BIOENGINEERING RESEARCH

2018–2019

UNIVERSITY OF CALIFORNIA
UC RIVERSIDE

Marlan and Rosemary Bourns
College of Engineering
Bioengineering

CONTENTS

Xiaoping Hu
Chair, UCR Bioengineering
Provost Fellow

Dear Colleagues,

Welcome to another year of pioneering research at UC Riverside's Department of Bioengineering. Our program continues to grow each year and in 2018, Bioengineering Interdepartmental Graduate (BIG) program students are experiencing a new era in bioengineering at UC Riverside.

First, we are excited to welcome three accomplished faculty members to our core research program. Their expertise in neuroengineering, computational bioengineering, and molecular and cellular engineering brings new capabilities in areas such as prosthetics, molecular dynamic simulations, and image processing.

In addition, many of our faculty will move into the new, 180,000 square-foot Multidisciplinary Research Building (MRB) located next door to our Materials Science and Engineering facility. Of the eight teams slated to move during phase one, seven of them include BIG faculty members.

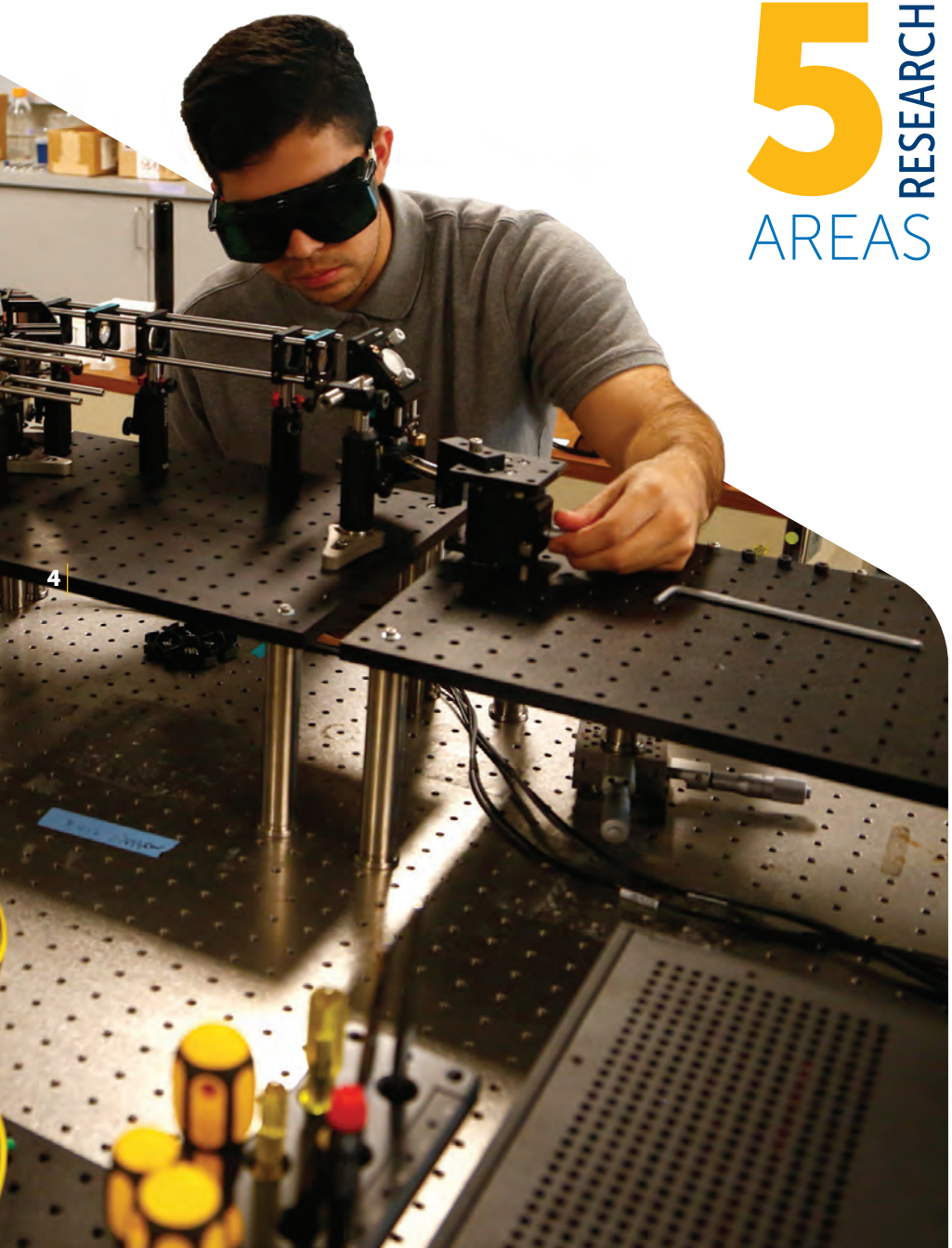
Among the accomplished professionals they will be working alongside are experts in statistics, psychology, medicine, cell biology and neuroscience in such teams as food, bugs, guts and brains; imaging; mind and brain health; and molecular, circuit and behavioral mechanisms of neurodevelopment.

The foundation of the BIG program is built on convergence in research, bringing together experts in various disciplines to address critical challenges facing us today and tomorrow.

Exciting research is happening here and this brochure highlights research accomplishments by our faculty and students. We welcome you to learn more about the Department of Bioengineering at UC Riverside by visiting our website at www.bioeng.ucr.edu. We look forward to continuing our growth and delivering on our promise to help make the world a better place through bioengineering advancements.

