“Biomass Upgrading through the Combination of Biotechnology, Green Chemistry & Downstream Process”

Under the patronage of local communities (Conseil Regional Grand Est, Conseil Departemental de la Marne and Grand Reims), AgroParisTech has built the team “Industrial Agro-Biotechnologies” (URD ABI) devoted to the valorization of biomass.

To carry out its missions, URD ABI has built from October 2021 a multi-disciplinary team. With expertise in chemistry, microbiology, process and chemical engineering, as well as analytical chemistry, URD ABI is able to conduct fundamental, as well as applied multidisciplinary research projects.

Our ambition is to develop and optimize sustainable industrial processes and high valued-added products from agro-resources (e.g., biorefineries by-products, agro-waste). More precisely, the scientists aim at the development of platform molecules from biomass that will be used to develop new functional bio-based additives, polymers or materials, but also valuable sustainable fine chemicals.

Our strategy is based on the combination of different approaches such as: identifying a promising biobased synthon and develop new (macro)molecules with innovative properties; devising a safer, cheaper, greener and biobased alternative to a known commercial compound; working with industrials to overcome their technological and/or scientific bottlenecks.

Examples illustrating these approaches will be presented.

4:00 PM – WebEx Meetings Link
“Building Novel Methods of Gene Regulation in Bacteria”

Abstract:

Predictable control of gene expression within living systems is vital to achieve high production yields and titers by dynamically controlling when biochemical pathways are turned off or on. Genetic ‘parts’ must be developed that can enable user-defined gene expression both as sensing elements, where environmental inputs result in ‘readable’ outputs, and as DNA-based ‘knobs’, where user-defined inputs result in precise levels of expression. To make these parts, elucidating the sequence−function relationship of promoters is crucial for manipulating gene expression at the transcriptional level, particularly for inducible systems dependent on transcriptional regulators. In this talk, two types of systems for transcriptional control in bacterial systems will be discussed.

First, we demonstrate methods for modulating the strength of transcription factor-DNA binding site interactions through both rational and high-throughput approaches. We engineer multiple chemically-responsive transcription factor regulated promoters (inducible biosensors) elucidate sequence-function relationships. We demonstrate tunability of gene expression though altering the number, location, and sequence of the transcription factor binding sites. Second, we have developed a regulatable CRISPRi gene repression for the tuning of biosynthetic pathways using Cas12a (née Cpf1) CRISPR effector protein, which are better suited for use in Clostridium due to the genus’ AT-rich genomes and the corresponding simple and T-rich protospacer adjacent motif. We demonstrate in Clostridium repression in single and multiplexed formats with repression levels above 99%. Redistribution of carbon flux is shown as an example of efficacy. These approaches will enable an expansion of the synthetic biology toolkit, thus empowering greater use of biological solutions to chemical engineering challenges.

Biography:

Nicholas Sandoval is an assistant professor in the Department of Chemical and Biomolecular Engineering at Tulane University. Prior to joining the faculty, Dr. Sandoval was a postdoctoral researcher in the Department of Chemical and Biomolecular Engineering at the University of Delaware in the Papoutsakis research group with support from an NIH National Research Service Award. He earned his Ph.D. in 2011 at the University of Colorado Boulder in Ryan Gill’s research group with support from an NSF Graduate Research Fellowship. Additionally, Dr. Sandoval was a lecturer in the Colorado Mesa University/University of Colorado Mechanical Engineering Partnership Program in Grand Junction, Colorado. Dr. Sandoval has recently been the recipient of the NSF CAREER Award (2019) and ORAU’s Ralph E. Powe Junior Faculty Award (2018).
Programming Intelligence through Geometry, Topology, and Anisotropy

Shu Yang
University of Pennsylvania
Department of Materials Science and Engineering

Abstract Programmable shape-shifting materials can take different physical forms to achieve multifunctionality in a dynamic and controllable manner. We take geometry from nano- to macroscales by (re)programming anisotropy in liquid crystal elastomers (LCEs) and their nanocomposites in the forms of films, fibers, and droplets. Through inverse engineering, that is pre-programming inhomogeneous local deformations in LCEs, we show shape morphing into arbitrary 3D shapes. By incorporating 1D and 2D nanomaterials (e.g. cellulose nanocrystals, carbon nanotubes, graphene and gold nanorods) in LCEs, we demonstrate tendon-like actuators and reprogrammable shape transformation in response to heat, light, magnetic field, electric field and pneumatic actuations. In my talk, I will show several potential applications, including soft robotics and 3D displays.

