

ECS's IE&EE

by Robert F. Savinell
Division Past Chair



Our Featured Division

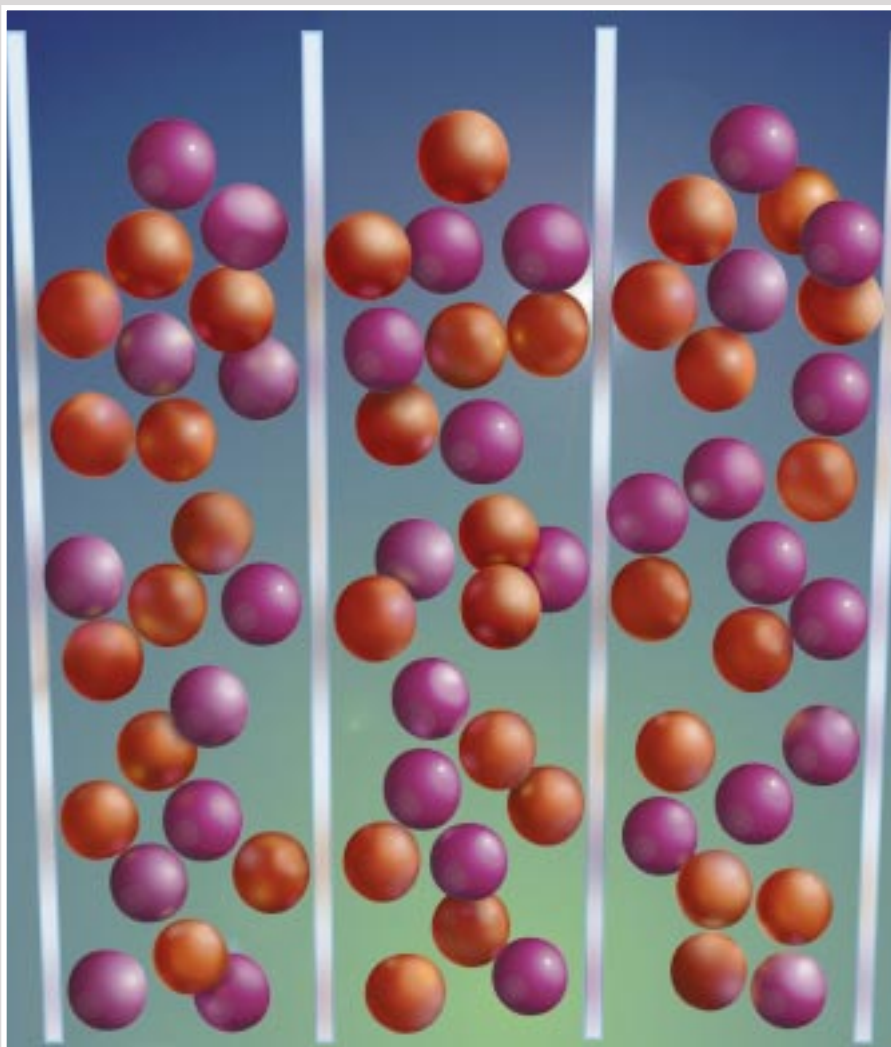
The name of our division is sometimes confused with an organization representing electrical engineers. As a matter of fact, recently I saw a Call for Papers with reference to sponsorship by the IEEE, but I didn't recognize the symposium. As it turns out, that symposium was indeed from the dry side of the Society, and it did refer to that other society.

The Industrial Electrolysis and Electrochemical Engineering Division of the Electrochemical Society was founded in 1943 as an outgrowth of the Society's Alkali and Chlorine Technical Committee. The IE&EE Division was last featured by *Interface* in the Fall 1994 issue. In that issue, Bob Karpiuk wrote about the first 50 years of the Division. Rich Varjian gave a broad overview of the electrolytic industry. Ron Dotson described the development of chlor-alkali mercury cell technology for synthesizing a high energy material (hydroxyl ammonia nitrate). There was an article featuring the late Professor Charles Tobias, a very influential figure in the development and growth of electrochemical engineering discipline. This short article will describe the IE&EE Division, its purpose, its activities, and its special features that make it a home to many members of the Society. This issue of *Interface* features several focused articles from Division members related to an important industrial issue, that of the environment.

