CLASS OF 2018

This Is Our Moment
Our PHD Journey

| Friday, 27 July 2018 |

NTU SINGAPORE
INTERDISCIPLINARY GRADUATE SCHOOL

SOLVING GLOBAL CHALLENGES THE INTERDISCIPLINARY WAY
INTERGENERATIONAL IMPACT
INTERRELATED FOCUSES
INTERESTING RESEARCH
INTERNATIONAL REPUTATION
INTERDISCIPLINARY MOBILITY
Congratulations >

This is your moment!

As Dean of the Interdisciplinary Graduate School (IGS), I’m especially proud to congratulate the 3rd batch of 100 graduates from our interdisciplinary frontier programmes. Congratulations on your outstanding achievements at NTU! You should celebrate the hard work you have put in over the years and the exciting discoveries you have made.

On your interdisciplinary journey you have forged new and interrelated directions, while inspiring others on this very important journey of bringing together NTU’s scientific disciplines for the betterment of our world in forward looking and impactful ways.

You have also moulded and formed professional and social relationships as you challenged yourselves while you were challenging others as well. May those connections and affinity you have built continue as you move onto more academia, industry or other paths. Remain a part of our NTU family no matter where you are headed, serving as ambassadors of the meaningful work you have achieved as shining examples to others.

May you continue to undertake interesting research that has intergenerational impact and solve global challenges the interdisciplinary way. I sincerely wish you all the best to your future endeavors!

Dean, Interdisciplinary Graduate School
Prof Bo Liedberg
Special Feature >
Tech it forward

Dr Tang Jing scored an academic breakthrough after pursuing a doctorate at NTU’s Interdisciplinary Graduate School

CHRISTINA CHING

After obtaining a bachelor’s degree in computer science and technology at the University of Science and Technology of China, Dr Tang Jing (left) decided to pursue a doctorate.

The 28-year-old — a scholar from Nanyang Technological University’s Interdisciplinary Graduate School (IGS) — wanted to deepen his knowledge and conduct research on the subject.

Says Dr Tang: “I was curious about new technology and science. Since I am also innovative and creative by nature, I thought a research job would best suit my personality.”

After noting that research is increasingly becoming more complex and requires more interdisciplinary knowledge, he felt that IGS would be the right place to make new breakthroughs in research.

Delving into online social networks

The IGS MAGIC (or Multi-platform Game Innovation Centre) alumnus graduated from the four-year Doctor of Philosophy (PhD) programme last year.

His thesis explored the usage of data management and analytics for large-scale online social networks.

Dr Tang explains: “Social networks attract billions of users, who spend a lot of time on social networks every day. Thus, there are many opportunities and challenges in this domain.”

“Viral marketing is one example of a typical application in social networks. My work attempts to find the best strategy for conducting viral marketing campaigns.”

The biggest challenge Dr Tang faced was getting his research results published in well-regarded conferences or journals.

After being rejected almost 30 times, he experienced his proudest moment when his first published paper won the Best Paper Award in a top-tier computer conference in 2014.

So far, nine of his papers have been published in such computer conferences or journals. He has also attended two overseas conferences and one local conference, where he exchanged ideas with well-known scholars in his field.

The PhD programme has been instrumental in Dr Tang’s personal and professional development.

Currently a research assistant professor at the National University of Singapore’s engineering faculty, he is working towards a tenured professorship.

“I’m trying to open start-ups using my experience and knowledge. I think it’s important to apply our knowledge to real products in industries,” says Dr Tang.

“Most importantly, the knowledge, research attitudes and skills for acquiring new technology I learnt from this programme will stay with me for life.”
Dr Aamani Budhota  
Future Healthcare PhD Programme | NTU Institute for Health Technologies (HealthTech NTU)

Thesis Title: Analysis Of Kinematic And Muscular Synergies As Assessment Tools During Rehabilitative Robotic Training

Main Supervisor | Assoc Prof Domenico Campolo  
School of Mechanical and Aerospace Engineering

Co-supervisor | Assoc Prof Xiang Liming  
School of Physical and Mathematical Sciences

Mentor | Dr Karen Chua  
Tan Tock Seng Hospital

- **What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?**
  My passion for healthcare is the motivation to pursue research in biomedical engineering and computational neuroscience.

- **What is your thesis about?**
  My thesis is about development and analysis of kinematic and muscle synergies as assessment tools for robotic rehabilitation training by validating and assessing novel control algorithms based on motor control principles.

- **Why did you choose this topic and how does it benefit people or industries globally or internationally?**
  I chose this topic because of stroke, the most common neurological disease resulting in different impairments in the survivors. However, with effective rehabilitation its impact on the quality of life can be limited. The rehabilitation robotics industry is currently rising and will reduce increasing health costs and workload of therapists in the future which goes towards providing better healthcare for everyone.

- **What kind of interaction did you have in IGS? How did that help you?**
  IGS played a crucial role in my research. The choice of supervisors and mentors from different fields allowed me to pursue my multidisciplinary thesis with feedback from the clinicians and engineers. Moreover, the IGS seminar series exposed me to very innovative and interesting works of fellow students and expert researchers in the different fields.
• **What are the challenges you faced during the candidature and how did you overcome it?**

I joined PhD with bachelors and a little experience in research. Being a novice to research and living independently for the first time in a foreign country, I had few difficulties in adapting to the new environment. However, with the support of my excellent colleagues, professors, and friends, life became more enjoyable. I learnt to assess my performance, not comparing to others and set feasible deadlines.

• **What do you think are the key attributes for PhD students to successfully complete their candidature?**

The key attributes to a successful PhD are thorough literature knowledge, the relationship with your supervisor and an attitude to keep it going in all hard times.

• **What was your proudest moment or fondest memories over the years of candidature?**

My oral defence day sums up the ebb and flow of my PhD journey. It was a very special day where I could present my work to my colleagues and friends confidently.

• **Please share 1 key motivational/ key take away message with your juniors.**

Perseverance and hard work never fails a true scientist.

• **What is your next adventure / challenge or any plans for the future?**

My future plans are to contribute to the society with my work and also to extend my research abilities. I would like to be in a position where I can take active participation in science and technology policy making.
What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?

The structure of IGS program was the main motivation for me to pursue a doctorate here. The structure, where you have expert advisors from different fields/domains and a mentor from industry, research centres or as a clinician, gave me opportunities to not only explore the research area scientifically but also to explore the applied implications and practical solutions of the research work. The applied part of the project always kept my enthusiasm and motivation high throughout my PhD. With the guidance from a multidisciplinary team I was able to gain different perspectives of the problem to be addressed and at the same time I got access to different facilities with ease. This made my PhD a pleasant journey, while allowing self-fulfilment and satisfaction as it addresses a crucial problem in healthcare.

What is your thesis about?

My thesis work is focused on a comprehensive understanding of water-and thermo-responsive shape memory effect in polymers and hydrogels to develop functional biomaterials for smart medical device development. It was aimed to develop a bioabsorbable radiopaque water responsive shape memory polymer-hydrogel composite embolic device for temporary vascular occlusion for liver cancer treatment.

Why did you choose this topic and how does it benefit people or industries globally or internationally?

The topic I chose was complementary to my background in polymer science and passion to work for medical/healthcare application. Another reason is domain expertise of my PhD supervisors, Prof Subbu Venkatraman in Therapeutic medical devices and biomaterials, and Prof Huang Weimin in shape memory polymers. Liver cancer is 2nd highest cause of cancer related deaths (~1 million deaths annually) in the world and the embolic device developed as a part of my PhD work has potential to improve the efficacy of treatment. Besides, the concept of water and thermal-responsive shape memory effect can be used to design and develop state-of-the-art medical devices for various other applications.

What kind of interaction did you have in IGS? How did that help you?
For technical discussions, I had regular meetings with my TAC members either in groups or individually to monitor the progress of the research work, animal trials or publications. The yearly meeting with the Dean of IGS, Prof Bo Liedberg, to follow up on our progress in my PhD journey or any other issues, gave me a sense of belonging and motivated me to go through all the hard work and toil.

The events organized by the Student Club for all IGS students were extremely helpful short escapes from the research. Skill workshops and IGS development series seminars were beneficial for personal development. I was part of IGS Student Club where I got an opportunity to improve my leadership ability.

- **What are the challenges you faced during the candidature and how did you overcome it?**
  I was fortunate to have very supportive professors as my advisors and highly knowledgeable postdoctoral candidates and a mentor to guide me through the challenges whenever I was stuck. Besides this, the strong support from IGS admin staff throughout the 4 years was a very important factor for the smooth journey.

- **What do you think are the key attributes for PhD students to successfully complete their candidature?**
  In PhD there are no longer tests to cram or procedures to follow; it is more of continual learning to tackle new challenges to generate novel scientific findings and solutions for problems. Perseverance and learning from negative results and improving the work-plan are very important. Cogency is a very important attribute for a successful PhD. As important as it is to have good quality research work, the ability to clearly and boldly articulate work and ideas, in person and in writing, is essential.

- **What was your proudest moment or fondest memories over the years of candidature?**
  After years of working in the lab, for the first time when my developed embolic device was used in an animal trial and the outcome was positive, it was a moment of fulfilment and motivation for future work. The work led to an international patent and publication in a top journal in the field.

- **Please share 1 key motivational/ key take away message with your juniors.**
  PhD is a roller-coaster ride which at the end will take you to new highs. The self-fulfilment, satisfaction and the rewards you achieve are amazing. Be curious and make your work more interesting so that you will never reach attrition.

  This is my favourite quote which explains research in one sentence...

  In completing one discovery we never fail to get an imperfect knowledge of others of which we could have no idea before, so we cannot solve one doubt without creating several new ones.

  - Joseph Priestley, British Chemist

- **What is your next adventure / challenge or any plans for the future?**
I will continue exploring the area of polymers and biomaterial in industry and work towards getting a medical device successfully to the market which will help to improve the quality of life of millions.
Dr Abhiruchi Suresh Gadgil  
Sustainable Earth PhD Programme |  
Energy Research Institute @ NTU (ERI@N)  

Thesis Title: Lubrication Mechanisms In Offshore Wind Turbines  

Main Supervisor | Assoc Prof Zhou Kun  
School of Mechanical and Aerospace Engineering  

Co-supervisor | Dr Narasimalu Srikanth  
Energy Research Institute @ NTU (ERI@N)  

Mentor | Prof Chen Zhong  
School of Materials Science and Engineering  

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Dr Adam Hotra  
Future Healthcare PhD Programme |  
NTU Institute for Health Technologies (HealthTech NTU)  

Thesis Title: Design Of Novel F-ATP Synthase Inhibitors Of Mycobacterium Tuberculosis  

Main Supervisor | Assoc Prof Roderick Wayland Bates  
School of Physical and Mathematical Sciences  

Co-supervisor | Prof Gerhard Gruber  
School of Biological Science  

Mentor | Assoc Prof Thomas Dick  
National University of Singapore (NUS)
What motivates or triggers you to pursue a doctorate or decide to apply to IGS?
The opportunity to create something new and proprietary that could be readily applied in the world was the key driving force in me pursuing a doctorate. Specifically, I chose energy storage as the field to pursue a doctorate as I found it was key to realising the full potential of renewable energy technologies. My background in chemical engineering and chemistry was essential to researching new technologies in the lithium battery field. However, it was not sufficient. I had to understand the physics of crystal structures of materials from the materials science field and also the electrochemical principles that are critical to understanding battery technology. With three expertise in three fields required to understand a complete lithium battery, I realised an interdisciplinary approach was required to tackle the challenges faced and hence I applied to the IGS school.

What is your thesis about?
My thesis is on development of novel high voltage sulphate chemistries for next generation lithium ion battery cathodes.

Why did you choose this topic and how does it benefit people or industries globally or internationally?
The topic provided insight into the battery industry as it was based on a collaboration with leading specialty chemicals manufacturer – Johnson Matthey.

What kind of interaction did you have in IGS? How did that help you?
The IGS interaction was crucial to development of many of my skills and network. I was exposed to a wide variety of research topics, all of them of an interdisciplinary character. The struggles and wins of fellow IGS students provided me the confidence and ideas to tackle the problems in my own PhD and these points of learning aid me even now in my work life. In addition the IGS student club and its kaleidoscope of activities and opportunities exposed me to situations that have enriched my life culturally and intellectually.
What are the challenges you faced during the candidature and how did you overcome it?
The major challenges I faced in my PhD were in the technical areas of gaining results in my experiments. I looked to tackle this by always returning back to literature to figure out new pathways or solutions. A database of ideas is absolutely critical to overcoming obstacles. With respect to personnel and resources, I have been fortunate that my supervisor has been kind and generous. That said it is important early on to realise the strengths and weaknesses of supervisors and collaborators so that expectations are tempered. Understanding people was essential to minimising conflict and maximising productivity during my 4 years.

What was your proudest moment or fondest memories over the years of candidature?
There were many of these. I am hard pressed to pick certain moments in this regard.

What do you think are the attributes for PhD students to successfully go through the 4 years?
Strength of mind – Failure with experiments is the norm in a PhD, it is imperative that repeated failures are not taken personally. Always have confidence in yourself.

Good health – There are times when even waking up to leave the bed for lab becomes a difficult task. In such situations, do not compromise on health. Pick a sport, eat light and use physical exercise keep your mind away from dark thoughts.

Hobbies – Pick a hobby that makes you get out of the campus at least once a week. The hobby should be easy to commit to and something you enjoy.

Please share 1 key motivational/ key take away message with your juniors.
Make up your mind that your supervisor’s role during your PhD is only for support and not for direction. In the first-year focus on a deep literature review of your area of study. Results are not important in the first year but your knowledge of the subject is critical.

What is your next adventure / challenge or any plans for the future?
My plan is to be leading a startup in the energy storage technologies space by the time I am 35. If the opportunities align themselves I hope to be an important factor in realising the practicality of flying automobiles.
Dr Arish Shareef Kottungal Paramba  
Sustainable Earth PhD Programme |  
Energy Research Institute @ NTU (ERI@N)  

Thesis Title: Piezoelectric Energy Harvesting Interface Circuits For Energy Autonomous Sensors  

Main Supervisor | Assoc Prof Goh Wang Ling  
School of Electrical and Electronic Engineering  

Co-supervisor | Dr Narasimalu Srikanth  
Energy Research Institute @ NTU (ERI@N)  

Co-supervisor | Dr Gao Yuan  
Institute of Microelectronics (IME)  

Mentor | Assoc Prof Siek Liter  
School of Electrical and Electronic Engineering  

“You will either step forward into growth or you will step back into safety.”  
Dr Abraham Maslow  
American Psychologist  
Father of Humanistic Psychology
What motivates or triggers you to pursue a doctorate?
It was my passion for scientific research that motivated me to pursue a doctorate degree. Initially, I was searching for opportunities overseas. However, when I saw the interdisciplinary nature of the IGS program, I was eager and also determined to apply for it. Fortunately, I was successful in my application and I have enjoyed my PhD journey.

Why or how did you decide to apply to IGS or the interdisciplinary route of research?
The main reason to go interdisciplinary was that I realised that scientific research cannot be focused on only a single aspect of science. An interdisciplinary approach would allow me to look at a research topic from various angles and also, apply a variety of techniques for problems analysis. The strong advocate on being interdisciplinary from IGS was very attractive for me.

What is your thesis about?
My thesis had two broad aims. Firstly, it was to study the impacts of protozoan predation on complex microbial communities in wastewater systems. To complement the first aim, we investigated further on the mechanisms that these microbial communities had against protozoan predation by using a simpler and defined system. In general, the results would provide new insights in improving wastewater treatment processes by better understanding predator and prey interactions in wastewater.

Why did you choose this topic and how does it benefit people or industries globally or internationally?
I always had a strong interest in water-related research. Furthermore, I had previously completed a final year project at The University of Queensland which had focused on the impacts of viral predation on wastewater processes. Fresh and clean water is a limited resource all around the world. With constant increases in the world population, it is absolutely essential to ensure that there is a constant supply of clean water for consumption. Hence, wastewater treatment holds significant importance in ensuring that water discharged into our environment will be clean and non-toxic. I therefore strongly believe that a better understanding of the microbial communities in wastewater treatment systems is crucial for sustainable development.
can allow better management of the current treatment processes, both locally and globally.

- **What kind of interaction did you have in IGS? How did that help you?**
  IGS is made up of a community of students from different cultures and ethnicities. I enjoyed interacting with students with these different backgrounds. Furthermore, the student seminar series organized by IGS also allowed me to be exposed to various areas of ground-breaking research that are ongoing in NTU.

- **What are the challenges you faced during the candidature and how did you overcome it?**
  Doing a PhD required me to be highly independent and also be responsible for my own research work. It was difficult at first as I did not have a strong understanding in my research topic. But with hard work and the support of my supervisor, I managed to pull through the difficult hurdles and gained significant knowledge in my research area. In addition, I was also fortunate to receive generous guidance from several experienced PhD students in SCELSE.

- **What was your proudest moment or fondest memories over the years of candidature?**
  My fondest memories over the years of candidature were the opportunities that I had to present my research work at two different overseas conferences in USA and Denmark. Although I was not selected for oral presentations, I had great interactions with other researchers from different parts of the world. I am grateful to both IGS and SCELSE for these opportunities. Also, the friendships I have at SCELSE are very precious to me. I look forward to my convocation day where my family, including my soon-to-be born daughter to witness my graduation.

- **What do you think are the attributes for PhD students to successfully go through the 4 years?**
  Definitely a passion for research is essential. However, for the passion to persist, it is important to cultivate a strong sense of determination and perseverance. Also, it will be helpful to remind oneself of the reason that motivated him or herself to embark on this PhD journey. Never be afraid to ask questions and be vocal.

- **Please share 1 key motivational/ key take away message with your juniors.**
  I learnt that while 4 years may seem really long and tedious, time actually passes really fast. So it is important to plan and always be ready to handle unexpected occurrences. It is also important to have good communication with the supervisors as they are often your best line of support.
• How did it feel when you received the scholarship offer?
  I was really delighted to be given the opportunity to start my graduate studies with IGS and SCELSE. Being given the scholarship also helped to strengthen the belief in myself that I am capable to do a PhD. I also felt really grateful that I am able to stay in Singapore with my family while completing my studies.

• Share with us some memorable photos you’ve taken with 1 line description of each photo.
  ![At the Millenium Park, Chicago with two other researchers who also attended the same conference](image)

• What will you miss after graduating?
  I will definitely miss the camaraderie that I have in SCELSE. Also, the flexibility and freedom I have enjoyed while completing my PhD. More importantly, I hope my future job will also encompass the level of interdisciplinary that I have enjoyed during my PhD studies.

• What is your next adventure / challenge or any plans for the future?
  A job related to water research would be great but I am open to other fields of research as well. Also, I am looking forward to my new role as a father to my new born daughter.

• Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
  I am especially grateful to NTU, IGS and SCELSE for the opportunity and scholarship to do my PhD. Special thanks to my family who have been very supportive and encouraging throughout these 5 years. Last but not least, my friends and colleagues, without them I would not have completed my PhD successfully.
Dr Chan Wei Wei
Sustainable Earth PhD Programme | Nanyang Environment & Water Research Institute (NEWRI)
Thesis Title: 3D Printed Shockwave Transducer For Cavitation Research
Main Supervisor | Assoc Prof Claus-Dieter Ohl
School of Physical and Mathematical Sciences
Co-supervisor | Assoc Prof Law Wing Keung
School of Civil and Environmental Engineering
Mentor | Assoc Prof Thomas Dick
School of Civil and Environmental Engineering

Dr Chen Haipeng
New Media PhD Programme | Active Living for the Elderly (LILY)
Thesis Title: Large Scale Strategic Decision Making In Multi-Agent Systems
Main Supervisor | Prof Soh Yeng Chai
School of Electrical and Electronic Engineering
Co-supervisor | Assoc Prof Bo An
School of Computer Science and Engineering
Mentor | Assoc Prof Ling Keck Voon
School of Electrical and Electronic Engineering

Dr Chen Huizhi
Future Healthcare PhD Programme
NTU Institute for Health Technologies (HealthTech NTU)
Thesis Title: Tissue Engineering Approach Using Fibrous Scaffold With Matricellular Protein For Wound Healing
Main Supervisor | Assoc Prof Tan Lay Poh
School of Materials Science and Engineering
Co-supervisor | Assoc Prof Andrew Tan Nguan Soon
School of Biological Science
Mentor | Dr Mark Tang
Mount Alvernia Medical Centre
• **What motivates or triggers you to pursue a doctorate?**
  I have always cared about the worldwide water and energy crisis and it would be a great opportunity for me to pursue a higher degree to address these challenges.

• **Why or how did you decide to apply to IGS or the interdisciplinary route of research?**
  Water and energy issues cannot be dealt with in an individual disciplinary. Pursuing solutions across different courses is a more efficient and effective way to provide solutions for water and energy challenges.

• **What is your thesis about?**
  My thesis work dealt with fabrication and development of robust hollow fiber membranes for pressure retarded osmosis (PRO) process. I obtained extensive experience about membrane fabrication and modification to design a robust membrane for PRO. I also studied the fouling behavior when using real wastewater brine as feed and fabricated two inch modules for pilot test. The results show great potential of the membranes in practical PRO operations in pilot scale.

• **Why did you choose this topic and how does it benefit people or industries globally or internationally?**
  This topic could be a potential solution to the high energy cost and brine management issues during seawater desalination and NEWater production. Potentially, my work could also help international researchers and industrial collaborators with practical applications about pressure retarded osmosis and inspire them about the development process for pilot-scale hollow fiber modules.

• **What kind of interaction did you have in IGS? How did that help you?**
  IGS has provided numerous opportunities for us to interact with researchers, experts and professionals from other disciplines and this broadened my horizon and enhanced my expertise in collaborating with them.
• What are the challenges you faced during the candidature and how did you overcome it?
In the first two years, I was so occupied with my research work that I neglected the interaction between my family and friends. This lead to a hard time for me during my last two years of PhD study. Fortunately, I found balance between life and research work later while my family and friends also provided the strong support.

• What was your proudest moment or fondest memories over the years of candidature?
My presentation at Qatar in the huge auditorium gave me great confidence as a researcher.

• What do you think are the attributes for PhD students to successfully go through the 4 years?
Perseverance, diligence and most importantly, confidence.

• Please share 1 key motivational/ key take away message with your juniors.
Interact actively with researchers in your research group.

• How does it feel like when you received the scholarship offer?
Excited, honoured and grateful.

• What will you miss after graduating?
The vibrant life of IGS and all of these memories during PhD.

• What is your next adventure / challenge or any plans for the future?
To become an inventor of membrane product and provide professional solutions to water problems.

• Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
Thank you all for your support, patience and guidance during this journey.

• Share with us some memorable photos you’ve taken with 1 line description of each photo.

First interaction with a falcon!
Dr Cheng Xuntao
New Media PhD Programme
Active Living for the Elderly (LILY)

Thesis Title: A High-Performance Main-Memory Query Engine On Emerging Many-Core Processors

Main Supervisor | Assoc Prof Lau Chiew Tong
School of Computer Science and Engineering

Co-supervisor | Assoc Prof Boon Chirn Chye
School of Electrical and Electronic Engineering

Co-supervisor | Assoc Prof He Bingsheng

Mentor | Assoc Prof Tang Xueyan
School of Computer Science and Engineering

● What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?
I was advised by my then, soon-to-be supervisor to apply to IGS, which, according to him, will give me accesses to more domains, where I can find rich applications for whatever that I am going to build during my PhD.

