

## Engineering Conference and Gala Nite 2019

The IESL NSW Chapter Engineering Convention 2019 and Gala Nite were held on Friday May 24 and Saturday May 25 at the Engineers Australia Auditorium at Chatswood and the Fairfield RSL Club, respectively.

### Engineering Conference 2019

A gathering of over 60 attendees were present at the Engineers Australia Auditorium for the event which commenced at 6.00 pm. The attendees were welcomed by the Chapter Chair Eng. Rohitha Silva. The Chief Guest for the occasion was Eng. Prof. T. M. Pallewatta, the President of IESL who addressed the audience. The Master of Ceremonies for the evening was the Chapter Immediate Past Chair Eng. Sarath Wijayapala. The proceedings were concluded around 9.30 pm with Chapter Secretary Eng. Sisira Sandakan proposing the Vote of Thanks.

### Engineering Excellence Awards and Shortlisted Nominees

The proceedings included the presentations for the IESL NSW Chapter Engineering Excellence Awards, held annually for awards under three categories:

- Best paper published in a professional forum
- Best innovation and/or invention
- Best achievement and or contribution in an Applied engineering project

The objectives of Engineering Excellence Awards are to recognise the contribution of engineers with Sri Lankan background living in NSW or ACT for ecologically sustainable development and wellbeing of the community. In addition, we wish to recognise cost effective, innovative and excellent engineering solutions delivered in their professional capacities.

Each technical document submission was evaluated by a panel of seven adjudicators with different engineering and/or professional background and expertise in academia and industry. Submissions considered suitable for awards were shortlisted for presentation at the Engineering Conference. They were invited to make a 15-min presentation at the IESL NSW Chapter Engineers' Conference 2019 held on 24 May 2019. Each technical submission and presentation was evaluated based on the evaluation criteria below:

- Scope of the nominee's involvement
- Originality
- Innovation or/and invention
- Value to the community and environmental sustainability
- Solutions to an engineering challenge, and
- Demonstration of sound engineering science in both practice and principle.

The following eight submissions that were shortlisted for presentations. They consist of four for Best Paper Published and two each for the other two categories. This year, two awards- one for Highly Commended and the other the Winner, will be awarded for each category.



## **Chemical clogging of granular media under acidic ground water conditions -**

### **Eng. Subhani Medawela**

Eng. Subhani Medawela graduated in 2015 from the University of Ruhuna as a Civil and Environmental Engineer. She worked as a temporary lecturer at the Faculty of Engineering, University of Ruhuna. In 2016, she started her doctoral studies on “**Permeable Reactive Barriers in Acid Sulphate Soil Floodplains in Australia**” at the University of Wollongong, under the supervision of Distinguished Professor Buddhima Indraratna.

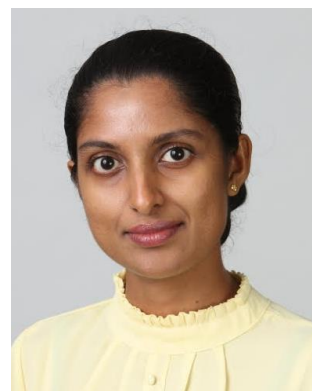


**This paper mainly focuses on chemical clogging of permeable reactive barriers where limestone was used as the reactive material.**

Groundwater acidity resulting from acid mine drainage (AMD) and pyrite ( $\text{FeS}_2$ ) oxidation in acid sulphate soil terrains is often responsible for catastrophic environmental impact in most low-lying coastal regions of Australia. Numerous field solutions have been implemented over decades for treating highly acidic groundwater and after numerous preliminary trials, permeable reactive barriers (PRBs) have proven to be one of the most cost-effective and efficient passive treatment methods of neutralising groundwater acidity in low-lying pyritic floodplains and AMD in coal collieries. Nevertheless, chemical clogging of the PRB granular assembly baffles the reactivity and treatability of filter grains due to encrustation of reactive medium surfaces and accumulation of secondary mineral precipitates within the voids. Thus, it is essential to examine the mechanism of clogging to determine the effective life span of a PRB.

