AAAS Pacific Division
2016 San Diego Meeting
Abstracts for Friday Afternoon Talks

Hobbies Among Early Sigma Xi Members, **GEORGE EDWARD SEYMOUR** (Retired, P.O. Box 461719, Escondido, California 92046-1719; George.Seymour@Gmail.com).

In 1936 Henry Baldwin Ward and Edward Ellery, honoring the founding and early history of Sigma Xi, published a twelve hundred page tome titled, "Sigma Xi Half Century Record and History, 1886-1936," which to this day serves as a prime historical document of the Society (Ward & Ellery, 1936). It identified each Chapter in chronological order as well as all of the members and associates in alphabetical order. Equally interesting was the inclusion of a twenty-four page listing of member hobbies. Those hobbies serve as the focus of this report which seeks to understand both the types of hobbies appreciated most by scientists and engineers back then, as well as to explore the hobby concept and changes over the centuries. Consequently, the primary objective of this talk is to analyze the hobbies reported by the Sigma Xi membership just prior to 1936.

Thermodynamics and Life, **ANDREW REX** (University of Puget Sound; rex@pugetsound.edu).

Like all natural processes, the physical and biochemical processes of life are governed by the laws of thermodynamics. Whether these laws are absolute or liable to exception has a direct impact on how we think about life. Regarding the First Law there seems little doubt. Energy is always conserved, provided it is understood to include mass-energy and every form of potential energy.

The Second Law is more interesting. It can be expressed as a tendency for processes to flow in one direction, which creates a preferred arrow of time. In the process, energy changes to less useful forms. The Second Law seems to hold universally in bulk materials. However, many of us have spent years looking for exceptions on the atomic and molecular level, where the status of the Second Law is less certain. Some sessions of this conference are devoted to some new and interesting results.

These studies teach us as a lot about the laws of nature. They may also teach us something about life, not just as the biologist or biochemist thinks of it, but rather something for everyone to contemplate, as we each decide how best to live our own lives. The constraints imposed by the Second Law and other laws of nature set limits on all physical systems, including living things. We have to face those limits squarely and decide what they mean. Are these limits roadblocks that impede us, challenges to overcome, or something else?

Interdisciplinary Water Quality Research Through the Lens of the Liberal Arts, **JAMES BOLENDER** (Department of Chemistry, University of San Diego, San Diego, CA; bolender@sandiego.edu).

Access to clean, uncontaminated water is a global issue, impacting both developed and developing countries. While addressing the problems of access to clean water differs greatly between the developed and developing world, a broader, interdisciplinary perspective is required to successfully address and remediate these issues. As scientists and engineers, we have the ability to quantify and remediate water issues anywhere on the globe. However, successful work to bring these types of projects to fruition require the support of the local technical community, and education of the local populace, in a culturally appropriate manner, so that they may make informed choices about their sources of water. This presentation will focus on water quality issues in Uganda and other regions of East Africa, and the challenges that arise in quantifying and remediating the problems, as well as addressing the need for education of the local technical community and the local populace.

Climate Change Communication: The Need for Interdisciplinary Efforts and Innovative Resources to Reach Diverse Audiences, **MICHEL A. BOUDRIAS** (Department of Environmental and Ocean Sciences, University of San Diego, 5998 Alcala Park, San Diego, CA 92110; boum@sandiego.edu).

Over the past several years there have been many coordinated efforts to improve climate change literacy of diverse audiences. The challenge has been to balance science content with messaging to reach audiences ranging from K-12 students to undergraduates to informal audiences and up to decision makers. Successful programs have integrated climate science, social and learning sciences and effective communication strategies to create innovative resources and new approaches to climate change communication in order to engage audiences more actively. The goal of these programs is to provide the scientific background and learning context within a framework that is audience specific; this can lead to increased literacy about climate change and its impacts, increased knowledge about possible solutions for adaptation and mitigation and informed decision making for leaders. In the San Diego Region, Climate Education Partners have been working with business leaders, elected officials, tribal leaders, and

other Key Influentials and have developed a suite of programs and activities to enhance the channels of communication outside traditional settings. We have interviewed over 140 Key Influential San Diego leaders, engaged them directly in the creation of an innovative educational resource and included them as ambassadors in our activities. Results of the interviews indicate that 90% of these leaders are concerned about climate change, more than 50% are already doing something about the impacts, and the majority of them want more information, greater dialogue and examples of actions taken by other community leaders. For climate change communication to be successful in the future, we will need creative and coordinated approaches.

