



School of Energy and Environment

Newsletter



School of Energy and Environment
香港城市大學
City University of Hong Kong

August 2019 Issue

Dean's Message

In this issue of *SEE Newsletter*, we share with you the recent research and academic development of the School of Energy and Environment (SEE). We are glad to witness the growth of our alumni, and have one of them sharing with us her career aspirations.



I am delighted to welcome Dr Liang Dong (joint appointment with Department of Public Policy), Dr Yuhe (Henry) He, Dr Chun Ho (Jason) Lam and Dr Wanxin Li to our team. The new faculty members will further strengthen our research in diverse areas. Dr Dong's research focuses on applying principles of industrial ecology to fight against the challenges facing the development of sustainable, smart and low-carbon cities. Dr He is more on toxicological assessment on Oil Sands Process-affected Water, while Dr Lam's research aims to mitigate against global dependence on fossil resources by promoting the production of sustainable energy and chemicals. As for Dr Li, her research is on policy experimentation and evaluation for advancing environmental governance and quality of life in China.

SEE is dedicated to both research and teaching. In May, SEE and the Asian Aerosol Research Assembly organised the 11th Asian Aerosol Conference 2019 to provide a platform for exchange of ideas in aerosol. Meanwhile, we spare no efforts in nurturing young professionals in areas related to energy and the environment. This summer, we provide our undergraduates with abundant internship opportunities to get a flavour of work in a real-life work environment. By interning with public utilities, consultancy firms, contractors and other well-established companies in Hong Kong, our students will be more prepared for the challenges that lie ahead. In the past few months, SEE has staged many collaborative events to foster its relationships with industry. An energy audit training programme has been established with CLP Power Hong Kong Limited, and a course in gas engineering was offered in collaboration with The Hong Kong and China Gas Company Limited (Towngas).

In addition to the recent expansion in laboratory space, the office of SEE will also expand to support the continual growth of the SEE family. Now in its 10th year of servicing the community, the School will continue to strive to

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provide innovative solutions to challenges related to energy, the environment and sustainability.

Best,

Professor Chak K. Chan
Dean of School of Energy and Environment
City University of Hong Kong

New Faculty

Dr Dong Liang
Assistant Professor
(Joint appointment
with Department
of Public Policy)



Dr Dong Liang obtained his B.E. in Environmental engineering from Tsinghua University, China, and Ph.D. in Urban Environmental Studies from Nagoya University, Japan. Before joining CityU, he worked in National Institute for Environmental Studies, Japan, and Institute of Environmental Sciences (CML), Leiden University, Netherlands, in the field of industrial

ecology, circular economy and low-carbon and eco-city planning.

Dr Dong's research focus to apply principles of Industrial Ecology to fight to the challenges of developing sustainable, smart and low-carbon cities, with focuses on the sustainability science and policies, environmental system analysis, and policies design under the theme of urban sustainability. Sub-topics also include development on holistic and integrated socioeconomic and environmental system analytical tools (e.g. life cycle assessment, urban metabolism approach, input-output model and their integration), sustainability indicators/policies, energy

and environmental economic approaches, big data and spatial planning tools, and their applications in eco-industrial development, as well as sustainable, low-carbon and smart cities planning. He took charge and engaged in a series of national level circular economy, smart cities, and low-carbon cities projects in EU, Japan and China. He also actively engaged in providing broad academic services, like consulting to UN-ESCAP, Energy Foundation and many local stakeholders of Industrial and Urban planning, to forward circular, eco and low-carbon urban and regional transition in EU, Asia-Pacific and globe.

Dr Yuhe (Henry) He
Assistant Professor



Aquatic organisms are under constant threat of dysfunction due to stressors such as persistent organic pollutants in the aquatic environment. An intricate network of molecular and biochemical process regulates the adaptive or maladaptive organism performance in the face of these stressors. Understanding of these responses is increasing but there is much left unknown.

The research program of Dr He will determine effects of these stressors on teleost by characterizing 1) adaptive cellular responses that allow organisms to cope with stressors, and 2) mechanisms by which stressors cause dysregulation of cellular processes leading to adverse outcomes. The research program will use *in vitro* (immortal cell lines), *ex vivo* (primary tissues culture), *in ovo* (fish embryo) and *in vivo* (whole organism) models coupled with chemical analysis. Emphasis will be placed primarily on species relevant to Hong Kong and Eastern Asia freshwater and marine environments, such as Japanese medaka (*Oryzias latipes*) and marine medaka (*Oryzias melastigma*),

but studies will also be performed with the model teleost species, such as zebrafish (*Danio rerio*).

The goal of Dr He is to develop an integrative aquatic toxicology research program in the School of Energy and Environment. Dr He looks forward to collaborating with talent research groups in SEE and other departments in CityU and utilise a variety of cutting-edge tools to achieve this research goal. Dr He's research will contribute to the continued development of a diversified multidisciplinary environment for the School.

Dr Chun Ho (Jason) Lam
Assistant Professor



Dr Chun Ho (Jason) Lam's research goal is to mitigate global dependence on fossil resources by promoting the production of sustainable energy and chemicals. Specifically, he explores how non-food grade biomass can be

transformed into commodity chemicals through electro- and photocatalysis. He received his doctoral degree in chemistry from Michigan State University. He then became a Donnelley Environmental Postdoctoral Fellow at Yale University, where he developed a mild electrocatalytic protocol to convert biodiesel refinery waste into useful chemicals. He has also worked on highly porous aerobic catalysts for renewable chemical production and environmental remediation.

Outside of lab work, Dr Lam is also an educator and an environment enthusiast. During his postdoc appointment, he was invited to design and teach a green chemistry and sustainability certificate program at The University of Washington's Continuing Education Programs. After that, he became a visiting assistant professor at Wesleyan University for a year before joining City University of Hong Kong.