● What is your thesis about?
My thesis is about the optimization of database technologies and the application of them in the field of ageless computing. In my thesis, I studied emerging computer hardware and state-of-the-art software techniques, proposed new optimization techniques, developed a database system, and applied it to process specific queries in the domain of ageless computing.

● Why did you choose this topic and how does it benefit people or industries globally or internationally?
Although my topic is rather old-school, it has wide applications in all sorts of domains, including businesses, big data, cloud, healthcare, etc. So, what I contributed can have big impacts in various industries. In my future job, the database system I will be working on will be deployed in the cloud that serves all kinds of customers around the globe.
• **What kind of interaction did you have in IGS? How did that help you?**

The most frequent interactions I had in IGS are those weekly seminars, given by my peers. Although not all talks are interesting to me, I did find some of them very inspiring and informative. They broadened my views outside my own field. For example, I learned about how ecologists travel in the fields and use state-of-the-art technologies to study volcanoes, rivers, rocks and seas. It’s like a real National Geographic show.

The IGS-DL (Distinguished Lecture) series invited quite a lot of world-renowned scientists who gave us fantastic talks. I remember there was one talk introducing how scientists have been studying and preserving the cultures and heritages on Bali Island in Indonesia. Without such talks, the best I can do in my life is probably to be a tourist. But, now, because of these DL talks, I know the inside stories.

Moreover, I also interacted with IGS staff from time to time. They helped me on all sorts of issues, which are mostly administrative. They are very professional. I appreciate their efficiency.

• **What are the challenges you faced during the candidature and how did you overcome them?**

Self-doubt, or lack of confidence, is probably my biggest challenge. It took me quite a long time to come up with my first manuscript for a paper submission, and even more time to score a good publication. It made me question my competence as a PhD student, given that many of my peers are much faster than me in publishing their work. This kind of experience is rare for me before I started my PhD.

There is no secret weapon to conquer this. I just carried on and tried not to think about giving up. My supervisor allowed me to submit my work to a low-tier conference to boost my confidence, which did help me a lot.

I now believe it is okay to be slow. But, it’s not okay to avoid the real problem. The time taken to address the real problem is necessary and meaningful.

• **What do you think are the key attributes for PhD students to successfully complete their candidature?**

Persistence and an open-mind. Pursuing a PhD is difficult. There is no easy way out. One must be committed and keep on trying.

We must acknowledge that we may be wrong, even if we think we are correct. Or, in other words, we must open our mind to all kinds of critics. Critics help us realise the weaknesses of our work in reaching our goals.
• **Please share 1 key motivational/key take away message with your juniors.**
  Don’t escape from challenges. We can only contribute by solving them, not avoiding them. Solving them results in good publications.

• **What is your next adventure/challenge or any plans for the future?**
  After my years in NTU and Singapore, I’m going to work back in my country, where I will join a top class company (Alibaba) to work on issues that are both very related to my interests and important for businesses that can help customers and the society in general. The work I am about to do will not be constrained by borders of any country. A big part of it is going to be applied in Singapore (via Lazada).

  I plan to have some kid(s) and tell them that their parents met in NTU, Singapore. 😊 I hope NTU will enroll them in the future, should they choose to apply.

• **What was your proudest moment or fondest memories over the years of candidature?**

  I published one of my work in a top-tier conference and got the opportunity to showcase it to a lot of experts in my field. In this photo, I am standing by the side of my poster and the computer running my software (which is not in the photo). Among all the people asking me about my work, there was an IBM Fellow, who gave me a lot of valuable comments that helped my work significantly.
Dr Chong Wee Kiang
Sustainable Earth PhD Programme | Energy Research Institute @ NTU (ERI@N)

Thesis Title: Bound Excitons In Low Dimensional Halide Perovskites

Main Supervisor | Assoc Prof Sum Tze Chien
School of Physical and Mathematical Sciences

Co-supervisor | Prof Subodh Mhaisalkar
School of Materials Science and Engineering

Mentor | Asst Prof Nripan Mathews
School of Materials Science and Engineering

Dr Chua Hui Yee
Future Healthcare PhD Programme | NTU Institute for Health Technologies (HealthTech NTU)

Thesis Title: Bioactivity And Controlled Release Studies Of Ranibizumab From Polymeric Carriers

Main Supervisor | Prof Subbu Venkatraman
School of Materials Science and Engineering

Co-supervisor | Prof Peter Preiser
School of Biological Science

Mentor | Adj Prof Tina Wong
Singapore Eye Research Institute (SERI)

“Life is a sum of all your choices.”
Albert Camus
French Novelist, Essayist
Playwright & Philosopher, Nobel Laureate
Dr Chua Khi Pin
Future Healthcare PhD Programme |
NTU Institute for Health Technologies (HealthTech NTU)

Thesis Title: Mechanistic Insights Into Proteins Association Through Molecular Dynamics

Main Supervisor | Assoc Prof Chew Lock Yue
School of Physical and Mathematical Sciences

Co-supervisor | Assoc Prof Mu Yugang
School of Biological Science

Mentor | Assoc Prof Konstantin Pervushin
School of Biological Science

- **What motivates or triggers you to pursue a doctorate?**
  During my final year project, I became highly interested in doing research and the topic I studied at the time was proteins folding. A doctorate is the best way I can learn how to perform scientific research independently, hence I enrolled in the PhD programme with IGS.

- **Why or how did you decide to apply to IGS or the interdisciplinary route of research?**
  I found out about IGS and was very interested in the fact that it encourages multi-disciplinary research. Then, I discussed with my supervisor-to-be at that time and thought that if I were to study proteins as a physicist, a collaboration with someone from School of Biological Sciences would be ideal and thus IGS was the best option for me.

- **What is your thesis about?**
  My thesis studies the interactions between proteins through computational simulations. I essentially zoom in to a protein and look at the atoms that make up the protein. Using computer clusters such as the National Supercomputing Centre, I ran a program that moves the atoms around using a physically realistic model and tried to understand what happens when proteins come together in different situations.

- **Why did you choose this topic and how does it benefit people or industries globally or internationally?**
  I chose this topic because I was interested in how the knowledge of physics can be applied to biology, in particular, proteins folding. The research started out of curiosity, but I’ve gradually realised how useful computational simulations of proteins are to the healthcare industries. For example, pharmaceutical companies that need to screen through large drug libraries can carry out an initial screening via computational tools to narrow down the drugs that go into in-vitro experiments. This is just one of the many applications enabled by increasingly powerful computers around the world.
What kind of interaction did you have in IGS? How did that help you?
IGS organised many events throughout the years to help the students to interact with each other. For example, in my first year, I participated in Outward Bound Singapore’s camp which was a refreshing experience. I got to interact with students working in other fields of research and this played an important role in imparting different perspectives in my own research.

What are the challenges you faced during the candidature and how did you overcome them?
The main challenge I faced during my candidature was learning how to pick up knowledge quickly to be used in my own research. Reading papers proved to be extremely challenging even to this day. However, I am grateful to have had a very experienced supervisor who motivated me along the way and taught me how to learn efficiently.

What was your proudest moment or fondest memories over the years of candidature?
My fondest memory was the overseas conference (Conference of Complex System) in Amsterdam in 2016. I was able to travel to Europe for the first time in my life to give a talk to scientists from around the world on my own research. It was an eye-opening experience just for the fact I was able to interact with so many scientists in one place.

What do you think are the attributes for PhD students to successfully go through the 4 years?
I think perseverance is the key to a successful journey in doing a PhD. A PhD humbles one by teaching him/her just how much he/she does not know and that failures are the norm in doing research. The uncertainty can certainly be discouraging and hence as a PhD student, he/she always needs to keep in mind not to give up.

Please share 1 key motivational/ key take away message with your juniors.
A PhD is training on how to learn efficiently and effectively.

How did it feel when you received the scholarship offer?
I was very happy to hear that I was accepted for IGS research scholarship. It was a big relief to know that I would be able to do what I loved to do for four years without having a financial burden.

What will you miss after graduating?
I will certainly miss some of the friends I’ve made during the four years of study in NTU. While we can still keep in touch, we can no longer meet easily like we have been in NTU.
• What is your next adventure / challenge or any plans for the future?
  I will be starting a post doctorate position soon and the research will be quite different from what I’ve been doing. It will be a great challenge. My plan for the future is to continue to do research in the bioinformatics/computational biology field and hopefully I can contribute to the field from a unique inter-disciplinary perspective.

• Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
  I am really grateful for my supportive family and supervisors. Without them, I could have given up at any point during this journey. I would also like to thank my friends who have provided me the social life I needed to unwind and relax besides working in a lab.
Dr Daniele Cortecchia
Sustainable Earth PhD Programme | Energy Research Institute @ NTU (ERI@N)

Thesis Title: Controlling Luminescence Properties Of 2D Perovskites By Structural Design

Main Supervisor | Assoc Prof Cesare Soci
School of Physical and Mathematical Sciences

Co-supervisor | Prof Lam Yeng Ming
School of Materials Science and Engineering

Mentor | Asst Prof Nripan Mathews
School of Materials Science and Engineering

- **What motivates or triggers you to pursue a doctorate?**
  The passion for science and scientific research.

- **Why or how did you decide to apply to IGS or the interdisciplinary route of research?**
  Because I believe that interdisciplinarity is the key to trigger new scientific discoveries and for the future development of new technologies.

- **What is your thesis about?**
  It is about the study of two-dimensional metal halide perovskites for application in photonics and light emitting devices.

- **Why did you choose this topic and how does it benefit people or industries globally or internationally?**
  Metal halide perovskites are highly promising materials for the fabrication of cost-effective photovoltaic, photonic and light emitting devices. They can be easily solution processed while retaining exceptional optoelectronic properties. Therefore, they open the way for more efficient, high-performing technologies for energy harvesting and consumption.

- **What kind of interaction did you have in IGS? How did that help you?**
  I interacted with the IGS administration staff for everything concerning the development of the candidature, attendance in conferences, refunding, organization of my secondment to IIT (Milan), etc. The administration staff was supportive and quickly helped me to solve any problem I encountered.

- **What are the challenges you faced during the candidature and how did you overcome them?**
  Difficulties to define a solid PhD project. I just kept working and adjusting my objectives according to the new results.
- **What was your proudest moment or fondest memories over the years of candidature?**
  The publication of my first paper was very liberating, since the publication process was very tough.

- **What do you think are the attributes for PhD students to successfully go through the 4 years?**
  Resilience and passion for science.

- **Please share 1 key motivational/ key take away message with your juniors.**
  At the end, everything will be fine.

- **How does it feel like when you received the scholarship offer?**
  I felt like a new adventure and new stage of my life were starting.

- **What will you miss after graduating?**
  My friends and colleagues.

- **What is your next adventure / challenge or any plans for the future?**
  Continue my scientific career.

- **Is there anything you want to say to your family, supervisors, mentors, friends or anybody?**
  Thanks for the support during these years – it was fundamental to successfully conclude this journey.
  To IGS: I think that the level and overall quality of the seminars organized by the school improved a lot during these four years. I hope this progress will continue in the future.

- **Share with us some memorable photos you’ve taken with 1 line description of each photo.**

  ![Photo](image_url)
  Best Poster Announcement Ceremony at the 1st International Conference on Perovskite Solar Cells and Optoelectronics (PSCO 2015), EPFL, Lausanne (Switzerland)
“Men often become what they believe themselves to be. If I believe I cannot do something, it makes me incapable of doing it. But when I believe I can, then I acquire the ability to do it, even if I didn’t have it in the beginning.”

Mahatma Gandhi
India’s Independence Movement Political & Spiritual Leader
What motivates or triggers you to pursue a doctorate?
The main motivation for me to pursue the doctorate program is my interest in academic research. Apart from my interest in pursuing scientific knowledge, I enjoyed the working-nature of academic research. Here, your work is driven by your own curiosity and creativity. You are also allowed to work at your own pace. Such working conditions give you plenty of space to reflect and grow.

Why or how did you decide to apply to IGS or the interdisciplinary route of research?
Since I was first introduced to academic research during my undergraduate studies, my research field has always been somewhere in between material science and fundamental physics. The main reason I joined IGS was because I was asked by my academic supervisors. Since my research interest is “kind of” interdisciplinary, I decided to apply for IGS.

What is your thesis about?
I studied the transient optical-spin dynamics in organic-inorganic hybrid lead halide perovskites for my doctorate thesis. Basically, I studied how electrons’ spin in this material system interacts with light and whether we can optically control the spin polarization. My thesis focused on uncovering and understanding the fundamental processes behind these interactions.

Why did you choose this topic and how does it benefit people or industries globally or internationally?
The idea to study this topic came from my academic supervisors. The reason I agreed to this topic was because of its novelty within my research field. Because no one had really studied my topic, I was challenged to build the knowledge from the very basic without anyone to be my reference. So, instead of advancing the research field, it was more like building my own research “sub-field”. To be honest, my field does not have any direct short-term impact to industry for now. However, if realized it will open a new branch of technology called opto-spintronics, which will overcome the limitations of our current electronic technology.
• What kind of interaction did you have in IGS? How did that help you?
Being in IGS forced me to interact with people from different research fields, with totally different mind-sets and “language”. It trained me in both communicating my research to other people and at the same time to understand their research fields and points of view. These skills are really needed in research to find a collaboration to pursue a common interest and achieve higher than what a single research field can hope to achieve.

• What are the challenges you faced during the candidature and how did you overcome them?
The main challenge during the candidature period is to cope with failure. While probably a lot of us were “lured” into science by some successful stories of big scientists, it is during this period I realized that research is more about failure than success. More than 90% of my time I failed to get any useful results. Sometimes the failure came about because of ill-planned experiments, sometimes because of unfortunate factors which you cannot control, and probably most of the time you don’t know the reason at all. The experiment simply worked the day before but not on the day after, or vice versa. I managed to overcome this kind of stress because of my faith and friends. As a Christian, I believed everything including failure, is God planned, and happens because of a good reason. It helped me to keep moving on. With friends by my side, I also had people to share my struggles with. Video games helped as well. These factors made my PhD years, despite being full of failures, quite enjoyable.

• What was your proudest moment or fondest memories over the years of candidature?
Probably when I published my first paper. Since my field is totally new, I am proud that I was the first to establish a new sub-field.

• What do you think are the attributes for PhD students to successfully go through the 4 years?
I think two most important aspects that you need to have are creativity and tenacity. Creativity is for you to think and try some something new that people have never done before. Tenacity is for you to keep moving on despite stress and failures.

• Please share 1 key motivational/ key take away message with your juniors.
Be process-oriented, not result-oriented. Try to see whatever you are going through as an enjoyable process, learn from it, and move on.

• How does it feel like when you received the scholarship offer?
I was happy I guess, since I wanted to get a PhD. When I got the offer, a way was opened for me. Since I didn’t come from a rich family, I needed the scholarship, not only to sustain myself but to financially support my family as well.

• What will you miss after graduating?
Probably some student discounts or promotions. Hahaha.
- What is your next adventure / challenge or any plans for the future?
  Up to this point, I still believe that my vocation is to stay in academic research. Hence, I will stay as a postdoctoral fellow for a few years in Singapore, probably a few years outside, then I would apply for an academic faculty position somewhere.

- Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
  I would like to thank everyone, especially my supervisors, wife and friends, who have endured and enjoyed my PhD candidature period together with me. I appreciate their companionship, which have not only given me ideas or inspiration in my research but also kept me away from stress/depression when I faced a lot of failures. I hope I have been a good student and friend to all of you.

- Share with us some memorable photos you’ve taken with 1 line description of each photo.

My friend and I, during our California trip after SPIE Photonic West 2016 conference.
Dr Ding Yichen
Sustainable Earth PhD Programme | Singapore Centre for Environmental Life Sciences and Engineering (SCELSE)

Thesis Title: Revealing The Adaptive Evolution Of Pathogenic Bacteria By Next-Generation Sequencing

Main Supervisor | Assoc Prof Yang Liang
School of Biological Science

Co-supervisor | Assoc Prof Scott Rice
School of Biological Science

Mentor | Assoc Prof Cao Bin
School of Civil and Environmental Engineering

“The test of our progress is not whether we add more to the abundance of those who have much. It is whether we provide enough for those who have little.”

Franklin D Roosevelt
United States’ 32nd President
Dr Dinh Quang Huy
New Media PhD Programme | Institute for Media Innovation (IMI)

Thesis Title: A New Interaction Framework For Human And Robot

Main Supervisor | Assoc Prof Seet Gim Lee Gerald
School of Mechanical and Aerospace Engineering

Co-supervisor | Prof Nadia Thalmann
School of Computer Science and Engineering

Mentor | Prof Lin Weisi
School of Computer Science and Engineering

- **What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?**
  During my undergraduate, I joined several research competitions which made me interested in studying the human-computer interaction problems.

- **What is your thesis about?**
  My thesis dealt with conceptualizing and developing an effective, safe and user-friendly framework for multiple human-robot interaction. The proposed framework has made significant improvements in terms of reducing the operator workload and enhancing the safety problems. The result has contributed to a comprehensive understanding toward a safe close-proximity human-robot interaction.”

- **Why did you choose this topic and how does it benefit people or industries globally or internationally?**
  Robots are deployed in many areas in the daily life and they current can collaborate or work in proximity with human. It is important to assure that human and robot interact safely and effectively. My idea is to develop a human-robot framework with an interaction paradigm to solve this problem. My work provides individuals and companies a safe and efficient way to use a robot in the vicinity of humans.

- **What kind of interaction did you have in IGS? How did that help you?**
  First, I have a main Supervisor, a Co-supervisor and a Mentor who guide me to overcome many academic and daily life problems. Next, I have the opportunity to know many IGS friends who help me in research, have fun with me and share moments in my PhD journey. Finally, I want to thank all IGS staff who care and help me not only in the academic issues but also in creating a wonderful environment for the IGS family.

- **Please share 1 key motivational/ key take away message with your juniors.**
  Make sure you plan and understand what you are doing for every steps in your PhD journey.
• **What are the challenges you faced during the candidature and how did you overcome them?**

There are two main challenges. My first challenge is to clearly define the research problem. This step is difficult for me because I am quite new to the research area and there is a lot of things that I do not know or understand. The solution is to read a lot, meet your supervisor frequently, and open my mind for new ideas. Second, PhD is a long journey and it is hard to manage the time. Sometimes, I lost my target, I got bored and I wondered what I am doing at that moment. The solution is to have a notebook and write down the list of tasks for every days or weeks.

• **What do you think are the key attributes for PhD students to successfully complete their candidature?**

The key to success is to have a clear plan for you PhD and learn to manage your time.

• **What is your next adventure / challenge or any plans for the future?**

I will continue to work in the Human-robot Interaction field and develop more safe and efficient interface to support the communication between human and robot.

• **Share with us some memorable photos you’ve taken with 1 line description of each photo.**

  - Participating in the Inter-school game
  - The end of my PhD journey - Presenting my thesis competition
Dr Fan Yanliang
Future Healthcare PhD Programme | NTU Institute for Health Technologies (HealthTech NTU)
Thesis Title: Drug Delivery In Anterior Chamber Of The Eye For Islet Transplantation As A Diabetic Treatment
Main Supervisor | Assoc Prof Joachim Loo Say Chye
School of Materials Science and Engineering
Co-supervisor | Vg Prof Per-Olof Berggren
Lee Kong Chian School of Medicine
Co-supervisor | Asst Prof Yusuf Ali,
Lee Kong Chian School of Medicine
Mentor | Assoc Prof Sierin Lim
School of Chemical and Biomedical Engineering

• What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?
I was interested to improve my technical skills as well as critical thinking ability to further my career. The interdisciplinary project was very attractive because it broadens the exposure in PhD, and was what I was looking for.

• What is your thesis about?
It was about developing a drug delivery device for diabetic treatment. The project combines the knowledge of bio-engineering with medical application, which provides a fresh angle of how diabetes treatment is approached.

• Why did you choose this topic and how does it benefit people or industries globally or internationally?
I chose the topic because it was relevant to my background and training. Also, the potential application of the project is exciting. It is targeting at a common problem, of which millions of people are affected. The beneficial effect is definitely international.

• What kind of interaction did you have in IGS? How did that help you?
Since the beginning, I felt very welcomed by the IGS group. I had a lot of interaction with the professors, staff and students from different centres. Later on, I joined the club to contribute back. The friendship built during these interactions helped me to handle the stress during the PhD candidature.
• What are the challenges you faced during the candidature and how did you overcome them?
I had difficulties in terms of communication with multiple parties, and to concurrently ensure experiments were going well at multiple sites. The expectations from different disciplines was very different. Hence, lots of effort was required to manage expectations. I put in a lot of hard work so that I was able to use results to prove my theory and therefore convince the different parties.

• What do you think are the key attributes for PhD students to successfully complete their candidature?
The key attributes are determination and endurance. Every PhD candidate will have their own unique challenges and some will be easier while others are tougher. With strong determination, you will have the driving force to find a way out. You may need to create your own path, which will require lot of endurance through the long and dark times.

• What was your proudest moment or fondest memories over the years of candidature?
There were times I got travel awards, presentations in conference, even a presentation competition (Falling Walls). But the proudest moment for me is when I successfully completed the most crucial experiment in the entire PhD. It was one experiment many thought would fail. The result was the best evidence to prove myself and complete my thesis. At that moment, there was no need for an audience and applause. The result itself is the best reward I will always remember.

• Please share 1 key motivational/ key take away message with your juniors.
My motivational message is spend your time wisely. Four years seems to be a long time but it is actually not. Plan properly according to what you want to achieve at the end of the PhD. The plan does not need to be perfect. But with a plan, it is easier to monitor whether you are on track or not. It helps you to think long-term and adds a positive pressure to motivate you. With a plan, you feel more in control rather than being pursued by deadlines.

• What is your next adventure / challenge or any plans for the future?
I am back in the industry to translate the knowledge I acquired in PhD to actual technical development. It is a different field but a lot of things they do is relevant to my PhD. I hope to make some difference in the new job I am doing.
Dr Feng Kaiyu
New Media PhD Programme | Active Living for the Elderly (LILY)

Thesis Title: Selecting The Best Group Of Objects In Spatial Databases And Graphs

Main Supervisor | Assoc Prof Cong Gao
School of Computer Science and Engineering

Co-supervisor | Prof Jane Wang
University of British Columbia

Mentor | Dr Shen Zhi Qi
School of Computer Science and Engineering

• What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?
IGS provides a great opportunity for students to conduct research in the interdisciplinary way. By bridging the disciplines, we have a chance to apply ideas to address real life problems.

• What is your thesis about?
Selecting the best group of objects in spatial databases and graphs.

• Why did you choose this topic and how does it benefit people or industries globally or internationally?
People are facing massive data nowadays. In order to help people to have a better understanding of the data, there have been various data management and exploration systems. My research topic is one of the fundamental tasks in such systems. My research can help people to address several queries in real life, e.g., finding the most diversified region for a tourist to explore.

• What kind of interaction did you have in IGS? How did that help you?
I attended IGS student seminars, where students from different schools introduce their research topics and progress. The IGS student seminar is an excellent opportunity to expand my knowledge. It also inspires me to come up with new ideas about my own research.
• What are the challenges you faced during the candidature and how did you overcome them?
  One challenge during my studies is that I needed to come up with novel research problems to work on. I needed to convince the reviewers that my problem is necessary and useful. To find the appropriate research problem, I discussed with my supervisors and my workmates in the lab, attended seminars to find inspiration, and read papers to see other’s work.