The Evolution of Drug Discovery: Past, Present, and Future Perspectives, **JOZEF STEC** (Department of Pharmaceutical Sciences, College of Pharmacy, Marshall B. Ketchum University, 2575 Yorba Linda Blvd., Fullerton, CA 92831; jstec@ketchum.edu).

Since ancient times the human race searched for antidotes to various diseases. Notable examples of cures used by the ancient civilizations in India and China include extracts from roots and leaves of *Dichroa febrifuga*, Lour, (containing dichroine *B*) as a medicament for malaria; the oil from seeds of *Hydnocarpus wightiana* (containing hydnocarpic acid) as the treatment of leprosy; and dried roots of *Rauwolfia serpentina* (containing reserpine) as panacea for insanity, snakebites, and fever. The ancient Sumerians, Egyptians, Greeks, and Romans used willow tree bark (containing acetylsalicylic acid) as a remedy for pain, fever, and inflammation. Inorganic compounds such as copper oxides, ores of sulfide and mercury were also used in antiquity to address skin complaints. Alchemists in the Middle Ages glorified antimony, mercury, arsenic, and their salts as cure-alls. With the innovation and expansion of the chemical industry observed in the 19th century, efforts were made to isolate and identify the pharmacologically active ingredients. Accordingly, morphine, emetine, and quinine were isolated as pure compounds in 1803, 1816, and 1820, respectively. The 20th century was highlighted by the "Golden Era of Antibiotics" with groundbreaking contributions from P. Ehrlich, A. Fleming, and G. Domagk. Pharmaceutical research rapidly proliferated towards finding medications suitable to treat major diseases and disorders of the human body. The anticancer research is also fast growing with paclitaxel, vincristine, and vinblastine being the landmark of the 20th century antitumor drug discovery landscape. The beginning of the 21st century is marked by the era of genomics in drug discovery.

The Autodigestion Hypothesis, **GEERT W. SCHMID-SCHÖNBEIN** (Department of Bioengineering, University of California San Diego, La Jolla CA 92093- 0412; gschmid@ucsd.edu).

Many acute and chronic diseases have gastrointestinal co-morbidities. But no molecular mechanism has been proposed to explain abnormal cell/tissue dysfunctions in an association with the gastrointestinal track. We identified a previously unrecognized mechanisms due to the powerful pancreatic digestive enzymes used for normal digestion and usually compartmentalized inside the lumen of the intestine.

Our evidence in *acute* forms of experimental shock indicates that the digestive enzymes may escape out of the lumen of the intestine into the systemic circulation at concentrations sufficient to start autodigestion. The activity of the digestive enzymes causes cell and organ dysfunctions and death. Enteral blockade of digestive enzymes in the intestine reduces autodigestion and the co-morbidities in shock.

In *chronic* metabolic disease unchecked proteases may also be present in the systemic circulation at lower concentrations, still causing cell dysfunctions. For example, unchecked extracellular protease activity causes cleavage of the beta-2 adrenergic receptor in arterioles, contraction and elevation of central blood pressure. The protease activity also causes cleavage of the insulin receptor with reduced insulin resistance and cleavage of many other receptors causing co-morbidities.

Autodigestion may be a fundamental mechanism for cell and organ dysfunction, disease and death. The digestive enzymes in the pancreas and intestine not only serve degradation of food but also leak into the circulation and lead to autodigestion.

Supported by GM 85072, HL 10081 and an unrestricted gift from Leading Biosciences Inc..

How to Engage the Liberal Arts by Capturing the Sciences, **NOELLE NORTON** (Dean, College of Arts and Sciences, University of San Diego, 5998 Alcalá Park, San Diego, CA 92110; norton@sandiego.edu).

A Liberal Arts and Sciences education is central to the mission of the University of San Diego. Regardless of major, all students and faculty understand that the liberal arts educational model is at the foundation of everything we do at USD – graduate and undergraduate. But, how do we integrate the humanities and STEM in this effort? The methods, approaches, and pedagogical styles are sometimes strikingly different between the divisions. Faculty and students in these different divisions only see each other in core or general education classes. USD's designation as an Ashoka Changemaker campus and our commitment to environmental sustainability ensures that we inspire

students to study and reflect on issues facing our local and global communities. Drawing on the resources provided by all disciplines within the liberal arts and sciences we blend technology, science, social science, fine arts, and humanities. This approach encourages our students to challenge preconceived ideas, and to discern significant truths about reality, faith, the scientific world, and human existence. Our students collaborate with community partners and develop into innovative and ethical leaders, ready to shape change, not just react to it. Our work to integrate the humanities and STEM disciplines can serve as a model for other institutions interested in similar approaches to the a 21st century educational model.