Dr Wanxin Li
Associate Professor



Dr Wanxin Li previously worked with the World Bank, OECD and Tsinghua University. Her research focuses on environmental governance for sustainable development in China. Environmental governance is defined as government agencies, the business community, civil society and international organisations who work through formal and informal institutions to manage and conserve environmental and natural resources, control pollution and resolve environmental conflicts.

More specifically, she engages in intellectual inquiries in the following areas: (1) policy design and innovation, (2) institutional capacity of government agencies and policy outcomes, (3) health and subjective well-being and (4) individual environmental attitudes and behaviours and social learning. Her research output appears in tier-one academic journals such as *Nature*, *Land Use Policy*, *Journal of Environmental Management*, *Habitat International*, *The China Quarterly*, *Administration and Society*, *Children and Youth Services Review* and *Child Indicators Research*.

In addition to the research community, her work also speaks directly to policy-makers. She single-handedly authored

the OECD 2009 report entitled "Eco-innovation policies in the People's Republic of China", and she has been invited to speak at forums such as the Policy Dialogue with the Ministry of Environmental Protection in Beijing, the OECD International Conference on Environmental Compliance Assurance in Paris and the Trade and Environment Session of the WTO 2011 Public Forum in Geneva.

Besides classroom teaching and academic research, she is a strong believer in experiential learning. She is thus active in guiding students towards service learning, interaction with practitioners and engagement in policy consultancy.

Promotion of Faculty Members

Two faculty members have recently been promoted. The School is proud of what they have accomplished in teaching and research that bring them this hard-earned recognition. Let's learn more about their research!

Prof Zhou Wen
Professor



Understanding the variability and predictability of monsoon systems, as well as its timescale oscillation is an important science that must not be overlooked. My research focuses on the East Asian Climate (winter and summer monsoons) and its impacts over the Asia-Pacific region by detecting and assessing extreme events such as floods and droughts; cold surges and heat waves; precipitation patterns and sea level rise; and related natural

hazards. Investigating the drivers and mechanisms of these events both for historical, present and future climates are also key areas of research interest as we continue to advance our knowledge of climate systems.

In line with SEE vision and mission, my teaching and mentoring include several undergraduate and graduate courses on atmospheric physics, climate science, environmental data analysis, climate change and extreme weather; 4 Master's graduates; and 7 PhD. graduates. With over 30 research projects on targeted themes completed, my research has expanded our understanding of climate variability, extreme events and climate modeling which have now been applied by various agencies and in the society. The ongoing research GRF projects "Biases of North Atlantic Storm Track and Ural Blocking Influencing on East Asian Winter Monsoon Projection" and "Teleconnections and Future Changes in the East Asian

Winter Monsoon under Arctic Amplification" or a completed GRF project "Characteristics of blocking events over Siberia for the present and future climate condition" I pursue will enable us to not only advance the state-of-the-art of East Asian monsoon climate research and the risk assessment of extreme events probability, but also produce many results and findings of great importance for sustainable social-economical development of South China including Hong Kong. I have served as a scientific advisor to the Hong Kong Observatory and expert witness on flood insurance claims amongst other various community service roles and consultancy.

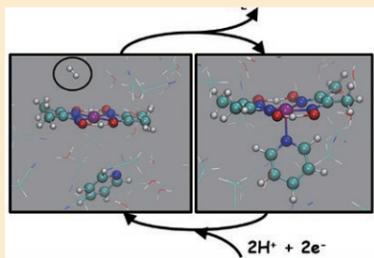
Dr Patrick Sit
Associate Professor



Efficient harnessing and storage of renewable energy is key to tacking the emerging

energy and environment issues nowadays. Development of advanced technologies for this purpose requires fundamental understanding of the energy conversion and storage processes down to the atomic and electronic level. Using high-performance computing and cutting-edge simulation techniques, my research group focuses on revealing the fundamental details of these processes, which provide important guide for our design of advanced materials for next-generation energy applications. Our on-going projects cover a wide range of topics including the development of robust and efficient solar cell materials, catalysis for energy storage and fuel cell applications, and novel rechargeable batteries.

Beside research, I am teaching two undergraduate core courses on Engineering Thermofluids. These courses aim to equip our students with a strong foundation in engineering which enables them to become independent, life-long learners in the modern days with fast technological advancement. The extensive experimental components in the courses also helps strengthen the students' understanding on these fundamental topics with hand-on experience. I also serve as the programme leader of the Energy Science and Engineering (ESE) programme at SEE involving in the management and enhancement of the undergraduate programme. Being a teacher has brought me much satisfaction and happiness.



SEE Research Development

Dr Alicia An's project received over HK\$2M from the Innovation and Technology Fund



Dr Alicia An's research group in the SEE at CityU proposed a novel membrane distillation system for the efficient and sustainable treatment of textile wastewater. The project entitled "Design and Development of a Novel Membrane Distillation Process for Textile Wastewater Treatment and Reuse for Zero Liquid Discharge" received more than HK\$2M in funding from the Innovation and Technology Fund (ITF) Collaborative Research Project of the Innovation and Technology Commission (ITC) and L Industries Limited.

Wastewater produced during textile processes is highly polluting and is estimated by the World Bank database to comprise nearly 20% of global industrial water pollution. This wastewater is difficult to treat due to its low biodegradability, high chemical oxygen demand and strong acidity and alkalinity. Taking this into account, new technologies for the treatment of textile wastewater can bring significant, positive changes in the global water situation. The project will develop a novel membrane distillation system that uses waste heat and generates recycled treated water suitable for reuse, thus allowing the process to achieve zero liquid discharge.