## **Analytical Solution for the Consolidation behaviour of Deep Cement Mixed Column Improved Ground - Eng. Dr. Manasi Wijerathna**

Eng. Dr. Manasi Wijerathna obtained her Bachelor's degree with First Class Honours in Civil Engineering from University of Moratuwa, Sri Lanka in 2014. She completed her Master of Science degree in Engineering from the same university in 2015. Last year, she completed her PhD from Western Sydney University (WSU), Australia. Currently she is working as a Geotechnical Engineer at GHD Group, Australia and also as a visiting lecturer at WSU. **She is an author of more than 20 technical publications.**



**This paper presents an analytical solution for the consolidation behaviour of deep cement mixed (DCM) column-improved ground on the basis of the equal strain condition.**

Soft ground improvement methods, including deep cement mixing, are frequently used in practice to improve consolidation characteristics of the natural soft soil. The interdependent consolidation behaviours of the improved soil and the natural soil, including lateral drainage and the stress concentration, alter the overall consolidation mechanism of soft ground after application of ground-improvement methods. Therefore, the general theory of Terzaghi's one-dimensional (1D) consolidation for homogeneous soil is not directly applicable to investigate the consolidation behaviour of improved ground. The equivalent permeability proposed in this paper takes into account the effects of vertical consolidation of both DCM soil and natural soil and the radial drainage of pore water from the natural soil to DCM columns. The analytical solution proposed in this paper is in the same form as the Terzaghi's 1D consolidation equation, but uses a composite coefficient of consolidation along with an equivalent permeability.

## **Yalut: Privacy-Aware Cost Efficient Mobile Social Networking Platform -**

### **Eng. Dr. Kanchana Thilakarathna**

Eng. Dr Kanchana Thilakarathna is a Lecturer in Distributed Computing at the School of Computer Science, The University of Sydney. Prior to that, Dr. Thilakarathna was a Research Scientist at the Information Security and Privacy Group at Data61-CSIRO. He received B.Sc. Eng. degree with First Class Honours specialising in Electronics and Telecommunications Engineering from University of Moratuwa, Sri Lanka and PhD in Electrical Engineering from The University of New South Wales, Australia. His recent research activities on encrypted video traffic classification, IoT security and drone security are funded by Defence Science and Technology Group, NSW Defence Innovation Hub, Data61-CSIRO and NSW Cyber Security Network. Dr. Thilakarathna is also a recipient of the Google Faculty Awards 2018 and the 2018 Dean's Award for Industry Collaboration.



**Yalut is a user-centric social networking platform that enables users control of their data and to protect their privacy without negatively impacting the usability and cost when using online services such as online social networking.** Service providers are making available more free services, as they are able to monetize user data through third parties such as advertisers. Learned information about users could be misused to propagate malware or ransomware, which again may result in identity theft, financial losses and social damage. Therefore, it is vital to develop services that do not increase the cost and compromise the user privacy. Yalut fills this gap by enabling content sharing with online friends while keeping user data in the users' own device or their trusted friends' devices. To increase the content availability, reduce the communication and energy cost of hosting content on user devices, efficient content replication algorithms were developed by grouping devices into tribes. **Overall, this project has produced 12 technical publications in top journals and conferences and one patent. The project received AIIA iAwards'15 for the best postgraduate project of NSW and the 2015 "Malcolm Chaikin Prize" for the Best PhD Thesis at Faculty of Engineering, University of New South Wales.**

### **An Innovative Approach of Using Continuous Impedance-Graded Metallic Composite System for Attenuation of Stress Waves - Eng. Lakshitha Fernando**

Eng. Lakshitha Fernando obtained his Bachelor's Degree in Civil Engineering with First Class Honours in 2015 and Master's Degree in 2016, from the University of Moratuwa. He also worked as a research assistant in a joint research project on precast building systems between the University of Moratuwa and National Building Research Organisation. In his doctoral studies at The University of Sydney, he is developing a "multi-metallic composite system to resist the effects of high energetic dynamic loads such as blasts and impact".



**This paper presents an innovative conceptual framework to mitigate the effects of dynamic loads on a structure.**

Safeguarding people as well as structures from extreme events such as explosions and impact is a major concern for modern day engineers. The unpredictable nature of such occurrences makes it extremely hard to prevent or even quantify the potential damage. Therefore, both civil and military related critical infrastructure require innovative techniques, which goes beyond traditional protective mechanisms. To this end, multi-material systems are preferred over monolithic systems, but such current systems show major drawbacks such as interfacial delamination and tensile scabbing failure at free surfaces. The conceptual framework presented in this paper, which has also been tested experimentally, goes beyond a traditional multi-material system and is geared towards providing a novel solution. A composite multi-metallic system with enhanced ductility is proposed to minimize the level of stress propagation in a structure during high energetic dynamic loads.