Regards,

Xiaoping Hu
Chair, UCR BIEN
Provost Fellow



5 RESEARCH AREAS

BIOMATERIALS AND REGENERATIVE MEDICINE

Optical nano-materials; polymeric scaffolding; high-throughput screening; 3D biomaterials; 3D tissue engineered scaffolds and bioreactors; vascular nanotherapeutics, biodegradable implants

BIOMEDICAL IMAGING

Optical coherence tomography; biophotonic technologies; non-invasive monitoring; image guided spectroscopy; optical neuroimaging; nonlinear optical microscopy and spectroscopy; MRI; neuroimaging

COMPUTATIONAL BIOENGINEERING

Bioinformatics; modeling of biomolecular structure, dynamics and interactions; protein and peptide design; crowded protein osmotic pressure; modeling of cellular signaling pathways; image processing and analysis; computational drug discovery

MOLECULAR AND CELLULAR ENGINEERING

Cellular biomechanics; mechanotransduction; signal transduction pathways; regulation of immune system; vascular inflammation; metabolic controls; intracellular biosensors; biomolecules/biomolecular interactions

NEUROENGINEERING

Modeling of the neural system; processing of neurophysiological signals and neuroimaging data; modulation and intervention of the neural system; engineering of devices, constructs, and therapeutics for treating brain disorders

BY THE NUMBERS

DEGREES OFFERED
B.S., M.S.
B.S./M.S.
MS Online
Ph.D.

RESEARCH AREAS
5

GRADUATE STUDENT TO FACULTY RATIO
3.8:1

BIG PARTICIPATING FACULTY REPRESENT
4 Colleges

BIG FACULTY
50

FACULTY
17

AFFILIATED CENTERS
10

INCREASE IN RESEARCH EXPENDITURES FROM 15/16 TO 16/17
30%

STUDENTS
→ **358** Undergraduate
→ **12** Master's
→ **49** Ph.D.

FELLOWS OF PROFESSIONAL ORGANIZATIONS
11

Bahman Anvari, Professor

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Ph.D.: Bioengineering, Texas A&M
Postdoctoral Training:
Beckman Institute, UC Irvine
Fellow: BMES, SPIE, AAAS, AIMBE

Research Focus

Anvari lab focuses on the engineering and development of light-based theranostic constructs derived from biological materials for clinical translation, and use of optical methods to study cellular mechanobiology

Summary

Research is focused on the development and application of optical methods for biological measurements, imaging, and therapy as well as using optical methods to study mechanobiology. Learn more: www.anvaribiophotonicslab.org

Selected Publications

- Burns JM, Vankayala R, Mac JT, Anvari B (2018) Erythrocyte-derived theranostic nanoplatforms for near infrared fluorescence imaging and photodestruction of tumors, ACS Appl. Mater. Interfaces, doi: 10.1021/acsami.8b08005.
- Mac JT, Vankayala R, Patel DK, Wueste S, Anvari B (2018) Erythrocyte-derived optical nanoprobes doped with indocyanine green-bound albumin: material characteristics and evaluation for cancer cell imaging, ACS Biomater. Sci. Eng., doi: 10.1021/acsbiomaterials.8b00621.

Justin W. Chartron, Assistant Professor

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Ph.D.: Biochemistry and Molecular Biophysics, California Institute of Technology
Postdoctoral Training: Stanford University
Highlight: Research featured in *Nature* magazine

Research Focus

Quantitative systems biology, biophysics of protein maturation, molecular and cellular engineering, biotechnology, and biopharmaceutical production

Summary

The Chartron group uses systems and synthetic biology to develop biomaterials, therapeutics and industrial enzymes.

Selected Publications

- Chartron JW, Hunt KCL, Frydman J (2016) Cotranslational signal-independent SRP preloading during membrane targeting, *Nature*, 536, 224–228.
- Pechmann S, Chartron JW, Frydman J (2014) Local slowdown of translation by nonoptimal codons promotes nascent-chain recognition by SRP in vivo, *Nat. Struct. Mol. Biol.* 21, 1100–1105.

Kevin Freedman, Assistant Professor

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Ph.D.: Chemical and Biological Engineering, Drexel University

Postdoctoral Training: Imperial College London, Joint Genome Institute

Highlight: Human Frontier Science Program Young Investigator Award

Research Focus

Single molecule methods, nano-sensors and molecular manipulation, biophysics, device characterization and device physics, microfluidics, molecular kinetics, and electrical and optical recordings

Summary

The Freedman Lab integrates single molecule methods with microfluids for studying fundamental biology as well as developing diagnostic and prognostic tools and devices.

Selected Publications

- Freedman K, Otto L, Ivanov A, Oh S, Edel J (2016) Nanopore sensing at ultra-low concentrations using single molecule dielectrophoretic trapping, *Nature Communications*, 7, 10217.
- Freedman K, Crick C, Albella P, Barik A, Ivanov A, Maier S, Oh SH, Edel J (2016) On-demand surface and tip enhanced raman spectroscopy using dielectrophoretic trapping and nanopore sensors, *ACS Photonics*, 3 (6), 1036-1044.

Kaustabh Ghosh, Associate Professor

MSE 207
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Ph.D.: Biomedical Engineering, State University of New York, Stony Brook

Postdoctoral Training: Boston Children's Hospital, Harvard University

Highlight: National Institutes of Health R01 grant

Research Focus

Vascular mechanobiology, inflammation, and nanomedicine

Summary

The Ghosh Research Group aims to integrate the principles of mechanobiology and nanotechnology to tackle vascular inflammation associated with diabetes and aging.

Selected Publications

- Cabrera A, Bhaskaran A, Xu J, Yang X, Scott HA, Mohideen U, Ghosh K (2016) Senescence increases choroidal endothelial stiffness and susceptibility to complement injury: implications for choriocapillaris loss in AMD, *Investigative Ophthalmology and Visual Science*, 57: 5910-5918.
- Yang X, Scott HA, Monickaraj F, Xu J, Ardekani S, Nitta CF, Cabrera A, McGuire PG, Mohideen U, Das A, Ghosh K (2016) Basement membrane stiffening promotes retinal endothelial activation associated with diabetes, *The FASEB Journal*, 30:601-611.

