

President's Foreword



Within one year since I penned the Foreword in March last year, the coronavirus pandemic has caused an additional 277 million infections and 3.4 million deaths to reach 382.6 million and 5.7 million respectively. The highly transmissible Omicron variant of COVID-19 is driving an unprecedented surge of infections globally. The most effective steps individuals can take to reduce the spread of the virus is to keep a good personal hygiene and get vaccinated. Eventually, we have to live with the virus as endemic.

But mankind is facing an even more serious threat due to climate change. Various instrumental data show that the climate system is warming and the surface temperatures are rising by about 0.2 deg C per decade to reach a temperature of 1.2 deg C above the pre-industrial era. Climate change manifests itself in myriad ways with record floods, raging storms and deadly heat and is experienced by every living being. The World Health Organisation has declared climate change the greatest threat to global health in the 21st century.

There is a clear scientific consensus that the climate warming is caused by human activities such as burning fossil fuels, cutting down forests and farming livestock. These activities add enormous amounts of greenhouse gases to the atmosphere. Carbon dioxide (CO₂) produced by burning fossil fuels is the largest contributor to global warming. To address the climate change, there is an urgent need to address the energy challenge confronting the human race.

The current global energy consumption is about 17.7 Terawatt (TW). The projected consumption in 2050 is about 28 TW, an increase of 10 TW due to population and economic growth. Currently, 55% of the world's pollution

of 7.8 billion live in urban areas. By 2050, this number is expected to rise rapidly to 68% when the population reaches 9 billion, especially in more population-dense areas such as Asia.

According to The International Energy Agency, the current world's energy needs are met by burning fossil fuels which accounted for 80%. The remaining 20% is shared between nuclear power and renewable energy. To cap CO₂ at 550 ppm i.e. twice the pre-industrial level, the additional energy need for 2050 must come from carbon-free sources such as solar, wind, geothermal etc. Over the past few years, solar and wind have seen substantial growth and progress and renewables represented 75% of all new electricity generation installed in 2019.

Solar energy is the largest carbon-free energy source of 100,000 TW. The energy needs of the mankind in 2050 are just a very small fraction (0.03%) of the total solar energy. The good news is that solar cells, as many people have demonstrated, can be highly efficient. In 2019, the world record for solar cell efficiency at 47.1% was achieved by using multi-junction concentrator solar cells, developed at the National Renewable Energy Laboratory, Golden, Colorado, USA. These cells are still mostly too expensive for commercial use, but ongoing research may one day make implementing these super-efficient cells possible.

Reducing energy demand is another major aspect of reducing CO₂ emissions. If the world needs less energy, there is more flexibility for clean energy development. Currently, buildings consume 40% of the global energy, more than industry or transportation. The focus in the building sector is on better design of new buildings and higher levels of energy efficiency in retrofitting. With innovation in semiconductors, it is possible to transform UV and IR light into electricity and make buildings producing energy.

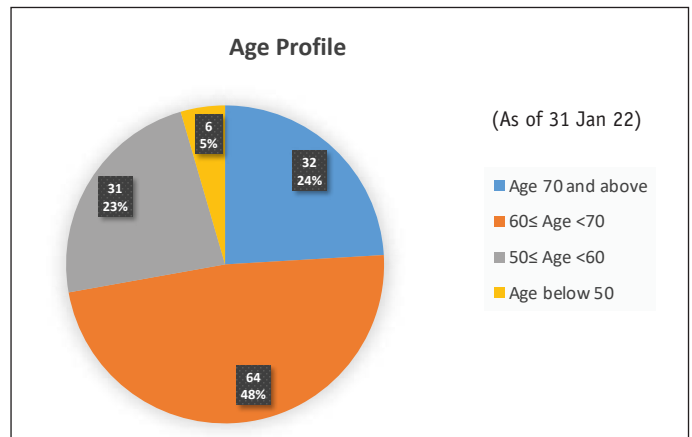
Engineering will be playing a pivotal role in solving the energy challenge to address the climate change. We need more good engineers to drive engineering innovation to solve the world challenge created by humankind. Ultimately, we need engineering innovation to engineer human activities in a green way.