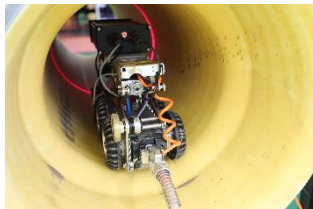
## **Intelligent Sensing and Robotics for Sewer Condition Assessment - Eng. Associate Professor Sarath Kodagoda**

Eng. A/Prof. Sarath Kodagoda is the Vice President of the Australian Robotics & Automation Association, ambassador to the NSW Smart Sensing Network, Deputy Director (Teaching & Research Integration) of Centre for Autonomous System and Coordinator of the Mechanical and Mechatronics program at University of Technology Sydney (UTS). He is the recipient of the prestigious UTS Medal for teaching & research integration and Australia wide OLT awards. He has published over 150 papers, received \$6M industry grants and 5 research awards including state, national and international awards. He is co-chair of the first robotic roadmap for Australia launched in 2018, supervised 12 PhD students. He has been a keynote speaker and held key positions in prestigious robotics conferences and journals and contributed to 20 media articles. He completed his bachelor degree in Electrical Engineering from University of Moratuwa in Sri Lanka and his MEng and PhD from Nanyang Technological University in Singapore.

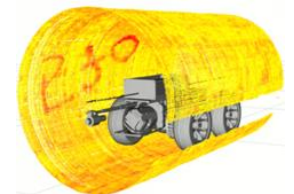


**This project presents development and deployment of innovative sensing and robotic technologies to remotely and non-invasively carry out condition assessment of challenging sewer walls.**

Underground sewer systems are an important national infrastructure to any country. Majority of those sewers are built using concrete materials and they could be hundreds of meters below



ground. Over the time, they deteriorate leading to essential requirements of monitoring and intervention. The originality of this project is that we propose a sensor suite to directly measure the remaining intact concrete cover to reinforcement bars. The sensors are designed to measure the total depth to the reinforcement and to identify the boundary between the corroded (soft layer) and the intact (hard



layer) layers. The deployment system is designed to accommodate inserting through a small manhole and operate remotely as a robotic device. This will allow to minimise the deployment costs as well as the OH&S issues, since there is no need for manned entry. Further, the developed smart sensing technology will provide information-rich data to the utilities for monitoring concrete sewer corrosion over a longer period for timely intervention.

## **Evaluating the Effect of GGBFS in Alkali Silica Reaction in Geopolymer Mortar with Accelerated Mortar Bar Test - Eng. Dinesh Mahanama**

Eng. Dinesh Mahanama is a Civil Engineer who graduated from University of Moratuwa in 2013. He worked as a structural design engineer specialising in high rise buildings at the Central Engineering Consultancy Bureau in Sri Lanka. He is currently completing his doctoral studies at University of New South Wales and his research work includes durability of concrete, structural designing of concrete elements and geopolymer technology.



**This Paper analyses the ASR mechanism in Geopolymer mortar and the role of GGBFS.**

Despite being one of the most consumed materials in the world, Ordinary Portland Cement (OPC) is considered neither sustainable nor eco-friendly and thus, demands an alternative solution in the near future. Even though geopolymer is a potential substitute to the OPC, it possesses high theoretical risk of alkali aggregate reaction (AAR) due to the use of alkaline solution as an activator. However, studies showed that it is ground granulated blast furnace slag (GGBFS) that elevates the AAR risk in geopolymer mortar. Since GGBFS also governs the early age properties of geopolymer concrete, optimisation of GGBFS is essential in the commercial adaptation of geopolymer concrete. This research is focused on laying the platform to this by identifying the ASR mechanism in geopolymer and the role of GGBFS in it.

## Mobile Network End to End Performance Monitor - Eng. Indaka Raigama

Eng. Indaka Raigama is an engineering professional who graduated from the University of Moratuwa, Sri Lanka, specialising in software systems and electronics design. He has played diverse roles from a software engineer to a delivery manager at Virtusa Inc., then headed the South Asian operation of Navantis Inc. as the CEO. Indaka is now heading iTelaSoft Pty Ltd as the Co-Founder and CEO. iTelaSoft is a Technology Innovation Agency focused on FinTech, IoT & Embedded Devices, Machine Learning, and Software Product Engineering in Australia, Sri Lanka and UK.



