at Santa Barbara, CA (23–27 Aug. 2005)

[29] Burtt, E. H., Jr. and V. Saranathan. Similarity of repeated samples of plumage microflora of resident birds in Arizona, Ohio and Washington. Paper presented by EHB the 123rd Stated Meeting of the American Ornithologists' Union, at Santa Barbara, CA (23–27 Aug. 2005)

[30] Saranathan, V. and E. H. Burtt, Jr. Variation in plumage microbial communities among Song Sparrows (Melospiza melodia) of Arizona, Ohio and Washington. Poster presented at the 122nd Stated Meeting of the American Ornithologists' Union held jointly with Society of Canadian Ornithologists/ Société des Ornithologistes du Canada, at Québec, QC (16–21 Aug. 2004)

[31] Saranathan, V. and E. H. Burtt, Jr. Effect of solar Ultraviolet radiation on feather- degrading bacteria. Paper presented at the Annual Meeting of the Association of Field Ornithologists and the Wilson Ornithological Society, Cornell University, Ithaca, NY (22–24 Apr. 2004)

Grants, Awards, and Honours

"From genes to products: Study and application of butterfly structural colors for biomimetic manufacture"
Co-PI, NRF Competitive Research Programme CRP20 (2019-2023; SGD 4,881,217.20)

"High-memory, High-core, High-performance Research Computer"
PI, with 4 Co-PIs, Yale-NUS College (2016-2017; SGD 81,370.29)

Start-up Funds, Yale-NUS College (2015-2020)

Alfred Deakin Postdoctoral Research Fellowship (*declined*), Deakin University (2015-2017; AUD167,218)

UK Royal Society Newton Alumni Scheme (2013-2023; £60,000)

UK Royal Society Newton Fellowship, University of Oxford (2011-2013; £106,000)

Edward P. Abraham Cephalosporin Junior Research Fellowship, Linacre College, University of Oxford (2011–2013)

Dillon and Mary Ripley Graduate Fellowship, Yale University (2005–2009; $110,000)

EEB Chair Award, Yale University (2006, and 2008; Total $6,335)

International Ornithological Congress Travel Award (2006, 2010)

SICB Charlotte Magnum Student Travel Award (2010)

American Ornithologists' Union's Marcia Brady Student Travel Award (2005, 2009)

Graduate School Conference Travel Award, Yale University (2007)

Cooper Ornithological Society Student Membership Award (2007–2009)

Society for the Study of Evolution Student Travel Award (2007)

North American Ornithological Conference Student Travel Award (2006)

American Ornithologists' Union Student Membership Award (2005–2007)

Founder's Prize, for expository writing in the Sciences, Ohio Wesleyan University (2005)

Wilson Ornithological Society Travel Award (2004)

Daniel E. Anderson Memorial Award, for excellence in philosophy research, Ohio Wesleyan University (2004)

Trustee Scholarship and Dean's List for academic achievements, Ohio Wesleyan University (2001–2004)

Inducted into **Sigma Xi**, **Sigma Phi Sigma** (Physics) and **Phi Sigma Tau** (Philosophy) Honor societies, Ohio Wesleyan University (2004)

Skills

Programming - C, C++, FORTRAN, JAVA (J2SE, J2ME), mySQL, JSP, PHP, PERL, ASSEMBLY (8086, 68K)

Operating Systems - Windows, Macintosh, Linux

Field - GIS/GPS, Censusing, Banding, Mist-Netting, Nest-box trapping

Scientific Software - Sequencher, ClustalX, PAUP, Mesquite, R, MATLAB, Mathematica, Minitab, Scheme (MEEP, MPB)

Materials Characterization - Scanning (SEM) and Transmission Electron Microsocopy (TEM), Focussed Ion Beam Milling (FIB), Small Angle X-ray Scattering (SAXS), Fibre Diffraction

Teaching and Mentoring Experience

COURSES TAUGHT (Yale-NUS College)

- *YSC 3234: Principles of Biophysics*
  with integrated labs; jointly listed in both Life and Physical Sciences majors
  (2x; Spring 2019, Fall 2017)

- **Common Curriculum (YCC)**
  - *YCC 1122 Quantitative Reasoning*
    (6x; Fall 2018 - 2 sections, Fall 2017, Spring 2017 - 2 sections, Spring 2016)
  - *YCC 2135 Foundations of Science: Field Ornithology*
    (2 sections with 2 half-modules; Fall 2016)
  - *YCC 2132 Foundations of Science: Just History and Mass Extinctions*
    (1 section with 2 half-modules; Spring 2016)
  - *YCC 1131 Scientific Inquiry 1*
    (4x; Spring 2020, Spring 2019, Fall 2015)
- *YIR X31Y Independent Reading and Research*(Spring 2017)
- *Week 7 Learning Across Boundaries* – intensive week-long experiential modules
  'Conservation and Reintroductions in South Africa' (Fall 2015)
  'Wildlife Conservation in a Fragmented City State' (Fall 2019)

UNDERGRADUATE MENTORING:

