# Guest Editorial:
# Special Issue on Outreach to Prospective Electrical, Electronics, and Computer Engineering Students

**O**UTREACH can be considered as an effort by an organization or group to connect its ideas or practices to the efforts of other organizations, groups, specific audiences, or the general public. Engineering outreach enlightens prospective students and the public about the importance and attractiveness of the engineering profession. The world without engineers is unimaginable. Their wide-ranging contributions are evident in all possible aspects of our lives. Engineering inventions shape the world and create whole new industries, generating wealth and bettering our environment. Electrical, electronic, and computer engineering is poised to continue to be a broad area of engineering, with electronics as a key sector of major manufacturing industries. New and strong areas continue to grow from this established field, such as nanotechnology, bioelectronics, and interactive and digital media.

It is clear that the world will need a continuous, strong inflow of good students in mathematics and science to be educated and trained as electrical, electronics, and computer engineers in order to sustain the achievements that are necessary to keep the world moving efficiently. Yet, the number of students opting for engineering education appears to be declining, with many young students now selecting other programs in the universities. In many universities and other institutions of higher education, explicit and extensive efforts in outreach have been implemented to try to arrest this trend and to reinstate enthusiasm for engineering among prospective students.

A multitude of social factors collectively affects students' enrollment in engineering, or more generally, their decline in interest in this field. One possible cause may lie in its receding professional status when perceived from certain angles, such as the militarization of science and technology since the 1940s, negative contributions toward the environment, a shift from the 18th- and 19th-century engineer-entrepreneur model to the current engineer-employee model, and the fact that a number of prominent scientists and engineers of the late 20th century did not have to go through the length and laboriousness of studies in the university. Other causes may relate to the working conditions and remuneration of engineers, career opportunities, and evolving global trends. A common assumption behind the design of outreach activities is that "if students just knew about engineering, they'd love it." However, to a possibly big number of young folks, not pursuing engineering may in fact well be a sensible and deliberated decision these days when engineers are visualized as an unglamorous and uninteresting bunch of people working in uninviting environments, clocking up laboratory time.

Reversing these negative stereotypes may require a change to engineering itself in both its social and reward structures and its culture. These are clearly beyond what localized outreach can address entirely. Therefore, a niggling question often arising to those involved in outreach is: On the whole, is the outreach effort worth their while, and how successful have these efforts been? Unfortunately, this question cannot be answered simply by measuring enrollment numbers, but must be approached through complex observation of outreach activities and their outcomes. Each outreach activity is unique and offers only a one-time possibility for any evaluation, in the sense that we cannot turn back the clock to iterate aspects of that activity and measure the differences in the outcome to draw a conclusion. Some will maintain the view that outreach simply does not belong to the kind of efforts that one would expect to have a crisp return of investment (ROI) measurement, and that while the result may not show up immediately in terms of some ROI numbers, it may be expressed in better understanding and higher appreciation of the engineering field.

This Special Issue on Outreach focuses on the important and difficult subject of preparing and attracting students to an electrical, electronic, and computer engineering education via a full spectrum of innovative, meticulously designed activities. These innovations can include improvements or changes to the K-12 curriculum, specially delivered classes to demonstrate the engineering applications of science and mathematics, engineering projects for prospective students, inspirational information on the profession, and other engaging activities. Worldwide, a great deal of work is underway in outreach; the goal of this issue is to consolidate and conceptualize these efforts and disseminate results of this work internationally.

The response to the call for papers for this Special Issue has been very encouraging. More than 40 submissions were received, out of which 21 manuscripts have been selected for publication in this issue, considering development, implementation, and evaluation of different outreach initiatives worldwide. We hope that the special issue will be a useful collation of outreach experience for colleagues embarking or already immersed in outreach programs. Finally, we are very grateful for the support given to us by the Editor-in-Chief, Prof. Charles B. Fleddermann, and the Editorial Administrator,

Dr. Kirsty Mills. Prof. Fleddermann and Dr. Mills have also on several occasions shared with us their thoughts on the subject matter, for which we are most thankful. Happy reading!

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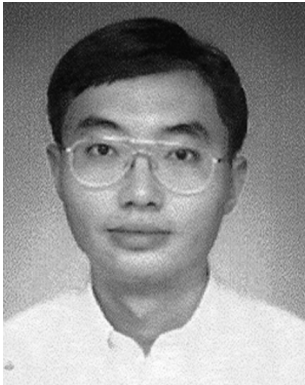
**Kok Kiong Tan** (M'95) received the B.Eng. and Ph.D. degrees in electrical engineering from the National University of Singapore (NUS), Singapore, in 1992 and 1995, respectively.

He is currently an Associate Professor with the Department of Electrical and Computer Engineering at NUS. His teaching domain spans the control and automation discipline, but his research interests are more specifically in precision motion control and instrumentation, advanced process control and automatic tuning, and general industrial automation. He has been involved in the outreach program of the department and the faculty for the past five years, and he has set up Engineering Corners at high schools and conducted physics supplementary workshops for pre-university students.

Prof. Tan is a Member of the ISA, SME, and the Fieldbus Foundation Association. He has also won several best paper and best teaching awards, both locally and internationally.



**Lawrence J. Genalo** is an award-winning teacher and University Professor at Iowa State University, Ames. He was ASEE Division Chair for Freshman Programs and DELOS. He has originated outreach programs including a summer internship program for rural and minority high school girls and a K-12 engineering education program called "Toying With Technology." It includes undergraduate- and graduate-level engineering courses for pre- and in-service teachers and a large outreach program. His current interests include bringing engineering education to K-12 students, teachers, and their classrooms; technological literacy for current and future K-12 teachers; and computations in materials.



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