Professor Cham Tao Soon

New Fellows

The Academy's fellowship currently stands at 133 strong with the election of 9 new fellows in 2021.

We are pleased to welcome the following new Fellows to the Academy.



Dr YANG Yi Yan

Covering Executive Director and Senior Principal Investigator, Institute of Bioengineering and Bioimaging, A*STAR
Adjunct Research Professor, Department of Orthopaedic Surgery, Yong Loo Lin School of Medicine, National University of Singapore (NUS)

Dr Yang obtained the PhD degree from Tsinghua University (China) in 1990. She has 273 publications in peer-reviewed journals including Nat. Mater., Nat. Nanotech., Nat. Chem., Nat. Biomedical Eng., Nat. Commun., and 87 primary patents filed, 69 primary patents granted, and 5 patents licensed out. She has received many awards and honours. In 2016, she was elected to Fellow, the American Institute for Medical and Biological Engineering. Her work on antimicrobial polymers was named Scientific American's "Top 10 World Changing Ideas" in 2011. She serves as an Associate Editor for Nanomedicine: Nanotechnology, Biology and Medicine.



Professor Guo Yongxin

Professor, Department of Electrical and Computer Engineering
National University of Singapore (NUS)

Professor Guo is a Full Professor in the Department of Electrical and Computer Engineering at the National University of Singapore (NUS). His current research interests include antennas, MMIC, wireless power transfer and electromagnetics for 5G and beyond, wireless sensing, biomedicine and IoTs. He has published more than 500 journal and conference papers and 4 book chapters. He holds more than 50 granted and filed patents. He received the 2020 IEEE Microwave and Wireless Components Letters Tatsuo Itoh Prize from IEEE MTT-S. He currently serves as Editor-in-Chief, IEEE Journal of Electromagnetics, RF and Microwave in Medicine and Biology. He is a Distinguished Lecturer of IEEE Antennas and Propagation Society. He is an IEEE Fellow.



Professor Thean Voon-Yew, Aaron

Dean, College of Design and Engineering
Director, NUS-A*Star SIMTech Flexible-Hybrid Electronics Joint Lab.
Director, Faculty of Engineering - E6Nanofab
National University of Singapore (NUS)

Professor Thean is a Professor of Electrical and Computer Engineering at the National University of Singapore and Dean of College of Design and Engineering. Prior to NUS, he was the Vice President of Logic Technologies at IMEC from 2011 to 2014; Engineering Manager of Qualcomm's CDMA technologies from 2009 to 2011; Device Manager at IBM from 2007 to 2009. He received the 2014 Compound Semiconductor Industry Innovation award for their III-V Nanodevice work; 2013 Samsung Collaboration Award from the Samsung LSI EVP for his research contribution to Samsung; 2010 Young Alumni Achievement Award from his Alma Mater, University of Illinois, for his contribution to advanced transistor R&D. He also serves on several Scientific Advisory Boards that include Singapore-MIT Alliance (SMART-LEES), A*Star Institute of Microelectronics (IME), Huawei Singapore Research Center, and he is Consulting Fellow to IMEC CEO.



Professor Leung Chun Fai

Emeritus Professor, Department of Civil and Environmental Engineering
National University of Singapore (NUS)

Professor Leung is an Emeritus Professor in the Department of Civil and Environmental Engineering at the National University of Singapore (NUS). His research interest is in geotechnical engineering. He has published more than 100 articles in top tier international journals and served on the editorial board of many international geotechnical and offshore engineering journals, notably the top Geotechnique Journal from 2016 to 2018. He has been invited to deliver more than 20 keynote lectures at various international conferences across the globe. Professor Leung has also served as geotechnical consultant in more than 100 projects in Singapore and overseas, notably the Tuas and Pasir Panjang container ports, Tekong reclamation, Sembcorp Marine integrated shipyards as well as reclamation projects in Hong Kong.