William Grover, Assistant Professor

MSE 219
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Ph.D.: Chemistry, University of California, Berkeley

Postdoctoral Training: Massachusetts Institute of Technology

Highlight: UC Riverside Junior Faculty Distinguished Teaching Professor

Research Focus

Instrumentation, sensors, medical diagnostics, single-cell analysis, microfluidics, biomaterials, and design automation

Summary

The Grover Lab develops "meta-instrumentation," a framework of hardware and software components that supports many different instruments and applications in research, healthcare, and education.

Selected Publications

- Mesbah Oskui S, Bhakta HC, Diamante G, Liu H, Schlenk D, Grover WH (2017) Measuring the mass, volume, and density of microgram-sized objects in fluid, *PLoS ONE*, 12(4): e0174068.
- Hill DA, Anderson LE, Hill CJ, Mostaghim A, Rodgers VGJ, Grover WH (2016) MECs: "Building blocks" for creating biological and chemical instruments, *PLoS ONE*, 11(7): e0158706.

Jia Guo, Assistant Professor

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Ph.D.: Bioengineering, University of California San Diego

Postdoctoral Training: University of California, San Diego, Stanford University

Highlight: Presented at the last 10 ISMRM annual meetings

Research Focus

Arterial spin labeling, noninvasive oxygenation measurement, new MRI contrast mechanism, image processing, machine learning

Summary

The Guo Lab focuses on exploring and developing novel MRI techniques such as arterial spin labeling and deep learning for improved image quality and quantification a ccuracy.

Selected Publications

- Guo J, Wong EC (2015) Increased SNR efficiency in velocity selective arterial spin labeling using multiple velocity selective saturation modules (mm-VSASL). *Magn Reson Med*. 74(3):694-705.
- Guo J, Wong EC (2012) Venou s oxygenation mapping using velocity-selective excitation and arterial nulling. *Magn Reson Med*. 68(5):1458-71.

Xiaoping Hu, Provost Fellow Department Chair and Professor

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Ph.D.: Medical Physics, University of Chicago
Postdoctoral Training: University of Chicago
Fellow: IEEE, AIMBE, ISMRM

Research Focus

Biomedical imaging, magnetic resonance imaging, neuroimaging, neuromodeling, neuroengineering, and molecular imaging

Summary

The Hu group works on the development of in vivo magnetic resonance imaging/spectroscopy techniques, applications of these techniques for studying the brain of normal subjects and patients, modeling the brain with imaging measures and developing methods to modulate the brain.

Selected Publications

- Chen S and Hu X (2018) Individual identification using functional brain fingerprint detected by recurrent neural network, *Brain Connect*, 8(4):197-204. doi: 10.1089/brain.2017.0561.
- Sulzer D, Cassidy C, Horga G, Kang U, Fahn S, Casella L, Pezzoli G, Langley J, Hu X, Zucca F, Isaias I, and Zecca L (2018) Neuromelanin detection by magnetic resonance imaging (MRI) and its promise as a biomarker for Parkinson's disease, npj *Parkinson's Disease*, 4:11; doi:10.1038/s41531-018-0047-3.

Elena Kokkoni, Assistant Researcher

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Ph.D.: Biomechanics and Movement Science University of Delaware
Postdoctoral Training: University of Delaware
Highlight: TBD

Research Focus

Development and application of physical rehabilitation environments that combine novel technology and enriched movement training for pediatric populations with mobility impairments.

Summary

Dr. Kokkoni's group uses biomechanical and behavioral methods to assess the change in motor development and learning of children as they train with the technology.

Selected Publications

- Kokkoni E, Logan SW, Stoner T, Peffley T, Galloway JC (2018) Use of an in-home body weight support system by a child with spina bifida, *Pediatric Physical Therapy*, 30 (3), E1-E6.
- Babik I, Kokkoni E, Cunha AB, Galloway JC, Rahman T, Lobo MA (2016) Feasibility and effectiveness of a novel exoskeleton for an infant with arm movement impairments, *Pediatric Physical Therapy*, 28 (3), 338-346.

Jiayu Liao, Associate Professor

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Ph.D.: Biological Chemistry, University of California, Los Angeles

Postdoctoral Training: Scripps Research Institute

Fellow: AIMBE

Research Focus

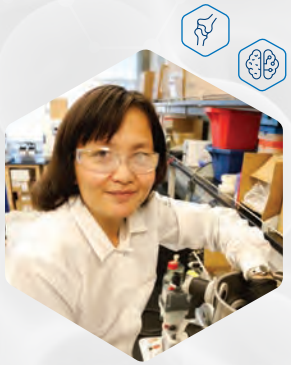
Molecular engineering, drug discovery, and translational medicine

Summary

Liao's group develops molecular engineering and high-throughput technologies for quantitative systems biology and translational research/development.

Selected Publications

- de Graaf C, Donnelly D, Wootten D, Lau J, Sexton PM, Miller LJ, Ahn J, Liao J, Fletcher MM, Yang D, Alastair J, Brown H, Zhou C, Deng J, Wang MW (2016) Glucagon-like peptide-1 and its class B G protein–coupled receptors: a long march to therapeutic successes, *Pharmacological Reviews*, 68:954-1013.
- Wiryawan H, Dan K, Etuale M, Shen Y, Liao J (2015) Determination of SUMO1 and ATP affinity for the SUMO E1 by quantitative FRET technology, *Biotechnol Bioeng*, 112:652-8.



Huinan Liu, Associate Professor

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Ph.D.: Biomedical Engineering, Brown University

Previous Institution: University of Pittsburgh

Highlight: Hellman Family Foundation Fellow

Research Focus

Biomaterials, medical implants, and regenerative medicine

Summary

Liu Lab is interested in fundamental studies and applied research in the world of biomaterials and nanomaterials for tissue repair, drug delivery, medical implants and devices.

