LIFE AT THE INTERFACE OF
SCIENCE + ENGINEERING
lecture series

These lectures are part of a collaboration between the University at Albany and Rensselaer Polytechnic Institute (RPI). This is the sixth speaker in the series. Previous speakers include: Nobel laureate Thomas Cech (University of Colorado) (2016), Karl Deisseroth (Stanford University) (2017), Nobel laureate Frances Arnold (Caltech) (2018), David R. Liu (Harvard University) (2019) and Stephen R. Quake (Stanford University) (2021).

Featuring Nobel Laureate Jennifer A. Doudna, Ph.D.
Howe Hughes Medical Institute Investigator
Li Ka Shing Chancellor’s Chair
Professor of Chemistry and of Molecular and Cellular Biology
University of California, Berkeley

Tuesday, September 21, 2021
“CRISPR: The Science and Opportunity of Genome Editing”
1:00 p.m.

Zoom ID: https://albany.zoom.us/j/96444072569?pwd=eYrcIV5a0RjNyRkova1Qvr0NoWmhlZz09
Password: 070849

ZoomID: https://albany.zoom.us/j/96444072569?pwd=eYrcIV5a0RjNyRkova1Qvr0NoWmhlZz09#success
An FDA Approved Medication Discovered at Rensselaer

Mark P. Wentland  
Professor Emeritus  
RPI Department of Chemistry and Chemical Biology

**Tues, 9/21, at 4:00 PM -- Part 1: Drug Design and Synthesis**

Part 1: Samidorphan was discovered in Cogswell Labs at Rensselaer as part of a NIH-funded effort to identify a long-acting oral medication to treat opioid use disorder in humans. The starting points for this effort were a biological hypothesis published by Rensselaer professor Sydney Archer and co-authors and the lead compound, cyclazocine, discovered by Dr. Archer in the early 1960's. Using rational drug design and modern synthetic techniques, a 500 compound library was made that included samidorphan.

(Reception on Tues, 9/21 at 3:30 PM in CBIS Auditorium Lobby)

**Wed, 9/22, at 10:00 AM -- Part 2: Navigating “The Valley of Death”**

Part 2: The process of translating NIH-funded academic biomedical research into an FDA-approved medicine has all too often failed due to "The Valley of Death". Rensselaer’s medicinal chemists and the Office of Intellectual Property Optimization as well as outside patent experts efficiently navigated this process to the point of inking a license agreement with the Irish biotech company Alkermes, Inc. In an effort to commercialize one or more compounds in Rensselaer's IP portfolio, Alkermes found that samidorphan mitigated the weight gain side effect in patients taking olanzapine, a highly effective medication to treat schizophrenia and bipolar I disorder. Alkermes expertly performed the necessary
preclinical and clinical tasks to bring the now FDA-approved samidorphan-olanzapine combination (LYBALVI™) from the "bench to bedside".

Both lectures will be held live in CBIS Isermann Auditorium and via WebEx.

WebEx Link is also available for Tuesday’s 4:00 pm lecture:
https://rensselaer.webex.com/rensselaer/j.php?MTID=m8024295c7113e8b14d136e1016de2c14

WebEx Link is also available for Wednesday’s 10:00 am lecture:
https://rensselaer.webex.com/rensselaer/j.php?MTID=mfb71163e78547e7a74975c247b751e40
Abstract  There is nothing more personal than healthcare. Health care should move from its current reactive and disease-centric system to a personalized, predictive, preventative, and participatory model with a focus on disease prevention and health promotion. As the world marches into the era of the Internet of Things (IoT) and 5G wireless, technology renovation enables the industry to offer a more individually tailored approach to healthcare with better health outcomes, higher quality, and lower cost. However, empowering the utility of IoT-enabled technologies for personalized health care is still significantly challenged by the shortage of cost-effective wearable biomedical devices to continuously provide real-time, patient-generated health data. Textiles have been concomitant and playing a vital role in the long history of human civilization. The textile forms endow biomedical devices with biocompatible, biodegradable, even bioabsorbable features, allowing them to serve as on-body healthcare platforms with incomparable wearing comfort. Merging biomedical devices and textiles becomes increasingly important owing to the growing trend of IoT. In this talk, I will introduce our current research on smart textiles for biomedical monitoring and personalized diagnosis, textile for therapy, and textile power generation as an energy solution for future wearable medical devices.

