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65 South Main Street
Pennington, NJ 08534-2839, USA
Tel 609.737.1902
Fax 609.737.2743
www.electrochem.org

Editor: Krishnan Rajeshwar, rajeshwar@uta.edu

Guest Editor: Jeff Fergus, jwfergus@eng.auburn.edu.

Contributing Editors: Donald Pile, donald.pile@gmail.com; Zoltan Nagy, nagy.z@email.unc.edu

Managing Editor: Mary E. Yess, mary.yess@electrochem.org

Production & Advertising Manager:

Dinia Agrawala, interface@electrochem.org

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The Electrochemical Society is an educational, nonprofit 501(c)(3) organization with more than 8000 scientists and engineers in over 70 countries worldwide who hold individual membership. Founded in 1902, the Society has a long tradition in advancing the theory and practice of electrochemical and solid-state science by dissemination of information through its publications and international meetings.



On Robots, Artificial Intelligence, and Singularity

Autonomous vehicles proceeding to their destination without driver intervention. Drones that hover overhead in a surveillance or in a target attack mode. Robots performing surgeries and safely disposing of roadside bombs in war-torn locales or to defuse terrorist threats. “Nanobots” swimming about in our bodies performing a variety of sensing and therapeutic functions (à la Eric Drexler). These scenarios are not out of science fiction novels but many represent a technological reality today. For example, devices that aid in parallel-parking or safely changing lanes are a boon to spatially-challenged drivers like myself and are already available in high-end cars. Of course robots have been routinely used in the manufacturing sector such as automobile assembly. The robotics industry is evolving much like the computer revolution did some three decades ago. The toughest problems of robotics such as visual recognition, navigation, and machine learning are being solved by the world’s best minds. However it is worth noting that robots have been around for a very long time now and references to them date back to Greek and Roman mythology. More recent examples may be found in Leonardo da Vinci’s sketches of the 15th century.

Where is all this automation heading? To what extent will robots become an integral part of our day-to-day living? Computer technology is already playing a pivotal role in healthcare; patients afflicted with Parkinson’s disease and individuals with cochlear implants are two examples that come to mind. Futurists like Ray Kurzweil have pointed out that biological systems may be regarded as a set of software processes. As nanotechnology continues to advance, our ability to put computers in our bodies in a non-invasive manner may open up a whole new array of diagnostics and therapies. Along with this new revolution come machines performing functions that used to require human intelligence. In Kurzweil’s view, the tipping point happened in 1997 when IBM’s Deep Blue supercomputer defeated the Soviet Grandmaster Garry Kasparov in chess. He claims that the point of “singularity” when humans and computers become indistinguishable or even when computers surpass humans in intelligence is near. One acid test of singularity would involve machine learning situations that require recognition of language subtleties, metaphors, irony, and such. Annoying situations that remind us of this technological drawback frequently occur with voice-recognition software that is being increasingly deployed to save the cost of employing human substitutes. I am sure many of us have longed to talk to a human voice at the other end (instead of to a computer) to resolve an issue! “Haptics” or technology that adds tactile sensations to gadgetry will further aid in robotic advances and will move beyond immediate applications that drive them such as the gaming industry.

This special issue of the magazine features education, both in a general context and as it applies to electrochemical science and technology. We last featured this topic in the summer 2010 issue (Vol. 19, No. 2), but with a slant toward electrochemical engineering. That particular issue featured education/outreach activities within the ECS Industrial Electrochemistry and Electrochemical Engineering (IE&EE) Division. The current issue is sponsored by the Education Committee and is guest-edited by Jeff Fergus of Auburn University. I would like to thank Jeff for a fine job in arranging for several of the feature articles that appear in the following pages, for coaxing their ultimate submission, and thus in helping to bring this issue to print. Stay tuned.

Raj K.

Krishnan Rajeshwar
Editor