The group's research is currently focusing on developing and optimizing this novel membrane distillation system for a pilot scale operation at an actual textile factory, to provide a compact, feasible and affordable technical solution for wastewater treatment in the textile industry. This project has the potential to strengthen the scientific and technological contributions of our School while fostering strong relationships with industry partners.

SEE received funding from The Bill & Melinda Gates Foundation to investigate the growth of multiple strains of human gut microbes in a single reactor



SEE has been awarded US\$100,000 by Grand Challenges Explorations (GCE), an initiative of the Bill & Melinda Gates Foundation, for a novel way to cultivate 10 distinct probiotic bacteria simultaneously.

Dr Carol Lin, an expert on microbial fermentation and bioprocessing, will lead the project in collaboration with Dr Srinivas Mettu from the Department of Chemical Engineering at The University of Melbourne, with expertise in soft surfaces and hydrogels.

GCE supports innovative thinkers worldwide to explore ideas that can break the mold in how we solve persistent global health and development challenges. Dr Lin and Dr Mettu's bold idea is one of 56 GCE Round 22 grants announced by the foundation from approximately 1,700 proposals submitted in the round (i.e. an overall successful rate of 3.3%).

The grant will be used to develop a specially designed bioreactor that can accommodate a huge variation in the microbial environment. Mimicking the human gut, the microbial environment

enables the growth of multiple strains of probiotic bacteria. The bioreactor can help to manufacture low-cost gut microbial biotherapeutics with a target cost of USD\$0.1 per dose consisting of 1 billion bacteria.

Gut microbiota is a community of microorganisms that lives in the digestive tracts of humans. The reduced diversity of gut microbiota affects health. Fermenting individual commercial probiotic bacteria is common in the market, but the complex microbial diversity existing in the human gut cannot be restored using a single strain of probiotic bacteria. However, live biotherapeutic products containing multiple strains of probiotic bacteria can perform this function.

"To produce low-cost gut microbial biotherapeutics is very challenging" said Dr Lin, adding that gut microbiota across the digestive tract contains a massive amount of aerobic and anaerobic bacteria that requires various growth conditions such as different nutrients, gas composition and pH values. As such, these gut microbes are currently cultivated individually and then mixed together to form a biotherapeutic product, which is a complex and costly process.

However, in the research, titled "Novel Bio-Degradable Radial Gradient in-situ-Fibrous-Bed Reactor", the team will develop such a bioreactor using the intelligent design of immobilisation materials, i.e. the cellulose hydrogel

to cultivate the bacteria, with varying degrees of spatial structuring and gradients.

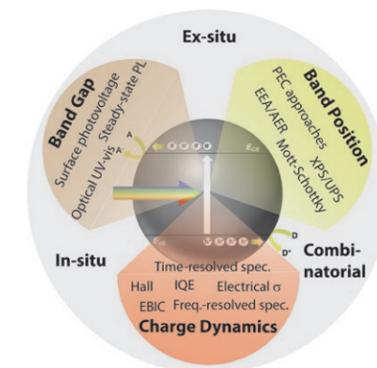
"There are well-developed and low-cost bio-degradable materials such as cellulose [abundant plant-based material] hydrogels, which are ideal candidates for immobilising gut bacteria" said Dr Mettu. "However, these materials need novel modification strategies so that they can be integrated into the free cell fermenters to simulate the human gut environment in the fermenters."

Dr Greg Martin, who is the other investigator in the team and a chemical engineer with bioprocessing expertise in the Department of Chemical Engineering at The University of Melbourne, said, "Creating an artificial environment to grow complex mixtures of gut bacteria is a significant engineering challenge. The use of immobilisation materials will enable different species to grow rapidly under their own optimal conditions in a low-cost, scalable reactor".

Grand Challenges Explorations is a US\$100 million initiative funded by the Bill & Melinda Gates Foundation. Launched in 2008, over 1420 projects in more than 65 countries have received Grand Challenges Explorations grants. The grant programme is open to anyone from any discipline and from any organisation. Initial grants of US\$100,000 are awarded two times per year. Successful projects have the opportunity to receive a follow-on grant of up to US\$1 million.

Dr Yun Hau Ng's paper published in *Chemical Society Reviews* with an impact factor of 40.18

Dr Yun Hau Ng's latest review paper: "Heterogeneous photocatalysts: an overview of classic and modern approaches for optical, electronic and charge dynamics evaluation" was recently published in **Chemical Society Reviews**, a leading journal in chemistry and chemical engineering with an impact factor of 40.182. With more than 10 years of experience in with photocatalysis, Dr Ng and his team summarise current experimental techniques, including both conventional and state-of-the-art tools, directed at the examination of key aspects that governs the performances of semiconductor photocatalysts. Although it is not exhaustive, this didactic review will be useful in apprising the research community of the sophisticated research tools currently available for the characterisation of photocatalysts.



Dr Wanxin Li being one of the lead authors of Chapter 3 “ of Air Pollution in Asia and the Pacific: Science-Based Solutions” released by the United Nations

Extract from the report:

UNEP/CCAC Regional Assessment of Air Pollution in Asia-Pacific Region

Report: *Air Pollution in Asia and the Pacific: Science-based Solutions*

Institutions: Climate and Clean Air Coalition (CCAC), United Nations Environment Programme,

Asia Pacific Clean Air Partnership

Year of publication: 2019

UN Environment Programme press release

<https://www.unenvironment.org/news-and-stories/press-release/new-report-outlines-air-pollution-measures-can-save-millions-lives>

Millions of lives could be saved and one billion people living in Asia could be breathing clean air by 2030 if 25 simple and cost-effective measures are implemented, according to a new UN report. Currently, about 4 billion people – 92 per cent of Asia and the Pacific’s population – are exposed to levels of air pollution that pose a significant risk to their health.