Selected Publications

- Cipriano AF, Sallee A, Tayoba M, Cortez-Alcaraz MC, Lin A, Guan RG, Zhao ZY, Tayoba M, Sanchez J, Liu H (2017) Cytocompatibility and early inflammatory response of human endothelial cells in direct culture with Mg-Zn-Sr alloys, *Acta Biomaterialia*, 48: 499-520.
- Zhang N, Lock J, Sallee A, and Liu H (2015) Magnetic nanocomposite hydrogel for potential cartilage tissue engineering: synthesis, characterization, and cytocompatibility with bone marrow derived mesenchymal stem cells, *ACS Applied Materials and Interfaces*, 7(37): 20987-20998, 10.1021/acsami.5b06939.

Joshua Morgan, Assistant Professor

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Ph.D.: Mechanical and Aeronautical Engineering, University of California, Davis

Postdoctoral Training: University of California, Davis, University of Delaware

Highlight: 2018 Regents Faculty Fellowship Recipient

Research Focus

Aging-associated disease, tissue engineering, and cell and tissue homeostasis

Summary

The Morgan research group fuses engineering and molecular biology techniques to better understand, slow, and reverse the aging process.

Selected Publications

- Morgan JT, Stewart WG, McKee RM, Gleghorn JP (2018) The mechanosensitive ion channel TRPV4 is a regulator of lung development and pulmonary vasculature stabilization. Cellular and Molecular Bioengineering. In Press.
- Morgan JT, Raghunathan VK, Chang Y, Murphy CJ, Russell P (2015) The intrinsic stiffness of human trabecular meshwork cells increases with senescence, *Oncotarget*, 6(17):15362-74.

Dimitrios Morikis, Professor

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Ph.D.: Physics, Northeastern University

Postdoctoral Training: University of Cailfornia San Diego, The Scripps Research Institute

Fellow: AAAS, AIMBE

Research Focus

Biocomputation, immune physics and immunoengineering, biomarker and drug discovery, structural and translational bioinformatics, and systems immunology and disease models

Summary

The Morikis group uses physics and engineering approaches to understand molecular mechanisms of immunology, develop disease models, and design new drugs and diagnostics for autoimmune and inflammatory diseases.

Selected Publications

- Zewde N, Morikis D (2018) A computational model for the evaluation of complement system regulation under homeostasis, disease, and drug intervention, *PLOS ONE*, 13(6): e0198644.
- Harrison RES, Mohan RR, Gorham RD Jr, Kieslich CA, Morikis D (2017) AESOP: A python library for investigating electrostatics in protein interactions, *Biophysical Journal*, 112:1761-1766.

Jin Nam, Associate Professor

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Ph.D.: Materials Science and Engineering
The Ohio State University

Postdoctoral Training: The Ohio State University

Highlight: Dean's Award of Excellence in Research

Research Focus

Tissue engineering, stem cell mechanobiology, and multi-functional scaffolding

Summary

The Nam Laboratory focuses on developing enabling technologies to repair damaged tissues via stem cell/tissue engineering approaches, specifically by controlling the physical microenvironments of cells.

Selected Publications

- Brunelle, A., Horner, C., Low, K., Ico, G., Nam, J. (2018) Electrospun thermosensitive hydrogel scaffold for enhanced chondrogenesis of human mesenchymal stem cells. *Acta Biomaterialia* 66:166-176.
- Maldonado, M., Luu, R., Ico, G., Ospina, A., Myung, D., Shih, H., Nam, J. (2017) Lineage- and developmental stage-specific mechano-modulation of induced pluripotent stem cell differentiation. *Stem Cell Research & Therapy* 8:216.

B. Hyle Park, Associate Professor

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Ph.D.: Physics, University of California, Irvine

Postdoctoral Training:
Wellman Center for Photomedicine

Highlight: Outstanding Engineering Achievement Merit Award, Engineer's Council

Research Focus

Optical coherence tomography, and neuroimaging

Summary

The Neuroscience and Optical Imaging Research (NOIR) group advances optical imaging technology for label-free characterization of biological tissue, focusing particularly on detection of neural activity.

Selected Publications

- Tong MQ, Hasan MM, Lee SS, Haque MR, Kim DH, Islam MS, Adams ME, Park BH (2017) OCT intensity and phase fluctuations correlated with activity-dependent neuronal calcium dynamics in the Drosophila CNS, *Biomedical Optics Express*, 8:726-735.
- Eberle MM, Hsu MS, Rodriguez CLR, Szu JI, Oliveira MC, Binder DK, Park BH (2015) Localization of cortical tissue optical changes during seizure activity in vivo with optical coherence tomography, *Biomedical Optics Express*, 6: 1812-1827.

Giulia Palermo, Assistant Professor

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Ph.D.: Computational Drug Discovery and Development, Italian Institute of Technology and University of Genova

Postdoctoral Training: Swiss Federal Institute of Technology Lausanne, EPFL, University of California, San Diego

Highlight: Work featured in the 2018 Journal of the American Chemical Society Young Investigators Virtual Issue

Research Focus

Biophysics, Molecular Simulations, Multiscale modeling, Gene editing, RNA/DNA processing, cryo-EM

Summary

The Palermo Lab combines physics, chemistry and computational engineering to unravel the function and improve the application of key macromolecules responsible for gene editing and regulation.

Selected Publications

- Palermo G, Ricci CG, Fernando A, Basak R, Jinek M, Rivalta I, Batista VS, McCammon JA (2017) PAM-induced allostery activates CRISPR-Cas9. J, *Am. Chem. Soc.*, 139, 16028–16031. Journal Cover Art
- Palermo G, Miao Y, Walker RC, Jinek M, McCammon JA (2017) CRISPR-Cas9 conformational activation as elucidated from enhanced molecular simulations, *Proc. Natl. Acad. Sci. USA*, 114, 7260–7265.