• What do you think are the key attributes for PhD students to successfully complete their candidature?
  I think the key attribute is the ability to learn new knowledge.

• What is your next adventure / challenge or any plans for the future?
  In the future, I plan to get a faculty position and continue my research in data management.

• What was your proudest moment or fondest memories over the years of candidature?
  I attended a top tier conference, SIGMOD 2016, in San Francisco and presented my work to the audience.
**What motivates or triggers you to pursue a doctorate?**
Better career development, my personal interest and to study abroad.

**Why or how did you decide to apply to IGS or the interdisciplinary route of research?**
To get supervision from different schools.

**What is your thesis about?**
Machine learning algorithms for modelling sequential transitions. Predict the next locations for users, and potential visitors for a given location. Find the influential users on social networks.

**Why did you choose this topic and how does it benefit people or industries globally or internationally?**
It’s a very interesting topic, and the proposed models can be exploited for many applications.

**What kind of interaction did you have in IGS? How did that help you?**
Discuss with friends from different backgrounds. Attend many events organised by IGS, which were very useful and interesting.

**What are the challenges you faced during the candidature and how did you overcome them?**
Publications!!!! Keep calm and work hard. Enjoy life, enjoy research.

**What was your proudest moment or fondest memories over the years of candidature?**
To publish my first paper in a top conference, and attend the conference in Canada.
● What do you think are the attributes for PhD students to successfully go through the 4 years?
  Critical thinking and creative thinking. We need to find new research problems and propose novel solutions.

● Please share 1 key motivational/key take away message for your juniors.
  For PhD, EQ is much more important than IQ.

● How does it feel like when you received the scholarship offer?
  Very happy and looking forward to my new life.

● What will you miss after graduating?
  The freedom of research and having lots of time to learn new things.

● What is your next adventure/challenge or any plans for the future?
  Enjoy life, enjoy work. Create something useful for society.

● Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
  Thank you so much. Without their support, I cannot finish my PhD candidature.

● Share with us some memorable photos you’ve taken with 1 line description of each photo.

The photoshoot organized by IGS was professional
Dr Gao Guanyu  
New Media PhD Programme | Rapid-Rich Object Search Lab (ROSE)  
Thesis Title: Towards Resource-Efficient And Qos-Aware Video Adaptation In Media Cloud  
Main Supervisor | Assoc Prof Wen Yonggang  
School of Computer Science and Engineering  
Co-supervisor | Prof Tan Yap Peng  
School of Electrical and Electronic Engineering  
Mentor | Assoc Prof Cai Jianfei  
School of Computer Science and Engineering

Dr Gayatri Shankar Chilambi  
Sustainable Earth PhD Programme | Singapore Centre for Environmental Life Sciences and Engineering (SCELSE)  
Thesis Title: The Mechanism Of Resistance To Conjugated Oligoelectrolytes In Enterococcus Faecalis  
Main Supervisor | Prof Chan Bee Eng Mary  
School of Chemical and Biomedical Engineering  
Co-supervisor | Assoc Prof Scott Rice  
School of Biological Science  
Mentor | Assoc Prof Duan Hongwei  
School of Chemical and Biomedical Engineering

“Opportunities multiply as they are seized.”  
Sun Tze  
Chinese Author of The Art of War on military strategy
Dr Gu Jun
Sustainable Earth PhD Programme | Nanyang Environment & Water Research Institute (NEWRI)

Thesis Title: Novel A-B Processes For Energy-Efficient Municipal Wastewater Reclamation With Minimized Sludge Production

Main Supervisor | Prof Liu Yu
School of Civil and Environmental Engineering

Co-supervisor | Prof William Chen Wei Ning
School of Chemical and Biomedical Engineering

Mentor | Prof Ng Wun Jern
School of Civil and Environmental Engineering

- **What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?**
  In the interdisciplinary environment, I have more opportunity to communicate with people from different areas. This often inspires me in many ways. Moreover, I could also be co-supervised by a professor from a different school.

- **What is your thesis about?**
  My thesis is about developing novel A-B processes for energy-efficient municipal wastewater reclamation with minimized sludge production. The integrated process consists of an A-stage for energy recovery with minimized sludge production and a B-stage for energy-efficient biological nitrogen removal processes, i.e. nitritation-denitritation and mainstream deammonification.

- **Why did you choose this topic and how does it benefit people or industries globally or internationally?**
  Nowadays, wastewater treatment plants worldwide are operating in an energy-negative situation. In fact, the organic matters in the wastewater are not effectively recovered, but wasted in intensive aeration process and forms a huge amount of excess sludge. My topic could enhance the energy recovery with minimized sludge production and reduce the energy required for the subsequent nitrogen removal. This study may lead to a paradigm shift of the WWTP operation from energy-negative to energy self-sufficient.

- **What kind of interaction did you have in IGS? How did that help you?**
  The student seminars I attended expanded my horizon. Supervisors’ talks encouraged me and set examples for us to follow.
What are the challenges you faced during the candidature and how did you overcome them?
The first challenge is to identify a scientific or engineering issue I want to address. It was settled after reading the literature under the supervision of my supervisor in the first six months. The second challenge is the difficulties in operating my reactors. After reactor collapse for a few times, I consulted with my seniors, asked advice from my supervisor and read more papers to solve this problem.

What do you think are the key attributes for PhD students to successfully complete their candidature?
Get inspired by the talks with supervisors and people in your area. Take action quickly to work on the ideas.

What was your proudest moment or fondest memories over the years of candidature?
My proudest moment would be when my first paper got published.

Please share 1 key motivational/ key take away message with your juniors.
Think while you work in the lab.

What is your next adventure / challenge or any plans for the future?
Continue my research work and seek to apply the developed process on a larger scale.
Dr Guo Qingyu
New Media PhD Programme | Active Living for the Elderly (LILY)
Thesis Title: Combating Adversaries In Network-Structured Security Domains
Main Supervisor | Assoc Prof Bo An
School of Computer Science and Engineering
Co-supervisor | Assoc Prof Wang Huaxiong
School of Physical and Mathematical Sciences
Co-supervisor | Prof Miao Chun Yan
School of Computer Science and Engineering
Mentor | Dr Shen Zhiqi
School of Computer Science and Engineering

Dr Guo Tao
New Media PhD Programme | Rapid-Rich Object Search Lab (ROSE)
Thesis Title: Geospatial Data Analysis: From Querying To Visualized Exploration
Main Supervisor | Assoc Prof Cong Gao
School of Computer Science and Engineering
Co-supervisor | Assoc Prof Yap Kim Hui
School of Electrical and Electronic Engineering
Mentor | Prof Lin Weisi
School of Computer Science and Engineering

“You can be anything you want to be, do anything you set out to accomplish if you hold to that desire with singleness of purpose.”

Abraham Lincoln
United States’ 16th President
What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?
The ambition and interest in research related to materials science and energy storage motivated me to pursue a doctorate in IGS.

What is your thesis about?
My thesis is on iron oxide-based hybrids were in-depth studied for lithium ion batteries. The nanostructure evolution of iron oxide anodes was revealed through ex-situ TEM and XRD measurement to comprehensively understand their electrochemical behaviour during cycling.

Why did you choose this topic and how does it benefit people or industries globally or internationally?
Lithium ion batteries have been extensively utilized in our daily life. The development of novel anode materials with high capacities seems to be urgent and necessary. My PhD project focuses on iron oxide-based materials processing attractive and promising properties and the conclusion could lead to performance improvement of iron oxide anodes.

What kind of interaction did you have in IGS? How did that help you?
IGS offers great opportunities for collaboration with industrial companies, which broadened my mind and enriched scientific ideas and industrial knowledge. It has also prepared me for employment in the semiconductor industry.
● What are the challenges you faced during the candidature and how did you overcome them?
Exploration of science is a lonely but exciting journey, which requires patience and involvement. To offset the frustration from experiments, it’s good to have some hobbies and friends to share the pain and happiness.

● What do you think are the key attributes for PhD students to successfully complete their candidature?
The key attributes are to be patient and always ready to have communication with experienced scientists. Sometimes, collision of academic minds and spirits can create a real spark in scientific area.

● What was your proudest moment or fondest memories over the years of candidature?
During my spare time, while pursuing the PhD degree, I passed the CFA-level 1 exam. These experiences largely extended my vision and readies me to work in an industrial area.

● Please share 1 key motivational/ key take away message with your juniors.
Please be logical and patient, and the spirits will be your friends and lead you to a better life.

● What is your next adventure / challenge or any plans for the future?
The next challenge would be how to be a good engineer in the semiconductor area. Since it’s a totally strange area for me, this would be a fresh and huge adventure. God bless me, may everything be better.
Dr Hitomi Shirahama
Future Healthcare PhD Programme | NTU Institute for Health Technologies (HealthTech NTU)

Thesis Title: Gelatin Methacryloyl Inverted Colloidal Crystal Scaffolds As Artificial Liver Platform

Main Supervisor | Assoc Prof Cho Nam-Joon
School of Materials Science and Engineering

Co-supervisor | Asst Prof Moon Seung Ki
School of Mechanical and Aerospace Engineering

Mentor | Assoc Prof Jeffrey S. Glen
Stanford University

“Time is the coin of your life. It is the only coin you have, and only you can determine how it will be spent. Be careful lest you let other people spend it for you.”

Carl August Sandburg
American Poet, Historian Novelist & Folk Musician
Dr Hou Yaqing  
New Media PhD Programme |  
Multi-PlAtform Game Innovation Centre (MAGIC)

Thesis Title: Evolutionary Transfer Learning For Complex Multi-Agent Reinforcement Learning Systems

Main Supervisor | Prof Ong Yew Soon  
School of Computer Science and Engineering

Co-supervisor | Assoc Prof Lim Meng-Hiot  
School of Electrical and Electronic Engineering

Mentor | Assoc Prof Chng Eng Siong  
School of Computer Science and Engineering

- **What motivates or triggers you to pursue a doctorate?**  
  To be able to work with intellectual people who share a common interest.  
  To give me better qualifications in my area.  
  To have a global or international vision.

- **Why or how did you decide to apply to IGS or the interdisciplinary route of research?**  
  1). IGS is new, and to some extent different from the conventional subjects. And I like to try new things. 2). I am interested in the disciplines that I cross in my research.

- **What is your thesis about?**  
  My thesis is about the topic of multi-agent system in computer science. This particular focus is placed on an evolutionary transfer learning framework for problem solving in multi-agent learning systems.

- **Why did you choose this topic and how does it benefit people or industries globally or internationally?**  
  On one hand, my supervisor is a very famous expert on this topic. On the other hand, multi-agent systems are not only important in our common life, but also bring us big opportunities towards smarter artificial intelligence, which is very useful and hot.

- **What kind of interaction did you have in IGS? How did that help you?**  
  Very nice group activities, such as those at Outward Bound Singapore. When I was a newbie in IGS, these activities definitely helped me get familiar with the IGS family and PhD studies.

- **What are the challenges you faced during the candidature and how did you overcome them?**  
  One of the challenges is to determine the research topic. The answer in my case is to discuss more with supervisors and read more. Another challenge will be the long-playing research time during PhD studies. And to overcome this, you need to develop some personal hobbies or interests.
• What was your proudest moment or fondest memories over the years of candidature?
The very first time that I published my first paper. That feeling is good. It proves that I really
can do some research and come up with some outcomes.

• What do you think are the attributes for PhD students to successfully go through the 4 years?
Be patient, keep track of things you do. Everything could possibly inspire an idea for
publication.
Learn to get some simple things done, so as to become more confident.

• Please share 1 key motivational/ key take away message with your juniors.
PhD Belongs to the Persevering.

• How does it feel like when you received the scholarship offer?
That is great! I can never imagine that I will have a chance to become a doctor in my future.
But I know it will be hard to finish that.

• What will you miss after graduating?
To learn is a happy thing. To be a student is a happy thing too. But I will have no more
chance to be a student again!

• What is your next adventure / challenge or any plans for the future?
Find a good job. And give full play to the professional knowledge that I have learnt.

• Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
I would like to express my deepest gratitude to my supervisor. Without his help, I can never
complete my PhD journey successfully. I would also like to extend my special thanks to my
family and girlfriend for their deepest love and everlasting encouragement throughout my
PhD candidature.

• Share with us some memorable photos you’ve taken with 1 line description of each photo.

Interaction at Outward Bound Singapore
• **What motivates or triggers you to pursue a doctorate?**
  When I was doing my bachelor degree in Vietnam, I really wished to have an opportunity to study abroad for a higher degree in a highly developed country in order to improve my educational background and seek better professional opportunity. Therefore, pursuing a doctorate degree was the best option to achieve my goal.

• **Why or how did you decide to apply to IGS or the interdisciplinary route of research?**
  I always believe that the interdisciplinary study and research environment is the best place to develop my ability to quickly adapt to the intensive collaborations and correlations between individuals as well as disciplines in real working life nowadays. Therefore, I decided to apply to IGS.

• **What is your thesis about?**
  My thesis presents the study on the performance enhancement of vortex induced vibration (VIV) energy harvesting systems by introducing nonlinear dynamics elements. In addition, the thesis also discusses the mitigation of chaotic response that might occur in the system.

• **Why did you choose this topic and how does it benefit people or industries globally or internationally?**
  The world energy supply is mainly relying on fossil fuels which are hardly renewable and environmentally destructive. Therefore, renewable energy technologies need to be developed as alternative solutions. The VIV energy technology is a potential solution to harvest energy from low speed water flows with prominent merits such as high output efficiency, low production cost, etc. Therefore, I chose this topic in order to develop the VIV energy technology and make it more applicable.
• **What kind of interaction did you have in IGS? How did that help you?**
  There were 3 kinds of interaction that I had in IGS. The first is the interaction with IGS supervisor, Dean. I learnt from him insightful advice to be a good researcher. The second is the interaction with the IGS Team, ERI@N Administrators and other staff. Their dedicated support made a great part of my PhD journey successful. Last but not least, it is the interaction with other IGS students. They are all my lovely friends. I had a lot of stress release and shared experiences with them, while I was doing research for 4 years.

• **What are the challenges you faced during the candidature and how did you overcome them?**
  The biggest challenge was my very limited English speaking skill at the beginning. My supervisor was also complaining about it. Therefore, I joined the Nanyang Scholars Toastmaster Club to practise my speaking skill and it is much improved now.

• **What was your proudest moment or fondest memories over the years of candidature?**
  There were two most memorable and meaningful moments. The first was when my first journal paper was accepted for publication after being rejected 3 times. It felt like all the hard work and efforts paid off. And the second, of course, was when I successfully completed my oral examination. At that moment, I felt deeply thankful to IGS, my supervisors and my friends for the wonderful journey as well as for making my PhD journey possible.

• **What do you think are the attributes for PhD students to successfully go through the 4 years?**
  Firstly, PhD students should be good at communication skills since they have to communicate with many people such as supervisors, admin staff, technicians, suppliers, team members, FYP students. Secondly, the basic skill-set of a researcher, e.g. critical thinking, problem solving, creative and innovative thinking, lab-skill, etc. Last but not least, PhD students must always strictly follow the research integrities.

• **Please share 1 key motivational/ key take away message with your juniors.**
  To my juniors, be always prepared as opportunity will knock on the door at any time!

• **How does it feel like when you received the scholarship offer?**
  I was extremely excited, happy and nervous. I knew it was going to be a turning point in my life (and it is true now 😊). At the same time, I was sad since I was going to be away from my girlfriend (who is my wife now 😊).
● **What will you miss after graduating?**
To be honest, I will miss all the lovely and friendly members of the IGS Team, ERI@N Administrators and other staff. They always make me feel that I am not alone in my PhD journey. Again, a lot of thanks for your all dedicated support.

● **What is your next adventure / challenge or any plans for the future?**
For next few years, I would like to work in Singapore as a researcher to earn more experience and enrich my academic profile. After that, I still don’t know 😊!

● **Is there anything you want to say to your family, supervisors, mentors, friends or anybody?**
Again, a lot of thanks to Singapore, NTU, IGS, ERI@N, my family, supervisors, mentors, IGS Team, ERI@N staff, technicians at Mechatronics Lab and my friends who have made my PhD journey possible.

● **Share with us some memorable photos you’ve taken with 1 line description of each photo.**

![Attending the ISMA Conference, trip sponsored by EEE for IGS students Leuven – Belgium, 2016](image1)

![After successful PhD Oral Examination on 23 Nov 2017](image2)
Dr Huynh Nam Khoa
Sustainable Earth PhD Programme | Energy Research Institute @ NTU (ERI@N)

Thesis Title: Model-Based Optimal Control Coupled With CFD Analysis For Performance Of Energy Recovery Ventilator In HVAC System

Main Supervisor | Assoc Prof Li Hua
School of Mechanical and Aerospace Engineering

Co-supervisor | Prof Soh Yeng Chai
School of Electrical and Electronic Engineering

Mentor | Prof Xie Lihua
School of Electrical and Electronic Engineering

Dr Huynh Phuoc Tho
Sustainable Earth PhD Programme | Singapore Centre for Environmental Life Sciences and Engineering (SCELSE)

Thesis Title: Development of Micro-Calorimeter System To Characterize Thermal Behavior Of Biofilm

Main Supervisor | Asst Prof Zhang Yilei
School of Mechanical and Aerospace Engineering

Co-supervisor | Prof Yehuda Cohen
School of Biological Science

Mentor | Assoc Prof Cao Bin
School of Civil and Environmental Engineering

Dr Jedrzej Marcin Majewski
Sustainable Earth PhD Programme | Earth Observatory of Singapore (EOS)

Thesis Title: Coral Microatoll Based Sea Level Records From The Sunda Shelf

Main Supervisor | Assoc Prof Adam D Switzer
Asian School of the Environment

Co-supervisor | Assoc Prof Federico Lauro
Asian School of the Environment

Co-supervisor | Assoc Prof Charles Martin Rubin
Asian School of the Environment

Mentor | Assoc Prof Nathalie Goodkin
Asian School of the Environment
Dr Jerripothula Koteswar Rao
New Media PhD Programme | Rapid-Rich Object Search Lab (ROSE)

Thesis Title: Co-Saliency Based Visual Object Co-Segmentation And Co-Localization

Main Supervisor | Assoc Prof Cai Jianfei
School of Computer Science and Engineering

Co-supervisor | Assoc Prof Yuan Junsong
School of Electrical and Electronic Engineering

Mentor | Assoc Prof Zheng Jianmin
School of Computer Science and Engineering

● What motivates or triggers you to pursue a doctorate?
My ambition of becoming a scientist.

● Why or how did you decide to apply to IGS or the interdisciplinary route of research?
Interdisciplinary research is the need of the hour.

● What is your thesis about?
My thesis work dealt with tackling challenging problems like joint object segmentation and localization in a group of images or videos containing similar objects. These are important problems in the multimedia and big data era. I gained extensive experience in developing weakly supervised ideas like saliency co-fusion, co-saliency activated tracklets, object co-skeletonization, etc; all based on co-saliency. The results generated demonstrate well the significance of co-saliency in handling such problems.

● Why did you choose this topic and how does it benefit people or industries globally or internationally?
I am quite passionate about computer vision research; and object segmentation and localization are basic problems in computer vision.

● What kind of interaction did you have in IGS? How did that help you?
I had great interactions with my supervisors and friends I made in IGS. I had the great opportunity to meet my supervisor once every two weeks, which gradually helped me develop as a researcher. Different seminars and events conducted by IGS became nice platforms to share our ideas and experiences with other friends.
What are the challenges you faced during the candidature and how did you overcome them?
It was quite tough in the beginning because I was just an undergraduate with very little experience in research. Respecting my supervisors' expertise, I followed their guidance and finally overcame all the hurdles I faced during my PhD.

What was your proudest moment or fondest memories over the years of candidature?
The moments when I realized that I got my papers accepted in the top CV conferences: CVPR and ECCV.

What do you think are the attributes for PhD students to successfully go through the 4 years?
Persistence and Obedience

Please share 1 key motivational/ key take away message with your juniors?
PhD is 99% perspiration and only 1% inspiration, despite that, what drives it is correct motivation.

How does it feel like when you received the scholarship offer?
I felt extremely grateful.

What will you miss after graduating?
Close guidance from my supervisors and the friends I made in due course.

What is your next adventure / challenge or any plans for the future?
Getting into premier institutes of India like IITs as a faculty member.

Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
Thanks for being there; without you all I wouldn't have achieved what I did.
Dr Jin Mengyi  
Sustainable Earth PhD Programme | Nanyang Environment & Water Research Institute (NEWRI)  

Thesis Title: Development Of High-Performance Polydimethylsiloxane-Based Nanofibrous Composite Membranes For Phenol Removal From Wastewater  

Main Supervisor | Prof Wang Rong  
School of Civil and Environmental Engineering  

Co-supervisor | Prof Tan Choon Hong  
School of Physical and Mathematical Sciences  

Mentor | Asst Prof Chong Tzyy Haur  
School of Civil and Environmental Engineering  

“Whatever you do, do it well. Do it so well that when people see you do it, they will want to come back and see you do it again; and they will want to bring others and show them how well you do what you do.”  
Walt Disney  
American Film Producer, Director, Entrepreneur, Philanthropist, Academy Award Winner, 26 times
Dr Jogdeo Prasanna
Sustainable Earth PhD Programme | Singapore Centre for Environmental Life Sciences Engineering (SCELSE)

Thesis Title: Role Of Mixed Species Microbial Community Biofilms In Microbially Influenced Corrosion

Main Supervisor | Assoc Prof Scott Rice
School of Biological Science

Co-supervisor | Dr Enrico Marsili
School of Chemical and Biomedical Engineering

Mentor | Assoc Prof Federico Lauro
Asian School of the Environment

• What motivates or triggers you to pursue a doctorate?
  Doing a doctorate taught me to address a question in a holistic approach. It is important to understand, plan, execute, analyse and present / summarize a research question in an orderly manner. My PhD taught me this approach which can be implemented to any question or a problem in my personal and professional life.

• Why or how did you decide to apply to IGS or the interdisciplinary route of research?
  Implementing different disciplines is the ideal way for addressing environmental problems. Since I was working on corrosion, an interdisciplinary approach allowed me to think of the research question from different disciplines like Material Science, Electrochemistry, and Microbiology. Working in SCELSE provided me with a platform with access to experts in all these fields.

• What is your thesis about?
  I worked on role of mixed microbial communities in microbially influenced corrosion. I designed two systems to monitor corrosion behaviour of metal in the presence of a fixed marine community, by implementing imaging, sequencing, surface analysis techniques along with electrochemistry. This approach is the first of a few to understand the role of mixed community biofilms in corrosion in contrast with the traditional culture based, single species approach.

• Why did you choose this topic and how does it benefit people or industries globally or internationally?
  Corrosion is a worldwide problem causing huge economic and infrastructure loss. However, a unified theory to understand the process is missing. Understanding this complex process will benefit several industries like shipping, aviation, oil piping, drinking water distribution systems etc with large metal infrastructures. Understanding the process will allow us to think about more efficient solutions to the problem.
What kind of interaction did you have in IGS? How did that help you?
Being a part of IGS student club taught me to operate as a team member as well as a team leader. Planning and managing events was beneficial for honing communication skills. I also had the opportunity to attend USLS University student’s leadership symposium in Hong Kong, which was a wonderful opportunity.