**End-to-End Performance Monitor (E2EPM) a solution for providing monitoring and diagnostic information on various services & capabilities run on mobile networks, to reduce effort and costs of monitoring, testing and diagnosing, and eventually reducing risks associated with SLA commitments.**

The mobile service provider space is filled with multiple services (voice, messaging, broadband data, narrowband data, message brokers), standards (2G, 3G, 4G, 5G) and applications (USSD, STK, IVR based Apps, Handset based Apps). During the deployment period, as well in the service period, it takes a significant effort in testing and monitoring. For a telco, while offering mobile capacities, “end-to-end testing” is paramount to achieve (a) Maintaining test coverage (b) Detecting outages faster with useful troubleshooting data (c) Back SLA commitment with factual information. XG Service Monitor platform is a centrally managed, distributed test framework for testing multiple capabilities with large number of test scenarios with both manual and automated test cases in legacy & new-gen cellular deployments. It is designed as an end-to-end mobile capability testing platform, with hardware-based test executors and a software-based test management framework. The platform is built with (a) ability to execute test scenarios on the network with real hardware-based RF equipment (b) scripted test scenarios maintained in a library so that they are repeatable and reusable many times (c) manage tests centrally and execute tests remotely to reduce cost of testing (d) report underlying status and issues to business stakeholders quickly and intuitively.



E2EPM was conceptualized, designed and fabricated completely by the iTelaSoft team in Australia and Sri Lanka. **iTelaSoft IoT group consists of electronics engineers and software engineers who are dedicated for IoT innovations and implementations.**



## Rapid Response Robotic Tool for Critical Water Mains Condition Assessment - Eng. Distinguished Professor Gamini Dissanayake, Eng. Dammika Vitnange and Eng. Jeya Rajalingam

**A robotic solution to mitigate the risk of multiple large diameter water pipe bursts in the same geographic area. A collaboration between UTS and Sydney Water.**

Eng. Prof. Gamini Dissanayake is the James N Kirby Distinguished Professor of Mechanical and Mechatronic Engineering at University of Technology, Sydney (UTS). He graduated in Mechanical/Production Engineering from the University of Peradeniya, Sri Lanka. He received his M.Sc. and Ph.D. from the University of Birmingham, England. His work on Simultaneous Localisation and Mapping for robots resulted in the most cited journal publication in robotics in the past twenty years. He has been involved in developing robots for a range of applications including cargo handling, disaster response, mining, infrastructure maintenance and aged care.



Eng. Dammika Vitnange is the Asset Infrastructure Research Coordinator for Sydney Water. He graduated in 1980 with BSc (Hons) in Civil Engineering from the University of Peradeniya Sri Lanka. He has more than 39 years of water industry experience in asset management, operations, maintenance, and water quality. This includes 15 years in managing Research and Development. Current research programs he manages include corrosion in concrete sewers, assessing failure prediction of critical water mains and bio-solids management. His recent achievements include providing leadership to develop collaborative water industry led research projects with universities, consultants and technology providers.



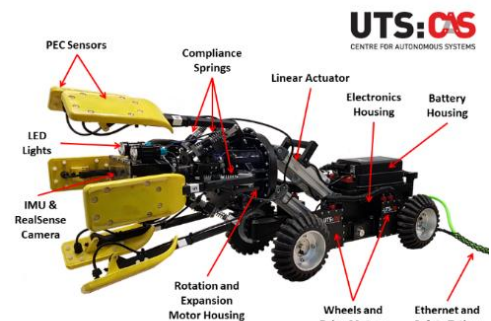
Eng. Jeya Rajalingam is a Principal Engineer at Sydney Water. She has over 30 years' experience in the UK, Australia and Sri Lanka and has specialised in water supply management. For the last twelve years she has been in charge of the condition assessment of pressurised water pipelines and has contributed to the development of Sydney Water's risk assessment based strategy for renewals and methodologies to identify pipes needing intervention. She has won many aqua awards in Sydney water for her contribution and awarded a Lawrence Choy Memorial Fellowship funded by TRILITY in UK visiting major water utilities on behalf of Sydney Water.