First, what about our name, the Industrial Electrolysis and Electrochemical Engineering Division? The original title was Industrial Electrolysis, but was quickly changed in 1944 to Industrial Electrolytic Division to better define the scope of industries it represented. The interest of industry and that of the Division expanded from electrolyzer design and scale-up to pre- and post-solution processing along with modern electrode and membrane materials. The Electrochemical Engineering aspect has been a recent addition to the title of the Division (circa 1990). Coverage of electrochemical engineering has been a

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Industrial Electrolysis and Electrochemical Engineering Division



Our Featured Division

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major factor in the growth of the Division. This academic discipline has only been around for the last half of this century. Engineering methods and mathematical tools make it possible to elucidate the mechanisms and processes taking place in electrolytic systems and to quantify electrochemical reactor and system design. Now it's possible to predict performance and to optimize operation of an electrochemical system. University faculties who study electrochemical engineering, based primarily in chemical engineering departments, now find a home within our Division. This marriage between academia and industry has resulted in stimulating interactions and the introduction of many advances in the field.

The name of our Division includes many "E"s and one can associate the Division with other E-words as well. A fourth E could be for Energy. After all, the electrochemical industry consumes about 10% of the world's electricity. Some of these are major manufacturing methods that were developed over 100 years ago (e.g., the Hall-Heroult process for aluminum production), and only minor improvements have been made since then. Reducing energy and improving Efficiency (another E-word) are major targets of the industrial electrolytic industry. Finally, another E could be Environment, an important concern for industry today. Jim Fenton, in an article in *Interface* (Spring 1998), made a convincing argument for this additional E. He pointed out that with federal legislation emphasizing what to do, rather than how to do it, electrolytic industries are finding economic ways to reduce wastes and emissions.

Two electrochemical technologies are highlighted in this issue that impact the environment. The first is an electrodeionization unit that combines features of ion exchange, membranes, electrodialysis, and acid/base generation to produce high purity water. The second is an electrolyzer that regenerates chlorine gas. The process uses PEM (polymer electrolyte membrane) fuel-cell technology to recover the large quantity of chlorine that ends up as spent HCl. Pollution prevention is becoming an increasingly larger part of all industries, including the electrolytic industries, and electrochemical engineers will

play a key role in how they thrive and survive.

Electrochemistry and likewise, the Divisions of the ECS, are interdisciplinary, and consequently, there are overlapping interests among the Divisions. For example, energy issues related to the electrolytic industries are also of interest to the Energy Technology Division. The industrial syntheses of organic chemicals include issues of interest to the Organic and Biological Electrochemistry Division, and process and environmental sensing are topics addressed by the Sensor Division. Interfacial process in industrial process are of fundamental concern to divisions like Physical Electrochemistry and Electrodeposition. These overlapping interests are often accommodated by sponsorship of joint symposia. In this way, a symposium attracts a larger and more diverse group of presenters and attendees, which leads to more intellectually stimulating discussions and cross-fertilization of ideas. At the San Diego meeting in May 1998, three of the IE&EE's five symposia were co-sponsored by other Divisions of the Society.

According to the IE&EE bylaws, "The purpose of this Division shall be to encourage activities aimed at increasing the knowledge required to support improvements in existing industrial electrolytic processes and provide a sound basis for the establishment of new processes and to advance the purposes of the Society." The Division does this by a number of means. Some of the more important functions of the Division are symposia planning, award presentations, and preparation of the Report of the Electrolytic Industries.

Symposia planning is an important activity as it is the forum for rapid communication of advances in the field and the dissemination of new knowledge. Experiences are shared, discussions are held, and solutions to challenging problems are presented. Because of its importance, this is a major agenda item at each executive committee meeting. At this time plans are nearly complete for the 1999 Hawaii meeting and some symposia plans are in place for the 2000 Toronto meeting. (See sidebar for Future Symposia Plans.)

Awards are important because they recognize the accomplishments of people and organizations. The IE&EE Division is the home division of the Vittorio de Nora Award for outstanding contributions to engineering

and technology directed toward the utilization of electrochemical phenomena and processes. This prestigious Society award is given biannually to a deserving recipient at the Spring ECS meetings on even years. The recognition of young people is especially important because it introduces them to the Society and forms the basis of its vitality. The IE&EE Division presents annually two student achievement awards. One is sponsored by an endowment from the Dow Chemical Corporation and carries the name of "H.H. Dow Student Achievement Award." The Division itself sponsors the other.

