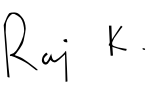
All Things Bio

Corrosion has been *classically* associated with metallic objects in non-biological environments. But this is certainly no longer true—the corroding surfaces being studied have progressively encompassed other types of materials (*e.g.*, polymers, semiconductors) over the years and the relevance of biological environments in corrosion processes has been increasingly recognized. Biofilms and the products of their metabolic activities including enzymes, organic and inorganic acids, as well as volatile compounds such as ammonia and hydrogen sulfide can have a profound influence on the rates of corrosion processes. An examination of how the electrochemistry is altered at a biofilm/metal surface is the *raison d'être* of a new sub-discipline within corrosion science and technology, namely biocorrosion or microbially influenced corrosion. This issue of *Interface* focuses on the corrosion of materials within the human body—another equally important topic considering, as the Guest Editor Barbara Shaw, points out later, that we accumulate a variety of foreign materials in our body (such as dental fillings or cardiac stents) as we go through life. It is interesting that corrosion, like many other disciplines as we shall soon see, has taken on an increasingly "bio" character.

When I was an undergraduate student in the late 1960s, chemistry was mainly comprised of three sub-disciplines: organic, inorganic, and physical. Analytical chemistry had not yet evolved as a separate field of specialty being mainly taught and practiced by physical chemists, a trend that arguably continues even to this day in some universities. Biochemistry, encompassing the study of chemical processes in living organisms, similarly has a more recent history as a distinct sub-discipline. This is in spite of the fact that many biochemical discoveries, *e.g.*, enzymes, fermentation, and the like can be traced to the 18th century or even earlier. On our own campus, the Department of Chemistry morphed into the Department of Chemistry and Biochemistry only in the 1980s and I suspect that this is a trend that pervades elsewhere also. Nowadays instances where the prefix "bio" is *not* tacked on to an existing discipline are rare: bioinorganic chemistry, biophysical chemistry, biophysics, bioanalytical chemistry—the list goes on and on. It can even be argued that the pendulum is swinging to the other side; there are pedagogical discussions for replacing chemistry as a "central discipline" with its bio incarnations such as chemical biology or biological chemistry. Biomaterials (*e.g.*, biopolymers) and biomedical engineering are important and popular fields of specialization. Biosensors are becoming staples of our everyday life as manifested by glucose monitors and, disturbingly, bio has reared its dark and ugly head in bioterrorism in the 20th century.

There is a more positive and intriguing aspect to the bio trend. Scientists and engineers are realizing that they can learn much from the marvels of nature; indeed this recognition has spawned a vigorous, global biomimetics movement. Chemists and biologists are attempting to understand and recreate the intricate plant photosynthetic apparatus. The naturally self-cleaning and water-repellant nature of the lotus leaf has attracted attention as has the effortless movement of a gecko on a vertical surface. Cocklebur inspired the invention of Velcro. Nature has manipulated materials into structures of incredible complexity, strength, and toughness as exemplified by the abalone shell. The sensors on a snake or bat or even our eyes, ears, and tongue will put most artificial device counterparts to shame in their intricacy, sensitivity, and selectivity. To what extent did the flight of birds and insects influence aerodynamic designs? Can we learn from a whale's flippers to navigate better in water or even to design better wind turbine blades? What lessons do a fly's wings or sharkskin provide us in terms of engineering new generations of materials and devices? Little wonder that many bright and impressionable minds are gravitating toward bio-oriented R&D endeavors. Stay tuned.



Krishnan Rajeshwar
Editor

The Electrochemical Society Interface (USPS 010-327) (ISSN 1064-8208) is published quarterly by The Electrochemical Society, at 65 South Main Street, Pennington, NJ 08534-2839 USA. Subscription to members as part of membership service; subscription to nonmembers $58.00 plus $16.00 for postage outside U.S. Single copies $6.00 to members; $13.00 to nonmembers. Periodicals postage at Pennington, New Jersey, and at additional mailing offices. POSTMASTER: Send address changes to The Electrochemical Society, 65 South Main Street, Pennington, NJ 08534-2839.

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.

The Electrochemical Society
INTERFACE

Published by:
The Electrochemical Society
65 South Main Street
Pennington, NJ 08534-2839 USA
Tel 609.737.1902
Fax 609.737.2743
Web: www.electrochem.org

Editor: Krishnan Rajeshwar
e-mail: rajeshwar@uta.edu

Guest Editor: Barbara A. Shaw

Managing Editor: Mary E. Yess
e-mail: mary.yess@electrochem.org

Production & Advertising Manager:
Dinia Agrawala
e-mail: interface@electrochem.org

Production Notes
Design Consultant:
O&Y Design,
Trenton, NJ

Printed by:
Cummings Printing Co.
Hooksett, NH

Canada Post:
Publications Mail Agreement #40612608
Canada Returns to be sent to:
Bleuchip International, P.O. Box 25542,
London, ON N6C 6B2