A Year in Review

I write my final column as president of the IEEE Control Systems Society (CSS) with much gratitude and an ongoing sense of duty. These 2018 "President's Message" columns have dealt with a range of topics. My February column discussed the meaning and advantages of volunteering for a nonprofit professional society of like-minded individuals like the CSS. My April, June, and October columns were written with inexperienced authors in mind and provided useful information on modern copyright law and practice; digital tools for scientific publishing; and advice for effective communication in writing, speaking, and reviewing. Finally (and most importantly), my August column focused on nurturing diversity and reducing implicit evaluation bias. In this column, I review recent initiatives by the CSS and some of my activities as president.

RECENT CSS HIGHLIGHTS

This is a follow-up to the August column on the important ethical matter of the discrimination of women in engineering. The CSS Board of Governors (BoG) met on Tuesday, June 26, 2018, immediately preceding the American Control Conference in Milwaukee, Wisconsin. The BoG voted unanimously to

1) reaffirm the IEEE Codes of Conduct, Code of Ethics, and Nondiscrimination Policy
2) clarify the importance of inclusiveness in committee composition, adopting language similar to that adopted by other IEEE committees

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3) broaden the basis for judging most CSS awards to include broad impact, diversity, and inclusiveness.

Regarding 3), an example is provided of the new approved language. As stated on the CSS web site, the 2018 basis for judging of the CSS Control Systems Technology Award is "an outstanding control systems technology contribution in either design and implementation, or project management." Beginning in 2019, the new basis for judging will additionally include the following sentence: "the broader impacts of the contribution towards the benefit of society at large and toward the CSS diversity and inclusiveness

Francesco Bullo delivering an explanation during the Chinese Control Conference in Wuhan, China, in July 2018. (Photo courtesy of the conference organizers.)

goals in terms of geography, gender, and work sector."

On the topic of awards, it is worth recalling how the CSS BoG approved, in December 2017, the new Conference on Decision and Control (CDC) Best Paper Award named in honor of our beloved colleague Roberto Tempo. In terms of timing, 2018 CDC papers will be eligible for the inaugural 2019 award, which is to be presented during the 2019 CDC in Nice, France. Moreover, 2019 will also be the first year that the IEEE Control Systems Letters Outstanding Paper Award will be available, pending approval by the IEEE Technical Activities Board (TAB). Many thanks go to the chair of the CSS Awards Committee Joao Hespanha and the chairs of all individual award committees for their tireless work.

For our publications, the trend continues to be toward growing submission rates and citation counts. Regarding our two newest publications, *IEEE Control Systems Letters* got off to a great start (2018 is its second year), and *IEEE Transactions on Control of Network Systems* is extremely well established in terms of submission volume, citation counts, and overall visibility (2018 is its fifth year). For the top-ranked *IEEE Transactions on Control Systems Technology*, new senior editor positions were established, and distinguished volunteers were

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appointed. For the Society magazine, it may surprise some readers to learn that its official name is *IEEE Control Systems* and not *IEEE Control Systems Magazine*. This past June 2018, the CSS BoG decided to consistently adopt the name *IEEE Control Systems* across our websites and documentation. For our flagship publication *IEEE Transactions on Automatic Control*, 2018 is the first year under the leadership of new Editor-in-Chief Alessandro Astolfi; yearly submission counts continue to break new records. Many thanks go to Alessandro as well as Editors-in-Chief Jonathan How, Yannis Paschalidis, Andrea Serrani, and Elena Valcher for their dedicated service.

For conferences, 2018 is the second year of the new CSS conference series, the IEEE Conference on Control Technology and Applications (CCTA). The second conference in this new series took place this past August in Copenhagen, Denmark. In related news, this year's BoG formally approved the establishment of a yearly Meet the Faculty Candidate poster session at future CDCs. This poster session is an opportunity for faculty and search committee members to speak directly with graduate students and postdoctoral researchers seeking faculty positions. Many thanks to Warren Dixon for this initiative.

In a similar spirit, the 2018 American Control Conference in Milwaukee, Wisconsin, featured a new CSS-sponsored special session, Young Professionals in Industry Lunch; hopefully, this lunch was only the first of a successful series of outreach events. Many thanks to Jeff Peters for this initiative. In looking toward future conferences, the BoG approved financial support to deploy a new mobile application for upcoming CDC and CCTA conferences. Many thanks to all general chairs of past and future CDCs and CCTAs.

