JOSE B. CRUZ, JR.

Excellence in Engineering Design of Complex Systems

by Joeriggo M. Reyes

Technology is an essential, if not an indispensable, part of modern life, embedded in most of our daily conveniences and concerns—from television to the internet, to transportation and communication, to weather surveillance, the stock market, health and environmental issues. What is interesting is that however simple or common each particular form of technology seems, there is always an underlying design to implement its operation, allowing us to enjoy its benefits.

Jose B. Cruz, Jr. is an exceptional Filipino electrical engineer who has made his mark in the field of engineering by pioneering and establishing theories, principles, analysis tools, and design methodologies in complex systems with dynamic feedback mechanisms. These concepts have the flexibility of being applied to many fields, not only in engineering, but in other disciplines like economics, social sciences, biology, chemistry, and physics as well.

Dr. Cruz is the first *summa cum laude* graduate of the Electrical Engineering program of the University of the Philippines (UP) and topped the Electrical Engineering Board Examinations. He served as an instructor at the UP before pursuing graduate studies at the Massachusetts Institute of Technology, where he obtained his SM degree in Electrical Engineering, and at the University of Illinois in Urbana, where he obtained his PhD, also in Electrical Engineering. Today, he has served in the engineering profession for more than 50 years.

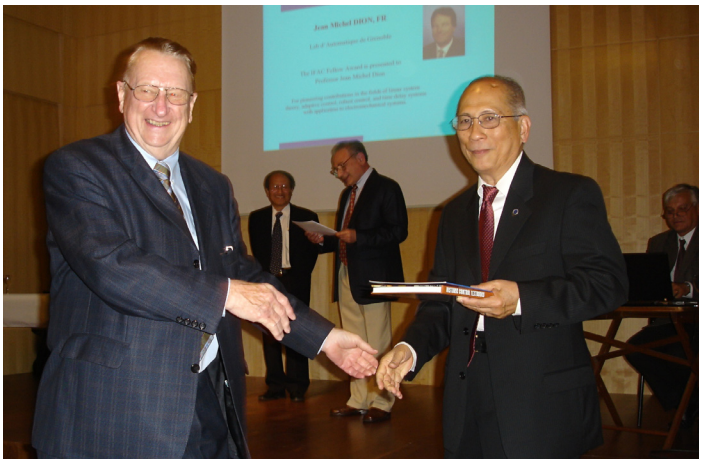
Early in his career, Dr. Cruz joined the Coordinated Science Laboratory at the University of Illinois-Urbana Champaign, led by his PhD mentor Dr. Mac E. Van Valkenburg. Here he started to gain for himself and his group international recognition by developing sensitivity theory and control in the presence of uncertainties, together with his colleagues William R. Perkins and Petar V. Kokotovic. It was also in this laboratory that Dr. Cruz pioneered the development of leader-follower concepts, which at the time was intended for simulating military strategies in light of the United States' involvement in the Korean War. These concepts later on found use in economics and market interactions, and the concept of comparison sensitivity would be useful for exploiting the power of feedback in evaluating the stability and robustness of a given system, as well as in designing its control and optimization, predicting the behavior of complex systems. He later on became Associate Head of the Department of Electrical and Computer Engineering in the same university.

Aside from sensitivity analysis, Dr. Cruz also focuses his research interests in multi-agent based modelling for decentralization and control in large systems or networks, which in turn can be used to aid in the design of methods or algorithms for cooperative, competitive and adversarial decision making, policy making, and the ability to intervene in dynamic systems for optimization. Most important applications of multi-agent systems, with the integration of sensitivity analysis, can be found in complex business enterprises, communication networks, mil-

itary forces, and in the emerging field of systems biology. His research group has also been involved in the development of bi-directional associative memories for training artificial neural networks in engineering and in the life sciences. His work is put to literature as books and journal publications. He has authored or co-authored six books, one of which was translated to Spanish and another to Polish and to Chinese. He has also published more than 260 research papers in international journals and peer-reviewed conference proceedings.

His leadership and excellence in the field of engineering have been recognized by numerous other institutions and organizations. He was Dean of the College of Engineering and first holder of the Howard D. Winbigler Chair in Engineering at the Ohio State University, Chair of the Department of Electrical and Computer Engineering at the University of California, Irvine, and he is currently holding the Distinguished Professor of Engineering position and Professor of Electrical and Computer Engineering at the Ohio State University. His memberships in professional organizations encompass the most prestigious and respectable international organizations in science and engineering; he is a Fellow of the American Association for the Advancement of Science (AAAS), where he was also Chair of the Engineering Section and member of the AAAS Council; a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) where he held the position of Vice President for Publication Activities and Vice President for Technical Activities; a Fellow of the American Society for Engineering Education, and a Fellow of the International Federation of Automatic Control (IFAC). He is also a member of the U.S. National Academy of Engineering (NAE). Membership in the National Academies is the highest recognition for American scientists and engineers. Dr. Cruz is also a Founding Member of the Philippine American Academy of Science and Engineering (PAASE), and Corresponding Member of the Philippine National Academy of Science and Technology (NAST).

He made his mark in the field of engineering by establishing theories, principles, analysis tools, and design methodologies in complex systems with dynamic feedback mechanisms.



Professor Dr. Ing. Manfred Thoma, Past President of IFAC, congratulating Dr. Cruz on his award of IFAC Fellow.

Due to his extensive contributions in the development of control systems and their impact on economic analysis, he has received numerous awards; among the most notable are the Richard E. Bellman Control Heritage Award, the highest award of the American Automatic Control Council; the Curtis W. McGraw Research Award from the American Society for Engineering Education, the Richard M. Emberson Award from IEEE, and numerous awards from different universities where he worked, recognizing his outstanding career in engineering. He received the *Dangal ng Lipi* Award (Pride of the Ancestry Award) in Science and Technology from the Government of his home province, Bulacan, Most Outstanding Alumnus from the University of the Philippines Alumni Association in America, and the Founders' Lectureship Award (Severino and Paz Koh Award) in Engineering from the Philippine American Academy of Science and Engineering.

But more than the distinguished achievements in engineering that are attached to his name, Dr. Cruz is a mentor who is able to share learning, as an immersive experience, with his students. He has inspired them, including 50 PhDs and fellow researchers, with his exemplary teaching skills and outlook as a scientist, many of whom he has maintained close research collaborations with, resulting in research accomplishments documented in numerous books and publications. His outlook as a scientist also does not end in academic terms, but extends to his strong support for cultural and social diversity and the minorities in the profession. Dr. Cruz has, in effect, engineered what is to society the highest level of professional excellence and success!