Professor Li Haizhou
President, Chinese and Oriental Languages
Information Processing Society (COLIPS),
Singapore
Associate Dean and Professor
School of Data Science
The Chinese University of Hong Kong (Shenzhen)

Professor Li is a Professor at The Chinese University of Hong Kong (Shenzhen), and National University of Singapore (NUS). He received the President's Technology Award 2013 in Singapore for the outstanding contributions to human language technology that have empowered the industry and benefited the Asian society. He had served as the Editor-in-Chief of IEEE/ACM Transactions on Audio, Speech and Language Processing from 2015 to 2018, the President of the International Speech Communication Association from 2015 to 2017, the President of Asia Pacific Signal and Information Processing Association from 2015 to 2016, the President of the Asian Federation of Natural Language Processing from 2017 to 2018, and has been the President of Chinese and Oriental Languages Information Processing Society (COLIPS) since 2011. Professor Li is a Fellow of IEEE and a Fellow of ISCA.



Professor Liu Ai Qun
Professor, School of Electrical and Electronic
Engineering and
Director, Quantum Science & Engineering Centre
(QSec)
Nanyang Technological University, Singapore (NTU
Singapore)

Professor Liu received the PhD degree from the National University of Singapore (NUS). He is a Professor in the School of Electrical and Electronic Engineering at Nanyang Technological University (NTU). Currently, he is the Director of Quantum Science and Engineering Centre (QSec), the School of Electrical and Electronic Engineering. His research interests include quantum computers and quantum communication; photonic fabrication and devices; and optofluidics. He has published more than 200 peer-reviewed journal papers and two books. He has received multiple prestigious awards and honours including the IES Prestigious Engineering Achievement Award 2006. He is a SPIE Fellow, OSA Fellow and RCS Fellow.



Professor Wang Danwei
Professor, School of Electrical and
Electronic Engineering
Nanyang Technological University, Singapore (NTU
Singapore)

Professor Wang received the PhD degree from the University of Michigan, Ann Arbor. He is currently a full professor in the School of Electrical and Electronic Engineering (EEE) at the Nanyang Technological University (NTU). He had served as Head of Division of Control and Instrumentation in the School of EEE; Senator of NTU Academic Council; and Director of ST Engineering – NTU Corporate Laboratory. He is an IEEE Fellow and a recipient of Alexander von Humboldt fellowship,

Germany. Currently, he is the Chair of IEEE Robotics and Automation Singapore Chapter. He serves as Editor, IEEE/RSJ IROS and has been active in professional technical activities. He has published widely in robotics, control engineering, model-based diagnosis and prognosis, and satellite formation flying.



Professor Yeo Kiat Seng
Associate Provost for Research and
International Relations
Professor, Engineering Product Development
Chairman, University Research Board
Singapore University of Technology and Design
(SUTD)

Professor Yeo received the BEng and PhD degrees in electrical engineering from the Nanyang Technological University (NTU), Singapore. He is currently Associate Provost at the Singapore University of Technology and Design (SUTD). He is a widely known authority in low-power RF/mm-wave IC design and a recognized expert in CMOS technology. He has published 10 books, 7 book chapters, more than 600 journal and conference papers and holds 38 patents. He was awarded the Public Administration Medal (Bronze) and the Nanyang Alumni Achievement Award both in 2009. He is the principal author of World University Research Rankings (WURR) 2020 and ranked among the World's Top 2% Scientists by Stanford University in 2020. Professor Yeo is an AAIA Fellow and IEEE Fellow.



Professor Zhang Rui
Professor and Provost's Chair, Department of
Electrical and Computer Engineering
National University of Singapore (NUS)

Professor Zhang is a Provost's Chair Professor in the Department of Electrical and Computer Engineering at the National University of Singapore (NUS). His current research interests include wireless communication and wireless power transfer. He has published more than 470 papers which have been cited more than 57,000 times with a h-index of 119. He has been listed as a Highly Cited Researcher by Thomson Reuters/Clarivate Analytics since 2015. He was the recipient of IEEE Wireless Communications Technical Committee Recognition Award in 2020, IEEE Signal Processing and Computing for Communications Technical Recognition Award in 2021, as well as 12 IEEE Best Paper Awards. He is an IEEE Fellow and an IEEE Distinguished Lecturer.