Megan Peters, Assistant Professor

Bourns Hall A133
(951) 827-2412
mpeters@engr.ucr.edu

Ph.D.: Computational Cognitive Neuroscience (Psychology), University of California, Los Angeles

Postdoctoral Training: University of California, Los Angeles

Highlight: Organization for Human Brain Mapping Merit Abstract Award

Research Focus

Neuroimaging, computational modeling, machine learning, perception and awareness, and neural representations of uncertainty

Summary

The Cognitive & Neural Computation lab uses computational models, neuroimaging, and machine learning to understand how the brain processes uncertainty and uncertain information.

Selected Publications

- Peters MAK, Lau H (2015) Human observers have optimal introspective access to perceptual processes even for visually masked stimuli, *eLife*, 4:e09651.
- Peters MAK, Thesen T, Ko YD, Maniscalco B, Carlson C, Davidson M, Doyle W, Kuzniecky R, Devinsky O, Halgren E, Lau H (2017) Perceptual confidence neglects decision-incongruent evidence in the brain, *Nature Human Behaviour*, 1:0139.

Victor G. J. Rodgers
Inaugural Jacques S. Yeager, Sr. Professor of Bioengineering
Bourns Hall A127
(951) 827-6241
vrodgers@engr.ucr.edu
D.Sc.: Chemical Engineering
Washington University, St. Louis
Fellow: AAAS, AIMBE

Research Focus

Crowded protein analysis, biotransport phenomena, and membrane separations

Summary

The B2K Group blends fundamental principles of transport phenomena with experimental techniques to research and solve advanced biomedical engineering problems.

Selected Publications

- Hale CS, Ornelas DN, Yang JS, Chang L, Vang K, Batarseh RN, Ozaki-Felt NU, Rodgers VGJ (2018) Interrogating the osmotic pressure of self-crowded bovine serum albumin solutions: implications of specific monovalent anion effects relative to the hofmeister series, *The Journal of Physical Chemistry* B DOI: 10.1021/acs.jpcb.8b07000 (in press).
- Erudaitius D, Mantooth, J, Huang A, Soliman J, Doskey C, Buettner GR, Rodgers VGJ (2018) Calculated cell-specific intracellular hydrogen peroxide concentration: relevance in cancer cell susceptibility during ascorbate therapy, *Free Radical Biology and Medicine* Vol. 120. pp 356-367.

Valentine Vullev, Professor
MSE 235
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Ph.D.: Chemistry, Boston University
Postdoctoral Training: Harvard University
Highlight: Regents of University of California, Faculty Development Award

Research Focus

Charge transfer, bioinspired molecular engineering, biofunctional surfaces microbial biosensing, and microfluidics

Summary

Bioinspired molecular engineering: employing ideas from biology in unorthodox manners allows us to achieve functionalities beyond what nature offers for charge transfer, photonics and electronics.

Selected Publications

- Bao D, Upadhyayula S, Larsen JM, Xia B, Georgieva B, Nuñez V, Espinoza EM, Hartman JD, Wurch M, Chang A, Lin C-K, Larkin J, Vasquez K, Beran GJO, Vullev VI (2014) Dipole-mediated rectification of intramolecular photoinduced charge separation and charge recombination, *J. Am. Chem. Soc.*, 136: 12966-12973.
- Purc A, Espinoza EM, Nazir R, Romero JJ, Skonieczny K, Jeżewski A, Larsen JM, Gryko DT, Vullev VI (2016) Gating that suppresses charge recombination the role of mono-n-arylated diketopyrrolopyrrole, *J. Am. Chem. Soc.*, 138:12826-12832.

BIG PROGRAM

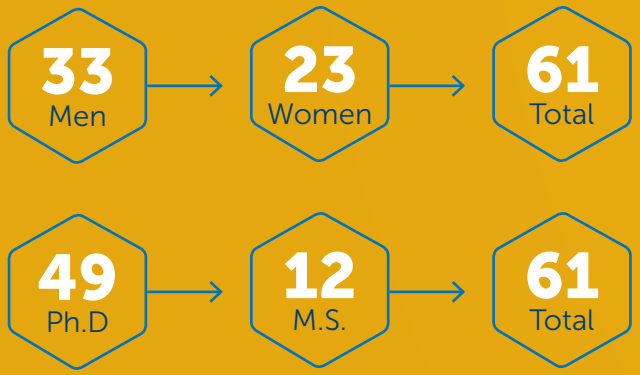
BIOENGINEERING INTERDEPARTMENTAL GRADUATE

The BIG program combines internationally acclaimed bioengineers with more than 50 additional faculty members from four colleges across campus to offer graduate students an immersive, interdisciplinary experience unique to UC Riverside.

BECOMING A BIG STUDENT PROVIDES ACCESS TO BENEFITS INCLUDING

- Competitive financial support packages including fellowships
- Experienced faculty with dedicated leadership training
- Exposure to industry leaders through distinguished speaker series
- Collaborative, cutting-edge medical research with UCR's School of Medicine, partner universities, and research institutes
- A rigorous but exceptionally interactive and welcoming educational training environment

GRADUATE STUDENT BREAKDOWN (2018)



AWARDS AND ACKNOWLEDGEMENTS

Reed Harrison received the Bioengineering Best Teaching Assistant Award by UCR's Graduate Division

Joshua Burns selected as the Early Career Scientist Board Representative (2017-2019) of the American Society for Laser Medicine and Surgery (ASLMS)

Zhehao Xiong awarded Podium Presentation Award at the 18th UC Systemwide Bioengineering Symposium

Dieanira Erudaitius awarded Rapid Fire Presentation Award at the 18th UC Systemwide Bioengineering Symposium

Joshua Burns received an $1,800 grant from The International Society for Optics and Photonics (SPIE) to attend and present at Photonics West in San Francisco

FELLOWSHIPS, INTERNSHIPS AND COLLABORATIONS

Reed Harrison – University of California President's Dissertation Year Fellowship

Andrea Cabrera – Graduate Research Mentoring Program (GRMP) Fellowship from UCR's Graduate Division