What are the challenges you faced during the candidature and how did you overcome them?
In the beginning coming back to academic life, research and coursework was a challenge after three years of professional experience in India. I think, putting in extra effort without losing enthusiasm helped me during that stage of PhD.

What was your proudest moment or fondest memories over the years of candidature?
Getting an opportunity to discuss my research with one of the leading scientists in my area, Dr. Brenda Little and being appreciated for the “brave” approach used was one of my proudest moments along with publishing my data in a good journal.

What do you think are the attributes for PhD students to successfully go through the 4 years?
I think innovative, out of the box thinking and perseverance are the keys for a successful PhD life. A PhD life has ups and downs. Holding on to the ground, not being overwhelmed by the success is very important. At the same time not getting frustrated or not giving up during a low tide is also a key.

Please share 1 key motivational/ key take away message with your juniors.
Keep at it no matter what! But don’t refrain from using an innovative approach.

How does it feel like when you received the scholarship offer?
It was a great feeling to get a scholarship in a top ranked university. Then the realisation of the huge responsibility sunk in.

What will you miss after graduating?
I will miss the discussions with experts from different fields, the freedom in implementing novel ideas. I will also miss student life at NTU.

What is your next adventure / challenge or any plans for the future?
A major challenge in my next endeavour is to prove the approach of phytoremediation in wastewater treatment and convince my customers. Being an entrepreneur is a big challenge and change after the PhD life.

Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
I would like to thank my supervisor Assoc Prof Scott Rice and my co-supervisor Dr. Enrico Marsili, in believing in me to take the challenge of studying a complex process like microbially influenced corrosion and helping me throughout the journey. I would also like to thank my family for having faith in me for the last four years and supporting me emotionally, mentally and financially.
• Share with us some memorable photos you’ve taken with 1 line description of each photo.

With team SCELSE at ISME 2016 in Montreal, Canada

The road - trip across Canada after ISME 2016

Presenting my research at Gordon Research Conference 2016 in New Hampshire, USA

Make new friends during GRC 2016

Fun IGS student activities
“Discovery consists of looking at the same thing as everyone else does and thinking something different.”

Albert Szent-Gyorgyi
Hungarian-born American Biochemist & Physiologist
Nobel Laureate
Dr Kanamarlapudi Venkata Ravi Kishore
Sustainable Earth PhD Programme | Energy Research Institute @ NTU (ERI@N)
Thesis Title: Soft-Switched DC-DC Converters For PHEV Charger

Main Supervisor | Assoc Prof So Ping Lam
School of Electrical and Electronic Engineering

Co-supervisor | Assoc Prof Chan Chi Chiu Julian
School of Chemical and Biomedical Engineering

Mentor | Asst Prof Tang Yi
School of Electrical and Electronic Engineering

• **What motivates or triggers you to pursue a doctorate?**
  Teaching. I am passionate about teaching and wanted to be in teaching from my childhood. After finishing my Bachelor studies, I worked in a service-based organization (Tata Consultancy Services, India) for two years and product-based organization (General Motors, India) for one and a half years. After having 3+ years of industrial working experience, I realized that I am very suitable for teaching and I can perform well at it. Then, I felt that completing doctoral studies would boost my career interests.

• **Why or how did you decide to apply to IGS or the interdisciplinary route of research?**
  In one sentence, interdisciplinary research program is a lot better compared to other research programs and much needed for future technologies. Prior to joining IGS, PhD program, I was working as a Research Engineer under Energy Research Institute @ NTU (ERIAN). Therefore, I am aware of IGS research theme and its peaks of excellence. For example, under ERIAN, it brings Professors with different expertise under one umbrella. It would give me an opportunity to learn technologies in cross disciplinary areas.

• **What is your thesis about?**
  My thesis work dealt with high efficiency, high power density dc-dc converters for charging the battery pack in plug-in hybrid electric vehicles. I have worked on analysis, design, development and testing of power converters, high frequency magnetics, gate drivers and control software. The experimental results validated the improved performance of proposed converters over conventional converters.
Why did you choose this topic and how does it benefit people or industries globally or internationally?
Adoption of plug-in hybrid electric vehicles and pure electric vehicles is inevitable for future transportation in-view of reducing the carbon emissions. Availability of high power density and high efficiency battery chargers is one of the big challenges for wide usage. Therefore, I chose soft-switched dc-dc converter topic for my research studies. The proposed work also finds use in solid-state transformer, server power supply and renewable energy power conditioning interface systems.

What kind of interaction did you have in IGS? How did that help you?
Interaction with peer students at seminars and workshops helped me to understand various interdisciplinary research topics and was useful for my own research as well.

Interaction with IGS administration staff helped me to have a vibrant and friendly environment at NTU.

What are the challenges you faced during the candidature and how did you overcome them?
Choosing The Right Research Topic: There were many areas of research (power converters for battery charger, battery management system, high frequency magnetics and control system design etc.,) to focus on when my supervisor gave me the research area (battery charging for electric vehicles). I did strong literature review for almost two years before finalizing the topic. Then, I decided to start with power converters first.

Hardware Development: It was very challenging to develop the hardware platform for the power converters. I had many discussions with peer researchers, researchers at other universities and conferences.

What was your proudest moment or fondest memories over the years of candidature?
There are many proud moments in my PhD journey:
First and foremost, receiving PhD admission with scholarship;
Best paper presentation award at IEEE INDICON conference, India, 2015;
Acceptance of first publication in IEEE Transactions in Power Electronics;
Outstanding Teaching Assistant Award from EEE, NTU for the academic year 2015-2016;
Outstanding Teaching Assistant Award from EEE, NTU for the academic year 2016-2017;
Finally, successful completion of my PhD.

What do you think are the attributes for PhD students to successfully go through the 4 years?
Patience, Diligence, Motivation.
• Please share 1 key motivational/ key take away message with your juniors?
Do not be frustrated and distressed with the hurdles in your PhD. Feel fortunate and happy as the experience gained will be very helpful for your future.

• How did it feel when you received the scholarship offer?
It is the happiest and proudest moment in my life till now.

• What will you miss after graduating?
Student Life @ IGS, NTU.

• What is your next adventure / challenge or any plans for the future?
Currently, I am working on a prestigious, ambitious and challenging project at ERIAN, NTU as a Research Fellow. In parallel, my friend and I are working on a start-up. I hope it will materialize in 2-3 years.

• Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
Family: My sincere respect to my family members for believing in me, accepting my decisions and encouraging me to achieve my dreams. I especially appreciate my brother, Mr. Kiran Kumar, for undertaking some family responsibilities for me and supporting me when I was in need.
Supervisors & Mentors: I wish to express my utmost gratitude to Prof. So Ping Lam, Prof. Gooi Hoay Beng, Dr. Sivaneasan, Dr. Nandha, Brahmendra, Prof. Tang Yi and Prof. Julian.
Friends: I would like to thank my dearest friends for their invaluable kindness, unconditional help and moral support.
I am also thankful for the support provided by the laboratory staff Chia-Nge Tak Heng and Foo Mong Keow Thomas. I especially thank Lily, Minying and Ellen at IGS for their administrative support.
My indebted thanks to each and everyone who have made NTU a vibrant and happy place for EDUCATION.

• Share with us some memorable photos you’ve taken with 1 line description of each photo.

IGS Family @ Singapore
Dr Khan Amit Kumar
Future Healthcare PhD Programme
NTU Institute for Health Technologies (HealthTech NTU)

Thesis Title: Self-Assembled Biomimetic Architectures: Protein-Polymer Conjugates And Lipid-Polymer Hybrids For Biomedical Applications

Main Supervisor | Prof Bo Liedberg
School of Materials Science and Engineering

Co-supervisor | Assoc Prof Sierin Lim
School of Chemical and Biomedical Sciences

Co-supervisor | Adj Asst Prof Madhavan Nallani
School of Materials Science and Engineering

Mentor | Prof Bernhard Otto Boehm
Lee Kong Chian School of Medicine

• What motivates or triggers you to pursue a doctorate?
When I was pursuing a master degree in Chemistry and Materials science, I started relating my studies to several bio-applications. I found a nice correlation between chemistry, materials science and biology. The advancement of materials can solve many long-standing challenges in biology and medicine. IGS allows me to merge both fields together as an interdisciplinary study between science and biology materials.

• What is your thesis about?
My thesis dealt with developing novel self-assembled biomimetic architectures for biomedical applications. My major research work involves design and synthesis of protein-polymer conjugated vesicles which mimic virus assemblies and lipid-polymer hybrid vesicles mimic cell membrane architectures. I extensively used bio-conjugation chemistry to design these complexes and played with various protein, lipid, and polymer materials to achieve my desired goal. These artificial assemblies are an excellent choice for drug delivery carrier and useful for various biomedical applications.

• Why did you choose this topic and how does it benefit people or industries globally or internationally?
I chose this topic because there is a huge scope of improvement in future biomedical application. Synthetic artificial assemblies are emerging at its highest and replacing conventional carriers because of their superiority in multi-functionality, stability, scalability, and customizability. These synthetic carriers have a tremendous impact on pharmaceutical products development (such as drug/gene delivery carrier, vaccine development), therapeutics, diagnostics and various biomedical applications.
• **What kind of interaction did you have in IGS? How did that help you?**
The interdisciplinary arena of IGS allow us to meet with students of various disciplines which helps us to learn many new things besides our own research topics. I learned many new and interesting facts from IGS-SS, IGS-DL, and IGS-DS. Motivational talks and experience sharing from IGS-ST helped me to deal with daily life challenges.

• **What are the challenges you faced during the candidature and how did you overcome them?**
Throughout my PhD candidature, IGS staff team and HealthTech NTU were a great help in every aspect. I am using this platform to thank them for their countless support and encouragement during those days. However, I would like to highlight one point about challenges I faced during my early years of PhD candidature and that is, getting access to the instruments. In particular this process is extremely slow and needs active participation on my part.

• **What do you think are the attributes for PhD students to successfully go through the 4 years?**
In my opinion, self-confidence is the most important attribute, more than anything else.

• **Please share 1 key motivational/ key take away message with your juniors.**
PhD is a training period where we learn how to deal with a problem, how to scientifically tackle and solve a problem. However, this is just a demonstration, and real challenges are yet to come. So, enjoy learning as a process rather than as an accomplishment.

• **What is your next adventure / challenge or any plans for the future?**
To prove and prepare me to be a principal investigator in the future.

IGS-HealthTech NTU - IITB Symposium, 2017
Dr Koon Yen Ling
Future Healthcare PhD Programme | NTU Institute for Health Technologies (HealthTech NTU)

Thesis Title: Computational Modelling Of Protein-Protein And Cell-Cell Interaction Across Multiple Scales

Main Supervisor | Assoc Prof Koh Cheng Gee
School of Biological Science

Co-supervisor | Prof William Chen Wei Ning
School of Chemical and Biomedical Engineering

Co-supervisor | Dr Chiam Keng Hwee
A*Star

Mentor | Dr Zacharias Aloysius Dwi Pramono
National Skin Centre (NSC)

● What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?
Research these days is more interdisciplinary and I felt it was important to have a broad opinion about developments in science. Also, I have always been interested in understanding biology using concepts in physics and engineering. And that is why I decided on an interdisciplinary route, so that I can pursue my interests in both biology and physics without having to sacrifice one or the other.

● What is your thesis about?
My research involves using ordinary differential equations to model the sprouting process in angiogenesis. Classical angiogenesis models fail to explain cellular patterns observed experimentally. I discovered that by including two commonly neglected mechanisms 1) intracellular Notch heterogeneity and 2) tension modulation of rate constants, my angiogenesis model is able to reproduce the diverse sprouting patterns and I then go on to validate my model predictions experimentally.

● Why did you choose this topic and how does it benefit people or industries globally or internationally?
Angiogenesis is a physiological process that is hijacked during cancer to provide tumour cells with the oxygen and nutrients to sustain uncontrolled cell proliferation. In order to investigate how we can modulate angiogenesis to inhibit cancer development, we first have to understand the angiogenesis process clearly. And I felt, having a computational model that can simulate the angiogenic process will be useful to further our knowledge of angiogenesis. Modifications and perturbations can then be performed in silico using the computational model which may be difficult or tedious to conduct experimentally.
● What kind of interaction did you have in IGS? How did that help you?
I enjoyed working with researchers from different fields. I have collaborated with physicists, molecular biologists as well as engineers. They have provided me different angles of looking at the same problem and their experience in their respective fields have also allowed me to widen my perspective on research.

● What are the challenges you faced during the candidature and how did you overcome them?
Occasionally, my models fail to predict experimental results. When this occurs, I have to go back to the drawing board to understand what I'm missing and why my model fails to perform to expectations. Talking to my supervisors as well as other collaborators have helped in fine-tuning the models and making the models more predictive.

● What do you think are the key attributes for PhD students to successfully complete their candidature?
Perseverance. Throughout my PhD journey, I had more setbacks than successes. And typically, things do not turn out the way they should. So having perseverance helps in ensuring projects reach completion even in the face of disappointment.

● What was your proudest moment or fondest memories over the years of candidature?
My proudest moment will be publishing papers. It's a proud moment knowing many months or years of hard work paid off in the form of a tangible article in a journal. And that, my work has been recognised by peer reviewers to be considered good enough for publishing.

● Please share 1 key motivational/ key take away message with your juniors.
Not all who wander are lost. During my PhD years, I spent a considerable amount of time trying to formulate my thesis and my personal research direction. Time spent looking for direction is not time wasted, but quality time spent preventing U-turns further in life.

● What is your next adventure / challenge or any plans for the future?
I am hoping to secure a postdoctoral position and hope to further my research career to greater heights. Hopefully, I can generate more papers. I enjoy science, and I hope to stay in science as long as possible.
What motivates or triggers you to pursue a doctorate?
Obsession towards scientific exploration, willingness to take bold risks and to be able to face the problems and challenges head on.

Why or how did you decide to apply to IGS or the interdisciplinary route of research?
Back in the year 2012, I was not fully aware of IGS nor did I meet the requirements of IGS/SCELSE PhD programs. It was Prof. Kimberly Kline, who was then my first doctoral advisor, who gave me rigorous scientific training, motivated and helped me to prepare for IGS PhD program. If it were not for Prof. Kimberly, I would not have made it to IGS.

What is your thesis about?
My thesis provides basic understanding on how proteins that reside in bacterial compartments changes its patterns when exposed to drug-like molecules. Furthermore, the thesis also sheds light on imaging techniques to quantify the dynamics of biomolecules.

Why did you choose this topic and how does it benefit people or industries globally or internationally?
As mentioned before, visualizing bacterial proteins and quantifying their interaction with drug-like molecules has long been a challenging task. I was fortunate to identify this problem at the very early days of my PhD and managed to provide a feasible solution, which can be used as a starting point to design novel drugs for bacterial infections.

What kind of interaction did you have in IGS? How did that help you?
The seminar events and bonding sessions were great platforms to share problems and challenges. The IGS staff in particular was very supportive in coordinating such events.
• What are the challenges you faced during the candidature and how did you overcome them?
During the course of my PhD, I got myself involved in conflicts and controversies with close friends, colleagues, and even with my advisors. Even today, some of those memories remain painful. However, I still have a great deal of respect for all of them. My critics were for the most part honourable as we engaged in battles of ideologies, morals, and ethics. As years go by, I learnt to deal with those criticisms in a constructive manner.

• What was your proudest moment or fondest memories over the years of candidature?
I would say almost all of the days in the first year of my PhD was memorable, as I marshalled along with a relatively small but dedicated group of researchers, to achieve what seemed to be a scientifically challenging and physically demanding task.

• What do you think are the attributes for PhD students to successfully go through the 4 years?
Try to learn and land on your own feet.

• Please share 1 key motivational/ key take away message with your juniors?
Do not depend on others too much, even supervisors for that matter. The only person you can rely on is just you.

• How does it feel like when you received the scholarship offer?
The feeling was so intense, once you experience it you will keep searching for it again.

• What will you miss after graduating?
Late night stay in the lab and heated scientific debates.

• What is your next adventure / challenge or any plans for the future?
My current challenge is to identify a below average student and to transform him/her to become an excellent and globally renowned scientist. The goal might sound farfetched but let me give it a shot.

• Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
To Liew Tze Horng (Clair) and Charles, wherever you are, I miss you...
• **Share with us some memorable photos you’ve taken with 1 line description of each photo.**
  The golden era. When the team was getting ready for scientific pursuit!!

L to R: Prof. Kimberly Kline, Ms. Liew Tze Horng, and myself.
Dr Li Zhuyun
Future Healthcare PhD Programme | NTU Institute for Health Technologies (HealthTech NTU)

Thesis Title: Promoting Of Neuronal Viability By Mechano-Regulation Of Neuron-To-Neuron Contacts

Main Supervisor | Prof Chen Xiaodong
School of Materials Science and Engineering

Co-supervisor | Assoc Prof Eugene Makeyev
King’s College London

Mentor | Asst Prof Eyleen L.K Goh
National University of Singapore (NUS)

“If you have an apple and I have an apple and we exchange these apples, then you and I will still each have one apple. But if you have an idea and I have an idea and we exchange these ideas, then each of us will have two ideas.”

George Bernard Shaw
Irish Playwright, Political Activist
Nobel Laureate & Oscar winner
Dr Lim Jia Hui
Sustainable Earth PhD Programme | Energy Research Institute @ NTU (ERI@N)

Thesis Title: Development Of (TAML)Iron Complexes For Photocatalytic, Oxidative Water Treatment

Main Supervisor | Asst Prof Soo Han Sen
School of Physical and Mathematical Sciences

Co-supervisor | Assoc Prof Lim Teik Thye
School of Civil and Environmental Engineering

Mentor | Assoc Prof Richard Webster
School of Physical and Mathematical Sciences

● What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?
I attended one of the recruitment talks by IGS towards the end of my undergraduate studies. I was fascinated by the idea of doing interdisciplinary research and the interdisciplinary exposure that this programme could offer. Subsequently I applied for the IGS scholarship.

● What is your thesis about?
My thesis described the research effort to photochemically activate the iron tetraamido macrocyclic ligand, (TAML)Fe catalyst for water pollutant degradation. The (TAML)Fe catalyst has been reported to be able to degrade persistent water pollutants such as chlorophenols, powered by chemical oxidants. However, there was little research about the photochemical activation of this promising catalyst. Therefore, our objective was to study the fundamental photochemical activation mechanism and subsequently assemble a photochemical setup to utilize light to activate the (TAML)Fe catalyst for water pollutant degradation.

● Why did you choose this topic and how does it benefit people or industries globally or internationally?
I have a strong passion for conservation of the environment through sustainable management of our resources. I believe that clean energy research can reduce our reliance on fossil fuels and its adverse effects on the environment. Hence, I decided to pursue a doctoral study in energy research at IGS/ERIAN. My thesis topic interests me immensely because it combines energy research with pollutant degradation, and a collaboration between Chemistry and Civil and Environmental Engineering will provide new insights to this research project.
• **What kind of interaction did you have in IGS? How did that help you?**
  I attended many IGS seminars, be it research related or non-research related, and I took a couple of IGS modules in my first year. The part I appreciate the most is the non-research related seminars such as transferable skills, career preparation, and motivational talks. These skills are important to help us transit from a PhD student to our career choice. It also shows IGS’s commitment and willingness to invest in its students to give us a good start in our careers.

• **What are the challenges you faced during the candidature and how did you overcome them?**
  The greatest challenge I faced was meeting the expectations of my supervisor for graduation. Fortunately, everything went on smoothly and I was able to complete my PhD.

• **What do you think are the key attributes for PhD students to successfully complete their candidature?**
  I think a PhD graduate should possess the skills to carry out independent research. This includes evaluating current research progress, identifying new areas of research, coming out with hypotheses, planning and conducting experiments to verify the hypotheses, analysing results, and convincing the relevant stakeholders of the significance of their results. I find that writing research papers is a very effective learning process to increase the proficiency in scientific writing, leading to a better thesis. In addition, presenting and defending one’s research results at group meetings and conferences is a good practice towards the PhD oral examination. In this regard, my supervisor has done a marvelous job at preparing me for my thesis and oral examinations.

• **What was your proudest moment or fondest memories over the years of candidature?**
  I take pride on the day that I passed my PhD oral examination, and that I was able to graduate! Probably because the journey towards graduation, especially in my final year, has been challenging emotionally. I am happy that I had overcome these challenges successfully. This experience has given me more confidence to deal with tough times ahead.

• **Please share 1 key motivational/ key take away message with your juniors.**
  Please take your time to get to know the research culture of the group that you would like to join before committing yourself to it. Take some time to speak to not only the potential supervisors, but more importantly to their research group members, to find out more about their research cultures. Be aware of the available help and resources around you to help you develop your research skills and personal growth. Be open to the idea that PhD is a learning opportunity and should you feel that this experience is not what you envision for yourself, don’t be afraid to make changes, even if they are not what others expect of you.
What is your next adventure / challenge or any plans for the future?
I will take a much needed rest for now to think about what I would like to pursue as my career. I will work with career coaches, talk to mentors, and travel to expose myself to more opportunities.

“Innovation distinguishes between a leader and a follower.”

Steve Jobs
American Co-Founder
Chairman and CEO of Apple Inc
**Dr Lim Swee Sien**
Sustainable Earth PhD Programme | Energy Research Institute @ NTU (ERI@N)

Thesis Title: Engineering Carrier Dynamics In Lead Halide Perovskites

Main Supervisor | Assoc Prof Sum Tze Chien
School of Physical and Mathematical Sciences

Co-supervisor | Prof Subodh Mhaisalkar
School of Materials Science and Engineering

Mentor | Asst Prof Nripan Mathews
School of Materials Science and Engineering

- **What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?**
  
  Apart from the cliché phrases like research interests and following a certain role model, I would like to add another phrase, which is the challenge in embarking on largely independent research and tackling scientifically relevant problems. Since contemporary research is, by nature, already interdisciplinary and no longer polarised to individual subject areas, choosing to pursue an interdisciplinary PhD in IGS was an easy decision.

- **What is your thesis about?**
  
  My thesis focused on using transient spectroscopy to study the influence of sample morphology on carrier dynamics in perovskite thin films mainly used for light harvesting applications. To determine its potential for hot carrier solar cells, hot carrier dynamics and transfer kinetics were also presented in my thesis.

- **Why did you choose this topic and how does it benefit people or industries globally or internationally?**
  
  Thin film morphology has always been revered as pivotal to achieving high performance semiconducting devices, and complex photophysical processes are involved in charge generation and transport. However, many of these critical carrier dynamics happen in the ultrafast timescales. Understanding these ultrafast dynamics allows researchers to systematically modify the growth conditions and observe its effects on the resultant dynamics. This is especially crucial when designing and engineering suitable interfaces and charge transport layers for efficient extraction.
• What kind of interaction did you have in IGS? How did that help you?
Many of the interactions came from participating in the IGS student sharing sessions, IGS-organised seminars and interactive workshops (e.g. Emergenetics). Cheekily, I would say that the most important ones were the get-together activities such as the CNY and Christmas parties. Apart from the most obvious tangible benefits, they are especially useful because it places each student in a situation where awkward silence will ensue for the next 30 minutes before the events kick-off. These situations were easily prevented by talking about our research and/or participating in the activities and workshops. Since research is fundamentally about sharing, conversing with strangers in conferences, and anywhere and anything else for that matter, becomes second nature. Confident communication is probably one of the most important soft skills one should master by the end of their PhD.