Biosketch: Dr. Jun Chen is currently an assistant professor in the Department of Bioengineering at the University of California, Los Angeles. His research focuses on nanotechnology and bioelectronics for energy, sensing, and therapeutic applications in the form of smart textiles, wearables, and body area networks. He has already published 2 books, 180 journal articles and 100 of them are as corresponding authors in Chemical Reviews, Chemical Society Reviews, Nature Materials, Nature Electronics, Nature Communications, Science Advances, Joule, Matter, and many others. His works were selected as Research Highlights by Nature and Science 6 times and covered by world mainstream media over 1,000 times in total, including NPR, ABC, NBC, Reuters, CNN, The Wall Street Journal, Scientific American, and Newsweek. He also filed 14 US patents and licensed 1. With a current h-index of 78, Dr. Chen was identified to be one of the world’s most influential researchers in the field of Materials Science by the Web of Science Group. He and his recent research is recognized by the Vebleo Fellow, IAAM Scientist Medal, 30 Life Sciences Leaders To Watch by Informa, UCLA Society of Hellman Fellows Award, Okawa Foundation Research Award, Advanced Materials Rising Star, ACS Nano Rising Stars Lectureship Award, Chem. Soc. Rev. Emerging Investigator Award, 2020 Altmetric Top 100, Top 10 Science Stories of 2020 by Ontario Science Centre, Highly Cited Researchers 2020/2019/2021 in Web of Science, Frontiers in Chemistry Rising Stars, JMCA Emerging Investigator Award, Nanoscale Emerging Investigator Award, ACS AEM Early Career Investigators Award, MINE2020 Young Scientist Excellence Award, and many others. Beyond research, he is an associate editor of Biosensors and Bioelectronics.
Abstract: Artificial intelligence (AI) has become the linchpin in a growing number of products, services, and research programs which are aimed at automating and enhancing the human decision-making process. Indeed, AI is poised to play a critical role in the future of healthcare, transportation, manufacturing, and defense, to name a few. However, there are still several application domains (satellites, wearables, wireless, etc.) that cannot afford the size, weight, and power (SWaP) overheads associated with executing state-of-the-art AI algorithms. In this talk, I will discuss our lab’s research to bridge the gap and enable AI in the most SWaP-constrained environments. This research takes a holistic approach, examining the entire AI stack, from devices and circuits to algorithms and applications. At the lowest level, I will present my research on memristor-based circuits for implementing weighted communication pathways in artificial neural networks (ANNs). Memristors reduce the power and latency associated with running ANNs on traditional computer architectures by directly emulating both the memory and computation of biological synapses. In addition, memristor plasticity enables on-chip learning and allows ANNs to function in the presence of hardware defects and process variations. Moving up the design hierarchy, I will discuss research on ANN topologies with partially random connectivity, which can lead to reduced hardware overhead and training cost while achieving state-of-the-art performance on classification tasks. Finally, the talk will highlight some recent research related to the trustworthiness and potential security vulnerabilities of AI hardware.

Bio: Cory Merkel is an assistant professor with the Department of Computer Engineering, Rochester Institute of Technology. He earned his BS and MS degrees in computer engineering (2011) and a Ph.D. in microsystems engineering (2015) from RIT. From 2016 to 2018, Dr. Merkel was a research electronics engineer with the Information Directorate, Air Force Research Lab. His current research focuses on
mapping of AI algorithms, primarily artificial neural networks, to mixed-signal hardware, design of brain-inspired computing systems using emerging technologies, and trustworthy AI hardware. Dr. Merkel’s research has been published in a number of peer-reviewed conferences, journals, and books.

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Center for Materials, Devices and Integrated Systems Seminar

September 24 (Friday), 2021: 12:00 pm – 1:00 pm (EDT)

“Selective and Atomic Scale Processes to Enable Future Nano-Manufacturing”

by: Dr. Robert D. Clark
Technical Director, TEL Technology Center, America, LLC
via Webex (password:12345)

Abstract: Moore’s law has driven scaling of semiconductor devices to the point that modern feature sizes can be measured in atomic dimensions.(1,2) As shrinking the device footprint becomes increasingly difficult a new power, performance, area and cost scaling paradigm making use of vertical scaling has emerged; initially by adopting non-planar devices, and now by stacking devices on top of one another to create 3D architectures as well.(3) Fabricating 3-dimensional electronic structures with atomic scale dimensions in high yields presents a number of daunting process challenges. Among these are the need to tightly control film thickness, uniformity, morphology, and composition within high aspect ratios. The need for selective deposition of both functional films and sacrificial layers presents another challenge if we are to transition towards a more additive style of nano-manufacturing. Selective and atomic scale processes are being developed in order to enable a number of self-aligned process schemes as well as scaling boosters required for future device nodes.(4) Dielectric on dielectric (DoD) selective deposition is being developed to enable fully self-aligned vias, alleviating edge placement error challenges encountered when manufacturing advanced interconnects. Selective metal on metal (MoM) depositions are useful for depositing metal capping layers as well as hardmasks. Scaling boosters such as air gaps, super-vias and buried power rails could benefit from well-controlled processes with topographical selectivity. And dielectric on metal depositions (DoM) could provide relief from the growing overburdens needed to enable chemical mechanical planarization during replacement metal gate integration in the front end. Progress in these areas as well as future needs and an outlook on future device scaling pathways will be presented.


Biography: Robert D. Clark, Ph.D. joined Tokyo Electron (TEL) in 2006 at TEL Technology Center, America, LLC (TTCA) in Albany, NY. In 2010 he relocated to Silicon Valley and is currently a Sr. Member of the Technical Staff. His research focuses on thin film process technologies for advanced and emerging devices, materials, and interconnect structures for use in semiconductor manufacturing. Dr. Clark has contributed to processes for advanced CMOS contacts and high k and metal gate structures used currently in advanced semiconductor device manufacturing.

Prior to joining Tokyo Electron, Dr. Clark was a Principal Research Chemist for Air Products and Chemicals, Inc. (APCI) where was the lead technologist for the development of high k and metal gate precursors and helped to develop the first precursor used for ALD high k gate dielectrics in CMOS manufacturing. Dr. Clark completed his Ph.D. in Chemistry at the University of California, Irvine in 2000 and B.S. and M.S. degrees in Chemistry at Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, VA, USA in 1993 and 1995 respectively.

Dr. Clark has served previously as the science advisory committee chair for SRC device sciences, and has received the SRC Mahboob Khan outstanding industrial liaison award. He currently contributes to SRC Decadal Plan executive committee, and is a member of multiple conference committees including the AVS ALD, AVS ASD, and VLSI-TSA conference committees. At TEL he has been a U.S. employee of the year, and in 2018 received the most impactful patent award for the U.S. as well. He currently holds more than 60 issued U.S. patents and has authored or co-authored hundreds of journal and conference publications including numerous invited/plenary talks and articles.

Contact: Deniz Rende (rended3@rpi.edu)