The report, “Air Pollution in Asia and the Pacific: Science-based Solutions”, is the first comprehensive scientific assessment of the air pollution outlook in Asia and the Pacific. It details 25 policy and technological measures that will deliver benefits across sectors.

According to the report, effectively implementing the 25 measures would result in a 20% reduction in carbon dioxide and a 45% reduction in methane emissions, preventing

up to a third of a degree Celsius in global warming. The resulting reductions in ground-level ozone would reduce crop losses by 45% for maize, rice, soy and wheat combined.

Approximately 7 million people worldwide die prematurely each year from air pollution related diseases, with about 4 million of these deaths occurring in the Asia-Pacific region. The reductions in outdoor air pollution from the 25 measures could reduce the rate of premature mortality in the region by one third and help avoid about 2 million premature deaths from indoor air pollution.

Erik Solheim, head of UN Environment, said: “It is an unfortunate fact that breathing clean air, the most basic of human needs, has become a luxury in many parts of the world. But there are numerous tried and tested solutions that we can put in place now to solve this problem. Implementing these air quality measures is not only good for health and the environment, it can also boost innovation, job creation and economic growth.”

Implementing the 25 measures is projected to cost US\$300–600 billion per year, only about 5% of the projected annual GDP increase of US\$12 trillion. In addition to delivering substantial benefits to human health, food production, environmental protection and climate change mitigation, a basket of co-benefits will accrue, including savings on pollution control.

The analysis takes the region’s considerable diversity into account and groups the selected measures into three categories:

1. Conventional emission controls focusing on emissions that lead to the formation of fine particulate matter (PM2.5). This includes activities such as increased emissions standards and controls on vehicles, power plants and large- and small-scale industry.

2. Further (next-stage) air-quality measures for reducing emissions that lead to the formation of PM2.5 and are not yet major components of clean air policies in many parts of the region. This includes activities such as reducing the burning of agricultural and municipal solid waste, preventing forest and peatland fires and proper management of livestock manure.
3. Measures contributing to the development of priority goals with benefits for air quality. This includes activities such as providing clean energy for households, improving public transport and promoting the use of electric vehicles, using renewable energy for electricity generation and working with oil and gas companies to stop flaring and reduce methane leaks.

The 25 clean air measures are not equally appropriate for every part of the Asia-Pacific region. The region’s diversity means the measures must be tailored, prioritised and implemented according to national conditions.

The report is a collaboration between the United Nations Environment Programme (UN Environment), the Asia Pacific Clean Air Partnership (APCAP) and the Climate and Clean Air Coalition (CCAC); it was launched at WHO’s first Global Conference on Air Pollution and Health.

Further reading: <http://www.ccacoalition.org/en/content/air-pollution-measures-asia-and-pacific>

11th Asian Aerosol Conference 2019

Aerosol science and technology is the focus of a major international conference that coincides with the 10th anniversary of SEE.

SEE and the Asian Aerosol Research Assembly (AARA) organised the 11th Asian Aerosol Conference 2019 (AAC) from 28 to 30 May.

Around 600 delegates from more than 20 countries and areas will



exchange ideas on topics such as aerosol chemistry, aerosol exposure and health, aerosol instrumentation, aerosol modelling, aerosol physics, aerosol-climate-meteorology, bio aerosols, emission inventories, filter and control technology and indoor air at plenary lectures, symposia, oral sessions, and 18 exhibitions showing advanced aerosol instruments.

Officiating at the opening ceremony were Prof Way Kuo, CityU President; Prof Alex Jen, CityU Provost; Prof Ahn Kang-ho, President of AARA; and Prof Chak K Chan, AAC Conference Chair and Dean of SEE.

President Way Kuo says that aerosol science and technology are well connected to scientific advances in nanotechnology and environmental research.

“Aerosol science and technology are well connected to scientific advances in nanotechnology and environmental research, such as climate change and air pollution,” Professor Kuo said.

“Hong Kong has become a research hub and technology centre as scientists, engineers and environmentalists join hands in finding cross-disciplinary solutions to these problems. As a response to global challenges, CityU regards one health, digital society and smart city as its three overarching themes in its current strategic plan,” he said.



Aligned with the objectives and goals of CityU, SEE is one of the few leading schools of its kind in Asia that pursues interdisciplinary research and offers educational training on a broad spectrum of issues pertinent to climate science, energy and sustainability.

Prof Ahn said AAC fostered technical exchange and international cooperation on aerosol issues related to the environment, One Health and climate change. “I hope the academic research and discussion at this conference will ensure continued cooperation among Asian countries even after the conference is over,” he said.

One of the focuses of the conference at the first plenary is the ideal aerosol measurement, which is delivered by Prof Richard C Flagan from the Division of Chemistry and Chemical Engineering, California Institute of Technology. Experts discuss the progress, challenges and different aspects of ideal measurement.

The impact of atmospheric aerosols on the climate and numerical weather prediction is discussed in the second plenary delivered by Dr Oliver Boucher, CNRS Senior Research Scientist of Institut Pierre-Simon Laplace, Paris. It reviews progress in quantifying the effects of atmospheric aerosols on climate and the challenges facing the aerosol research community.

Prof Jonathan Abbatt from the Department of Chemistry, University of Toronto, will give a talk on multiphase chemistry in the indoor environment in the third plenary. Reaction systems such as ozone reactions with skin and cooking oils, and the process controlling the indoor abundance of nitrous acid (HONO) are addressed specifically in the talk.

AAC has been held biannually since 1999 under the auspices of AARA.