**The Rapid Response Thickness Tool (R2T2) is deployed within the short 3-4 hr timeframe between a mains break and its repair. Sensors attached to R2T2 can assess whether there are pipe segments with large corrosion patches that have the potential to initiate a break in the near future are present in the vicinity.**

### Key innovations in R2T2 are

- A sensor system that is able to rapidly measure remaining wall thickness of a cast iron pipe,
- A robotic system able to navigate through debris and steps present in the pipes, adapts to pipes with diameters from 375mm – 750mm and can travel up to 100m either side of the break and
- Produce a map of the wall thickness for use with failure prediction tools used by Sydney Water.



## Engineering Excellence Awards Evaluation Panel

**Dr. Chinthaka Fonseka** graduated with a first class honours degree in Civil Engineering from University of Moratuwa and the UNESCO Gold Medal in 1985. He joined the academic staff of the Department of Civil Engineering in 1985. He obtained his PhD in Finite Element Analysis of Shell Structures from University of Southampton, UK in 1990 and served as a Senior Lecturer until 1996. He has published many research papers during his tenure as a Senior Lecturer and received three Best Paper awards from the Institution of Engineers, Sri Lanka. Dr. Fonseka is currently a Senior Structural Engineer and a Sector Leader in Health Infrastructure at Cardno (NSW/ACT) Pty Ltd. He is also the Quality Management System Manager of the Buildings Division. He is a Chartered Professional Engineer (CPEng) and a member of the National Engineers Register (NER) of Engineers Australia and Asia Pacific Economic Cooperation Engineers (APEC) register.



**Dr. Jahan Peiris** is presently employed as Main System Planning Manager at TransGrid and is responsible for network modelling, system planning, technical design and system performance. Previously he has held a variety of positions in the power industry in the areas of power system modelling, analysis, planning and operations. Jahan is a member of IET, IEEE, and is a registered Chartered Engineer of Engineering Council, UK. He has contributed to a number of industry technical groups in planning and operation of Australian National Electricity Market including Operations Planning Working Group and Power System Modelling Reference Group. Jahan graduated with first-class honours from the University of Moratuwa, Sri Lanka, specialising in Electrical Engineering and received his PhD from the University of Auckland, New Zealand with main interests on power system stability and control. He is presently an Honorary Professorial Fellow at the University of Wollongong.



**Dr. Premaratne Samaranayake** received his PhD from the University of Melbourne and holds BSc Eng. (First Class Honours) from University of Moratuwa; M.Eng from Asian Institute of Technology; and PG Diploma (Computer Science). He also holds SAP Certification on Best Practices in ERP (BPERP). Currently, he is a Senior Lecturer at Western Sydney University and has extensive research and scholarly work experience in broader areas of Enterprise Resource Planning (ERP) using SAP ERP systems, Supply Chain Management (SCM) and Industrial Engineering, spanning over more than 25 years. He is actively engaged in research collaborations with industry and has successfully completed a number of research projects in recent times, including (i) Development of a methodology for integrating planning and scheduling techniques for aircraft heavy maintenance (funded by SAP AG - the market leader of ERP systems), and (ii) Kerbside assessment of freight and servicing activity in Parramatta CBD (funded by Transport for NSW).



**Dr. Ranjith Liyanapathirana** received his bachelor's degree in electronic and telecommunication engineering from University of Moratuwa, in 1981 and his MEng and PhD degrees in electrical engineering from Memorial University of Newfoundland, Canada in 1987 and 1995 respectively. From his graduation in 1981 to 1998, he worked in academia and industry in Sri Lanka, Saudi Arabia and Canada and Western Australia. In 1998, he joined Western Sydney University (WSU) to establish the Telecommunication Engineering Program. He is currently a Senior Lecturer in the WSU School of Engineering and Construction Management. His current areas of research interest include wireless sensor networks, biomedical engineering and structural health monitoring. He is a Senior Member of IEEE and ACS. He has a hobby interest in amateur radio (VK6BHV). He has published over 150 peer-reviewed papers in IEEE/IET conferences and journals.