Biosketch: Dr. Shu Yang is a Joseph Bordogna Professor of Engineering and Applied Science, Chair of the Department of Materials Science & Engineering, and Professor of Chemical & Biomolecular Engineering at University of Pennsylvania. Her group is interested in synthesis, fabrication, and assembly of soft matter; dynamic tuning of their sizes, shapes and assembled structures, and use geometry to create highly flexible, super-conformable, and shape changing materials for potential applications, including self-cleaning coatings, structural colors, adhesives, smart windows, sensors, actuators for robotics and biomedical devices. Yang received her B.S. degree from Fudan University, and Ph. D. degree from Cornell University. She worked at Bell Laboratories, Lucent Technologies as a Member of Technical Staff before joining Penn. She received George H. Heilmeier Faculty Award for Excellence in Research from Penn Engineering and was selected as one of the world’s top 100 young innovators under age of 35 by MIT’s Technology Review. She is a Fellow of Materials Research Society (MRS), Division of Soft Matter (DSOFT) from American Physical Society (APS), Division of Polymeric Materials: Science and Engineering from American Chemical Society (ACS), Royal Chemical Society, and National Academy of Inventors.
CBIS Constellation Seminar Series

George Makhatadze, PhD.
Constellation Chair of Biocomputation and Bioinformatics
Professor of Biological Sciences

Wednesday) November 3, 2021
1:30 pm

When it's time, join your Webex meeting here.

Join meeting

More ways to join:

Join from the meeting link
https://rensselaer.webex.com/rensselaer/j.php?MTID=m039b8ba39e82e9fdd6a5d5c442664d2d

Join by meeting number
Meeting number (access code): 2621 539 7830
Meeting password: mMttxSM32J2

Tap to join from a mobile device (attendees only)
+1-415-655-0001,,26215397830## US Toll

Join by phone
+1-415-655-0001 US Toll
Global call-in numbers

Join by video system, application or Skype for business
Dial 26215397830@webex.com
You can also dial 173.243.2.68 and enter your meeting number.

If you are a host, click here to view host information.
Mathematical Sciences
MIDO seminar

Ying Sun
Pennsylvania State University

4:00 - 5:00 pm,
(Wednesday) Nov. 03, 2021 (EST)

“Decentralized Optimization for Statistical Learning over Networks”

Meeting Link: https://rensselaer.webex.com/meet/xuy21

Abstract: Advances in computation, communication, and data storage techniques in recent decades significantly reduced the cost of data acquisition, leading to an explosion of data generated across different interconnected platforms. Apart from the computational difficulties that arise from nonconvex formulations, the sheer volume and spatial disparity of data also pose challenges to traditional learning procedures, which typically require centralized training sets. Reaping the dividend offered by the data deluge necessitates the development of collaborative learning methods capable of making inferences from data over the network. This talk discusses some recent developments in decentralized learning algorithms and their computational and statistical guarantees. A quick introduction to optimization-based decentralized learning problems will be given in the talk, followed by a novel algorithmic framework, SONATA, and its convergence properties for learning problems in different classes. Then we focus on the statistical properties of the algorithm. While statistical-computation tradeoffs have been largely explored in the centralized setting, our understanding over meshed networks is limited. Decentralized schemes, designed from a pure optimization perspective, can be either inefficient or even non-convergent when applied to solving statistical learning problems. Through two vignettes from low- and high-dimensional statistical inference, we will go over some designs and new analyses aiming at bringing statistical thinking in decentralized optimization.

Bio: Ying Sun is an assistant professor in the Department of Electrical Engineering at The Pennsylvania State University. She received the B.E. degree in electronic information from the Huazhong University of Science and Technology, Wuhan, China, in 2011, and the Ph.D. degree in electronic and computer engineering from The Hong Kong University of Science and Technology in 2016. She was a postdoc researcher with the School of Industrial Engineering, Purdue University from 2016 to 2020. Her research interests include statistical signal processing, optimization algorithms and machine learning. She is a co-recipient of a student best paper at IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP) 2017, and a recipient of the 2020 IEEE Signal Processing Society Young Author Best Paper Award.
Cardiac tissue engineering has emerged to create living, human, cardiac tissue outside the body as a model system in the near term and as a clinical replacement for diseased or damaged cardiac muscle in the long term. My laboratory is focused on understanding the intricate interplay between the extracellular matrix and cardiac cell types in vivo to guide cardiac tissue engineering efforts in vitro. In the course of this seminar I will share our most surprising mechanistic insights and describe how they now guide 3D bioprinting approaches to generating complex cardiac tissues.

Brenda Ogle is Professor and Head of Biomedical Engineering, Professor of Pediatrics, and Director of the Stem Cell Institute at the University of Minnesota. Her research team investigates the impact of extracellular matrix proteins on stem cell behavior especially in the context of the cardiovascular system. Insights gleaned over the years established mechanistic links between integrin engagement and the activity of critical transcription factors and most recently led to the development of optimized, extracellular matrix-based bioinks for 3D printing of cardiac muscle mimics featured in Newsweek. The primary strength of her laboratory is the ability to span multiple subdisciplines within both basic science (i.e., stem cell biology, cell-cell fusion, and extracellular matrices) and engineering (cytometry, instrumentation, and 3D printing) fields. Her work received funding from the National Institutes of Health, the National Science Foundation, the Department of Defense, the American Heart Association, the Coulter Foundation, Regenerative Medicine Minnesota, and MnDRIVE. She has partnered on research projects with Becton Dickinson, iCyt and Medtronic. Professor Ogle is an elected fellow of the American Institute for Medical and Biological Engineering and served as a member of the Board of Directors of the Biomedical Engineering Society. She has served as co-chair of the Women’s Faculty Cabinet, UMN and is recipient of the Mullen-Spector-Truax Women’s Leadership Award.