It is one of the premier events for researchers and professionals in Asia in aerosol science and engineering. Previous conferences were held in Jeju, Kanazawa, Sydney, Xi’an, Bangkok, Kaohsiung, Mumbai, Hong Kong, Seoul and Nagoya.





General Research Fund (GRF) and Early Career Schemes (ECS) 2019/20

SEE strives for excellence in research activities to enhance the sustainability and livability of megacities such as Hong Kong, as well as adapting them for climate change. This is achieved holistically through the development of innovative energy and environmental technologies, improving the resource management of megacities including water, energy and pollutions, forecasting the impacts of climate change, and to pursue the relevant policies. To facilitate our research, faculty members continue to participate in the General Research Fund (GRF) and Early Career Schemes (ECS) application exercise. Below is the list of SEE projects that succeeded in obtaining GRF/ECS in 2019/20 exercise.

Project Title	Principal Investigator
Preventing Wetting in Membrane Distillation: Membrane Fabrication and Wetting Detection & Control System Development	Dr Alicia An
Tropical Cyclone Genesis in Global Numerical Models	Prof Johnny Chan
Network-based Resilience Assessment of the Multi-modal Public Transport System in Hong Kong	Dr Shauhrat Chopra
Source contributions to and effects of aerosol acidity on the composition of atmospheric aerosols	Dr Theodora Nah
Development of High-Efficiency Non-TiO ₂ based Oxide Photocatalysts by Understanding the Underlying Photocorrosion Phenomena	Dr Yun Hau Ng
Study of Hybrid-Nanofluids in Superhydrophilic Wick Structure for Heat Transfer Enhancement in an Adsorption Cooling System	Dr Edwin Tso
Development of a Hybrid Absorption Thermal Energy Storage Technology for Higher Storage Density and Efficiency with Lower Charging Temperature	Dr Wei Wu

Academic Development

Energy Auditing Training Scheme with CLP

To acquire hands-on experience in a real work environment, six of our Energy Science and Engineering (ESE) senior students joined the energy auditing training scheme offered by

CLP Power Hong Kong Limited (CLP) from September 2018 to April 2019. Our students trained in workshops given by Senior Engineers of CLP regarding energy audits, assuming the roles of primary and secondary auditors when conducting on-site energy audits of various CLP clients (e.g., supermarkets, restaurants, schools and campsites). The students were also required to report their findings

and their recommendations for energy management opportunities to CLP and their respective clients.

An agreement-signing ceremony to cement the collaboration was held on 12 November 2018. The agreement was signed by Professor Paul K.S. Lam, Chief-of-Staff, CityU, and Ms. Lena LOW, Senior Director – Customer & Business Development, CLP Power Hong Kong Limited.



Engineering Course with Towngas

In collaboration with the Hong Kong and China Gas Company Limited (Towngas), the undergraduate course, *SEE4121 Gas Engineering*, was successfully offered as an energy elective during Semester A 2018/19 to more than 30 students majoring in Energy Science and Engineering. The students gained first-hand knowledge from experienced practitioners on gas engineering theories and technologies commonly used in society. The course included the operating principles of gas production, gas transportation and gas utilisation systems and their advantages and drawbacks.

Summer Course with Arizona State University

SEE developed a joint summer course on "Urban Sustainability in Hong Kong" with Arizona State University (ASU). This course, which is an elective of the ESE curriculum, includes students from ASU and CityU and intends to introduce sustainability concepts in five designated topics, namely (i) air pollution, (ii) energy, (iii) housing/urban planning, (iv) waste management, and (v) transportation, to undergraduate students during three weeks of intensive learning. Towards the end of the course, students in groups will present, explain and defend their research and recommendations with regard to the five topics at the poster exhibition.



Students and Outreach

SEE Tech Talk Series

SEE has been engaged in cutting-edge research to address urgent issues related to energy and the environment in sustainable technologies for energy,

environment and health; urban atmospheres and aquatic environments; and smart and healthy cities.

In December 2018, SEE hosted the third Tech Talk in the series, on the topic "Waste Management and Treatment". Dr Alicia An, Dr Shauhrat Chopra and Dr Yun Hau Ng shared with the audience their insights on the topics "Energy-efficient Emerging Membrane Technologies for Wastewater Treatment and Resource Recovery", "Data-driven Decision Making for Waste Management and Resource Efficiency: Path to a Circular Economy" and "Extraction of Molecular Hydrogen from Wastewater", respectively. Participants from industry and academia exchanged views actively during the break and the Q&A session. Another Tech Talk in the series was held in May 2019 on the topic "Building-related Technologies". Dr Edwin Tso, Dr Wei Wu, and Dr Keith Ngan shared their ideas on new developments in future air-conditioning and space cooling technologies; advanced heat pump technologies for higher energy efficiency; and applications of



computational fluid dynamics to urban air quality respectively.

Hefei University Delegation Visit

A group of Master's degree students from Hefei University visited SEE in December 2018. Apart from Dr Wanxin Li introducing the School to the group, Dr Edwin Tso shared his insights with the students on the topic "Converting Waste Heat to Cooling in Building Applications".



Zhejiang University Delegation Visit

On 30 January 2019, a group of 25 undergraduates from Zhejiang University visited SEE. The undergraduate students, led by Professor Yang Hou from the College of Chemical and Biological Engineering at Zhenjiang University, attended two sharing sessions offered by SEE faculty members and toured a teaching laboratory. The visit served as a platform to cultivate knowledge sharing.



SEE Mentorship Programme – Student Mentees Sharing

Lee Yiu Ting, Ben

Before I joined the SEE Mentorship Programme, I was expecting to receive guidance from a professional engineer in the industry. At the current state of the programme, I would say I got more than I expected.