**Dr. Ashok Peiris** is presently employed as Technical Director at GHD Pty Ltd and is responsible for design and providing construction stage services for major infrastructure projects in Australia and Overseas. Previously he has held positions in academia, including Head of the Dept. of Computer Science and Founder board member, Faculty of IT, University of Moratuwa and Professor/Founder Dean of the Faculty of Engineering at SLIIT. He is a registered Chartered Engineer of IESL and IEAust. As a professional engineer, Ashok was involved in many legacy projects such as the Ballina Bypass, Kempsey Bypass Alliances and design of a super tall building in excess of 600 m high. Ashok has published over 30 technical publications in journals and conferences. Ashok graduated with First Class honours from the University of Moratuwa, specialising in Civil Engineering and received his PhD from the University of Tokyo and MSc/DIC from Imperial College, University of London.



**Prof. (Sathaa) Arumugam Sathaasivan**, joined Western Sydney University (WSU) in January 2012. In total, he attracted research funding about 4 million dollars. His team has worked with almost all major utilities in Australia. Prior to joining WSU, he was an Associate Professor/Senior lecturer in Curtin University for 6 years and managed projects totaling about 1.2 million dollars including an ARC linkage grant. Sathaa supervised 25 postgraduate students inclusive of 12 PhD students to successful completion. Sathaa brings a balanced mixture of industrial and academic experience in environmental engineering from around the world. He finished his PhD in the University of Tokyo in Water Quality Engineering and then worked as a research fellow in the same university for two years. Following this, Sathaa was an Assistant Professor in Asian Institute of Technology, Bangkok for two years. Prior to joining Curtin, he worked with Sydney Water Corporation as a Water Quality Scientist for six years. He uses biotechnology in water/wastewater research. He loves the challenges sustainable development presents and the opportunities life cycle assessment tool and other technologies offer.



**Dr. Nalin Pahalawaththa** graduated with a first class honours degree in Electrical Engineering from University of Moratuwa. He obtained his PhD from University of Calgary, Canada in 1990 and MBA, Massey University, Palmerston North, New Zealand in 2003. He is currently the Senior Technical Director - Power Systems at GHD Pty Ltd. He worked as the Manager, Transmission Planning at TransGrid during 2012 – 2017. Prior to joining TransGrid in 2012, Nalin held senior planning roles with the Australian Energy Market Operator and Transpower New Zealand Ltd. From 1990 – 2000 Nalin held positions of lecturer and Associate Professor at the University of Auckland where he was the leader of the Power Systems research group. Nalin is an active member of a number of professional organisations and industry working groups. In 2012 Nalin received the Cigre Technical Award in recognition of outstanding contributions to HVDC and Power Electronics. He recently convened the Cigre Working Group on Connection of Wind Farms to Weak AC Networks. He has published more than 100 technical publications.



## Gala Night

The Chapter Engineers' Nite 2019 was held on 25 May 2019 at Fairfield RSL. This was held in grand style for the tenth consecutive year. The Gala Nite got underway from 6.00 pm onwards at the Fairfield RSL Club on 25 May with a DVD presentation on the IESL NSW Chapter's activities. The ceremonial lighting of the oil lamp was carried out by some of the distinguished guests present. A one-minute silence was observed by the audience to pay homage to Easter Sunday victims in Sri Lanka and the Past Prime Minister of Australia Late Hon. Bob Hawke. The Chair of the NSW Chapter of IESL Eng. Rohitha Silva delivered the welcome address. The chief guest of the evening the IESL President Eng. Prof. T. M. Pallewatta then addressed the audience. Dr



Marlene Kanga, President of the World Federation of Engineering Organisations [WFEO] and the Consul General Mr. Lal Wickramatunge addressed the gathering. The Keynote Speech was delivered by Distinguished Professor Buddhima Indraratne of University of Wollongong. The invited guests for the evening were representative of Engineers Australia, the representatives of sponsors and the top 10 finalist of the World Best Teacher.

The Gala Nite 2019 was attended by over 300 engineers, industry experts, academia and many distinguished invitees representing various collaborative organisations. Awards were presented to winners of Engineering Excellence at the Gala Nite; Past Chapter Chairs; Public Lecture Presenters; Engineers Australia; WFEO President Dr Kanga; Young Engineers Day Presenters and the 10th Finalist of World Best teachers award.

The live broadcast of Engineering Conference can be watched [here](#). The Gala Nite 2019 photographs can be found [here](#). The Gala Nite 2019 event booklet can be found [here](#).