Heran Bhakta – summer internship at Illumuna in San Diego, CA

Rohith Mohan – summer internship at Biogen in Boston, MA

Vipul Madahar – six-month internship at the Chinese National Compound Library/National Drug Screening Center of China

George Way – six-month internship at the Chinese National Compound Library/National Drug Screening Center of China

Patrick Gregory – working at a collaborator's lab at Stanford University on a NIH-funded project as part of NEI's Audacious Goals Initiative

Jason Qiu and Jorge Sanchez – working with collaborators at University of Southern California's Keck Medical Center

BIG 50 FACULTY

MARLAN AND ROSEMARY BOURNS COLLEGE OF ENGINEERING

Computer Science and Engineering

Bir Bhanu, Video bioinformatics, computational biology, computational neuroscience, big data to knowledge

Tao Jiang, Bioinformatics, design and analysis of algorithms, computational molecular biology

Stefano Lonardi, Computational molecular biology, data compression, data mining, information hiding

Chemical and Environmental Engineering

Xin Ge, Therapeutic antibody engineering

Nosang Myung, Nano-devices

Ian Wheeldon, Protein engineering, synthetic biology

Ashok Mulchandani, Biosensors and biodetoxification

Sharon Walker, Biofilms, bioremediation

Jianzhong Wu, Biothermodynamics and enzymatic process

Charles Wyman, Biological conversion of abundant, non-food sources

Electrical and Computer Engineering

Bir Bhanu, Bio-Imaging, multi-modal imaging, MRI, video bioinformatics, traumatic brain injury

Elaine Haberer, Bio-templated materials for electronics

Mihri Ozkan, Integrating quantum dots with cells

Mechanical Engineering

Guillermo Aguilar, Medical lasers

Cengiz S. Ozkan, Self-assembly of structures and nanofabrication

Thomas F. Stahovich, Computational design tools

Kambiz Vafai, Microcantilever arrays for bioanalysis

Elisa Franco, Biological feedback systems

Masaru P. Rao, Novel micro/nanofabrication methods for biomedical devices

Hideaki Tsutsui, Biomedical microdevices, stem cell engineering

COLLEGE OF NATURAL AND AGRICULTURAL SCIENCES

Botany and Plant Sciences

Sean Cutler, Chemical genomics, analysis and exploitation of natural variation using small molecules

Thomas Girke, Comparative genomics, data mining, cellular network analysis

Eugene Nothnagel, Control of biosynthesis in the golgi apparatus

Molecular, Cell and Systems Biology

Sarjeet Gill, Molecular mechanisms of toxic action and xenobiotic metabolism

Manuela Martins-Green, Wound healing and tumor development

Prue Talbot, Effects of cigarette smoke on cellular processes in stem cells

Nicole I. zur Nieden, Bone development to deduce novel therapeutic targets

Chemistry

Christopher J. Bardeen, Transport processes occur in complex systems

Quan Cheng, Biosensing and imaging arrays

Michael Marsella, Synthesis of both small molecules and macromolecules

Michael Pirrung, Chemical biology, synthesis, and nucleic acids

David Bocian, Energy-transducing systems, molecular photonic devices

Cynthia K. Larive, Ligand-protein interactions, tissue-targeted metabonomics

Thomas H. Morton, Mechanisms of receptor-ligand interactions

Entomology

Michael E. Adams, Signaling in the nervous system

Richard Cardullo, Biochemical and biophysical methodologies determining molecules involved in fertilization

Mathematics

Mark Alber, Mathematical and computational biology

Physics & Astronomy

Umar Mohideen, Signal transmission in the human brain

Harry W.K. Tom, Nonlinear optics, surface science

SCHOOL OF MEDICINE

Biomedical Sciences

Devin K. Binder, Neurosurgery

Nicholas DiPatrizio, Lipid messengers

Iryna Ethell, Molecular and cellular mechanisms of synapse development and plasticity

Byron Ford, Pathophysiology of stroke and acute brain injuries

Martin I. Garcia-Castro, Neural crest cells

David Lo, Mucosal vaccines

David Johnson, Enzyme mechanism analysis

Maurizio Pellecchia, Cancer research

Seema Tiwari-Woodruff, Mechanisms of neurodegeneration and neuroprotection

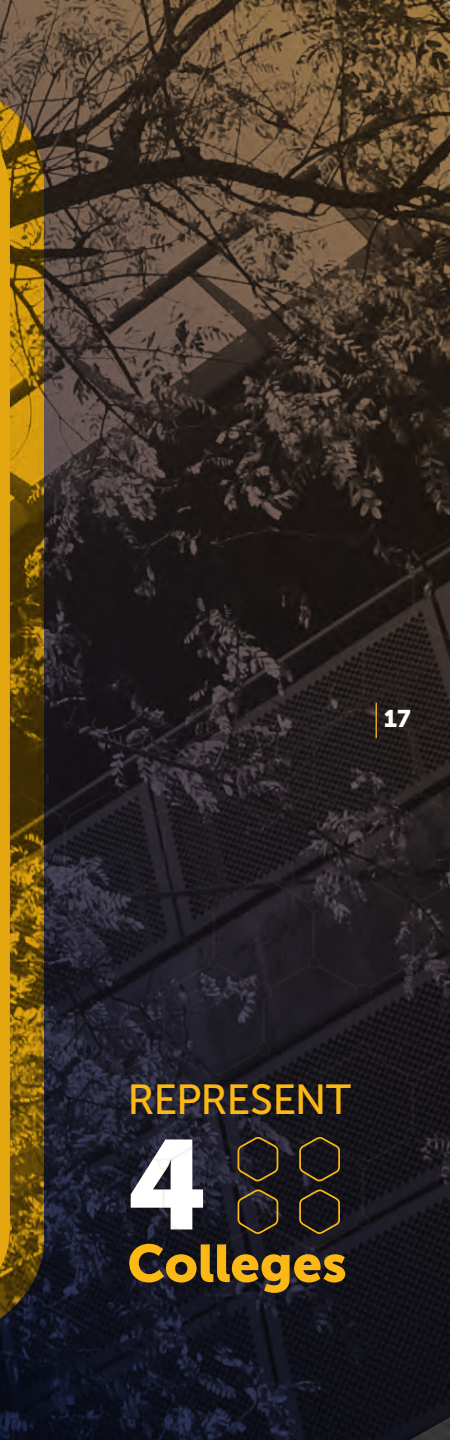
COLLEGE OF HUMANITIES, ARTS, AND SOCIAL SCIENCES

Psychology

G. John Andersen, Computational models of high level visual processing

Khaleel A. Razak, Development of sensory processing

Aaron Seitz, Brain adaptations to environmental changes



10 INSTITUTES & CENTERS

CENTER FOR ADVANCED NEUROIMAGING (CAN)