My mentor is Mr M. F. Sham, Fai Gor (as he asked to be called), a former director in a subsidiary of TownGas. Our first meeting was at a casual dinner in Tai Pai Tong. For a busy senior working in the engineering field, Fai Gor is overwhelmingly friendly. During our conversation, we exchanged ideas on various topics. We, the mentees, not only gained insight and ideas shared from Fai Gor, we also expressed our perspectives and opinions on various subjects.

The biggest learning point so far has been to learn the viewpoint of a senior engineer and his insights regarding the development and future of the industry he oversees.

Lo Tak Yan, Caleb

It is always best to have a wise, professional and experienced man to light some pathways in your unknown world. Through the SEE Mentorship Programme, I have been fortunate to have Mr Raymond Ng, CEO of Karin Technology, as my mentor. Our talks cover topics from school to the workplace, from travelling to self-financing, from family to friends. We have a good time. However, the most valuable thing I have gained is the attitude and the approach that Mr Raymond naturally demonstrates when facing a challenge. He is really a good example and set me on a direction to follow. Overall, I am thankful to have had this opportunity to participate in such a meaningful programme.

Prof. Michael Leung listed as one of ten Highly Cited Researchers from CityU in 2018 by Clarivate Analytics

Ten faculty members from CityU have been named Highly Cited Researchers for 2018 by Clarivate Analytics, reflecting the high academic standard of our faculty and our excellent research performance. The list recognises scientists and social scientists who have demonstrated substantial influence in their fields via publication of multiple highly cited papers ranked in the top 1% by citations between 2006 and 2016.

Prof. Michael Leung, Professor, School of Energy and Environment, and Director, Ability R&D Energy Research Centre, is listed under the Engineering category.



Student and Staff Achievement

First Prize in SPARCA 2019 Poster Presentation

Miss Jin Liu, a PhD student under Prof. Michael Leung's supervision, presented her study entitled "Cobalt Carbide Embedded in Carbon Nanofibers as Excellent Bifunctional Oxygen Reduction and Evolution Reaction Catalyst" at the



2019 Symposium for the Promotion of Applied Research Collaboration in Asia (SPARCA 2019) organised by the Asia Pacific Society for Materials Research (APSMR). She won First Prize in the Poster Presentation and received an award certificate from Prof. Wallace Leung, Representative of the Judging Panel and Chair Professor at The Hong Kong Polytechnic University.

UG Student received Hanson Outstand Award

Under the supervision of Prof. Michael Leung, Ng Yuen Man Alice, a recent graduate from ESE programme, obtained the "Hanson Outstanding Award" under the "Competition for Students - Secondary and Post-secondary School category" of Energy Saving Championship Scheme 2018. The project title is "Development of Integrated Organic Rankine cycle for recovery of waste heat from Vapor Compression Refrigeration Cycle for generation of electricity". The Scheme was jointly organised by Environment Bureau and the Electrical and Mechanical Services Department.

Dr Patrick Lee received special recognition diploma from the World Cultural Council

The 35th World Cultural Council (WCC) Award Ceremony, hosted for the first time in Hong Kong and the Greater China region, was successfully held at CityU on 8 November 2018.

The WCC Award Ceremony also granted special acknowledgements to young researchers and scholars from Hong Kong who have achieved outstanding performances in the fields of science, education or the arts. Dr Patrick Lee was among the nine awardees.



Dr Denis Yu selected as one of the awardees of the President's Awards (TPAs)

Dr Denis Yu, Associate Professor, has been selected by the University to receive one of The President's Awards (TPAs). TPAs recognise faculty who have made outstanding contributions to research, professional education and service that have helped CityU achieve local and global distinction.

Dr. Edwin Tso's paper published on HKIE Transaction and awarded HKIE Best Transactions Paper Prize 2018



Dr. Edwin Tso's paper entitled "Development of a phase change material (PCM)-based thermal switch" was published on HKIE Transaction Vol 24 No 2 and awarded the HKIE Best Transactions Paper Prize 2018! Dr. Tso invited to join an HKIE event to receive the award from Ir Ringo Yu, President of HKIE. More on the paper is elaborated below.

A thermal diode is a two-terminal device with a thermal conductance that depends on the direction of heat flow. In recent years, the possibility of controlling heat transfer using thermal diodes has attracted increasing attention because of its potential for saving energy. For example, thermal diodes can be integrated into adaptive walls for the thermal management of buildings, or combined into solar-thermal collector systems for preventing reverse circulation at night. Thermal diodes can also be used for cooling planar electronic components such as micro-processors, acting as super heat-spreaders. The aerospace industry and cryogenics are two other modern fields where thermal diodes can be applied. In this study, research group develop a phase change material (PCM)-based thermal diode which is durable (i.e. has thermal and chemical stability), low-cost (i.e. has no unpleasant odour, is non-toxic and can be easily sold at a low price), environmentally friendly, easy to construct, simple in design and competitively efficient. A high ON/OFF thermal conductance ratio is recorded under room pressure conditions. The developed PCM thermal diode has been integrated into a novel solar-thermal power system. Thanks to the second heat flux in the opposite direction provided by the PCM thermal diode, the novel solar-thermal power system can help to continuously generate power, even during the night.



Opinion Column

Win the trade war and lose the world? Why the US and China need to focus on the war against climate change

Dr Lin Zhang, Assistant Professor

As scientists, we acknowledge the existence of climate change; as economists, we know the potential huge economic costs of catastrophic events. Yet calculating how the knowledge we accumulate every day impacts the economic cost of climate change is not an easy task.