The Division has recently initiated a novel award called the New Electrochemical Technology (NET) Award, which is sponsored by an endowment from the Dow Chemical Company Foundation. The purpose of this award is to recognize important technological advances made by teams of people. It acknowledges that when new technology is introduced into the marketplace today, it is usually the result of a collaborative, multi-disciplinary, inter-functional effort. Singling out an individual for accomplishment that relates to newly introduced technology does not reflect the current industrial situation. The primary motivation of establishing this award is to promote high quality applied electrochemical research and development. The first NET Award presentation is scheduled for the Spring Meeting of the ECS in 1999.

The Report of the Electrolytic Industries is prepared annually by the Division and summarizes the status of the major components of this industry, in addition to electric power and advances that will impact the electrolytic and power industry, such as modern battery and fuel cell developments. The first report was written in 1953 by a single author; it was two pages in length with four references, being limited to the chlor-alkali industry. In 1956 the report was prepared by a junior and a senior author. This is still the practice today. A summary of the report is given at the annual business luncheon of the Division in the Spring ECS meeting. The full report is published in the **Journal of The Electrochemical Society**, usually in the late summer or early fall of the year following the report period. The report for the year 1996 (*J. Electrochem. Soc.*, **143**, 10, 3674 (1997)) was 18 pages with 216 references. Topics covered in this report included:

chlor-alkali, caustic soda production, sodium chlorate and chlorine dioxide, Al, Be, Cr, Cu, Li, Mg, Mn, Ni, Ti, Zn, batteries and electric vehicles, electric utility industry, fuel cells, environmental applications, and inorganic and organic electrosynthesis.

Words that describe the active membership in our Division are loyal, dedicated, and multi-generational. Upper-class undergraduate and graduate students worldwide are eligible for a Division award of free membership to the Society and the Division. The purpose of the Student Membership Award Program is to attract students of electrochemical engineering and applied electrochemical and related sciences into the Division and the Society. Young people coming into the Division often become very active. They are encouraged to contribute to symposia planning and organization and to become an author of the Report of the Electrolytic Industries. Past officers often continue to attend executive committee meetings. It is not unusual to have a recent graduate and a member since 1953 sitting next to each other at the executive committee meeting or at our annual business luncheons.

Operation of the Division

The elected officers of the Division are the chair, the vice-chair responsible for symposia planning, and the secretary/treasurer. The last is elected at the spring business luncheon in the even years. The period of office is two years, and normally the officers advance so only the secretary/treasurer is elected. This represents a six-year commitment, which actually becomes eight because the chair often remains active as the immediate past-chair. The executive committee meets at every national meeting, usually starting (at breakfast) at 7:00 a.m. on Monday morning. The primary business is symposia planning, but award decisions, officer nominations, and other activities that promote the Division or the Society are discussed. All members of the Division are invited to attend the executive committee meeting to contribute ideas and to participate in various activities.

The annual business luncheon is held at the Spring Meeting and is usually on Monday of the meeting week. This luncheon is an opportunity for the Division's membership to learn of future symposia plans, special activities, Society announcements, and

other points of information. In addition, a summary of the Report of the Electrolytic Industries is presented. This year Mark Vreeke, senior author of the report, gave a presentation that summarized the chlor-alkali industry, the nickel industry, and the electric power industry. His talk highlighted how these three industries were influenced by government regulation and how developments in each were coupled to each other. The annual luncheon is a focal event for the Division's membership. Many old friendships are renewed here and many new acquaintances are made. On behalf of the Executive Committee, I invite you to become an active member and to become a part of the legacy of this Division. ■

IE&EE Future Symposia Plans

Seattle
May 1999

Alternative Fuels and Processes for Electrochemical Energy Conversion (co-sponsored by the Energy Technology Division); Tutorials in Electrochemical Engineering; Mathematical Modeling, and Electrode and Cell Design Advances in Molten Salt Systems: Electrolysis, Batteries, and Fuel Cells (both co-sponsored by the Energy Technology and Battery Divisions); and the IE&EE General Session.

Hawaii
October 1999

Environmental Aspects of Electrochemical Technology and the R. B. Macullin Memorial Symposium: Chlor-Alkali and Chlorate Technology.

Toronto
May 2000

Mineral and Metal Processing: Fifth International Symposium, and the IE&EE General Session.

About the Author

Robert F. Savinell is a Professor of Chemical Engineering at Case Western Reserve University and Director of the Ernest B. Yeager Center for Electrochemical Sciences. He has been an active member of ECS since he was a graduate student and is currently immediate past chair of the IE&EE Division.