CAN facilitates cutting-edge neuroscience and neuroengineering research and houses a 13-ton "3 Tesla Siemens Prisma" MRI machine – a high-end, research grade system that is the first of its kind in the Inland Empire. CAN's MRI is capable of acquiring and analyzing numerous images of the brain to understand precisely how the brain works and how it functions differently when an individual is dealing with mental illness.

CENTER FOR PLANT CELL BIOLOGY (CEPCEB)

CEPCEB synergizes UCR's existing research strengths by providing an infrastructure that promotes interdisciplinary research and interaction among researchers between biology and various disciplines such as applied mathematics, statistics, engineering, physics and chemistry.

HIGH-PERFORMANCE COMPUTING CENTER (HPCC)

HPCC provides state-of-the-art research computing infrastructure and training accessible to all UCR researchers. An advantage of shared research computing environments is access to a much larger HPC infrastructure while also providing a long-term sustainability plan and professional systems administrative support.

CENTER FOR GLIAL-NEURONAL INTERACTIONS

The center is dedicated to providing an interactive and welcoming forum facilitating innovative collaborations between neuro- and glial-centric researchers as well as with researchers from outside the field of neuroscience. The ultimate goal is to define the multifactorial processes contributing to the health and dysfunction of the nervous system.

CENTER FOR NANOSCALE SCIENCE AND ENGINEERING (CNSE)

The center operates two Nanofabrication Cleanroom facilities on the UCR campus. The first is a state-of-the-art Nanofabrication Research facility available 24/7 to qualified users. The 2,000 square foot facility if certified at Class 100 in the Photolithography bay, Class 1000 in the Thin/ Film/Etch bay and the environment is being controlled and monitored. Our second Cleanroom is a 100/1000 space of approximately 8,000 square feet along with two small bays that are functional with the initial few tools installed.

CENTER FOR MOLECULAR AND TRANSLATIONAL MEDICINE

The multi-disciplinary center brings together researchers and clinicians from across the campus to help improve the health of individuals by translating basic findings into diagnostics tools to therapeutics.

CENTER FOR RESEARCH IN INTELLIGENT SYSTEMS (CRIS)

Established in 1998, the center promotes interdisciplinary research for developing computer systems that are flexible, adaptive and intelligent. The ultimate goal of the Center is the research and development of autonomous/semiautonomous systems with sensing capabilities that are able to communicate and interact with other intelligent (biological and artificial) systems.

UCR STEM CELL CENTER

The mission of the Center is to advance the stem cell field by fostering basic and translational resear4ch and engaging in education and outreach. Research focuses on understanding the basic mechanisms that control stem cell function and deciphering how the tremendous potential of stem cells can be used to improve human health. The center trains the next generation of stem cell scientists and prepares them to be leaders in the health sciences.

INTERDISCIPLINARY CENTER FOR QUANTITATIVE MODELING IN BIOLOGY

The center addresses challenges to bridging scales from molecular to clinical by catalyzing collaborations with clinicians. Among the challenges are multi-scale modeling of cell behavior and tissue growth in patients under stress conditions, multi-scale modeling of therapeutic interventions, and multi-scale modeling of biochemical networks personalized with omics data.

INSTITUTE FOR INTEGRATIVE GENOME BIOLOGY FACILITIES

The institute is organized around an 11,000 sq. ft. suite of Instrumentation Facilities that serve as a centralized shared-use resource for faculty, staff and students. The Core Facilities and staff offer advanced tools in the following areas to provide a focal point for broad-based cutting edge biological research:

Genomics – supporting research in the sequencing of genomes, RNASEq, ChIPSeq, methylSeq, metagenomics and chemical genomics.

Bioinformatics – providing resources for large-scale comparative genomics, data mining, systems modeling, and drug discovery.