In Memory

The Academy honours the memory of the following Fellow who had passed on.

Prof Lee Seng Lip (left us on 27 Nov 2021)

Our heartiest congratulations to the following Fellows who had been bestowed with various prestigious honours and awards by the respective professional institutions and organisations in 2021.

Prof Chen Xiaodong

- **President's Science Award 2021** for his outstanding contribution to advanced materials research for soft bioelectronics capable of digitising biological senses and extending human sensing capabilities, and their application to advanced manufacturing and healthcare wearables.

Prof Chen Zhi Ning

- **2021 John Kraus Antenna Award** by the IEEE Antennas and Propagation Society (APS) for his outstanding contributions to translational research of electromagnetic metamaterials for antenna engineering.

Er. Chong Kee Sen

- **The Federation of Engineering Institutions of Asia and Pacific (FEIAP) Engineer of the Year Award 2021** for his outstanding leadership and services to advance engineering in the Asia Pacific region and his exemplary contributions to the engineering profession, IES and the society.
- **Honorary Fellow Award 2021** by the Institution of Engineers, Singapore (IES) in recognition of his outstanding leadership and services to IES and his notable contributions to the engineering profession and the society.

Prof Er Meng Hwa

- **Distinguished Engineering Alumni Award 2021** by NUS Faculty of Engineering for outstanding contributions to the engineering profession.

Mr Koh Boon Hwee

- **Honorary Degree of Doctor of Letters** by Nanyang Technological University (NTU) for his enormous contributions that transformed NTU and the lives of many of its students.

Mr Lau Joo Ming

- **MND Medallion 2021** by Ministry of National Development in recognition of his continuous contributions to Professional Engineers Board (PEB) and other MND family of agencies.

Prof Lim Chwee Teck

- **Highly Cited Researcher 2021** by Clarivate Analytics for ranking in the top 1% by citations for field and publication year in Clarivate's Web of Science database.
- **Asia's Most Influential Scientist Award 2021** by business magazine Fortune Times for his distinguished academic achievements, independence of thought, originality, significance of discovery, overall impact of his research, being a good and inspiring role model.

- **IES Prestigious Engineering Achievement Award 2021** by Institution of Engineers, Singapore for engineering achievements that demonstrate outstanding engineering skills and which have made a significant contribution to the engineering progress and the quality of life in Singapore.
- **Fellow of the ASEAN Academy of Engineering and Technology** in recognition of eminent individuals from academia, research institutes, industry and government who have demonstrated successful leadership or outstanding contributions to engineering and technology, and played an important role in the overall development of the ASEAN region.

Mr Vincent Chong

- **Distinguished Engineering Alumni Award 2021** by NUS Faculty of Engineering for outstanding contributions to the engineering profession.

Prof Wang Rong

- **SG100WIT 2021** by Singapore Computer Society and Infocomm Media Development Authority in recognition of her over 30 years of experience in chemical and environmental engineering, water and energy related research and innovation.

