University at Buffalo
School of Engineering and Applied Sciences

SEAS DISTINGUISHED SPEAKER

The Biology Meets Its Match

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Abstract

Multifunctional sensing capability, ‘unusual’ formats with flexible/stretchable designs, lightweight construction and self-powered operation are desired attributes for electronics that directly interface with the human body. Today’s electronics are stiffer by up to six orders of magnitude compared to soft tissue. Thus, present systems limit intimate integration with biology. I have focused on novel microfabrication techniques and tricks to use active piezoelectric materials and required electronic components, which have the shape and the mechanical properties that match with those of human tissues, in order to allow intimate integration without any irritation and/or harm on body.

In this talk, I describe novel materials, mechanics and device designs for emerging classes of wearable health monitoring systems and implantable, minimally invasive medical devices. These include a variety of electrodes, sensors, and energy harvesting components, with promising applications in bio-integrated electronics, such as self-powered cardiac pacemakers, wearable blood pressure sensors, modulus sensor patches, and brain injectrodes. The devices can be twisted, folded, stretched/flexed and wrapped onto curvilinear surfaces or implanted without damage or significant alteration in operation. The fabrication strategies and design concepts can be applied to various biological substrates and geometries of interest, and thus have the potential to broadly bridge the gap that exists between rigid, boxy electronics and soft, curvy biology.

Biography

Canan Dagdeviren is an Assistant Professor at MIT Media Lab, where she leads the Conformable Decoders research group. The group aims to convert the patterns of nature and the human body into beneficial signals and energy.

Dagdeviren earned her Ph.D. in Materials Science and Engineering from the University of Illinois at Urbana-Champaign, where she focused on exploring patterning techniques and creating piezoelectric biomedical systems. Her collective Ph.D. research involved flexible mechanical energy harvesters, multi-functional cardiac vessel stents, wearable blood pressure sensors, and stretchable skin modulus sensing bio-patches.

As a Junior Fellow of the Society of Fellows at Harvard University, she conducted her postdoctoral research at the MIT David H. Koch Institute for Integrative Cancer Research, working on designing and fabricating multi-functional, minimally invasive brain probes that can simultaneously deliver drugs on demand and electrically modulate neural activity precisely and selectively for the treatment of neurological disorders, such as Parkinson’s disease.

Dagdeviren’s work has been featured in many media outlets, including Smithsonian Magazine, Popular Mechanics, CBS News, BBC News and Physics World. In 2015, MIT Technology Review, named her among the "Top 35 Innovators Under 35" (inventor category) and Forbes magazine selected her as one of the "Top 30 Under 30 in Science." Recently, Dagdeviren has been named as a Spotlight Health Scholar by Aspen Institute and World#1 in Medical Innovation Category of Ten Outstanding Young Persons of the World (TOYP) by Junior Chamber International (JCI). In December, 2016, Dr. Dagdeviren was awarded with Science & SciLife Prize for Young Scientists in Translational Medicine Category and invited to attend Nobel Prize Ceremony in Stockholm, Sweden. Recently, Dr. Dagdeviren has been named as 2017 Innovation and Technology Delegation of Academy of Achievement.

https://www.media.mit.edu/people/canand/overview/