• What are the challenges you faced during the candidature and how did you overcome them?
The major challenges were failures and identifying a research problem. The latter is relatively straightforward to resolve by simply reading sufficiently widely and discussing a feasible research plan with my supervisor and lab mates. The former, however, is far more problematic. If the failures were eliminated, all the data in my thesis could have been collected in at most a week. Realistically speaking, most of the time is spent failing: rubbish data, poorly-planned experiments, null results, equipment failure, flailing motivation and, of course, plain bad luck. The important thing is to see it to the end, reflect on what went wrong, and take precautions to prevent it from happening again (and of course de-stress, play games, just chillax). Which brings us to the next point...

• What do you think are the key attributes for PhD students to successfully complete their candidature?
Before starting my PhD, I incorrectly assumed that the key attributes of PhD students were to be intelligent and extremely hardworking. Do not get me wrong, though, these traits are most definitely desirable and a bonus; they will help in completing a PhD candidature faster, but not necessarily successfully, if one lacks the more relevant attributes. In my opinion, these are
- Perseverance: to not give up, to try and fail, fail, fail, fail even more, fail again, and finally succeed. The moment you give up forever, is the moment you fail your PhD. Never give up. You do not have to do Nobel prize-winning work, but it must be new and extend human knowledge. Go read the illustrated guide to a PhD.
- Emotional resilience: to pick yourself up. You will get scolded, stressed, depressed (duh come on... it’s grad school), but importantly, never stay beaten and berate yourself. Be better. Get back up.
- Ability to communicate: to persuade and share your results! The sooner you max this trait, for you gamers out there, the better. Take your group presentation seriously, step outside your comfort zone and just talk to people. Sure, they judge, who cares? Everyone does, even yourself! (Hint: you’re probably judging that they will judge you, see?)
• Please share 1 key motivational/ key take away message with your juniors.
Embrace your choice, live it, love it, learn with it, learn from it; but never lose sight of the end-game: your PhD in your hand. Never forget the PhD is a journey (see title!!), it’s a living process, and only you can give it life.

• What is your next adventure / challenge or any plans for the future?
I am not entirely good at forward planning and really wonder how I succeeded in completing my PhD candidature. My future lies ahead still and it is shrouded. I have no concrete plans for the future, but I would like to work in/at/with Google, somehow. Do not misinterpret these words as being ‘aimless’, after all, to live without purpose is to not live at all. What life has taught me is to live in the present, be content and satisfied with what I have. That being said, AI is the next big thing, that’s probably what I will start pursuing next.

• What was your proudest moment or fondest memories over the years of candidature?
The proudest moments were the first instances of everything and clearing defence! First conference, first paper published, etc. The fondest moments were slogging away in the lab (honestly, you will never forget that).

Our conference session at SPIE Photonics West 2016
Visiting Santa Cruz along the Pacific Coast Highway in California after the conference
Dr Lin Jiwei  
Sustainable Earth PhD Programme | Institute of Catastrophe Risk Management (ICRM)

Thesis Title: Modelling Of Critical Infrastructure Interdependencies For Vulnerability Analysis

Main Supervisor | Assoc Prof Tai Kang  
School of Mechanical and Aerospace Engineering

Co-supervisor | Assoc Prof Tiong Lee Kong, Robert  
School of Civil and Environmental Engineering

Mentor | Assoc Prof Wang Zhiwei  
School of Civil and Environmental Engineering

- **What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?**  
  I have always wanted to look deeper into areas of science and I have interest in research as I think it will bring interesting insights and outcomes if I dig deeply into the unknown.

- **What is your thesis about?**  
  My thesis is about modelling critical infrastructures and their interdependencies. As critical infrastructures are interdependent, the objective is to search for a way to evaluate how the worst case scenario will be like if a disruption happens on the critical infrastructure.

- **Why did you choose this topic and how does it benefit people or industries globally or internationally?**  
  I think critical infrastructure is a very important topic, in terms of risk and security of any nation. I have chosen this topic as I feel that this area is not really explored in-depth in the context of Singapore and I hope to have an impact in telling people that we should think of the future and secure what we have.

- **What kind of interaction did you have in IGS? How did that help you?**  
  I like the IGS student seminar where we had the chance to know what we are doing and shared what we are doing. It seemed to be a chore initially, but after a few rounds of the seminar, I think many people felt that the world is so big and people are really doing their best in different expert areas.
• **What are the challenges you faced during the candidature and how did you overcome them?**
  I think publication was a big challenge. It is not about the work that is good enough or not. Sometimes, I think packaging your research and talking about the problem in another angle might be what is required. It requires some thinking out of the box.

• **What do you think are the key attributes for PhD students to successfully complete their candidature?**
  Time management is what I think is the key to success for PhD study. You might feel that there is a lot of free time in PhD study, but most of the time, when things need to be done, you will have to rush, which is unhealthy. I think preparing and managing your time can better ease this problem.

• **What was your proudest moment or fondest memories over the years of candidature?**
  I personally think the chance to travel for overseas conferences and taking some time to tour the different countries are the best moments while studying for a PhD.

• **Please share 1 key motivational/ key take away message with your juniors.**
  If you feel that nothing is going right/well, go away from your work. Ask for an off day/leave and take a breather outside of the research environment.

• **What is your next adventure / challenge or any plans for the future?**
  I am hoping to continue to do research either in the academic area or in the industry, whichever can provide me with the chance to continue my area of research.
Dr Liu Guangxin  
Sustainable Earth PhD Programme | Earth Observatory of Singapore (EOS)  
Thesis Title: Tracking Hydro-Climate Changes In Mainland Southeast Asia Through The Past 180,000 Years  
Main Supervisor | Asst Prof Wang Xianfeng  
Asian School of Environment  
Co-supervisor | Assoc Prof Wen Yonggang  
School of Computer Science and Engineering  
Mentor | Assoc Prof Fidel Costa Rodriguez  
Asian School of Environment

- What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?
  Interdisciplinary research matters. Nowadays, to tackle big challenges, such as climate problems, scientists must learn to work together with scientists in different fields. To be better prepared, we should accommodate ourselves in a multidisciplinary environment, which IGS surely offers.

- What is your thesis about?
  My thesis is about the Asian Monsoon system and its variabilities. I used cave carbonates (speleothem) collected from mainland Southeast Asia to reconstruct the Asian Monsoon changes through the last 180,000 years. The results have essentially reconciled the long-lasting debate on the climatic interpretation of Chinese speleothem oxygen isotope proxy and shed light on Asian Monsoon dynamics.

- Why did you choose this topic and how does it benefit people or industries globally or internationally?
  Because the Asian Monsoon brings water to Asia and its changes can be consequential, my research work has improved our understanding of the Asian Monsoon history. The results can be used to assess climate models’ ability to hindcast past monsoonal rainfall, and hence improve models’ performance in predicting future hydroclimate changes.

- What kind of interaction did you have in IGS? How did that help you?
  Student seminars, group outings and dinners, conference experience sharing and supervisor’s talks. By mingling with peers from different research backgrounds, I learnt how other scientists conduct research, and what I am doing can be helpful in some “unexpected” area. For example, the mass spec technique which we use daily, can be applied to material science. The intriguing personal stories shared by IGS supervisors helped me to be better prepared for potential problems in my research.
What are the challenges you faced during the candidature and how did you overcome them?
As a non-native English speaker, English is the biggest challenge during my PhD studies. Luckily, I met a lot of friends who are native English speakers or Chinese that have been living in English speaking countries for many years during my studies at NTU. Over the years, they helped me to improve my English tremendously.

What do you think are the key attributes for PhD students to successfully complete their candidature?
Perseverance. I can’t remember how many times I was so frustrated and just wanted to give up. But whenever there are problems, there are always solutions. Persevere and be patient, because that will help you find solutions earlier.

Please share 1 key motivational/ key take away message with your juniors.
PhD is never easy, but it is also not that difficult.

What is your next adventure / challenge or any plans for the future?
I wish to keep on the career as a paleo-climatologist. I am looking for a professorship back in my country. Meanwhile, I want to be a part-time fantasy and historical fiction writer.

What was your proudest moment or fondest memories over the years of candidature?
There are many fond memories during my PhD studies, for example, two AGU meetings, Oxford summer school, field trips to Philippines, Myanmar, and Thailand, interview by Mediacorp, and my oral defence. The proudest moment is the caving expedition to central Myanmar in November 2016. This expedition was funded through “Dr. Stephen Riady Geoscience Scholarship”. Most importantly, I organized this entire trip, including the trip itinerary, logistics and communication with local authorities.
Dr Liu Yi
Future Healthcare PhD Programme | NTU Institute for Health Technologies (HealthTech NTU)
Thesis Title: A Study On Algorithms And Applications Of Eye Gaze Tracking
Main Supervisor | Assoc Prof Lee Bu Sung
School of Computer Science and Engineering
Co-supervisor | Prof Martin McKeown
University of British Columbia
Mentor | Assoc Prof Deepu Rajan
School of Computer Science and Engineering

- What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?
To be honest, when I applied for the degree five and half years ago, I did not know IGS, because at that time it was still very new, and a lot of students had never heard about IGS. My supervisor suggested to me to consider IGS, and finally I made the choice. In the development of technology and society, I found that it would be difficult to make any achievement in an individual discipline. It is necessary for us to explore new skills besides our own area.

- What is your thesis about?
My thesis work is a study on algorithms and applications of eye gaze tracking, which is spanning human-computer interaction, computer vision and machine learning. I mainly focused on developing an eye typing system that helps people with motor disabilities to communicate. In addition, I was also working on the exploration of a broader range of eye-tracking applications for generic users.

- Why did you choose this topic and how does it benefit people or industries globally or internationally?
Actually the inspiration was from ‘Ice bucket challenge’. At that time, we were thinking of whether we can improve the communication abilities of disabled people who are only capable of controlling their eye movement, so I was gradually diving into this area. I proposed a prototype of eye typing system with robust typing algorithms, which can help the disabled to communicate by only moving an eye.

- What kind of interaction did you have in IGS? How did that help you?
The first thing that comes to mind is TAC members. They have different knowledge background, e.g. my co-supervisor is a doctor at UBC, when I presented my method to him, he usually asked the practical question from the patient’s side, and he also taught me some medical knowledge which is helpful. Talking with Prof Liedberg, IGS Dean is a good experience, and he gave me valuable suggestions on research.
• **What are the challenges you faced during the candidature and how did you overcome them?**

The most difficult challenge is determining a research topic. Actually I spent one and a half year to find the topic, and during that period of time I struggled and tried a lot of potential research projects. I kept talking with my supervisor and seniors, and reading latest research papers. That time was very difficult and it was a long procedure. I cannot say I overcame it at any specific point.

• **What do you think are the key attributes for PhD students to successfully complete their candidature?**

Self-motivation, self-discipline and patience. Usually PhD students have flexible time to finish research work without specific requirements except the paper deadline. Sometimes freedom is not good which probably leads to time wasting. In addition, the experiment results are not always what we expect, we must be patient to repeat/fine-tune the experiment again and again. Last but not least, be happy and healthy, and enjoy life, which is the most important thing.

• **Please share 1 key motivational/ key take away message with your juniors.**

When we strive to become better than we are, everything around us becomes better, too.

• **What is your next adventure / challenge or any plans for the future?**

I am leaving the academic world to take a job in industry, which is different from my PhD research. That is a new journey for me, and I must learn more about the new skills. The future is variable, I neither know nor fear it.

• **What was your proudest moment or fondest memories over the years of candidature?**

Going to Brazil is the fondest memory. Because I have been loving Brazil soccer since I was six years old.

![Christ the Redeemer in Rio](image1.jpg)  
![Maracana Stadium in Rio](image2.jpg)
What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?
Interdisciplinary research has many advantages. It often solves the problems caused by the complexity of the study. It can mobilize the knowledge of each involved area to bring its own expertise into play. More and more papers in the academic community start citing papers outside their field.

What is your thesis about?
My thesis is about utilization of a kind of waste material, i.e. incineration ash, for civil engineering application. From my research, the amount of waste normally disposed of by landfill can be reduced on one hand, on the other hand, resources of construction material can be expanded.

Why did you choose this topic and how does it benefit people or industries globally or internationally?
With economic development and population increase, more and more waste is generated around the world. On the other hand, resources are getting scarcer. My research can contribute to environmental protection and sustainable development in construction industry.

What kind of interaction did you have in IGS? How did that help you?
I attended IGS student seminars and communicated with other IGS students. This helps me to stimulate my thoughts, open up the research horizon, and draw on research ideas.

What are the challenges you faced during the candidature and how did you overcome them?
The challenge I faced is the installation of my experimental set-up which is designed by me. It takes around one year to eliminate all the errors. To overcome it, I consulted other experts and tried many times, and finally I successfully developed it.
• What do you think are the key attributes for PhD students to successfully complete their candidature?
The key attributes are diligence, thinking hard and learning from others.

• What was your proudest moment or fondest memories over the years of candidature?
My proudest moment is the time I was told that my research results are granted a PCT patent.

• Please share 1 key motivational/ key take away message with your juniors.
Persistence makes success.

• What is your next adventure / challenge or any plans for the future?
To promote the commercialization of my research findings and start a start-up company is my next adventure.
Dr Lorenzini Paolo  
Future Healthcare PhD Programme | NTU Institute for Health Technologies (HealthTech NTU)  
Thesis Title: Global Analysis Of Alternative Splicing In Human Cells Of Myeloid Origin  
Main Supervisor | Asst Prof Francesc Xavier Roca Castella  
School of Biological Science  
Co-supervisor | Asst Prof Zheng Jie  
School of Computer Science and Engineering  
Mentor | Dr Ong Sin Tiong  
DUKE-NUS Medical School

Dr Lu Yihua  
Sustainable Earth PhD Programme | Energy Research Institute @ NTU (ERI@N)  
Thesis Title: Theoretical Analysis Of Lattice Energy And Morphology Of Transition Metal Dichalcogenides  
Main Supervisor | Assoc Prof Su Haibin  
School of Materials Science and Engineering  
Co-supervisor | Asst Prof Chen Gang  
School of Physical and Mathematical Sciences  
Mentor | Dr Fong Wen Mei, Eileen  
School of Materials Science and Engineering

“Do not go where the path may lead, go instead where there is no path and leave a trail.”  
Ralph Waldo Emerson  
American Essayist, Poet, Philosopher
What motivates or triggers you to pursue a doctorate?
The curiosity of how things work, why they work and what makes it work is the motivation to pursue a doctorate. It presents a way to find solutions, test possibilities based on logic and experimentation.

Why or how did you decide to apply to IGS or the interdisciplinary route of research?
IGS presents the opportunity for scientific research under the guidance of experience faculties from different schools. This provides a conducive setting for the study of many research problems that we are facing. The different perspectives provide a channel for convergence of ideas from different disciplines to deliver the best possible outcome.

What is your thesis about?
My thesis is about the design and synthesis of nano-materials with catalytic properties. The preparation of the material with control in their nano-architecture is studied. The establishment of structural activity relationship and their performance efficiency was evaluated.

Why did you choose this topic and how does it benefit people or industries globally or internationally?
Clean water is vital to people and industries globally. It is essential to know what goes into our water and how we can remove them by physical or chemical means which are sustainable. This is especially important in countries where clean water sources are scarce and over industrialization leads to excessive pollution endangering the environment and health of people.
• **What kind of interaction did you have in IGS? How did that help you?**
The interaction opportunities during student seminar and supervisor talks were precious. It is through those interactions that I see that everyone has similar difficulties and problems during their PhD candidature. This helped me maintain a positive mindset when taking on my PhD.

• **What are the challenges you faced during the candidature and how did you overcome them?**
My research group is small and my research topic is very different from my peers. This makes it difficult as there are limited people whom I can discuss my project with close by. However, this also allows me to obtain opinions from my peers from different perspectives which provides me a way to re-think and re-access the problem at hand.

• **What was your proudest moment or fondest memories over the years of candidature?**
My fondest moment was when I presented my research work at the European conference on Environmental Applications of Advanced oxidation processes. It was also at the same time when my first publication was accepted. This made the time during the conference the best memory during my candidature.

• **What do you think are the attributes for PhD students to successfully go through the 4 years?**
The most important attribute is to be resilient as we are bound to meet up with many failures during the process. It is therefore important to learn from our failures and come back stronger. Therefore, perseverance is also equally important since at times if we lose the strength to push on, we never know if success is just ahead.

• **Please share 1 key motivational/ key take away message with your juniors?**
Let your failures fuel the solution towards your future success.

• **How does it feel like when you received the scholarship offer?**
It was a mixed feeling of joy and uncertainty. It is really wonderful and exciting to be able to do research under engineering faculties when I was a science graduate. On the other hand, the uncertainty if I will be able to meet the expectations of my supervisors.

• **What will you miss after graduating?**
I will miss all the people I met during my PhD journey. No matter the positive or negative experiences, all experiences lead to certain learning outcomes. I will also miss the various events organised by the graduate club and school which made the journey enjoyable.

• **What is your next adventure / challenge or any plans for the future?**
I’m looking forward to starting work soon. In the near future, I may be looking for overseas opportunities for further research experience.
• **Is there anything you want to say to your family, supervisors, mentors, friends or anybody?**

  I want to thank my family and friends for all the moral support given to me throughout my candidature. I’m really grateful to my supervisors and mentor for the guidance and encouragement which kept me going till the end.

  “I think that everything is possible as long as you put your mind to it and you put the work and time into it. I think your mind really controls everything. You can’t put a limit to anything. The more you dream, the farther you get.”

  Michael Phelps
  American Record-Breaking World Champion
  Swimmer Olympic Gold Medal Winner, 23 times
Dr Ma Qinglang  
Sustainable Earth PhD Programme |  
Nanyang Environment & Water Research Institute (NEWRI)  
Thesis Title: Preparation Of Novel Special Wettable Materials For Water Remediation  
Main Supervisor | Prof Zhang Hua  
School of Materials Science and Engineering  
Co-supervisor | Assoc Prof Pu Kanyi  
School of Chemical and Biomedical Engineering  
Mentor | Prof Wang Rong  
School of Civil and Environmental Engineering

Dr Marcin Karol Rowinski  
Sustainable Earth PhD Programme |  
Energy Research Institute @ NTU (ERI@N)  
Thesis Title: Computational Fluid Dynamics Of Advanced Nuclear Reactor Cores And Its Contribution To Safety Analysis  
Main Supervisor | Prof Soh Yeng Chai  
School of Electrical and Electronic Engineering  
Co-supervisor | Prof Timothy White  
School of Materials Science and Engineering  
Mentor | Prof Claude Guet  
School of Materials Science and Engineering

Dr Nandini Shome  
Sustainable Earth PhD  
Singapore Centre for Environmental Life Sciences and Engineering (SCELSE)  
Thesis Title: Fate And Transport Of Pathogens In Freshwater Mesocosms: Role Of Biofilms  
Main Supervisor | Prof Stefan Wuertz  
School of Civil and Environmental Engineering  
Co-supervisor | Assoc Prof Sanjay Swarup  
Singapore Centre for Environmental Life Sciences and Engineering (SCELSE)  
Mentor | Dr Veronica Rajal  
Singapore Centre for Environmental Life Sciences and Engineering (SCELSE)
What motivates or triggers you to pursue a doctorate? Why or how did you decide to apply to IGS or the interdisciplinary route of research?
I used to joke that I pursued a PhD because I couldn’t get a job. That is not entirely false. I wanted a job where I can do impactful and novel research to deal with pollution and improve water security, and I knew that it would not be possible unless I have highly holistic and encompassing research training on the subject matter. That is why I choose to do my PhD in Singapore Centre on Environmental Life Science Engineering (SCELSE) and Interdisciplinary Graduate School (IGS) in Nanyang Technological University (NTU). SCELSE provided an extensive knowledge base and cutting edge research technologies where I can tap on during my research training. IGS, on the other hand, actively encouraged and nurtured my innovative thinking and enterprising mind-set through its many talks and networking sessions, and such soft skills are essential to excel in the competitive research environment.

What is your thesis about?
My thesis dealt with biofilm-mediated generation of nanomaterials and biofilm-templated nanocatalysts for water purification. I gained extensive experience in microbial biotechnology, advanced imaging and analytical techniques such as confocal laser scanning microscopy, electron microscopy, High Performance Liquid Chromatography and Gas Chromatography to understand and characterise bacterial biofilms and their catalytic activities for water purification. The results demonstrated an interdisciplinary strategy for the development of sustainable approaches to removing contaminants, in particular, carcinogenic heavy metals (e.g. Chromium) and trace organic compounds that are of emerging concerns (e.g. estrogens), from water.
• Why did you choose this topic and how does it benefit people or industries globally or internationally?
I am interested in water purification and contamination removal technologies that provide greater access to potable water and can curb the spread of disease. As developed as the world may be, there are currently 10% of human population globally who lack access to clean water. To compound this problem, various industries, some vital to the local communities, cause pollution to the environment and contaminate the water supplies. Thus, there is an urgent need to develop cheap and easy-to-implement contamination detection and remediation technologies. The results from my thesis provided a proof-of-concept towards cheap and efficient technology to remove contaminants and open new opportunities for industries and governmental agencies to further develop and adopt such technologies for environmental remediation.

• What kind of interaction did you have in IGS? How did that help you?
IGS provided many opportunities for me to interact with eminent scientists and thought leaders via IGS Distinguished Lecture series. IGS also nudged interactions among the research students from different disciplines through the IGS student seminar series. These opportunities honed my communication and networking skills which are important factors in career development.

• What are the challenges you faced during the candidature and how did you overcome them?
Pursuing a PhD is difficult. There’s no doubt about it. Experiments failed repeatedly and, most of the time, I had absolutely no idea why they failed. I was plagued by many sleepless nights and the constant stress, both physically and emotionally, can be suffocating. The toughest challenge is not making experiments work – it is to learn to let go of my initial hypothesis which didn’t work after thorough investigation, and develop new hypothesis from the available information that I have obtained.

• What was your proudest moment or fondest memories over the years of candidature?
I was very honoured to give poster and oral presentations of my research in several important international conferences. I was especially glad when I was awarded ‘Best Oral Presentation’ in the 6th International Conference on Environment Science and Biotechnology (ICESB 2016) held in Kyoto, Japan. It gave me joy to know that my presentation was clear and concise even though my area of research is interdisciplinary and complex in nature. Similarly, it brings me great pleasure to see the fruits of my labour and have my manuscripts accepted by scientific journals for publication.

One of the interesting moments over the years of my candidature came when I was working on estrogens. While troubleshooting one of my many failed experiments, I accidentally found a specific polymeric material that has exceptionally high binding affinity to estrogen. It was easy to ignore this finding and focus on my original hypothesis as my core research is not in material sciences but in biotechnology. However, the
interdisciplinary spirit within me urged me on and I took 6 months away from my main research to link up with the right expertise across disciplines to rigorously examine this phenomenon. Eventually I was able to develop a novel and low cost adsorption-based technology to remove estrogenic contaminants from polluted waters. Among my 10 publications, 3 are based on this unexpected findings and I am currently preparing to submit one more follow-up manuscript.