Dr Yan Shuicheng

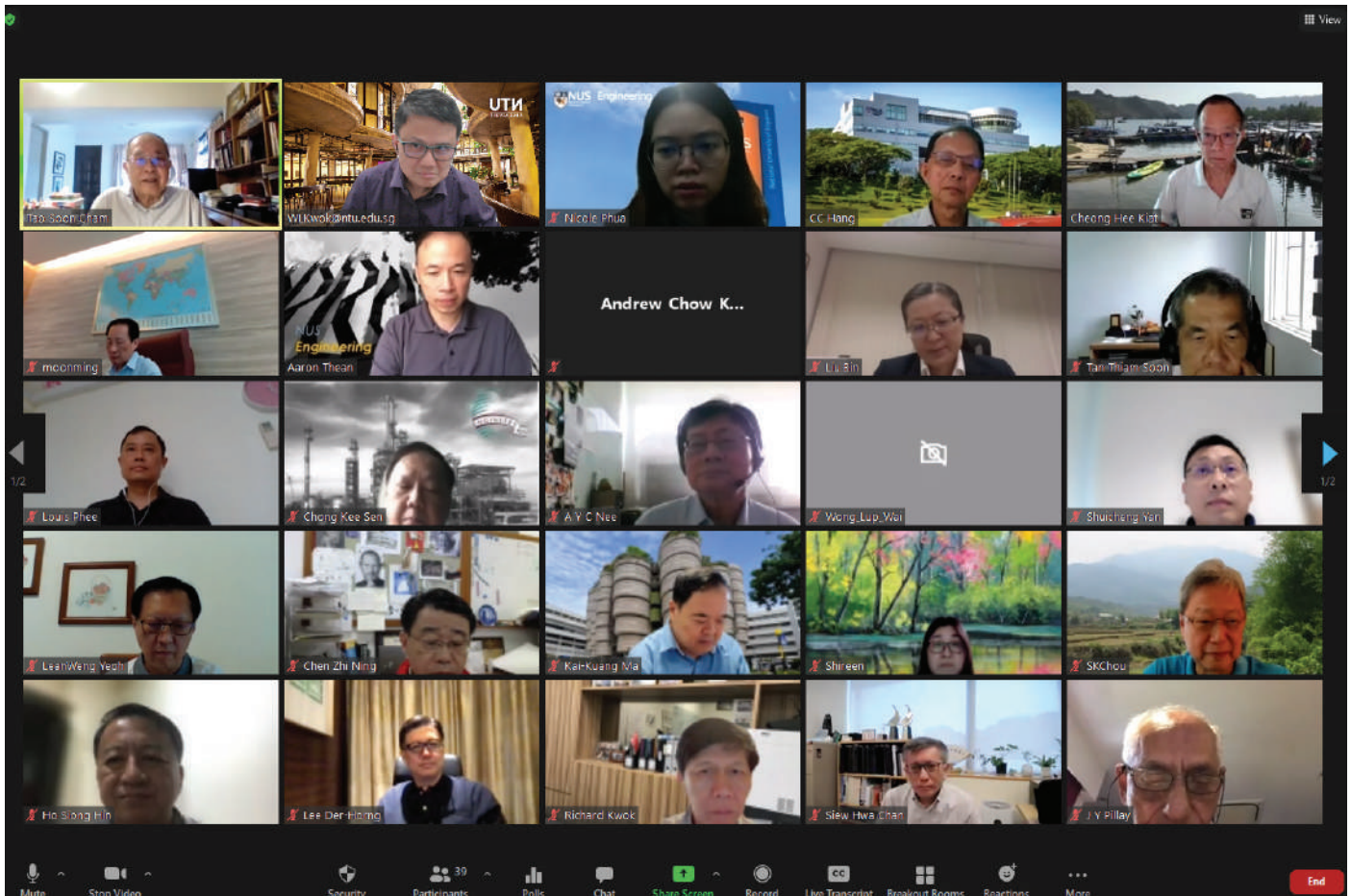
- **AAAI Fellow 2022** by the Association for the Advancement of Artificial Intelligence (AAAI) in recognition of the top individuals who have made significant, sustained contributions to the field of artificial intelligence.
- **Highly Cited Researcher 2021** by Clarivate Analytics for ranking in the top 1% by citations for the field and publication year in Clarivate's Web of Science database.

Prof Soh Chee Kiong

- **Lifetime Achievement Award** conferred by the International Conference on Futuristic Technologies (FT21) for his exemplary dedication and research contributions in Futuristic Technologies.