Thanks to William Nordhaus and Paul Romer, the Nobel laureates for Economic Sciences in 2018, we can investigate how technological innovation impacts the cost of climate policies. Integrating endogenous growth into climate economic analysis shows that developing countries like China can reduce climate change mitigation costs by 90 per cent if knowledge spillover between sectors and regions is present. This figure is about 20 per cent for advanced

economies such as those of Europe and the US.

To make this happen and drive technology transfer, helping to build the global knowledge-sharing platform and the innovative capacity of developing countries is key. Inter-governmental cooperation can help knowledge spillovers flourish and substantially lower the cost of climate mitigation.

Knowledge diffusion through international trade has played a major role in technological improvement in emerging economies. However, since US President Donald Trump began pursuing his pro-fossil-fuels agenda, efforts for climate change mitigation by the US government have taken a back seat.

To make things worse, the ongoing trade war between China and the US has imposed a stringent regulation on technology transfer, and the Trump administration has long complained about the “forced

technology transfer” in China. China’s efforts on climate change mitigation have been weakened to accommodate its economic burden from the trade war. The mitigation cost is expected to rise significantly. Both countries are seeking ways to win the trade war, but it is likely that the whole world will have to pay the price in the form of losing the climate-change war.

Technology transfer, access to technology and diffusion strategies are some of the crucial elements for solving adaptation challenges. Both the US and Chinese governments must push for wider communication between their nations for the greater good. We must win the climate-change war for ourselves and for future generations.

Source: South China Morning Post (<https://www.scmp.com/comment/letters/article/2180347/win-trade-war-and-lose-world-why-us-and-china-need-focus-war-against>)

SEE Faculties’ projects received Energy Saving Championship Scheme awards



Prof Michael Leung and Dr Edwin Tso have recently been awarded in the Energy Saving Championship Scheme 2018” jointly organised by the Environment Bureau and the Electrical and Mechanical Services Department.

Prof Michael Leung in collaboration with Harbour City Estates Limited, Aviva Yacht Limited & The University of Hong Kong

Award: Hanson I&T Outstanding Award

Project title: Energy Saving in Seawater - Cooled Chillers by Solar Photocatalytic Marine Antifouling

Category: Competition for Organisations

Prof Michael Leung in collaboration with Eastern Ferry Company Limited, Aviva Yacht Limited & The University of Hong Kong

Award: Hanson I&T Outstanding Award

Project title: Improving Fuel Efficiency in Fishing and Fish Farming Industries by Solar Photocatalytic Marine Antifouling

Category: Competition for Organisations

Dr Edwin Tso in collaboration with the School of Engineering, The University of Hong Kong

Award: Hanson I&T Outstanding Award and Best Innovation Award

Project title: Low-Cost High Performance Daytime Passive Radiative Cooling in Building Applications

Category: Competition for Organisations

The “Energy Saving Championship Scheme 2019” encourages the planning and adoption of Innovation and Technology on energy efficiency

and conservation and / or renewable energy technology by internal teams of various industry organisations or through collaboration with I&T partners, so as to promote concerted efforts among the industries in low-carbon transformation.

Dr Yun Hau Ng made finalists in 2019 ASPIRE Prize

The annual ASPIRE Prize, hosted by the APEC Policy Partnership for Science, Technology, and Innovation (PPSTI), recognizes scientists under 40 from across the Pacific Rim who demonstrate excellence in scientific research. They are nominated by their APEC member economies. The winner will receive a \$25,000 prize from Wiley and Elsevier at a ceremony at the August meeting of PPSTI in Puerto Varas, Chile.

Dr Yun Hau Ng is among the finalists for the 2019 ASPIRE Prize. His research in mimicking natural photosynthesis to generate renewable energy is being considered for this prize. Dr Ng specializes in using sunlight to split water into clean hydrogen. ASPIRE is an annual award that recognizes young scientists across the Pacific Rim region who demonstrate excellence in scientific research, this year the ASPIRE Prize promotes innovative research that advances society through “natural laboratories”.

“The ‘laboratory’ of nature has inspired generations of scientists to tackle the world’s most pressing challenges. In turn,

the scientists’ innovative approaches inspire us to pursue economic growth that is sustainable in the long-term,” said Dr Fabiola Leon-Velarde Servetto, Chair of the APEC Policy Partnership for Science, Technology, and Innovation, which oversees the prize. The press release highlights that this year’s ASPIRE Prize nominees represent APEC’s most inventive minds and were nominated for their scientific accomplishments and cross-border collaboration.

Dr Lin Zhang published a translated book issued by Peking University Press

Dr Lin Zhang has published a translated book by Peking University Press. The title of this book is “Greening Economy, Graying Society” (中文名：綠化經濟與構建可持續社會).

This book, written by Lucas Bretschger from ETH Zurich, aims to address the challenges to achieving a sustainable future, to provide novel ideas to rethink current positions, in particular on the costs of abandoning a fossil-based economy and on the benefits of developing a green economy. This translated book is a pioneer work to discuss the potential challenges and policy design for the construction of sustainable society. One highlight of this book is that mathematical equations and models are avoided, it is therefore a useful input for general public and policy making.



SEE 10th Anniversary Celebration

A range of events has been organised to celebrate the 10th anniversary of SEE.

Apart from the 14th General Circulation Model Simulations of the East Asian Climate (EAC) Workshop, the 11th Asian Aerosol Conference (AAC) 2019, the Joint Research Forum of SEE and Guangdong Institute of Energy Conversion (GIEC), Chinese Academy of Sciences (CAS) hosted earlier this year, an upcoming academia-industry event, **Improving Energy Efficiency Conference by Retro-Commissioning**, will be held in October.

