UNIVERSITY OF RHODE ISLAND
Department of Chemistry
SEMINAR

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"Electromicrobiology: Bioenergy, Bioremediation, Corrosion, Biogeochemical Cycling, and Novel Electronic Devices"

HOST
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Electromicrobiology: Bioenergy, Bioremediation, Corrosion, Biogeochemical Cycling, and Novel Electronic Devices

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Electroactive microorganism exchange electrons with extracellular electron donors and acceptors. This talk will focus on the natural environmental role of electroactive microbes as well as practical applications of electroactive microbes and their novel, electrically conductive proteins. For example, electroactive microbes like *Geobacter* play an important role in multiple biogeochemical cycles, including the reduction of Fe(III) oxides, an abundant electron acceptor for respiration that also controls the fate of nutrients and trace metals. Promoting the activity of electroactive microbes can stimulate the bioremediation of organic and metal contaminants. Direct interspecies electron transfer (DIET) between electroactive bacteria and methanogens is a key process in anaerobic digesters producing methane biofuel, and in wetlands releasing methane as a greenhouse gas. Electroactive microbes are abundant in intestinal systems and cause corrosion of metals in diverse environments. Electrical connections between microbes and electrodes are the basis for potential bioelectrochemical technologies for energy harvesting, the production of organic commodities, and bioremediation. Protein nanowires harvested from *Geobacter* are a revolutionary 'green' electronic material with demonstrated applications in sustainable electricity generation, neuromorphic memory devices, and biomedical sensing. A newly constructed *E. coli* chassis for mass production of protein nanowires is rapidly advancing the design and fabrication of new types of protein nanowire to further develop these technologies. There is a vast diversity of electroactive microorganisms not yet studied in detail, suggesting future possibilities for better understanding the environmental role of these microbes; controlling their activity to promote bioremediation or mitigate corrosion; and for developing additional sustainable electronics applications.