Dr Yang Yi Yan

- **Stanford's Top 2% Scientists Worldwide 2021** by Stanford University for outstanding contributions to the field of Biomedical Engineering.
- **A*STAR's Top 10 Creators (Patents) in 2014 - 2021** for outstanding contribution in patent filings to the fields of Bioengineering, Antimicrobial, Biomaterials and Nano—medicine patent applications between 2014 to 2021 in A*STAR.



Eleventh Annual General Meeting

The Academy of Engineering, Singapore held its eleventh Annual General Meeting (AGM) via Zoom conference on 6 July 2021.

Academy President Professor Cham Tao Soon extended a warm welcome to all the Fellows present at the meeting. Secretary Professor Louis Phee presented the Secretary's report to all present. On the subject of nomination for new fellowship, President Cham requested all Fellows to continue to nominate prominent young actors in the academia and industry to the fellowship. He shared that the Academy has established five project groups to address issues of national interest and challenges. It has received a proposal from Professor Ong Say Leong to establish a new interest group on "Promoting Circular Economy in Water Industry in the New Era" which will study important topics of public interest. The Academy has also established five expert groups to deliberate and provide recommendation and advice on key issues pertaining to the engineering profession in Singapore. He encouraged all Fellows to continue taking time out to contribute to the Academy's projects and activities. The Secretary's report was endorsed by Fellows present without any amendment.

Treasurer Professor Cheong Hee Kiat presented the Treasurer's report on the Academy's financial status for the year ending 31 December 2020 to the meeting for comments. The Treasurer's report was endorsed without any amendment.

During the meeting, the following nominees were proposed for the election of Executive Committee Members:

President: Prof Cham Tao Soon

Secretary: Prof Aaron Thean

Treasurer: Prof Cheong Hee Kiat

Ex-officio President IES: Dr Richard Kwok

Ex-officio Immediate Past President IES: Prof Yeoh Lean Weng

Ordinary Committee Members:

Er Chong Kee Sen	Prof Liu Bin
Prof Chong Tow Chong	Prof Andrew Nee Yeh Ching
Prof Chou Siaw Kiang	Prof Louis Phee
Prof Hang Chang Chieh	Mr Seah Moon Ming
Prof Lee Der-Hong	Prof Tan Thiam Soon
Dr Lee Shiang Long	

In closing, the President expressed his appreciation and thanks to the Executive Committee Members and the project groups who have dedicated precious time and hard work in pursuing the Academy's mission and objectives for the past year and thanked IES and Fellows for their valuable and generous support towards the Academy's activities.

Making a Donation

The Academy of Engineering, Singapore (SAEng) is a not-for-profit entity registered in Singapore, funded by contributions from individuals and private organisations. Your donations will enable the Academy to develop and sustain projects to attract aspiring engineers, encourage innovation, and provide support to advance and promote excellence in engineering, and also improve the public awareness and understanding of engineering in Singapore.

To make a contribution to the Academy, please contact saeng@ntu.edu.sg.

Our Donors

The Academy has received a total of S\$161,570 from organisations and individual donors thus far. We would like to express our sincere gratitude to all generous individuals and organisations that have supported the Academy over the past nine years. Here is our 2011-2021 Honour Roll of Donors:

Organisations (\$10,000 and above)	Individuals (\$10,000 and above)	Individuals (\$5,000 to \$9,999)
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The Tan Chin Tuan Foundation		
Individuals (up to \$4,999)		
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Patron
SM Teo Chee Hean

Executive Committee

President
Cham Tao Soon

Secretary
Aaron Thean

Treasurer
Cheong Hee Kiat

Ex-officio - President IES
Richard Kwok

Ex-officio - Immediate Past
President IES

Yeoh Lean Weng

Ordinary Member

Chong Kee Sen
Chong Tow Chong
Chou Siaw Kiang
Hang Chang Chieh
Lee Der-Horng
Lee Shiang Long
Liu Bin
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Tan Thiam Soon

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Er Meng Hwa

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Feedback on the Newsletter is welcome as well as all communications that you may wish to make and which we may publish. To contribute an article/give us your feedback, email us at secretariat@saeng.sg
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