- **What do you think are the attributes for PhD students to successfully go through the 4 years? Please share 1 key motivational/ key take away message with your juniors?**

Doing PhD is tough. Unlike traditional education where you excel by studying and reading books, PhD training throws you into the unknown, forces you to be a pioneer in what you do, and there’s no ‘guidebook’ to tell you where to go. I feel that one of the main objectives and outcomes of doing a PhD is to develop a ‘guidebook’ in your field for the world to follow. To fulfil this, PhD students should have resilience against challenges, curiosity and passion for their research, integrity towards their work, and be mentally, physically and financially prepared that the PhD training can very well go beyond 4 years. It is also inevitable that some will not be able to complete their PhD training due to motivation issues and project compatibility.

One important point is that I hope my junior will take away is that different people go through PhD differently – it can be a breeze for a handful, and it will be a long and difficult grind for most of us. Don’t compare your progress with others, because every PhD project is unique. Stay focused on your own goals and find your own motivations to keep you going.

- **How does it feel like when you received the scholarship offer?**

I was very happy that IGS accepted my application and awarded me the IGS Premium Scholarship, which is very prestigious and competitive. I remember telling my family and close friends once I got the confirmation letter and shared my happiness with them.

- **What will you miss after graduating?**

I miss my friends in IGS and NTU, especially fellow student leaders in IGS Student Club and NTU Graduate Student Council which juggles between research and Club/Council commitments. I will always remember the crazy things we did in the University.

I also miss the cheap and affordable food in the University. Food in the U.K. is quite expensive. The cheapest meal I can find to fill my tummy in Oxford costs £5 (S$9), while it cost S$3 to have a decent meal in NTU.

- **What is your next adventure / challenge or any plans for the future?**

I plan to do research in Oxford for the next two years, after which I hope to apply for faculty positions in Singapore or other countries. Academics don’t really earn much so I would need to save up if I want to settle down and start a family any time soon.
Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
I would like to express my heartfelt thanks to my supervisor, Assoc Prof Cao Bin, for his guidance throughout my research. As a chemistry student, I came to work in Singapore Centre for Environmental Life Science Engineering (SCELSE) with little theoretical and experimental knowledge in the field of environmental engineering and biotechnology. Bin meticulously taught me the basic know-hows in this field which gave me a head-start towards being an independent researcher in SCELSE. Without his help and inspiration, much of my time would be spent on banging my head on the table instead of executing well-planned experiments with a clear objective and aim in mind. I would like to thank my co-supervisor, Prof Sanjay Swarup, for his guidance on metabolomics studies, and his constructive feedback on my research progress. I would also like to extend my gratitude to my mentor, Assoc Prof Yang Liang, for his guidance on my project and his aptitude to tolerate my silly questions regarding microbiology.

I am also very grateful to be able to work with some of the best researchers in their respective fields and having them as my collaborators. They include Dr. Ji Liang Hui from Temasek Life Sciences Laboratory (Singapore), Prof Tang Chuyang from The University of Hong Kong, Prof Song Hao from Tianjin University (China), Prof Staffan Kjelleberg from SCELSE, Prof Lu Lanyuan from Nanyang Technological University (Singapore) and Prof Wang Rong from Singapore Membrane Technology Centre.

A special thanks to members of Environmental Microbial Biotechnology & Bioengineering (EMBB) research group (also fondly known as Bin’s research group) – Krish, Yichao, Yuanzhao, Yingdan, Anee, Yidan, Sudha, Daphne and Amit. I would also like to thank other fellow SCELSE colleagues for their immense support in my research.

I would like to take this opportunity to acknowledge my friends and family members, especially my parents, for their unwavering support in my pursuit of academic excellence. I would be forced to take another career path due to financial difficulties if my father chose to retire when he was retrenched, instead of finding a new job, in his 50s. Finally, I would like to acknowledge the financial support from National Research Foundation and Ministry of Education Singapore under its Research Centre of Excellence Program, and Interdisciplinary Graduate School Premium Scholarship for the year 2013-2017.
• Share with us some memorable photos you’ve taken with 1 line description of each photo.


Poster presentation at my first overseas conference ‘Biofilm6’ at University of Vienna, Austria! July 2014

Finally passed my QE! Nov 2014.

Team bonding session with fellow research students through Paintball. Even Prof Bo Gunnar Liedberg, Dean of IGS join in the fun! Jan 2015
My first published book chapter!
July 2015

I was selected as the student liaison for Nobel laureate Prof Stefan Hell in ‘Conference: Future of Learning’, Nobel Prize Series, Singapore. Nov 2015

I took a group photo with fellow student leaders and Minister Ong Ye Kung when he visited NTU this afternoon. He visited Earth Observatory Of Singapore (EOS) and got to know more about the research centre. March 2016

Team IGS expedition to Hong Kong to attend University Scholars Leadership Symposium! (From Left: Prasanna Jogdeo, Andrew Ong, Vikram Shenoy Handiru, Ng Chun Kiat) July 2015
We met with the NTU President, Prof Bertil Andersson, and had an engaging discussion about the positive and negative aspects of graduate education and experience in NTU. This is the last official meeting I have as the President of the NTU Graduate Student Council, and I’m really glad that Prof Andersson is very supportive of the recommendations and suggestions we raised during the meeting. Mission accomplished!
March 2016

Happy to get the best presentation award during the ICESB 2016 conference in Kyoto, Japan! I learned many new things and made several new friends from around the world who are working on environmental research!
Dec 2016

Ph.D. Oral Defence Success! Really Grateful to Bin and Liang for their support.
From Left: Ng Chun Kiat, Assoc Prof Cao Bin (PhD supervisor), Assoc Prof Yang Liang (PhD Mentor)
May 2017
**What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?**
My dream is to become a scientist in material science. Therefore I decided to pursue a PhD programme in IGS, NTU, which can provide the opportunity for me to learn and study from various disciplines.

**What is your thesis about?**
My PhD thesis has summarized the development of novel thermally stable additives for the positive electrolyte for vanadium redox flow battery. The new halide-free electrolyte formulation has been intensively characterized and demonstrated excellent thermal stabilizing capability without forming any toxic by-product. Moreover, such novel electrolyte also satisfies the longer-term stability and suitability in practical vanadium redox flow battery operation at high temperatures.

**Why did you choose this topic and how does it benefit people or industries globally or internationally?**
Renewable energy is the future energy source that can reduce dependence on fossil fuels and therefore help to solve many environmental problems. Vanadium redox flow battery is one of the most promising candidates in terms of renewable energy storage. This is an industrial collaboration project with NTU which is why I decided to choose this topic. The results from my PhD study can help to improve the performance of commercial vanadium redox flow battery system and contribute to the development of worldwide renewable energy technology.
• **What kind of interaction did you have in IGS? How did that help you?**
   Basically, I can summarize 3 main interactions that I have: supervisors, colleagues and officers.
   - With supervisors: The good interaction with my supervisors helped me to drive the PhD journey to the right way, solving quickly and effectively any obstacles for the research.
   - With friends and colleagues: I have many friends and colleagues, not only within IGS but also from other schools in NTU. They helped me to share everything in daily life, cooperating in learning and studying, entertaining together.
   - With IGS admin officers: I always get fast responses from IGS admin officers regarding any academic enquiries. They also strongly supported student activities which enriched our student life.

• **What are the challenges you faced during the candidature and how did you overcome them?**
   The change in research background is my most challenging problem during my PhD candidature. I moved from a physics research background to chemistry when I joined NTU. To overcome that, I asked and got great help from my supervisors to fill up the gap in my knowledge for the research in the new topic. Contemporary working and learning is also another way that helps me to save time and join more quickly into my PhD research. Overall I am satisfied with the time I have spent in NTU and Singapore.

• **What do you think are the key attributes for PhD students to successfully complete their candidature?**
   For me there are 3 key things that a PhD student needs to successfully complete the candidature:
   - High self-motivation: no way a student can complete their research without passion and determination.
   - Good supervision: PhD study is a high-level learning activity with requires the activeness of the student, however, good supervision is also one of the most important factors to secure the success of the student.
   - Full research facilities: an important thing that allows students to effectively do their research activity.
• Please share 1 key motivational/ key take away message with your juniors.
   Don’t work hard, work smart.

• What is your next adventure / challenge or any plans for the future?
   I am planning to find a postdoctoral research position overseas. In the future, coming back to NTU as a faculty staff is one of my plans.

• What was your proudest moment or fondest memories over the years of candidature?

   My visit to Gildemeister energy solution, Austria, one of the partners in my PhD collaboration project (June 2015)

   My first international conference oral presentation: NANOSMAT 2015, Manchester, UK (September 2015)

   My visit to SGL group, Germany, one of the partners in my PhD collaboration project (June 2015)

   My second time in the UK at a conference: IFBF 2017, Manchester, UK (June 2017)
“Teamwork is the ability to work together toward a common vision, the ability to direct individual accomplishments toward organizational objectives. It is the fuel that allows common people to attain uncommon results.”

Andrew Carnegie
Scottish-born American Industrialist
Entrepreneur & Philanthropist
• What motivates or trigger you to pursue a doctorate in IGS or the interdisciplinary route of research?
IGS’s professors came to my university to present IGS postgraduate study. At that time, I was under a multidisciplinary industrial engineer program. Therefore, it seemed like a good fit for me to choose the interdisciplinary route of research.

• What is your thesis about?
My thesis is about proposing and investigating novel designs of vibration energy harvester to improve its efficiency and applicability. The idea is on using external magnet oscillator to trigger the high-energy harvesting orbit of the vibration energy harvester. The vibration energy harvester is actually an electro-mechanical system.

• Why did you choose this topic and how does it benefit people or industries globally or internationally?
At the beginning, I was interested in renewable energy research. Wasted vibration energy is a potential source of energy that we have not fully exploited. Meanwhile, a self-powered mechanism is needed to replace or supplement chemical batteries to power small wireless sensors. Vibration energy harvester is proposed to fill the gap between these technologies. As a “clean” technology, these devices have a great potential to become an alternative of chemical battery to power small wireless sensors. Vibration energy harvester might play an important role in the coming century of Industry 4.0 and Internet of Things.

• What kind of interaction did you have in IGS? How did that help you?
IGS provides a nice environment for students, professors, experts to interact and communicate via many channels such as seminars, tech talks, or even recreational events. Through IGS events, I had chances to talk to many people from many different backgrounds and that somehow improved my research view and objectives.
• **What are the challenges you faced during the candidature and how did you overcome them?**
  One of my main challenges during my PhD journey was to find a suitable topic and research direction. Thanks to the help of my TAC as well as my colleagues, I was able to finally determine a clear direction and objective to follow.

• **What do you think are the key attributes for PhD students to successfully complete their candidature?**
  Research’s challenge is not about solving a problem but about finding a problem. As a PhD student, I think that finding a good problem to solve can decide 50% of the success of the course. Unlike engineering work where problems are normally exposed, problems for research are sometimes hidden behind many layers and can easily lead to misconception, which remains one of the biggest challenges for researchers.

• **What was your proudest moment or fondest memories over the years of candidature?**
  I have a good memory of USLS 2016 in Hanoi, Vietnam where I represented IGS and NTU as a delegate. I also have a great memory of NTU dancing club, when we had a great performance in JDC 2017.

• **Please share 1 key motivational/ key take away message with your juniors.**
  PhD journey is challenging but enjoyable!

• **What is your next adventure / challenge or any plans for the future?**
  I am still on the very first step of my career and there are many challenges. Choosing between academic and industry and trying to answer the question “what is the best suit for my future?” is two of them.
Dr Nie Lina
Sustainable Earth PhD Programme | Nanyang Environment & Water Research Institute (NEWRI)

Thesis Title: Syntheses, Crystal Structures, And Applications Of Novel Crystalline Metal Chalcogenides

Main Supervisor | Assoc Prof Zhang Qichun
School of Materials Science and Engineering

Co-supervisor | Prof Xu Rong
School of Chemical and Biomedical Engineering

Mentor | Assoc Prof Lim Teik Thye
School of Civil and Environmental Engineering

Dr Niu Zhaojie
New Media PhD Programme | Active Living for the Elderly (LILY)

Thesis Title: A Study Of Big Data Computing Platforms For Silver Testbed: Performance, Fairness And Energy Consumption

Main Supervisor | Assoc Prof Lau Chiew Tong
School of Computer Science and Engineering

Mentor | Assoc Prof Jian Ming
Nanyang Business School

“It is not the mountain we conquer but ourselves.”
Sir Edmund P Hilary
New Zealander Mountaineer & Explorer
Dr Ong Chuan En Andrew  
Sustainable Earth PhD Programme |  
Energy Research Institute @ NTU (ERI@N)  

Thesis Title: Wireless Power Transfer Systems  
Main Supervisor | Assoc Prof Goh Wang Ling  
School of Electrical and Electronic Engineering  
Co-supervisor | Assoc Prof Vun Chan Hua, Nicholas  
School of Computer Science and Engineering  
Mentor | Assoc Prof Arokiaswami Alphones  
School of Electrical and Electronic Engineering  

- **What motivates or triggers you to pursue a doctorate?**  
The lack of knowledge as well as the skills required to obtain knowledge with an analytical approach.  

- **Why or how did you decide to apply to IGS or the interdisciplinary route of research?**  
The demise of singular-discipline approach to today’s problems and challenges.  

- **What is your thesis about?**  
Wireless power transfer systems  

- **Why did you choose this topic and how does it benefit people or industries globally or internationally?**  
The application is far-reaching and has the capability to significantly change a small part of our lives. An everyday example is wireless communication embodied in the form of cellular and WiFi technologies, which not only changed the way we communicate but also transformed the way we live.  

- **What kind of interaction did you have in IGS? How did that help you?**  
The dynamic environment has allowed much exposure to people with different backgrounds, cultures and ideologies. This has given me the opportunity to understand diversity and the need to learn how to listen and accept differences. During our academic and research lives, we need to be able to accept different points-of-view and ways of thinking and this environment has helped me to adapt with greater ease.
• What are the challenges you faced during the candidature and how did you overcome them?
Lack of technical knowledge, guidance and equipment. By being pro-active in providing help to the people who need help, sometimes allowed me to acquire new knowledge or maybe even ideas to approach my own set of challenges. Friends whom I’ve made are also essential in assisting me to overcome certain challenges, which if left alone, would take a tremendous amount of resources to overcome.

• What was your proudest moment or fondest memories over the years of candidature?
When I had my first published journal paper after going through nearly a year of peer review process.

• What do you think are the attributes for PhD students to successfully go through the 4 years?
Independent, critical thinking, creativity and perseverance.

• Please share 1 key motivational/ key take away message with your juniors.
Where independence and critical analysis are both two natural by-products of PhD, creativity and perseverance are key in order to find novel ways of solving our PhD problem statement.

• How does it feel like when you received the scholarship offer?
Happy and (at the same time) anxious of the unknown PhD journey ahead.

• What will you miss after graduating?
The warmth and passion of the school staff in helping students to create a better and more conducive work and play environment.

• What is your next adventure / challenge or any plans for the future?
Short term: to learn more about the industry and commercial world.
Long term: to be able to overcome the limitations and boundaries of today with knowledge and technology.

• Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
Too many to thank but to those who have helped me in one way or another, THANK YOU!
• Share with us some memorable photos you’ve taken with 1 line description of each photo.

IGS Chinese New Year Celebration, 2013

IGS Christmas Party, 2014

Me lying in the middle. IGS Summer Retreat, 2014

IGS Team Bonding Adventure, 2015
• What motivates or triggers you to pursue a doctorate?
After working in the industry for a while, I realized that it is important to further improve my knowledge so that my career will be more successful once I complete a doctorate.

• Why or how did you decide to apply to IGS or the interdisciplinary route of research?
I asked my supervisor about funding for my research and he told me to apply to IGS since IGS can provide not only the funding but also opportunities for me to gain expertise in other research areas.

• What is your thesis about?
My thesis is about evaluating how the trace metals speciate in anaerobic digestion systems and how their bioavailability changes under different operating conditions. Different types of ligands i.e. organic or inorganic were tested to determine how they can alter the trace metal speciation. Dosing strategies for trace metals were developed to enhance the bioavailability of trace metals.

• Why did you choose this topic and how does it benefit people or industries globally or internationally?
I chose this topic because it has been misunderstood not only in practice but also in previous research. Therefore, I want to change the view of this topic so that people from industries can benefit from it and the performance of their processes will be much more improved.

• What kind of interaction did you have in IGS? How did that help you?
I had opportunities to interact with people in different research areas and I think it was very interesting to learn from people around me. I could obtain different perspectives and approaches and apply that into my research.
• What are the challenges you faced during the candidature and how did you overcome them?
The challenge was to manage timing as I had to do experiments in the laboratory and at the same time I had to analyze the results, write up reports and papers. Therefore, I learnt to plan my work and manage it efficiently.

• What was your proudest moment or fondest memories over the years of candidature?
I published 1 review paper and 5 research papers in high ranking journals with impact factor of more than 6. I was also able to attend the largest conference in my research field with the funding from IGS.

• What do you think are the attributes for PhD students to successfully go through the 4 years?
PhD students must be able to work independently and smartly so that they can obtain the best results within 4 years.

• Please share 1 key motivational/ key take away message with your juniors?
I believe it is a wonderful journey. In the end it is about what you learn and what person you become.

• How did it feel when you received the scholarship offer?
I was extremely happy to receive the offer as it not only provided the funding but also give me the opportunity to study at one of the best universities in Asia.

• What will you miss after graduating?
I missed the time when I had to work overnight in a laboratory. Although it was very tiring, I enjoyed it a lot. I also miss my football teammates as we used to play at the sport centre.

• What is your next adventure / challenge or any plans for the future?
I might continue my career in research with more focus on developing products for industrial uses.

• Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
I want to thank my family and my supervisors for their constant support and guidance during this wonderful journey. I also thank my friends who shared beautiful moments with me over the last 4 years.
• Share with us some memorable photos you’ve taken with 1 line description of each photo.

Group dinner

Farewell to a Research Fellow in the lab

Overseas conference in Chile, 2015
What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?
Challenge and novelty of being able to work with experts from other fields.

What is your thesis about?
My thesis is about the application of NO donor compounds as biofilm control agents.

Why did you choose this topic and how does it benefit people or industries globally or internationally?
The study of methods for control of biofilms is useful as biofilm plays a role in infections and structural damages.

What kind of interaction did you have in IGS? How did that help you?
IGS provides opportunities to interact with students of different disciplines through workshops and activities, which helps in knowing new people and team bonding.

What are the challenges you faced during the candidature and how did you overcome it?
Projects not working out as predicted. Find alternative methods to carry out your study.

What do you think are the key attributes for PhD students to successfully complete their candidature?
Perseverance, continuing even when faced with difficulties and challenges.

What was your proudest moment or fondest memories over the years of candidature?
The annual organization retreat provided a means to learn about research within SCELSE and a relaxed setting to interact with my colleagues. I was also given an opportunity to go on an exchange to an overseas lab, which was a wonderful experience.

Please share 1 key motivational/ key take away message with your juniors.
Don’t give up, you’ll achieve your goals soon.
Dr Prabhakar Arun Kumar
Future Healthcare PhD Programme
NTU Institute for Health Technologies (HealthTech NTU)

Thesis Title: Pine Pollen For Molecular Encapsulation And Oral Delivery Applications

Main Supervisor | Assoc Prof Cho Nam-Joon
School of Materials Science and Engineering

Co-supervisor | Prof Chen Peng
School of Chemical and Biomedical Engineering

Mentor | Assoc Prof Jeffrey S. Glenn
Stanford University

Dr Sachindra Thilomini Cooray
Sustainable Earth PhD Programme | Nanyang Environment & Water Research Institute (NEWRI)

Thesis Title: Valorization Of Brewer’s Spent Grain Using Fermentation: Potential For Food Sustainability

Main Supervisor | Prof William Chen Wei Ning
School of Chemical and Biomedical Engineering

Co-supervisor | Assoc Prof Thirumaran Thanabalu
School of Biological Science

Mentor | Prof Liu Yu
School of Civil and Environmental Engineering

Dr Shen Nan
Sustainable Earth PhD Programme | Energy Research Institute @ NTU (ERI@N)

Thesis Title: Iron Oxide Based Anode Material For Lithium Ion Battery

Main Supervisor | Prof Madhavi Srinivasan
School of Materials Science and Engineering

Co-supervisor | Assoc Prof Sun Handong
School of Physical and Mathematical Sciences

Mentor | Assoc Prof Alex Yan Qingyu
School of Materials Science and Engineering
Dr Sukriti Gupta  
Sustainable Earth PhD Programme  
Energy Research Institute @ NTU (ERI@N)

Thesis Title: Investigating The Governing Physico-Chemical Interactions In Vanadium Redox Flow Batteries Using Multiscale Molecular Modelling

Main Supervisor | Asst Prof Samir Hemant Mushrif  
School of Chemical and Biomedical Engineering

Co-supervisor | Prof Chan Siew Hwa  
School of Mechanical and Aerospace Engineering

Mentor | Assoc Prof Xu Zhichuan Jason  
School of Materials Science and Engineering

• What motivates or triggers you to pursue a doctorate?  
I always had interest in the field of renewable energy and my summer internship on fuel cell research in IISc Bangalore during the final year of my undergraduate studies motivated me to take up PhD program in ERI@N, NTU.

• Why or how did you decide to apply to IGS or the interdisciplinary route of research?  
I believe interdisciplinary research is the need of the hour as solving challenging problems require the knowledge of more than one discipline and having supervisors from two different disciplines can be really helpful. That’s why I decided to apply to IGS.

• What is your thesis about?  
My thesis is about using molecular modelling to get insights into the chemistry behind working of Vanadium Redox Flow Batteries. It mainly focuses on understanding the electrolyte thermal stability and the factors affecting the solubility of vanadium ions in the electrolyte.

• Why did you choose this topic and how does it benefit people or industries globally or internationally?  
Energy storage is a very important aspect in commercialisation of renewable energy, as they are intermittent in nature. VRFB is an excellent electrical energy storage system. However, low energy density due to poor solubility of vanadium ions in the electrolyte, make these batteries bulky. Thus, my work, which provides insights into the role of additives in improving the solubility of vanadium ions in the electrolyte, can help provide a systematic way to scan additives and increase energy density of the VRFB manifold, making it commercially viable.
- **What kind of interaction did you have in IGS? How did that help you?**
  IGS has a very vibrant culture with students and faculty of different nationalities. Thus, the IGS student seminars, outings etc. are very interesting and you learn a lot about diverse cultures when you interact with each other.

- **What are the challenges you faced during the candidature and how did you overcome them?**
  It is inevitable to face various challenges during your PhD journey as sometimes even after working for long hours you cannot get results and it is very disappointing. At this point, you need to have a strong support system who can encourage you to continue. I had the support of my friends, my supervisor and my family, which helped me overcome my challenges.

- **What was your proudest moment or fondest memories over the years of candidature?**
  Getting appreciated for my work in International Flow Battery Forum Conference, Karlsruhe, Germany.

- **What do you think are the attributes for PhD students to successfully go through the 4 years?**
  Patience, perseverance and hard-work are the key attributes.

- **Please share 1 key motivational/ key take away message with your juniors.**
  Work hard but maintain work life balance. Have a group of close friends with whom you can share all your worries and who will support you.

- **How did it feel when you received the scholarship offer?**
  I was overjoyed and felt a sense of achievement.

- **What will you miss after graduating?**
  My friends, which have become an integral part of my life. Also, if I go back to India for work, I will miss Singapore.

- **What is your next adventure / challenge or any plans for the future?**
  I am looking for an intellectually challenging and exciting career in the field of energy technology involving problem solving with the help of technical and analytical skills gained during my professional career till date.