- Yale-NUS Summer Research Project
  – Erika Loh '22, topic: iridescence in birds (Summer 2019)
- Yale-NUS Student Research Associates
  – Adam Goh '18, topic: plant structural colouration (2016-2017)
  – Erika Loh '21, topic: iridescence in birds (AY 2018-19)
  – Charis Tagtag '22, topic: membrane self-assembly (Spring 2020)
- University of California, Santa Barbara (UCSB) (Spring 2018)
  – James McCann '19, topic: dynamic iridescence in Loliginid squids
- Yale-NUS Undergraduate Capstone supervision
  – Adam Goh, 2018, "Does the southern cassowary (*Casuarius casuarius*) exhibit fruit color preferences?"
- UROPS project supervision (DBS, NUS):
  – Lin Jing Yi, "Physics and Evolution of Blue Bee Colors", Spring 2019
  (Co-supervised with Professor John Ascher)
- Final Year Projects (FYP) supervision (DBS, NUS):
  – Lin Jing Yi, "Physics and Evolution of Blue Bee Colors", AY 2019-2020
  (Co-supervised with Professor John Ascher)
- Yale-NUS College Academic Advising
  – 4 fresh(wo)men and 4 sophomores, in total (Fall 2015 – present)
- Yale-NUS College Life Sciences Major Advising – Adam Goh '18, Qing Wang '19, Olga Sirbu '21

POSTGRADUATE MENTORING:

- PhD Supervision (DBS, NUS)
  – Kwi Shan Seah (Jan. 2017 – present; Yale-NUS Graduate Scholarship)
  – Laura Berman (Jan. 2018 – present; Yale-NUS Graduate Scholarship)
  (Co-supervised with Professor Frank Rheindt)

POSTDOCTORAL MENTORING:

- Research Fellows (Yale-NUS College)
  – Dr. Venugopal Edakkal (Feb. 2018 – Jan 2019)
  – Dr. Cedric Finet (Jul. 2019 – present)

University of Oxford, 2011–2013

- Tutor – *Sensory Ecology* for six final year BSc undergraduate students (Michaelmas Term 2012-2013)
- Guest Lecturer – *Contemporary Issues in Biodiversity* module of the Biodiversity Conservation and Management MSc course (Hillary Term 2011-2012)
  Instructor: Dr. Shonil Bhagwat
- Post-graduates mentored at Linacre College (pastoral care)
  2011: Romita Munshi, Akshay Ramteke
  2012: Viksit Arora, Santiago Cornet, Katherine Rehberg

Yale University, 2005–2010

- Judge of biomimicry ideas of New Haven high school students for the *Bio21* program, University of New Haven (20 Dec 2010)
- Completed an intensive multi-year module, *Certificate of Teaching Preparation*, Yale Graduate Teaching Center
- Guest Lecturer – *Ornithology, EEB272* (2007, 2008)
  Instructor: Professor Richard Prum
- Graduate Teaching Fellow
  – EEB272/273L: *Ornithology Lecture and Lab* (Spring 2006, Spring 2008)
  Instructor: Professor Richard Prum
  – EEB115: *Conservation Biology* (Fall 2007)
  Instructor: Professor Jeffrey Powell and Dr. Marta Wells Martinez
  – EEB123L: *Principles of Ecology, Evolution and Behavior Lab* (Spring 2007)
  Instructor: Ms. Nancy Rosenbaum
- Undergraduates mentored:
  – Natasha Vitek (Freshwoman, 2008, extant feather colour)
  – Michael Zilm (Junior, 2010, keratin self-assembly)

Ohio Wesleyan University, 2001–2004

- Teaching Assistant – first-year undergraduate Honors Tutorial, ZOOL190.1: Birds, Bacteria and Feather Degradation (Fall 2004)
  Instructor: Professor Edward H. Burtt, Jr.
- Volunteer Physics Tutor – PHYS 380 Quantum Mechanics (2003)
  Instructor: Professor Brad Trees

Professional Service

American Ornithologists' Union International Affairs Committee (2006 – 2011)

Chairman, American Ornithologists' Union Website Committee (2007 – 2010)

Recent and current professional memberships:

American Ornithological Society (formerly American Ornithologists' Union)
American Physical Society
Cooper Ornithological Society
Materials Research Society
Sigma Xi
Society for Integrative and Comparative Biology
Society for the Study of Evolution

Publons Reviewer Profile: https://publons.com/a/1313662/

Invited to peer-review for

Nature Communications, Nature Plants, Science Advances, Proceedings of the National Academy of Sciences USA, Journal of the American Chemical Society (JACS), iScience (Cell Press), Advanced Materials, Advanced Optical Materials, Extreme Mechanics Letters, Proceedings of the Royal Society B, American Naturalist, New Phytologist, Scientific Reports, Biology Letters, Journal of the Royal Society Interface, Journal of the Royal Society Interface Focus, Applied Physics Letters, Optics Express, Optics Communications, Applied Optics, Color Research and Application, Bioacoustics, Journal of Zoology, FWF Austrian Science Fund, Hungarian National Innovation Office NKFIH

Advisor, for a transdisciplinary program in research and creation, *Mondes Visuels* by Dr. Olivier Perriquet, L'Ecole Média Art, Chalon-sur-Saône, France (2019 – 2022)

Consultant, for AMNH Immersive Theatre Project (Invisible Worlds Theatre), AMNH Gilder Centre (2019 – present)

Yale-NUS College and DBS, NUS

YNC Research Technology Computing Group (AY 2017-2018, AY 2018-2019)

YNC Curriculum Committee (AY 2016-2017)

DBS Final Year Projects (FYP)/Honours Theses Examiner
– AY 2016-2017 - 2 students
– AY 2018-19 - 5 students

DBS PhD Thesis Defense Chairman (AY 2018-2019)
Ian Chan (Advisor: Peter Todd), Jan. 2019

Thesis Advisory Committee and *Internal Theses Examiner*:
Anupama Prakash (Advisor: Antonia Monteiro), defended Dec. 2018
Zeng Hua (Advisor: Daiqin Li), defended Apr. 2019
Saoirse Foley (Advisor: William H. Piel), defended Apr. 2020

References

Upon request