Improving Energy Efficiency Conference by Retro-Commissioning

Improving energy efficiency has been well recognised as one of the most effective strategies to achieve net-zero carbon emission. In the building sector, retro-commissioning (RCx) is a useful knowledge-based approach to restore a building to its optimal operations, resulting in high energy efficiency. In Hong Kong, the government has assigned high priority to retro-commissioning in the Climate Action Plan 2030+. The government and professional institutions, such as ASHRAE, BSOMES, HKGBC, HKIE, etc., have taken initiatives to promote RCx by issuing guidelines, organizing training

events, conducting pilot projects, launching ACT-Shop Programme, etc. Researchers at universities and research institutes also develop building energy technologies that can facilitate the implementation of RCx. It is important for all stakeholders to disseminate the knowledge and share experience with the industry. As SEE at CityU has targeted building energy efficiency as one of its key areas for teaching and research, SEE is taking the lead to organise this event to promote RCx.

Chaired by Prof Michael Leung (Professor, SEE), this half-day event will provide a platform for energy professionals, engineers, consultants, government officials, policy makers, scientists, researchers and academics to exchange different fields of experience, challenges and insights. The networking between industry, government and academia will also promote retro-commissioning of buildings for improving energy efficiency and reducing carbon emissions.

Guest speakers will include Ir Cary Chan, JP (Director, Hong Kong Green Building Council), Ir Kenneth Li (Director, WSP (Asia) Limited), Mr Ross D. Montgomery, (Distinguished Lecturer, ASHRAE), Ir Alfred Sit (Director, EMSD, HKSAR Government), Ir Dr Wan Kok Wing, Kelvin (Engineer, EMSD, HKSAR Government), Dr Qingpeng Wei (Associate Professor, School of Architecture, Tsinghua University), Dr Edwin Tso (Assistant Professor, SEE) and Dr Wei Wu (Assistant Professor, SEE).

Alumni Story

Natalie's Career Story

I'm Natalie, currently a Railway Systems Engineer in the Rail Team of Arup, an internationally renowned engineering consultancy firm. I am actively developing my career in the design specialism of station planning and sizing, pedestrian flow modelling, rail systems and system assurance disciplines and working on projects across Asia, especially in Hong Kong, Singapore, Malaysia and the Philippines. I was recently elected the Woman Ambassador 2019 by the Institution of Engineering and Technology (IET) Hong Kong to promote gender diversity in science, technology, engineering and mathematics (STEM) education and industries.

My aspiration is to be a professional Chartered Engineer (CEng) in within 3-5 years as recognition of my ability and career in the industry. I



also aspire to further my study with a Master's degree in railway engineering overseas to enrich my technical abilities and experience various education systems and cultures.

SEE students, open yourself to this fast-changing digital world, always prepare yourself to welcome and seize new and unexpected opportunities. Cherish your youth to have long- and short-term

dreams, manage and assess your progress regularly. Don't use failures as an excuse to give up, and don't be the next one to lose persistence for your dreams. It will take time, but with faith and perseverance, nothing is impossible.

Welcome to the new generation of engineers!



Join our Alumni Association!

With the expansion in SEE alumni family that now also includes graduates from Bachelor's degree programme, the alumni association will be renamed to The CityU Alumni Association of School of Energy and Environment Limited (CAASEE). It is an alumni group that contributes to encouraging all alumni to stay connected.

The missions are:

- strengthening bonds between alumni and SEE
- acting as a major platform for alumni engagement
- promoting the welfare of SEE by serving as advocates for the SEE
- establishing a mutually beneficial relationship between SEE and its alumni by providing tangible benefits including career services, networking opportunities, events, lectures, etc.

JOIN US!

CityU Alumni Association of School of Energy and Environment Limited

(Provisional)

Membership Application Form

General Information

Graduate Year: _____

Name of Most Recent Programme:

- Doctor of Philosophy (Ph.D.) Bachelor of Engineering (BEng) in Energy Science and Engineering
 Master of Philosophy (M.Phil.) Master of Science (MSc) in Energy and Environment

Personal Particulars

Name: _____ (English) _____ (Chinese as applicable)

Nickname: _____ Gender: _____ Mobile phone No.: _____

Email address: _____ WeChat ID: _____ (Optional)

Current Status

- Full-time employment Part-time employment Self-employment Employment seeking
 Further Studies Others (please specify): _____

Employment Status (if employed)

Name of employer: _____ Year of service: _____

Department : _____ Current job title: _____

I have read Personal Data (Privacy) Notice – Use of Personal Data and agree to those terms:

Applicant's signature: _____ Date: _____

Personal Data (Privacy) Notice – Use of Personal Data

People who supply data in their application to the CityU Alumni Association of School of Energy and Environment Limited are advised to note the following points, pursuant to the Personal Data (Privacy) Ordinance:

1. Personal data provided in this application form will, during the entire process, be used solely for this purpose, and in this connection, the data will be handled by the Association's staff or by any committee members of the Association who is directly involved in the administration of this application.
2. After the applications have been processed and the relevant exercise completed:
 - a. the application papers/eForm of successful candidates will become part of the file which the Association open for each member.
3. Under the provisions of the Person Data (Privacy) Ordinance, applicants have rights to request access to, and to request the correction of, their personal data. Applicants wishing to access or make corrections to their data should send email to the see.enquiry@cityu.edu.hk

Declaration

1. I have noted the general points pursuant to the Personal Data (Privacy) Ordinance.
2. I authorize the CityU Alumni Association of School of Energy and Environment Limited or any other office that is directly involved in the administration of this application to use, check and process my data as required for my application.
3. I understand upon successful application, my data will become a part of my member record and may be used for all purposes as prescribed under relevant rules and regulations, as long as I remain member of this Association.

General Enquiry

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