- **Is there anything you want to say to your family, supervisors, mentors, friends or anybody?**
  Thank you for always believing in me. It would have not been possible without your support. Special mention to my sister, Aditi, for always having my back.
• Share with us some memorable photos you’ve taken with 1 line description of each photo.

AIChE conference 2016
San Francisco, USA

IGS Christmas celebration 2015 @ The Hive

IGS SG50 National Day Celebration, 2015
Dr Sun Peng
Sustainable Earth PhD Programme |
Energy Research Institute @ NTU (ERI@N)

Thesis Title: Performance Optimization For Distributed Machine Learning And Graph Processing At Scale Over Virtualized Infrastructure

Main Supervisor | Assoc Prof Wen Yonggang
School of Computer Science and Engineering

Co-supervisor | Wong Yew Wah
Energy Research Institute @ NTU (ERI@N)

Mentor | Assoc Prof Cai Jianfei
School of Computer Science and Engineering

Dr Swaroop Narayanan Nair
Sustainable Earth PhD Programme |
Energy Research Institute @ NTU (ERI@N)

Thesis Title: Effect Of In-Plane Fiber Waviness On The Failure Of Fiber Reinforced Polymer Composites

Main Supervisor | Prof Yue Chee Yoon
School of Mechanical and Aerospace Engineering

Co-supervisor | Assoc Prof Aravind Dasari
School of Materials Science and Engineering

Mentor | Assoc Prof Sunil Chandrakant Josh
School of Mechanical and Aerospace Engineering

Dr Tan Jun Hou
Sustainable Earth PhD Programme |
Singapore Centre for Environmental Life Sciences and Engineering (SCELSE)

Thesis Title: In-Vitro And In-Vivo Characterization Of Anti-Biofilm Activity Of LPXC Inhibitors Alone, And In The Combination Of Different Classes Of Antimicrobials

Main Supervisor | Prof Michael Giviskov
School of Biological Science

Co-supervisor | Assoc Prof Yang Liang
School of Biological Science

Mentor | Asst Prof Chng Shu Sin
National University of Singapore (NUS)
• **What motivates or triggers you to pursue a doctorate?**
  The opportunity to be a part of scientific research. To learn more about how to conduct scientific research. To learn more about my field.

• **Why or how did you decide to apply to IGS or the interdisciplinary route of research?**
  Because of the interdisciplinary nature of the thesis. It would have required knowledge and expertise from different fields. Being in an interdisciplinary school could have brought about this exposure.

• **What is your thesis about?**
  My thesis is about engineering regime shifts in cities. Specifically, to look for ways to reverse urban decay. Urban decay is a problem that many cities are dealing with.

• **Why did you choose this topic and how does it benefit people or industries globally or internationally?**
  This topic is aligned with my research interests. Being able to reverse urban decay would be beneficial to many cities suffering from it. This would have the overall effect of making a national economy more efficient in organizing and utilizing human and industrial resources.

• **What kind of interaction did you have in IGS? How did that help you?**
  I interacted with other students during student presentations. Their work helped inspire my work. I can also relate to and learn from their struggles when they presented about their PhD journey.
What are the challenges you faced during the candidature and how did you overcome them?
I faced numerous challenges from many different facets of a PhD’s student’s life. The most serious challenges arose from being let down by others. In overcoming these challenges, I have emerged stronger.

What was your proudest moment or fondest memories over the years of candidature?
Published papers; Conferences (I would like to thank IGS for supporting overseas conference); Scientific results discovered.

What do you think are the attributes for PhD students to successfully go through the 4 years?
Grit, determination, perseverance, and patience are important qualities to have when first learning the ropes of conducting scientific research. Scientific research is open ended and not every endeavour or thought will be fruitful. Being patient about the learning process and the scientific discovery process is important. But above all, a passion for learning and scientific discovery is a must.

Please share 1 key motivational/ key take away message with your juniors?
If you find a lack of motivation to go to the lab willingly or you find that you are not excited about going to the lab to make progress on your research, then either scientific research is not for you or you are in the wrong field.

How did it feel when you received the scholarship offer?
It felt great.

What will you miss after graduating?
My lab mates. The flexibility and freedom of academic research as a student. Being able to work whenever I want.

What is your next adventure / challenge or any plans for the future?
To work hard; to continue the lifelong process of learning.
Dr Tan Shi Ming
Sustainable Earth PhD Programme | Singapore Centre for Environmental Life Sciences and Engineering (SCELSE)

Thesis Title: Novel Method Of Probe Design For Characterizing Unclassified Microbial Taxa In Wastewater

Main Supervisor | Prof Yehuda Cohen
School of Biological Science

Co-supervisor | Assoc Prof Cao Bin
School of Civil and Environmental Engineering

Mentor | Assoc Prof Thomas Dick
National University of Singapore (NUS)

• What motivates or triggers you to pursue a doctorate?
   I decided to pursue a doctorate to advance my career in the scientific field. Besides this practical aspect, I wanted a challenge that would stimulate me intellectually – and it surely did! Lastly, I wanted to delay joining the work force after getting a bachelor’s degree.

• Why or how did you decide to apply to IGS or the interdisciplinary route of research?
   I decided to apply to IGS because of the prospect of doing a project that was interdisciplinary in nature. Having students from various schools was exciting because of the different perspectives they bring to the table. Furthermore, IGS was offering many other classes such as Photoshop and effective communication.

• What is your thesis about?
   My thesis is focused on characterising novel bacteria from complex microbial communities. Using methods developed in my thesis, spatial distribution of the novel bacteria could be visualised. In addition, I recovered an almost complete genome of a new genus of bacteria, and constructed an evolutionary relationship tree for it.

• Why did you choose this topic and how does it benefit people or industries globally or internationally?
   The topic was chosen because it involved the development of methods that can be applied by the scientific community. The methods developed can be used to study the low abundant, but functionally important members of the microbial communities.

• What kind of interaction did you have in IGS? How did that help you?
   The relationships that I forged with my peers was built over a social setting – and it was usually done through the many catering events at IGS! My friends at IGS would give travel tips to countries where they have attended their conferences. Networking tips at conferences were often shared among the IGS students.
• What are the challenges you faced during the candidature and how did you overcome them?
The biggest challenge was to manage a PhD project with an extremely busy supervisor (Deputy Director of a Centre of excellence) who was often travelling abroad, and not being on the ground with technical difficulties. The trick is to approach seniors who are in a similar field for advice, or to write to authors of papers who are in the same field of work.

• What was your proudest moment or fondest memories over the years of candidature?
Being the best at publishing beautiful images of microbial communities that were labelled with different colours. My images have been published on the cover of the npj Biofilms and Microbiomes, websites and calendars.

• What do you think are the attributes for PhD students to successfully go through the 4 years?
Grit and having the courage to approach people for help. The PhD journey will undoubtedly be sieged with several drawbacks, and the ability to persevere is a defining quality that will see you through to the end. Having the courage to ask for help from your thesis advisory committee (TAC), or from key leaders in your field will help you go a long way. Practice makes perfect!

• Please share 1 key motivational/ key take away message with your juniors?
“Anything can happen. Bend, but don’t break”.

• How did it feel when you received the scholarship offer?
A.W.E.S.O.M.E! Being granted a premier scholarship which would give a stipend amount that is comparable to my peers who are working in the similar field, and having the grant to travel to overseas conferences was the icing on the cake.

• What will you miss after graduating?
I would miss the luxury of presenting at oversea conferences, or the academic freedom to pursue experiments to satisfy my curious mind. I would also miss the nice food that comes with each IGS seminar!

• What is your next adventure / challenge or any plans for the future?
My next challenge is to further advance up the scientific career ladder, and to further refine my skills in bioinformatics and analytics. R and python, here I come! My next job requires me to manage a group of students as well. I guess it is time to put my management skills to the test!

• Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
Thank you for accompanying me on this PhD journey. Often at times, the journey seemed bleak with no end in sight. However, your constant encouragement and help have spurred me on! This journey was never about me alone, but rather the people who have helped along the way.
• Share with us some memorable photos you’ve taken with 1 line description of each photo.

Celebration with SCELSE’s peeps after the PhD oral defense

Hiking in the mountains in Seoul during our conference (ISME 15) off-day with SCELSE’s peeps

Visiting a friend from SCELSE’s summer course after the end of a workshop in Vienna
• **What will you miss after graduating?**
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Dr Tan Wen See
Sustainable Earth PhD Programme | Nanyang Environment & Water Research Institute (NEWRI)
Thesis Title: 3D Printing Of Feed Channel Spacers For Spiral Wound Membrane Modules
Main Supervisor | Prof Chua Chee Kai
School of Mechanical and Aerospace Engineering
Co-supervisor | Asst Prof Chong Tzyy Haur
School of Civil and Environmental Engineering
Mentor | Prof Wang Rong
School of Civil and Environmental Engineering

“Change will not come if we wait for some other person or some other time. We are the ones we’ve been waiting for. We are the change that we seek.”
Barack Obama
United States’ 44th President
Dr Tang Jing
New Media PhD Programme | Multi-Platform Game Innovation Centre (MAGIC)

Thesis Title: Seed Selection For Viral Marketing In Online Social Networks: From Influence Maximization To Profit Maximization

Main Supervisor | Assoc Prof Tang Xueyan
School of Computer Science and Engineering

Co-supervisor | Assoc Prof Yuan Junsong
School of Electrical and Electronic Engineering

Mentor | Prof Cai Wentong
School of Computer Science and Engineering

• What motivated or triggered you to pursue a doctorate?
  Two things motivated me to pursue a doctorate: interests and future career. When I obtained my bachelor degree, I felt interested in research in computer science. At that time, I wanted to study deeper in this domain. On the other hand, I thought research job is the best choice for me based on my personality (e.g., curious in new technology and science, innovative and creative).

• Why or how did you decide to apply to IGS or the interdisciplinary route of research?
  It’s a general trend that research has become increasingly more complex and requires interdisciplinary knowledge. To make new breakthroughs in research, IGS provides fertile soil. I personally believe that the concept of IGS is a future standard.

• What is your thesis about?
  My thesis work dealt with data management and analytics in large-scale online social networks. Specifically, I made significant research innovations and contributions towards optimizing the efficiency and accuracy of influence maximization in OSNs and extending its application to profit maximization. The results demonstrate the new technological advancements in the algorithms design and analysis for viral marketing in online social networks.

• Why did you choose this topic and how does it benefit people or industries globally or internationally?
  Social networks attract billions of users and people spend a lot of time on social networks every day. Thus, there are many opportunities and challenges in this domain. Viral marketing is such a typical application in social networks. My work attempts to find the best strategy for conducting viral marketing campaigns. For business, my work can help companies earn more money. For society, my work can be used to spread political opinions or new ideas as wildly and rapidly as possible.
What kind of interaction did you have in IGS? How did that help you?
Every year, there are several activities hosted by IGS, such as sports competition and various kinds of seminars. We, students from different disciplines, can gather together to communicate and share our ideas, research and achievements. We can learn from each other and especially for different thinking modes. These things benefit us a lot.

What are the challenges you faced during the candidature and how did you overcome them?
I think the largest challenge I faced during my candidature is not a specific research problem but how to get my research results published in top-tier conferences or journals. Actually, I have been rejected by around 30 times during my PhD study. The first few times, I felt rather upset. However, now, when I receive a rejection letter, I just look at the comments to further improve my work and do not feel so upset. My understanding is that it’s quite normal to get a rejection but a good work will finally appear in a good publication.

What was your proudest moment or fondest memories over the years of candidature?
I got married during my third year of PhD study. It was so exciting that my first published paper won the Best Paper Award in top-tier computer conference IEEE ICNP. I have attended 2 overseas conferences and 1 local conference where I met many great scholars in my domain. So far, 7 papers are published in top-tier computer conferences or journals.

What do you think are the attributes for PhD students to successfully go through the 4 years?
It is important to work slowly but surely. Many students can’t wait for good research outcomes, such as prestigious publication. However, they often make some mistakes by working so fast. PhD students need patience and stress tolerance of failure. Moreover, ideas are really cheap. Realization is rather important. Never think yourself above your business.

Please share 1 key motivational/ key take away message with your juniors.
Research is a long way and please enjoy your life on the way.

How did it feel when you received the scholarship offer?
I was very happy at the first time when I received the offer. After a couple of days, I felt blind of my future. I had no idea what I could do and whether I could do it better for my PhD study.

What will you miss after graduating?
I shall most miss the people here. It’s a very pleasant journey which is an unforgettable memory for me over a lifetime. I will also miss the campus rider (green line), MAGIC at N4B4, IGS office and some other places I frequently visited during my PhD study if I left NTU.
• **What is your next adventure / challenge or any plans for the future?**
  I plan to join academia after graduating. Meanwhile, according to my experience, I may also open some startups at the same time. I think it is important to apply our techniques and knowledge to real products in industries.

• **Is there anything you want to say to your family, supervisors, mentors, friends or anybody?**
  I show my immense gratitude and love to my wife Ms. Du Jiali for all the support she gave for my study and life. I would also like to show my great appreciation to my parents for their constant encouragement, understanding, support and love. I would take this opportunity to express my deepest gratitude to my advisors in NTU, i.e., my supervisor Prof. Tang Xueyan, co-supervisor Prof. Yuan Junsong, and mentor Prof. Cai Wentong. They gave me many useful suggestions and insights that inspired me in many aspects of my research direction. I would also like to thank all my fellow and colleagues for the projects we are working together, my relatives and friends for their encouragements and the staff in MAGIC for their technical support.

• **Share with us some memorable photos you’ve taken with 1 line description of each photo.**

  MAGIC peers. We are all graduating this year. Cheers!  
  NTU winter school 2017. A happy couple attending the academic seminar.
Dr Tay Ken
Sustainable Earth PhD Programme | Energy Research Institute @ NTU (ERI@N)

Thesis Title: Utilizing Large-Eddy Simulation In High-Resolution Wind Resource Modelling – A Coastal Low-Level Jet Case Study

Main Supervisor | Asst Prof Martin Skote
School of Mechanical and Aerospace Engineering

Mentor | Assoc Prof Ng Yin Kwee
School of Mechanical and Aerospace Engineering

“We do not choose to be born. We do not choose our parents. We do not choose the country of our birth. We do not, most of us, choose to die; nor do we choose the time and conditions of our death. But within all this realm of choicelessness, we do choose how we shall live.”

Joseph Epstein
Polish-born Activist
Leader of French Resistance (WWII)
Dr Tay Li Min
Future Healthcare PhD Programme | NTU Institute for Health Technologies (HealthTech NTU)

Thesis Title: Micro- And Nanotechnology Detection And Delivery Systems For Screening And Optimisation Of MSC Chondrogenesis For Cartilage Regeneration

Main Supervisor | Asst Prof Xu Chenjie
School of Chemical and Biomedical Engineering

Co-supervisor | Assoc Prof Zhao Yanli
School of Physical and Mathematical Sciences

Mentor | Prof Lee Eng Hin
National University Health System (NUHS)

• What motivates or triggers you to pursue a doctorate?
I have always been interested in taking up a job in relation to my degree. I wanted to take up a research job to value-add to healthcare. Thus, I was thinking why not do research and obtain a degree at the same time, which is pursuing a doctorate.

• Why or how did you decide to apply to IGS or the interdisciplinary route of research?
It was through recommendation from a friend of mine. Interdisciplinary route also caught my attention then as I would receive guidance from 3 professors from 3 different fields. I felt I could learn more.

• What is your thesis about?
My thesis consists of a combination of tissue engineering, nano- and micro-technologies. In general, my project is on developing a platform using nanosensors for screening of mesenchymal stem cells (MSCs) chondrogenic differentiation for regenerative therapy. An example will be to screen culture conditions for zonal chondrocytes in growth plate. Also, I worked on controlled release system using magnetic microbubbles embedded in three-dimensional hydrogel.

• Why did you choose this topic and how does it benefit people or industries globally or internationally?
The project works toward high content screening with nanosensors. This can potentially be used not only in tissue engineering field but also for drugs screening. In addition, little research has been done on growth plate regeneration, specifically obtain chondrocytes of distinct zones using MSCs. This platform can aid in regeneration of growth plate in near future.
● What kind of interaction did you have in IGS? How did that help you?
I attended the 7th University Scholars Leadership Symposium (USLS), 2016 in Hanoi, Vietnam. IGS nominated a team of 8 IGS students from different research centres. We got to know each other better through the trip and sharing our research. IGS has helped to expand my network beyond my research field.

● What are the challenges you faced during the candidature and how did you overcome them?
I failed multiple times throughout my 4 years of PhD, especially in the first two years. I got lost but I am lucky to find my way in the end with the help of good professors. I feel it is important to find a good professor to look up to.

● What was your proudest moment or fondest memories over the years of candidature?
Proudest moment will be to see my hard work published on my first paper with my name as the first author. It seems to be telling me that my hard work paid off.

● What do you think are the attributes for PhD students to successfully go through the 4 years?
Perseverance is the word. Also, one has to have critical thinking. When an experiment fails, ask why it fails, what could be changed and research more on that area.

● Please share 1 key motivational/ key take away message with your juniors.
Don’t give up when everything seems to fail as failure is also a process of learning.

● How did it feel when you received the scholarship offer?
I was just surprised and happy. However, part of me also hesitated a bit and I asked myself if I really wanted to commit 4 years to pursuing a PhD.

● What will you miss after graduating?
I will miss my lab mates and professors and NTU as a whole.

● What is your next adventure / challenge or any plans for the future?
With my current career as researcher in Cancer Science Institute, I hope to do more for people and get a breakthrough in cancer field.

● Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
I would like to especially thank my supervisors and mentor for the guidance they gave me. I am grateful to have their support. I also want to thank my lab mates who helped me throughout my PhD journey. Not to forget, thank you IGS staff team and my research centre’s administrative team.
• Share with us some memorable photos you’ve taken with 1 line description of each photo.

IGS team building: Rock climbing, 8 Dec 2015

IGS student representatives in 7th USLS @ Hanoi, 2016

Make new friends during the 7th USLS @ Hanoi, 2016.
It is a mixture of Singaporeans, Korean, Malaysians, Vietnamese and Taiwanese.
Dr Teng Long  
Sustainable Earth PhD Programme | Energy Research Institute @ NTU (ERI@N)  
Thesis Title: Advanced Control Of Complex Systems And Their Applications  
Main Supervisor | Prof Wang Youyi  
School of Electrical and Electronic Engineering  
Co-supervisor | Assoc Prof Cai Wenjian  
School of Electrical and Electronic Engineering  
Mentor | Assoc Prof Li Hua  
School of Mechanical and Aerospace Engineering

- **What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?**  
Interdisciplinary research is very important especially nowadays such that having knowledge from various disciplines will benefit one not only in research or career but also in everyday life.

- **What is your thesis about?**  
Advanced control algorithm design for complex industrial systems, such as systems with nonlinearities, time delays, and disturbances.

- **Why did you choose this topic and how does it benefit people or industries globally or internationally?**  
The control of complex systems is still a problem due to time efficiency, computational cost, and so on. These issues can be greatly improved by the proposed control approaches.

- **What kind of interaction did you have in IGS? How did that help you?**  
I had a co-supervisor who is from a different discipline. I met many friends from various research backgrounds. I also learned a lot from different seminars.

- **What are the challenges you faced during the candidature and how did you overcome them?**  
The need to improve my paper-writing skills.

- **What do you think are the key attributes for PhD students to successfully complete their candidature?**  
Hardworking, be interested in research
● Please share 1 key motivational/ key take away message with your juniors.
  Believe in yourself and work hard.

● What is your next adventure / challenge or any plans for the future?
  I am working at a start-up company now. I do not know exactly what my next adventure will be. But I am expecting it now.

● What was your proudest moment or fondest memories over the years of candidature?

I met my wife for the first time when I attended a conference in Florence, Italy. We travelled to a lot of places in Europe.
“Champions aren’t made in the gyms. Champions are made from something they have deep inside them – a desire, a dream, a vision.”

Muhammad Ali
American Former World Heavyweight Boxing Champion
Dr Velautham Dakisya
Sustainable Earth PhD Programme | Nayang Environment & Water Research Institute (NEWRI)

Thesis Title: Decision Making On Flood Mitigation Incorporating Uncertainty, Socio-Economic Factors And A Changing Future

Main Supervisor | Assoc Prof Lo Yat-Man, Edmond
School of Civil and Environmental Engineering

Co-supervisor | Assoc Prof Tai Kang
School of Mechanical and Aerospace Engineering

Mentor | Assoc Prof Law Wing-Keung, Adria
School of Civil and Environmental Engineering

- What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?
  Four years before interdisciplinary research was completely new for me. I was doing undergraduate studies and wanted to do PhD but not in theoretical studies. This was a great opportunity to pursue my life goals. I’m proud to be part of IGS.

- What is your thesis about?
  A decision frame-work is developed by accounting climate change, growing urbanization, and evolving socio-economic features of flood plain.

- Why did you choose this topic and how does it benefit people or industries globally or internationally?
  Flooding is the most prevalent natural disaster causing billions of dollars of loss each year worldwide. The flood risk is expected to change due to climate change, urbanization and socio-economic changes. I wanted to find a smart way to fight against it from developing countries’ perspective.

- What kind of interaction did you have in IGS? How did that help you?
  - Meeting with Prof Liedberg, IGS Dean in the 1st year – It gave me confidence on my progress.
  - Get-togethers (e.g. Christmas, New Year) – A great chance to meet my friends and batch mates. It’s usually a happy moment
  - Career talks – It helped me a lot on job applications

- What are the challenges you faced during the candidature and how did you overcome them?
  - Time management – I used to have my schedule with reasonable time allocation. It includes 10% additional time for failures.
  - Self-motivation – In some cases, my supervisor wasn’t satisfied with my results. I motivated myself as he believes that I can do better and I am more capable than this.
What do you think are the key attributes for PhD students to successfully complete their candidature?
- Time management – Schedule your work with a reasonable failure buffer
- Work effectively - Work 8 hours a day not more. Learn to finish your work on an 8 hours a day schedule.
- Rejections are part of PhD – Rejections or negative feedbacks are common in PhD studies. Don’t spend much time worrying about the failure. Keep moving forward.
- Be honest with your supervisor – If you made a mistake in research or forgot to do something, communicate with your supervisor truthfully and don’t be ashamed to ask for help and guidance. Don’t over-promise on your progress.

What was your proudest moment or fondest memories over the years of candidature?
- Nominated for Schmidt Science Fellows program 2018 by NTU
- Received 2017 ProSPER.Net Young Researchers’ School scholarship from the Institute for Advanced Study of Sustainability, United Nations University
- Invited to deliver seminar at Institute of Catastrophe Risk Management, NTU
- Met NTU president Prof Subra Suresh and his wife in person
- Published two journal papers in international journals
- Attended two international conferences

Please share 1 key motivational/ key take away message with your juniors.
Believe in yourself, if your supervisor is not satisfied with your performance, he believes you are more capable than what you are doing. Take it in a positive way.

