

Panel Session - Historical Visions: Enhancing Engineering Education through the History of Technology

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Abstract - This panel is organized by the Prometheans SIG of the Society for the History of Technology (SHOT) and by the International Network for Engineering Studies (INES). This panel introduces the FIE audience to our work in utilizing history, and humanistic-social perspectives more generally, to enhance engineering education. Specifically, we will use this panel to demonstrate and discuss how the history of technology can be used to help teach *engineering* to engineering students. Beginning with an overview by Atsushi Akera, Director of the First Year Studies Program at Rensselaer and co-editor of *Using History to Teach Computer Science and Related Disciplines*, the individual panelists, J. Douglass Klein (Union College), Frederik Nebeker (IEEE History Center, Rutgers), and Aristotle Tympas (University of Athens, Greece) will briefly describe the specific pedagogic techniques and strategies they use before opening up the panel to general discussion on the efficacy of these and other techniques.

Index Terms - History of Technology, Enhancing Engineering Education, Liberal Education, Professional Development

OVERVIEW

This “Historical Visions” panel is organized by the Prometheans (Engineering) Special Interest Group of the Society for the History of Technology (SHOT) and by the International Network for Engineering Studies (INES). Both of these organizations have a substantial commitment to reach out to engineering professional organizations, and for using history and humanistic-social perspectives to enhance the quality of engineering education. This panel introduces our work to the general FIE audience.

Specifically, we will be using the panel format at FIE to both demonstrate and discuss how the history of technology can be used in different ways to help teach *engineering* to engineering students. Beginning with an overview by Atsushi Akera, Director of the First Year Studies Program at Rensselaer and co-editor of *Using History to Teach Computer Science and Related Disciplines*, each of the panelists will briefly describe the specific pedagogic techniques and strategies they have adopted to make historical knowledge and historical modes of analysis relevant to engineering students in learning a technical

subject and for broadening the student’s understanding of what it means to be an engineer. The initial examples that the panelists will present in their opening statements will be as follows:

“Anticipating Unintended Consequences: Learning to Engineer in a Social and Historical Context.”
 J. Douglass Klein (Union College)

“Techniques to Get Students Engaged in Technology’s History”
 Frederik Nebeker (IEEE History Center, Rutgers University)

“Engaging the History of Technology to Understand Emerging Technical Demarcations and Concepts”
 Aristotle Tympas (University of Athens, Greece)

To elaborate, Klein’s initial presentation will demonstrate how getting students to think about “how to anticipate unintended consequences” also gets them to recognize how all engineering occurs in a social and historical context; Nebeker’s will describe how a student’s understanding of “technology’s history” can foster greater engagement with engineering knowledge and engineering professional identity; and Tympas’ will introduce innovative research on how historical case studies about the process of radical technological change can contribute to a deeper understanding and appreciation of major technical and conceptual changes that are underway today.

Following these brief presentations, the panel will be opened up to general discussion on the efficacy of these and other techniques. We will encourage active engagement from the audience in the hopes of fostering genuine interdisciplinary dialogue on the question of how historical understanding can be made to enhance engineering education and contribute to the broader objectives of engineering education today.

POSITION STATEMENTS

The following statements from the panelists provide further details about the specific pedagogic techniques and strategies that they will be introducing during the initial phase of the panel:

“Anticipating Unintended Consequences: Learning to Engineer in a Social and Historical Context.”
J. Douglass Klein (Union College)

Since the time that Prometheus stole fire from the gods and gave it to mankind, technology has created a dilemma, providing benefits but posing risks. Often the benefits are initially more evident than the risks, but risks should be weighed. Engineering students need to expand their concept of a "system" to include the social implications of their designs, even when those implications may be foreseen only dimly.

This presentation will include several examples of technologies that have had unexpected consequences, sometimes positive, sometimes negative, sometimes both. This will be followed by a discussion of how well these outcomes might have been anticipated, and what could have been, or should have been done compared with what was actually done.

Following the historical examples will be a discussion of current broad technological areas which are likely to lead to unintended consequences and a consideration of what lessons we can learn from history to maximize benefits and minimize risks. The theme of the presentation is to argue that there is an urgent need to expand the systems approach to engineering to include the social and historical contexts as well as a strictly technological context in the design process.

“Techniques to Get Students Engaged in Technology’s History”
Frederik Nebeker (IEEE History Center, Rutgers University)

There are various ways to get engineering students engaged in a course on the history of technology. One can include information on how earlier technologies worked to take advantage of the fact that these students are already interested in technology. Of course, such information is important in understanding how technological capabilities evolved. One would like also to engage the students in the social dimension of technology: how technology has shaped and been shaped by society, and what technologies have meant to people. And one would like to cultivate each student's sense of history, his or her feeling for historical depth, and to instill in each student the habit of seeing the historical dimension in things. This paper presents a variety of techniques that the author has used in teaching at Rutgers University to achieve these objectives. The techniques involve historical artifacts, film clips, slide shows, audio clips, and demonstrations, and most of them require activity on the part of the students. The strategy is to keep students active, to make the classroom less a place for the transfer of information and more a place where the students exercise their historical understanding, practice seeing the historical dimension of things, and develop their ability to perceive and analyze the social dimension of technologies.

“Engaging the History of Technology to Understand Emerging Technical Demarcations and Concepts”
Aristotle Tympas (University of Athens, Greece)

This presentation introduces the audience to some pedagogical experiments and research directed towards the use of the history of technology for improving the efficacy of learning in engineering education. The research is part of an ongoing, EU-funded, multinational research initiative, pursued as a joint collaboration between historians and computer scientists. It aims to understand how important new technical demarcations and technical concepts can be better understood through historical understanding of radical technological changes in the past. Case studies based on electrical power systems, control systems engineering, and computer engineering will be presented. These case studies draw on the extensive experience of the panelist in introducing both general and specialized history of technology courses in the US and Greece.

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