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Presidential Symposium

150 Years of Chemistry at Land Grant Institutions:

The Past as Prelude to the Future

Organized by

Stephen J. Weininger, Worcester Polytechnic Institute, and

Alan J. Rocke, Case Western Reserve University

Tuesday, August 21, 2012

8:30 AM

Introductory Remarks

Bassam Z. Shakhshiri, ACS President

8:40 AM

Chemical Laboratory Instruction, Democratic Ideals, and Mass Education In Midwestern Land-Grant Colleges, 1870-1914

Stephen Weininger, Worcester Polytechnic Institute

The inclusion of laboratory exercises for undergraduate students was a major innovation in 19th-century chemical pedagogy. This program reached the US from Liebig's laboratory in mid-century via German-trained American instructors and translated laboratory manuals. It was particularly welcomed in the new, democratically-minded mid-western land-grant colleges. These colleges initially had small enrollments, under-prepared students and a lack of many material and human resources. The Liebig laboratory program therefore underwent substantial modification, especially after college enrollments began to soar around 1890. Using data from representative institutions, I will describe how homegrown lab manuals and modified curricula accommodated changing local circumstances. Most land-grant institutions were coeducational when founded or soon thereafter. Their strong emphasis on science meant that female and male students studied science together, at least in beginning subjects. The talk will conclude with a brief overview of the numbers and career pathways of the early women students and alumnae.

9:10 AM

Chemistry under the Morrill Act: Agency Through Service

Alan I. Marcus, Professor of History and Head of Department, Mississippi State University

The Morrill Act was to open higher education to the vast mass of American citizens. Most land grants initially offered a broad spectrum of courses but agriculture quickly dominated. College chemists initially found favor by aiding farmers. They analyzed fertilizers to guarantee quality and milk for butterfat content. These technical successes established chemists as vital and led states and the federal government to support original chemical/life-science experiments. A varied agenda emerged: soil chemistry, vitamins, pharmaceuticals, principles of nutrition, chemotherapy and antibiotics. By the 1920s, the integration of chemistry within the land grant nexus was complete and most land grants formed free standing chemistry departments.

9:40 AM

Chemurgy and Biotechnology at the Land Grant Colleges: Bridging Agriculture, Industry, and Chemistry in the 1930s and Beyond

Mark Finlay, Professor of History, Armstrong Atlantic State University

Since the origins of the Morrill Act, land grant scientists have engaged in multiple strategies to connect agriculture with the mechanical arts. Following a long history of agricultural chemistry in service to farmers, the "chemurgy" movement emerged in the 1930s as an explicit effort to have land grant chemists and chemical engineers work in the service of industry. "Chemurgists" sought and promoted the industrial use of agricultural raw materials on the macro-level, such as motor fuel from corn and Jerusalem artichokes, starch from sweet potatoes, plastics from sawmill wastes, and much more. Although the chemurgy movement faded as the economic and wartime crises of the 1930s and 1940s passed, the search for industrial applications of biobased materials continued, focused in the postwar era on the micro-level search for valuable components within farm products. As the current passion for biotechnology suggests, efforts to build bridges between agriculture and science and industry have continued into the twenty-first century.

10:10 AM

Intermission

10:25 AM

Catalyst or Synthesis? The Rise of Chemical Engineering in the Land Grant College System

Robert W. Seidel, Professor Emeritus, University of Minnesota

Chemical engineering originated in land-grant colleges in the early 20th century as a result of the recognition of the need for trained personnel in the nascent chemical industry of the United States. MIT, Purdue, Minnesota, Wisconsin and other land-grant colleges initiated contacts with leading firms in that industry, imported techniques using consulting, interning, and other forms of personnel exchange to import knowledge which they then disseminated outside of industrial channels. Among the most important patrons of chemical engineering were members of the DuPont family and George Eastman at MIT, although local industries and agricultural interests fostered innovation in many other land-grant colleges where the new discipline was instituted. The rise of the car culture stimulated others to seize upon petroleum as the process of choice for the renovation of their departments. Chemical engineering escaped its industrial captivity when it became a true engineering science in the 1950s, after the development of new technologies in the government sector during World War II put a greater premium on mathematics and the physical sciences. The prestige of the discipline suffered, however, when Bhopal and other industrial disasters discredited international conglomerates like Union Carbide.

10:55 AM

Chemistry, Cooking, Animal Science, and Airplanes: Women in Land-Grant Science and Engineering

Amy Bix, Associate Professor, History of Technology and Science Program, Iowa State University

American education in science and engineering has a gendered history. Nineteenth-century women's colleges graduated scores of chemistry, biology, and other science majors, but female employment and professional advancement remained limited. Before WWII, schools such as Princeton, Caltech, and Georgia Tech remained primarily all-male. Many in American society considered it inappropriate or odd for women to pursue science seriously. But at land-grant colleges, female faculty developed pioneering home-economics programs, where ideals of domesticity justified teaching women chemistry, physics, nutrition, and household-technology. Botany, veterinary medicine, and other land-grant depart-

ments gradually opened doors to women. A handful of early-twentieth-century women even entered engineering at Purdue, Iowa State, Cornell, Minnesota, California, and other land-grants. During WWII, land-grants helped both government and industry by training women in airplane design, drafting, explosives manufacturing, and more. Through recent decades, land-grants continued to address issues of gender and education, fostering important ongoing discussions about women, science, and engineering.

11:25 AM

The Morrill Act as Prologue to Federal Participation in Higher Education and Research

Gary Schuster, Vasser Woolley Professor, Chemistry and Biochemistry, Georgia Institute of Technology

The goals of higher education may be divided into four epochs that pivot on the Morrill Act. Before the Morrill Act, higher education was foremost private serving elite citizens. This ended in 1862 when Lincoln, spurred by the industrial revolution and its need for an educated "industrial class", committed the federal government to higher education. The epoch of the industrial revolution ended in 1941 with the start of World War II. After the war, the massification of higher education began with the "G.I. Bill". In response to cold war pressures Congress passed the National Defense Education Act leading to the University-based research infrastructure that exists now. The third epoch ended in 1991 with the disintegration of the Soviet Union. Today we strive to extend the legacy of the Morrill Act and redefine the relevancy of higher education in an epoch of constrained federal resources and shifting national priorities.

11:55 AM

Concluding Remarks