What is your next adventure / challenge or any plans for the future?
To do more research as postdoc and land a faculty position. I want to be in a leading position in a research lab and keep on contributing to sustainable development.
Dr Vikram Shenoy Handiru
Future Healthcare PhD Programme | NTU Institute for Health Technologies (HealthTech NTU)

Thesis Title: Neural Signal Processing Techniques To Analyse Motor Functions In EEG-Based Brain-Computer Interfaces

Main Supervisor | Assoc Prof Vinod Achutavarrier Prasad
School of Computer Science and Engineering

Co-supervisor | Prof Guan Cuntai
School of Computer Science and Engineering

Mentor | Dr Ng Yee Sien
Singapore General Hospital (SGH)

- **What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?**

  Since the Interdisciplinary Graduate School (IGS) at NTU allows us to collaborate across schools and research institutions, it was a perfect choice for me to work on the research topic of Brain-Computer Interface which requires expertise across domains such as Neuroscience, Signal Processing, and Machine Learning. I am thankful to IGS for giving me the opportunity to be guided by Professors from the School of Computer Science as well as School of Electrical and Electronics Engineering and a rehabilitation specialist Doctor.

- **What is your thesis about?**

  The electroencephalogram (EEG)-based Brain-Computer Interface (BCI) provides an alternative pathway to transmit neural information to a computer. My thesis focuses on addressing some of the key challenges pertaining to the EEG-based BCI such as poor spatial resolution, non-stationary nature of cortical signals, and high variability of BCI performance across subjects. As the recorded EEG signals are usually noisy, special approaches for signal processing need to be used to extract useful information from highly non-stationary EEG signals. To this end, I have developed computationally efficient channel selection algorithm and robust spatial filtering algorithms that help us to improve the BCI performance as well as to better understand the underlying brain activity of stroke patients.

- **Why did you choose this topic and how does it benefit people or industries globally or internationally?**

  Stroke is a serious health issue across the world and also one of the top 5 reasons for death. Brain-Computer interface (BCI) is a technology that is used for stroke rehabilitation. Having an opportunity to work towards the betterment of stroke patients using BCI motivated me to pursue interdisciplinary research.
• What kind of interaction did you have in IGS? How did that help you?
IGS has been very helpful throughout my PhD journey. Especially, the systematic administration process allowed me to keep track of my progress and finish the PhD within the stipulated time. IGS has not only helped academically, but also supported our non-academic life by organizing several fun events that help us unwind from the busy research schedule. Also, because of the regular student seminars, development series, and supervisor talks conducted at IGS, all IGS students get to meet each other, share their research ideas and learn from one another.

• What are the challenges you faced during the candidature and how did you overcome them?
It would be untrue if I said my PhD journey was very smooth. There is always an inevitable ebb and flow in one’s PhD experience. There were times when I was not getting any good results, but that is the beauty of PhD journey. Only if we are persistent can we overcome the challenges. Fortunately, I had a strong research team to support me. Especially Dr. Vinod (Main Supervisor) and Dr. Cuntai (Co-supervisor) boosted my morale whenever I felt low in terms of research productivity.

• What do you think are the key attributes for PhD students to successfully complete their candidature?
Inquisitiveness is the key attribute that every PhD student should have. They should always question why certain methods work (or why not), how could they improve the existing solution and so on. Also, one should be keen to learn new things. PhD is not a phase of life, but it’s a journey. There are a lot of things to learn during the PhD not only in terms of research but also in one’s approach towards life. Intelligence/high I.Q. can only help to some extent, but it is the persistent hard work that allows one to successfully finish his/her PhD candidature.

• What was your proudest moment or fondest memories over the years of candidature?
The last 4 years at NTU has been an unforgettable experience. I have had a chance to learn and interact with the best minds in my field. During my first year of Ph.D., I got an opportunity to attend the flagship event of IEEE Systems, Man & Cybernetics (SMC) Society at San Diego, USA. I am also glad that I got the best student paper award at IEEE SMC. It was truly a remarkable experience.
Best Student Paper Award at IEEE Systems, Man, and Cybernetics Conference in San Diego, USA (2014) for my first research paper as a PhD student

Research Team Outing

NTU also encourages us to engage in extracurricular events to get some respite from a busy work schedule. It motivated me to become the President of IGS Student Club in December 2015, which gave me an opportunity to engage with the school administration in graduate matters as well as to interact with a diverse group of students.
Memorable activities with IGS Student Club over the 4 years.


Dr Vu Thanh Tung
Sustainable Earth PhD Programme | Nanyang Environment & Water Research Institute (NEWRI)

Thesis Title: Parallel And Distributed Algorithms For Computational Fluid Flow Simulations

Main Supervisor | Assoc Prof Law Wing-Keung, Adrian
School of Civil and Environmental Engineering

Co-supervisor | Assoc Prof Kim Neil Irvine
National Institute of Education (NIE)

Mentor | Prof Ng Wun Jern
School of Civil and Environmental Engineering

Dr Wang Jingwei
Sustainable Earth PhD Programme | Nanyang Environment & Water Research Institute (NEWRI)

Thesis Title: Experimental Investigation On Membrane Fouling Mitigation By Solid-Liquid Fluidization

Main Supervisor | Asst Prof Chew Jia Wei
School of Chemical and Biomedical Engineering

Co-supervisor | Prof Liu Yu
School of Civil and Environmental Engineering

Mentor | Prof Wang Rong
School of Civil and Environmental Engineering

“My goal is simple. It is a complete understanding of the Universe, why it is as it is and why it exists at all.”

Stephen William Hawking
English Theoretical Physicist
What motivates or triggers you to pursue a doctorate?
I aimed to pursue a Ph.D. back in 2013 because I wanted to understand fundamentally how rechargeable batteries actually work. By comprehending this, I could help design better batteries to mitigate the global warming problem by introducing a more effective rechargeable energy storage.

Why or how did you decide to apply to IGS or the interdisciplinary route of research?
I wanted to apply for a scholarship that allows me to experience a short stint in an overseas laboratory so that I could broaden my insights and research horizon. Therefore, I chose IGS as it offered a 1 year exchange programme to Grenoble INP (Grenoble, France) and a research stay at CEA in Saclay, France.

What is your thesis about?
My thesis is about understanding the working mechanism of Tin based oxides as anode in both Li and Na ion batteries. The work comprises of a collaboration between CEA in France and Argonne National Laboratory to better understand the capacity decay often encountered during battery cycling processes.

Why did you choose this topic and how does it benefit people or industries globally or internationally?
Currently, Earth is facing the problem of global warming and it is important to scale up the use of renewable energy. However, such sources are intermittent in nature and better energy storage devices are needed to store more charge and last longer. With better energy storage devices, hopefully the global warming phenomenon could be mitigated.
• What kind of interaction did you have in IGS? How did that help you?
  In IGS, it is common for us to have Seminar and Distinguished Guest lectures. This provided me with a basic understanding of the different problems and approaches encountered in other research areas. By placing myself in their solution toolbox, it helped broaden my perspective and allowed me to think out of my current box.

• What are the challenges you faced during the candidature and how did you overcome them?
  Communication between Singapore and France was a key issue due to time and difference in working culture. Asides from that, peers who have graduated with Bachelors’ have gone on to earn much more money during that time and this added pressure to me financially.

• What was your proudest moment or fondest memories over the years of candidature?
  When I first joined my group, I helped to establish the battery division in my laboratory. Starting from scratch, we managed to purchase laboratory equipment and went on to publish high impact papers in prestigious papers like Advanced Materials, Advanced Energy Materials and etc. Our collaborative work with CEA and ANL also won the best poster prize at the Singapore International Chemistry Conference in 2016.

• What do you think are the attributes for PhD students to successfully go through the 4 years?
  Tenacity, grit and the ability to cross-think between difference disciplines.

• Please share 1 key motivational/ key take away message with your juniors?
  People are out there to help you, so, make the best out of a collaboration.

• How did it feel when you received the scholarship offer?
  Initially, I was uncertain about doing the PhD, but I decided to go with my gut feeling that developing new ideas and products could help benefit the world.

• What will you miss after graduating?
  Seminar sessions and distinguished lectures

• What is your next adventure / challenge or any plans for the future?
  Plan to look for a new job that is related to R&D and/or project management.

• Is there anything you want to say to your family, supervisors, mentors, friends or anybody?
  My main supervisor, Assoc Prof Jason Xu from MSE was my main motivation for enduring on this PhD despite numerous setbacks. Without him, this PhD would not be possible.
• Share with us some memorable photos you’ve taken with 1 line description of each photo.

Group photo with colleagues from CEA going for a jog during lunch
“What this power is, I cannot say. All I know is that it exists, and it becomes available only when you are in that state of mind in which you know exactly what you want, and are fully determined not to quit until you get it.”

Alexander Graham Bell
Scottish Scientist
Inventor & Innovator
Dr Wanigarathna J.A. Darshika Kumari  
Sustainable Earth PhD Programme |  
Nanyang Environment & Water Research Institute (NEWRI)

Thesis Title: Adsorption-Based Fluorocarbon Separation In Zeolites And Metal Organic Frameworks

Main Supervisor | Assoc Prof Liu Bin  
School of Chemical and Biomedical Engineering

Co-supervisor | Assoc Prof Zhang Qichun  
School of Materials Science and Engineering

Mentor | Asst Prof Ni Ran  
School of Chemical and Biomedical Engineering

• **What motivates or triggers you to pursue a doctorate in IGS or the interdisciplinary route of research?**  
My Master’s degree was also a kind of interdisciplinary study. I found it very interesting and it helped me to think within a broad research area.

• **What is your thesis about?**  
My thesis is about adsorption-based separation of fluorocarbons. The focus was to recycle used fluorocarbon refrigerants. The work involved design and synthesis of suitable adsorbents for this separation.

• **Why did you choose this topic and how does it benefit people or industries globally or internationally?**  
When I heard about the topic of the research, I realized that it will create a positive impact on environmental sustainability. Industries still don’t recycle fluorocarbons and the economically feasible separation processes are urgently required. Our findings can be adopted easily on industry scale.

• **What kind of interaction did you have in IGS? How did that help you?**  
I often visit IGS to attend seminars and other important events such as New Year celebrations and Christmas parties.

• **What are the challenges you faced during the candidature and how did you overcome them?**  
Originally, I was a Civil engineering graduate and at the beginning I feel pressured because the research requires strong chemical engineering and material science background. But I received great support from my colleagues and learned everything step-by-step. I learned how to conduct research independently.
• **What do you think are the key attributes for PhD students to successfully complete their candidature?**
  At a certain stage of our candidature, we all feel pressure because of the work. I think perseverance is the most important attribute for PhD students. When facing difficulties, we should take actions to overcome them without stagnating.

• **What was your proudest moment or fondest memories over the years of candidature?**
  It was the moment I published a paper for the first time.

• **Please share 1 key motivational/ key take away message with your juniors.**
  Learn how to persevere.

• **What is your next adventure / challenge or any plans for the future?**
  While having an academic career, I am expecting to connect with relevant industries in Sri Lanka to conduct researches of an interdisciplinary nature.
"Many times a day I realise how much my own outer and inner life is built upon the labours of my fellowmen and how earnestly I must exert myself in order to give in return as much as I have received."

Albert Einstein
German-born American Physicist
Nobel Laureate
Time’s Man of the Century
Dr Yang Linyan
Sustainable Earth PhD Programme | Nanyang Environment & Water Research Institute (NEWRI)

Thesis Title: Occurrence, Formation And Treatment Of Disinfection By-Products (DBPs) In Swimming Pool Waters

Main Supervisor | Prof Wang Rong
School of Civil and Environmental Engineering

Co-supervisor | Assoc Prof Wan Man Pun
School of Mechanical and Aerospace Engineering

Mentor | Dr Victor Chang

- **What motivates or triggers you to pursue a doctorate?**
  Environmental engineering should be a promising and popular field in my motherland. I felt it would be meaningful to work in this research field. I would like to possess more skills and knowledge to contribute to the protection of the environment in my future career.

- **Why or how did you decide to apply to IGS or the interdisciplinary route of research?**
  In IGS, we have supervisors and mentors from different schools, which provides us a good platform to think, discuss, and operate from multiple directions. It also provides us a good opportunity to interact with students and colleagues with different research backgrounds. The interdisciplinary route of research could be a good simulation of our future research career.

- **What is your thesis about?**
  My thesis work explored the effectiveness and appropriateness of using alternative disinfectants to minimize the formation of disinfection by-products (DBPs) from the source and using membrane technology to remove the already generated haloacetic acids (HAAs, a group of prevalent DBPs) from swimming pool waters (SPWs). The results contributed to the mechanistic understanding of these promising technologies for SPW purification.
• Why did you choose this topic and how does it benefit people or industries globally or internationally?
The government raised significant concerns about swimming pool environment due to the unhealthy symptoms reflected by the swimmers, since they encouraged their citizens to have pool activities. In Singapore, less attention has been paid to pool safety especially from the chemical aspect. Based on our knowledge, DBPs are potentially related to these symptoms. Therefore, we explored the DBP situation in local pools and investigated the potential ways for DBP minimization. Our research could raise the public awareness of chemical safety in pools and provide the promising technologies for SPW purification. Our observations such as UV-induced chlorine variations, DBP accumulations, and recirculation of pool water, are also common to the pools in other regions/countries.

• What kind of interaction did you have in IGS? How did that help you?
The effective interaction within IGS is by attending the IGS-SS, which acts like a group meeting. I was inspired by some latest technologies or knowledge, which were useful in my own research. I even learnt the skills of how to make beautiful academic slides and do a creditable oral presentation.

• What are the challenges you faced during the candidature and how did you overcome them?
The most challenging issue happened at the beginning of my research. I did not know which topic I should handle and how to operate some sophisticated testing instruments. Reading and thinking more and communicating more with supervisors, colleagues and even lab technicians helped me to overcome these challenges. Do take note of the importance of “active learning”.

• What was your proudest moment or fondest memories over the years of candidature?
The proudest moment or fondest memories for me is publishing papers. Publication although is compulsory by schools, is nevertheless really a reflection of our achievements. During the paper submission, I thought more comprehensively by considering the comments raised by the reviewers, which is also an important part during my research.

• What do you think are the attributes for PhD students to successfully go through the 4 years?
To go through PhD successfully, students should have the following aspects: 1) active learning; 2) active thinking; 3) hard working; 4) strong mentality

• Please share 1 key motivational/ key take away message with your juniors?
After PhD, you will find nothing difficult.

• How did it feel when you received the scholarship offer?
I was very excited and moved when I received the scholarship offer. It is not only a recognition of my past, but also an encouragement for my future research career.
• **What will you miss after graduating?**
After graduation, I will miss a lot of things. I will miss my clean offices, miss the delicious and varieties of food in canteens, miss the beautiful campus. Most important is the people. I will miss my lovely supervisors, friendly admins and lab technicians, and all my friends in Singapore.

• **What is your next adventure / challenge or any plans for the future?**
In the current stage, the challenge to me is to find a good faculty job within a few months. To be a new mother, it would also be a challenge for me to balance the time between work and life.

• **Is there anything you want to say to your family, supervisors, mentors, friends or anybody?**
I am so lucky to have so many responsible and nice supervisors supporting and guiding me during my PhD study. I want to express my sincere thanks to them and wish them a good life in the future.

• **Share with us some memorable photos you’ve taken with 1 line description of each photo.**

  ![](image)
  *Graduation gown*

  ![](image)
  *Oral defence with my supervisor, Prof Wang Rong (L)*
Dr Zeng Zhiping  
Sustainable Earth PhD Programme |  
Nanyang Environment & Water Research Institute (NEWRI)  

Thesis Title: Graphene Quantum Dots (GQDs) And Their Derivatives For Multifarious Catalysis And Environmental Applications  

Main Supervisor | Assoc Prof Timothy Tan  
School of Chemical and Biomedical Engineering  

Co-supervisor | Prof Wang Rong  
School of Civil and Environmental Engineering  

- **What motivates or triggers you to pursue a doctorate?**  
  To make a perfect life.  

- **Why or how did you decide to apply to IGS or the interdisciplinary route of research?**  
  Actually, I was introduced by my supervisor.  

- **What is your thesis about?**  
  My thesis is mainly about rational design and construction of a large variety of 0D/0D, 0D/1D, 0D/2D functional nanostructures for advanced sustainable energy, water and environmental applications.  

- **Why did you choose this topic and how does it benefit people or industries globally or internationally?**  
  Graphene and graphene quantum dots generated a “gold-rush” period in academic and industrial projects. I found a series of nano-carbon functionalized nanomaterials with significantly enhanced electrocatalytic, antibacterial and antibiofouling properties towards energy conversion (like fuel cell), and water treatment.  

- **What kind of interaction did you have in IGS? How did that help you?**  
  IGS has various interesting and meaningful seminars/training, which can help us become motivated during the period when we are pursuing our PhD.  

- **What are the challenges you faced during the candidature and how did you overcome them?**  
  During my candidature, loneliness, I think, is a huge challenge in the research life. Gradually, it made me feel depressed and dissatisfied. But, sport is a good solution, and I like to play badminton and swim, and I can also make many friends and keep healthy during exercise.
What was your proudest moment or fondest memories over the years of candidature? It is the time when I was informed that my first journal paper was accepted after a prolonged effort.

What do you think are the attributes for PhD students to successfully go through the 4 years? Always keep interested and dissatisfied in research.

Please share 1 key motivational/ key take away message with your juniors. “Today is hard, tomorrow is much harder, and the day after tomorrow is beautiful. Most people died tomorrow evening if you don’t work hard.”

How did it feel when you received the scholarship offer? Of course, happy and excited.

What will you miss after graduating? The old friends in NTU.

What is your next adventure / challenge or any plans for the future? In the future, I plan to work hard in a research project. The project should be the one I feel most interested in.

Is there anything you want to say to your family, supervisors, mentors, friends or anybody? Many, many thanks to all the people, who always support and help me.

Share with us some memorable photos you’ve taken with 1 line description of each photo.

NTU, we love you!
“The only thing worse than being bling is having sight but no vision. Vision is non-negotiable for anyone who wants to succeed. It is the blueprint on the inside of a leader, before she ever sees the plan on the outside.”

Helen Keller
American Blind/Deaf Author - Lecturer & Civil Activist
Dr Zhang Xin  
Sustainable Earth PhD Programme |  
Nanyang Environment & Water Research Institute (NEWRI)  

Thesis Title: Mechanical Behaviours Of Individual Core-Shell Microspheres And Their Polymeric Composites Under Different Strain Rates  

Main Supervisor | Asst Prof Yang En-Hua  
School of Civil and Environmental Engineering  

Co-supervisor | Asst Prof Fan Zheng  
School of Mechanical and Aerospace Engineering  

Mentor | Assoc Prof Shu Dong Wei  
School of Mechanical and Aerospace Engineering  

- **What motivates or triggers you to pursue a doctorate?**  
  It is one of my dreams to pursue a doctorate. After graduating from NPU with a master degree, I became interested in science and technology, which drives me to pursue a PhD degree. However, the coincidence chance cannot be ignored.  

- **Why or how did you decide to apply to IGS or the interdisciplinary route of research?**  
  Actually I was already on an interdisciplinary route from undergraduate study in Honors College in NPU in China. During that period of study I learned a lot from interdisciplinary courses including physics, electronics, aerospace, mechanics, computer, automatization, etc. which really helped me a lot to understand the beauty of science and engineering. As a result, I continue to apply an interdisciplinary route on my research. IGS is really a good place for me to accomplish this.  

- **What is your thesis about?**  
  My thesis is about the mechanical behaviors of individual core-shell microspheres and their polymeric composites under different strain rates. In order to provide useful information to researchers for optimized design of core-shell microspheres filled polymer composite during application, it is significant to investigate the mechanical response of individual core-shell microsphere and their polymer composite. Meanwhile, mechanical modelling has also been applied on both individual core-shell structure and composite for better understanding.
Why did you choose this topic and how does it benefit people or industries globally or internationally?
Core-shell microspheres and their polymer composites are widely used in environment and water areas for anticorrosion, self-cleaning, waste absorption, antibacterial and deep sea exploration purposes due to the capability of core-shell structure to carry functional agents. It is also used in aerospace industry and automobile industry due to their lightweight and energy absorption capacities. Before my PhD study, my research focused on the structural design of aircraft which make me have confidence in doing my Ph.D. topic.

What kind of interaction did you have in IGS? How did that help you?
During the four years study, I really learned different courses from different disciplines. This broadened my field of vision. I also met people from different disciplines which inspired me in my own research. The supervisors from different schools also helped me to resolve different scientific problems in wider ways.

What were the challenges you faced during the candidature and how did you overcome it?
I changed the topic after my QE oral examination which left me struggling for a while. The previous topic was too wide for a PhD study, so I narrowed down my interest and tried a lot to investigate new methods and new technologies. Fortunately, finally I conquered the problems I met in my new research topic.

What was your proudest moment or fondest memories over the years of candidature?
I am excited to have my first SCI paper published. I am also proud that I finished my PhD study after I changed my research topic after my qualification exam. I am also pleased to meet my girlfriend during my study.

What do you think are the attributes for PhD students to successfully go through the 4 years?
First, I think a strong will is necessary as many challenges are going to come. Second, the ability and will to learn novel technology otherwise it will be even harder to fulfil a PhD degree. Last but not least, the ability to endure loneliness is a good attribute for a PhD student.

Please share 1 key motivational/ key take away message with your juniors.
Doing a PhD can also be a happy journey, don’t forget to enjoy your life. Make friends with your colleagues, you will be benefit from that.

How did it feel when you received the scholarship offer?
I was pleased but also worried about my future because I already had a job during that time. But I am glad that finally I chose to pursue my PhD, a decision which I have never regretted.
• Share with us some memorable photos you’ve taken with 1 line description of each photo.

I joined IGS student club and learned a lot from other club members.

This photo was taken when I first came to Singapore. Time flies.

IGS CNY Celebration 2017
I am pleased to attend the USLS 2016 with other IGS students. During the conference, I met a lot of friends from different nations and learned a lot on humanitarian affairs.

- **What will you miss after graduating?**
  I will miss my hard work during the past few years. And also the struggles which have made me stronger. The good memories will inspire me in the future. I will also miss all the club members in IGS student club. Most importantly, I will miss IGS.

- **What is your next adventure / challenge or any plans for the future?**
  I am trying to find a formal job. I am still thinking about whether to continue academic research or find work in a company. Probably I will go to South part of China to find a job. Following my heart will be a good choice.

- **Is there anything you want to say to your family, supervisors, mentors, friends or anybody?**
  I would like to sincerely appreciate my supervisors, and mentor, for without their guidance, I cannot finish my thesis. Also I would like to thank all my friends, as without their help, I cannot achieve the current results. Thanks are given to all people who have helped me.
Dr Zhang Yu
Sustainable Earth PhD Programme | Energy Research Institute @ NTU (ERI@N)

Thesis Title: Two-Dimentional Black Phosphorus For Rechargeable Batteries

Main Supervisor | Assoc Prof Alex Yan Qingyu
School of Materials Science and Engineering

Mentor | Assoc Prof Xue Can
School of Materials Science and Engineering

Dr Zhu Kaicheng
Future Healthcare PhD Programme | NTU Institute for Health Technologies (HealthTech NTU)

Thesis Title: Modelling Signalling Pathways On Diverse Scales

Main Supervisor | Assoc Prof Su Haibin
School of Materials Science and Engineering

Co-supervisor | Assoc Prof Liang Zhao-Xun
School of Biological Science

Mentor | Dr Yeo Seng Beng
Tan Tock Seng Hospital (TTSH)

“The pessimist finds difficulty in every opportunity; the optimist finds opportunity in every difficulty.”
Lawrence Pearsall Jacks
English Write, Educator & Philosopher