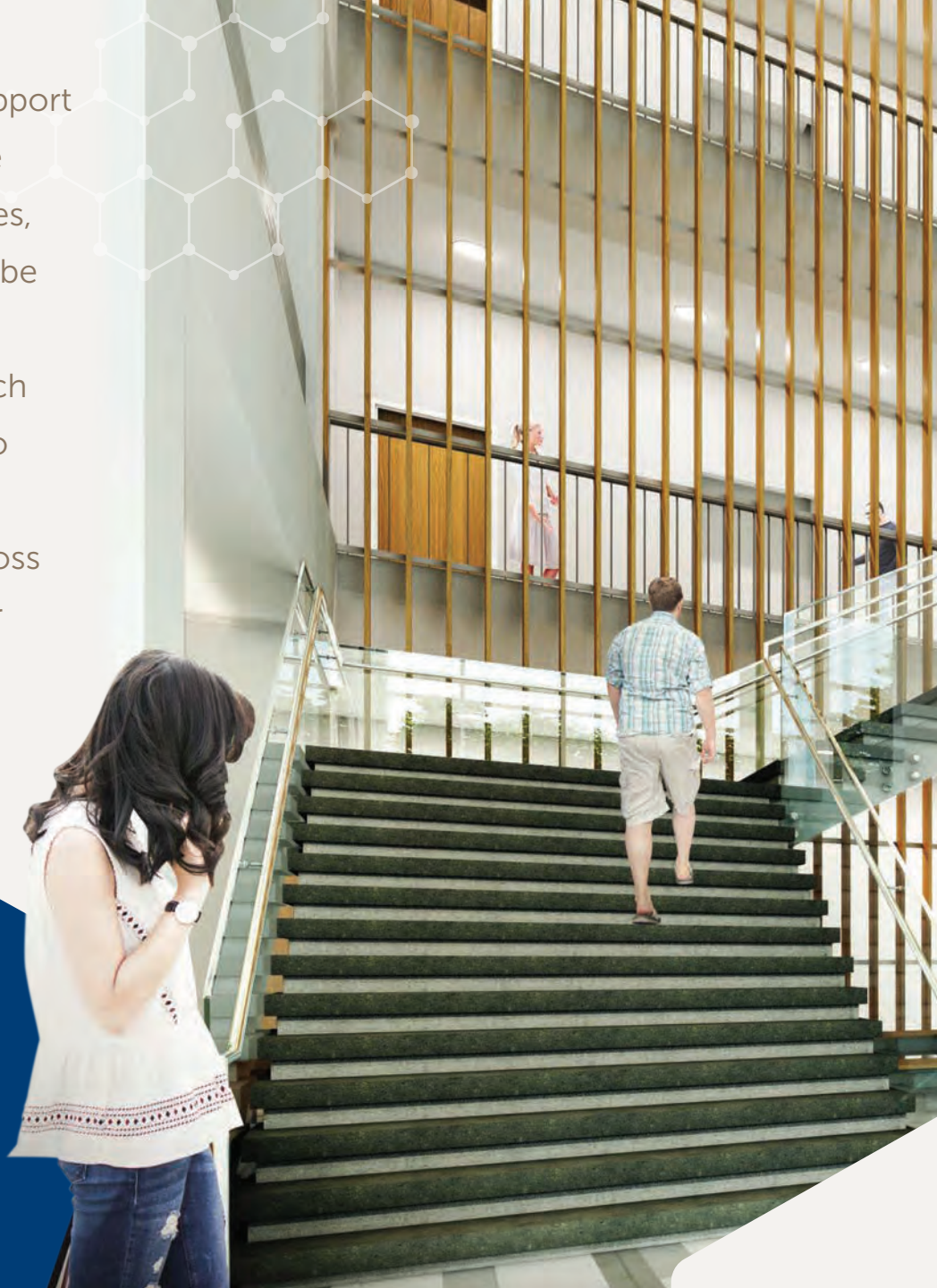
Microscopy – housing multiple microscopes including a 3D Palm super-resolution, plus tissue sectioning instruments, a laser capture system, a gene gun, and a fluidics robot.

Metabolomics/Lipidomics – accepting samples of powerful tools in systems biology that aim to understand metabolites and lipids present in samples of biological origins

Proteomic – promoting understanding in how thousands of cellular proteins are affected during growth or as a result of treatmentsor stresses.

MULTIDISCIPLINARY RESEARCH BUILDING (MRB)

This five-story facility will provide support to multiple themes of research at the intersection of Life/Chemical Sciences, Medicine, and Engineering. MRB will be flexible and adaptable, and will allow accommodation of emerging research demands. The goal of the center is to become a catalyst for new research collaborations between faculties across many colleges. The building is set for completion in early 2019 and will be housed on a 2.1-acre building site.



PROGRAM

MRB will provide 180,000 square feet in research space for up to 60 Principal Investigators and their teams; spaces will include:

- Five stories of research laboratories dedicated to wet research and dry, computation research
- Laboratory support areas
- Core laboratory facilities for specialized research and shared equipment
- Research offices, seminar, and colloquial areas
- Shell space for future growth

BIOENGINEERING TEAMS SLATED TO MOVE IN

- Imaging
- Food, Bugs, Guts & Brains
- Mind & Brain Health: Neuroinflammation, Neurotrauma and Neurodegeneration
- Molecular, Circuit and Behavioral Mechanisms of Neurodevelopmental Disorders

5 FACILITIES

Analytical Chemistry Instrumentation Facility

Housed in the Department of Chemistry, this facility consists of the Nuclear Magnetic Resonance (NMR) Facility, the Southern California Mass Spectrometry (SCMS) Facility, the Small Molecule X-ray Crystallography (SMXC) Facility and the Optical Spectroscopy (OS) Facility. The Department of Chemistry also houses a "hot-lab" for isotopic labeling.

W.M. Keck Foundation Proteomics Facility

This suite, run by Dr. Songqin Pan, is equipped with state-of-the-art mass spectrometers including oMAKDI MS/MS, Q-TOF ESI MS/MS, and LC-MALDI pep systems, and a 2D-gel system for protein separation.

UCR Nanofabrication Cleanrooms

UCR has two Nanofabrication Cleanroom facilities. The first is a Class 100/1,000 facility that is approximately 2,000 square feet and includes more than $7 million worth of equipment. The second cleanroom is also a class 100/1,000 facility that is approximately 8,000 square feet with two bays and includes significant safety and monitoring capabilities.

Institute for Integrative Genome Biology

The facility at the IIGB offers the systems and training needed to generate sharp images from the widest range of samples and staining techniques. Six different confocal microscopes cover all of the requirements for speed, sensitivity, versatility, resolution and automation. Other assets include a luminescence dark box imager, gene gun, laser-capture system, and a complete set of tissue sectioning instruments.

UCR Stem Core Facility

The UCR Stem Cell Core is a 4,000-square-foot facility of laboratory space that facilitates the development of basic and translational stem cell research by providing services and state-of-the-art equipment to stem cell researchers. The facility includes three cell culture rooms, two microscope rooms, an analytical room for molecular biology, a room for flow cytometry, two equipment rooms, three offices, and a conference room.

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