ACTIVITIES AS CSS PRESIDENT

As my service draws to a close, you may be curious to know what exactly a CSS president does during his/her year. Officially, most activities take place during the twice-yearly meetings of the Executive Committee (ExCom) and the corresponding twice-yearly meetings of the BoG. The president also represents CSS at the IEEE level and attends IEEE TAB meetings three times per year. Another rewarding presidential duty is to represent CSS in our collaborations with other professional societies. The CSS president is one of nine directors of the American Automatic Control Council (AACC), the IFAC national member organization. In that role, I attended the meeting of the AACC Board of Directors in Milwaukee, Wisconsin. Because of our collaboration with the Chinese Association of Automation and its technical committees, I attended the Chinese Conference in Decision and Control (CCDC) in Shenyang, China, in June 2018 and the Chinese Control Conference (CCC) in Wuhan, China, in July 2018. Both conferences are technically cosponsored by CSS. It is not well known that the CCC is currently the largest yearly conference in our discipline. I congratulate the organizers of the CCDC and the CCC for the flawless execution of two stimulating and rapidly growing conferences.

During my trips to China, I also had the opportunity to visit numerous research laboratories, and I wish to thank all of the Chinese colleagues

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controllers have continued to be used, although following work by G.H. Cohen and G.A. Coon of the Taylor Instrument Companies during the 1950s, alternative choices of parameters have become accepted for certain types of plants [3].

DEVELOPMENT OF A THEORETICAL UNDERSTANDING

In 1922, Nicolas Minorsky presented a very clear analysis of the control actions necessary to provide effective control of a system whose exact dynamics were unknown. He analyzed the actions taken by a good helmsman steering a ship and translated these actions into the appropriate mathematical formulations. He showed that the control action needed to be made up of the sum of three terms related to the error, integral of error, and derivative of error. Minorsky's work was on the steering of ships and was published in the *Journal of Naval Architects* ([32]; see also [33]). How did such work relate to the design of automatic temperature controllers? There was, in 1922, no common language of control systems; engineers did not draw block diagrams showing feedback.

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» **PRESIDENT'S MESSAGE** *(continued from p. 11)*

who kindly hosted me, including Prof. Yuqing He, Prof. Zhongkui Li, Prof. Hao Fang, Prof. Ye Yuan, and Prof. Jiming Chen. I am especially thankful to Prof. Tianyou Chai for hosting me at Northeastern University in Shenyang, China. His highly regarded State Key Laboratory of Synthetical Automation for Process Industries is a truly unique and impressive center focused on control science and technology transition in the context of automation and greening of complex industrial processes. I am also extremely thankful to Prof. Lei Guo, Prof. Yiguang Hong, Prof. Chen Ge, Prof. Yanlong Zhao, and Prof. Zhixin Liu for stimulating discussions, kind hospitality, and a productive workshop during my week-long stay at the Academy of Mathematics and Systems Science, Chinese Academy of Science, Beijing.

A LOOK AHEAD AND A FAREWELL

As we look to the future, we live in times of great change. Most importantly, this past year has witnessed a rising movement around the world against sexual and racial discrimination in the workplace, and each of us has a constructive role to play in this regard. A second major trend is the rise in productivity and impact of the scientific community in China and other rapidly developing countries. Our community stands to benefit from this great influx. It is also true that great changes are revolutionizing scientific publishing. The IEEE and the CSS must find a way to lead in this area. Last but not least, control scientists are currently competing to keep control science and technologies relevant in a world of massive data sets and machine learning.

One final time, I wish to reiterate my full-hearted encouragement for you all to become involved with a nonprofit, volunteer-driven professional society. Instead of donating your time and talents to for-profit entities, please contribute to the CSS and help it reach its full potential. While it may be true that the IEEE and the CSS are not perfect, remember that every major decision by the IEEE and the CSS is made by volunteers like yourself and can be improved in a completely transparent and open way. Elections to the CSS BoG are open once every year.

In my final farewell, I truly wish to thank all CSS volunteers for their dedicated service to our Society. A special thanks goes to my closest collaborators for their support and friendship during this special year, including the extraordinary ExCom team—Bob Bitmead, Ed Chong, Faryar Jabbari, Magnus Egerstedt, Li-Chen Fu, Thomas Parisini, Anu Annaswamy, and Ragu Balakrishnan—and all the outstanding former presidents I worked with in the past—Roberto Tempo, Rick Middleton, Christos Cassandras, Yutaka Yamamoto, Jay Farrell, Elena Valcher, and Frank Doyle. It is also a pleasure to acknowledge all the kind readers who sent me feedback and comments. Go CSS!

Francesco Bullo