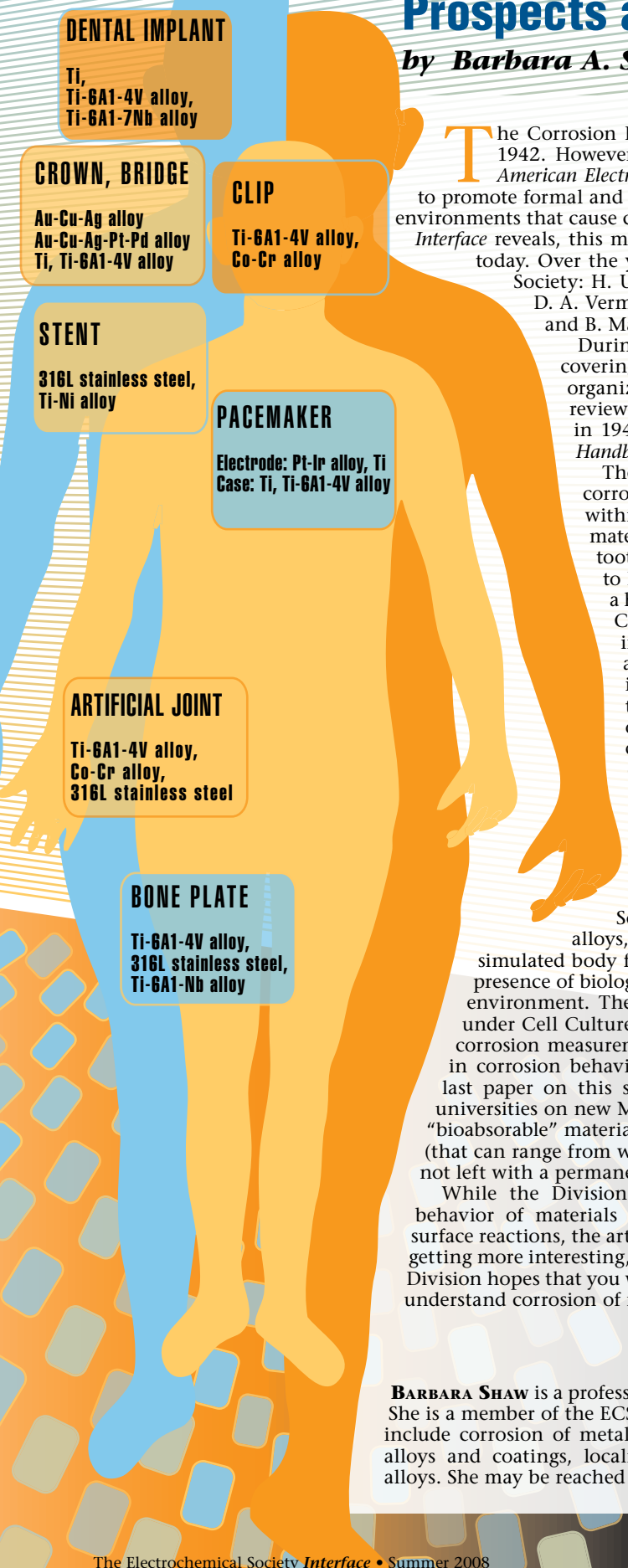
CORROSION WITHIN THE HUMAN BODY:
Prospects and Problems with Bioimplants

by ***Barbara A. Shaw***



The Corrosion Division, the sixth Division of ECS, was formally established in 1942. However, the first papers on corrosion appeared in *Transactions of The American Electrochemical Society* in 1903. The Division was originally organized to promote formal and informal discussions associated with the behavior of materials in environments that cause corrosion, oxidation, and related surface reactions. As this issue of *Interface* reveals, this mission is still being carried out by the Division and its members today. Over the years, a number of our members have served as president of the Society: H. Uhlig (1955-56), N. Hackerman (1957-58), F. L. LaQue (1962-63), D. A. Vermilyea (1974-75), T. R. Beck (1976-77), R. P. Frankenthal (1993-94), and B. MacDougall (2007-08).

During the past 65 years, the Division has sponsored numerous symposia covering a range of corrosion-related topics, published proceedings, and organized the Corrosion Monograph series of books that outline and review many areas of corrosion science. Originally edited by H. H. Uhlig in 1946 and then revised by R. Winston Revie in 2000, the *Corrosion Handbook*, has sold over 27,000 copies.

The articles in this issue focus on a newer area of research in corrosion science and within our Division—corrosion of materials within the human body. Many of us accumulate a number of these materials within our own bodies as we go through life: a filling in a tooth, a stainless steel plate to repair a broken tibia, a titanium screw to hold together broken bones in the foot, a polymer mesh to repair a hernia, or a coated stainless steel stent to open up a blocked artery. Corrosion of these materials within our bodies is an interesting and important subject to corrosion scientists, biologists, physicians, and all of us with implanted materials. While people have been implanting foreign materials within the human body for more than a thousand years, recently the applications for and number of different materials implanted within the body has been rising dramatically. As an example, more than 500,000 stainless steel cardiac stents are now implanted in the U.S. every year.

In the first article featured in this issue, "Metallic Corrosion in the Human Body: The Ultimate Bio-Corrosion Scenario", Doug Hansen provides a general overview of a number of the metals commonly implanted within the human body and their most pressing corrosion concerns. Photographs illustrate a number of the applications for these metals within the body. Patrik Schmutz discusses a number of the corrosion concerns for Ti/Ti alloys, stainless steel, Co-based alloys, and WE 43 (a Mg alloy) in simulated body fluids. He also addresses the challenge of corrosion testing in the presence of biological cells, a somewhat difficult but important addition to the test environment. The third article in this issue, "Corrosion of Metallic Biomaterials under Cell Culture Environments," by Sachiko Hiromoto discusses electrochemical corrosion measurements in biological fluids. This paper emphasizes the differences in corrosion behavior noted between *in vivo* and *in vitro* experiments. Finally, the last paper on this series presents research being conducted independently at two universities on new Mg-based alloys that are meant to dissolve within the body. These "bioabsorable" materials are implanted within the body, they function for a given time (that can range from weeks to months), and are designed to corrode away so that one is not left with a permanently implanted material.

While the Division is still actively involved with discussions centering on the behavior of materials in environments that cause corrosion, oxidation, and related surface reactions, the articles highlighted in this issue illustrate that the environments are getting more interesting, complicated, and (at least in some cases) personal. The Corrosion Division hopes that you will find these articles of interest and join us in the effort to better understand corrosion of materials in the human body.

About the Author

Barbara Shaw is a professor of engineering science and mechanics at Penn State University. She is a member of the ECS Corrosion Division Executive Committee. Her research interests include corrosion of metals (particularly light metals), development of corrosion-resistant alloys and coatings, localized corrosion, and development of bioabsorbable magnesium alloys. She may be reached at bas13@psu.edu.