

Physics Matters

APhO 2014

11 May marked the beginning of the 15th Asian Physics Olympiad (APhO). 165 participants from 27 countries, the highest participation in the history of APhO, convened at the National University of Singapore for the week-long event.

In his speech at the opening ceremony, Prof Tan Chorh Chuan, President of NUS, highlighted that APhO gave our region's most talented students the opportunity to truly exercise their minds. He hoped all participants would enjoy Singapore, learn from their experiences and make many good friends.

All the APhO 2014 participants were absolutely geared up for the theory paper and experimental challenge held on two different days. A host of programmes were also lined up for them from exploring heritage trails to tours at the local universities and research centers. Another highlight was a talk delivered by Nobel laureate Prof Roy J Glauber on Quantum Optics at the closing ceremony.

"Awesome" was the sentiment echoed by one team of participants when asked about their experience. Indeed it is hoped that all participants relished every moment of their APhO journey.

APhO 2014 would not be a resounding success without the tremendous effort put in. Prof Feng Yuan Ping thanked all staff and students, some of whom had worked through sleepless nights. "I also hope that this has been an enjoyable experience for everyone. Being part of such an event is the spirit of the Olympics and would be something memorable in our lives."



↑ Highspirited performance at the opening ceremony



↑ APhO participants at the closing ceremony



(Turn to pages 4 and 5 for more highlights of APhO 2014.)

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Thank You Profs!

It was an enduring moment for the Physics Department to honour outgoing head Prof Feng Yuan Ping and deputy head A/P Chung Keng Yeow at an appreciation tea held on 11 July.

In his thank you note, Prof Sow Chorng Haur, current head of the Department, praised Prof Feng for raising the Department's international status with his steady leadership in the past seven years. From the recruitment of excellent faculty to

raising the profile in research, teaching, graduate studies and external relations, Prof Feng has set the Department on course for greater success ahead. The strong support from the Deputy Heads has also been paramount.

A/P Chung has resumed a new portfolio besides teaching after serving as deputy head (resources and non-academic staff) for the past four years. Colleagues thanked A/P Chung for his commitment to work and careful execution of matters under his purview. A/P Chung is succeeded by A/P Phil Chan.

During the appreciation tea, both outgoing professors were each presented with a "Thank-You" card on which was penned many heart-felt notes of appreciation from individual colleagues of the department.

← From left: A/P Chung Keng Yeow, Prof Feng Yuan Ping and Prof Sow Chorng Haur



A Warm Welcome to Our Visitors

The Department was honoured to host Profs Chang Ching-Ray, Peter Knight and Axle Schenzle who were here for a review visit from 24 to 27 March. The professors met and interacted with faculty, non-academic staff, researchers, graduates and undergraduates. Besides sitting in lectures and visiting teaching labs and research centres, the professors also held meetings with individual groups. The Department is encouraged to receive all the positive feedback from the visiting committee and hopes to follow up with their recommendations and advice.

➔ From left: Profs Chang Ching-Ray, Axel Schenzle and Peter Knight with Prof Feng among graduate students at the UTown

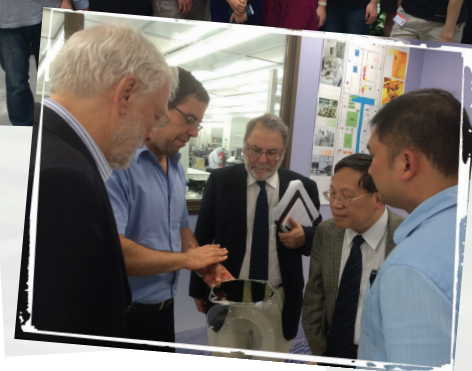


Cosmos Debut

Well-known astrophysicist Dr Neil deGrasse Tyson made a rare appearance on 14 Feb in the Science Faculty to promote the science documentary series "Cosmos: A Space-Time Odyssey". This new series is a successor to the original popular series presented by the late Prof Carl Sagan. An educator and advocacy for NASA, Dr Tyson also hosted the show which premiered on 15 March on the National Geographic Channel. Ms Ann Druyan, the executive producer, was also here to publicise the science behind the cosmos production.



↑ Dr Neil Tyson and Ms Ann Druyan with some Physics faculty



↑ Visiting the Graphene Centre



➔ Students at a packed LT 27 awaiting to hear Dr Tyson and Ms Druyan

My Journey as an Undergraduate

John Soo Yue Han who recently graduated with a First Class Honours in Physics shared about his journey as an undergraduate. He will be pursuing a PhD in Physics and Astronomy in September with the University College London in UK.

My journey as an undergraduate started on 29 July 2010 when I first landed my feet on NUS. I had an initial culture shock and was not quite ready for the university route of learning. The first year was like a revision of high school physics with more calculus, but second and third years were tough. There was a steep learning curve and concepts became harder to grasp. Many times I sat and smiled during lectures with no idea what was going on. But here friendships were strengthened as we needed one another's brains to complete our assignments!

The journey took a different path during my honours year. Life revolves around my FYP MATLAB codes, lab duties and application for a graduate school. Now in retrospect, my greatest takeaway was the entire learning process—how to think and analyse like a physicist. Those skills are part of my daily life now when it comes to problem solving. I have to mention it was my awesome friends that had made my journey as an undergraduate so enjoyable. ☺

Although I was a foreign student, Singapore was no stranger to me. The food, weather and languages were the same as back home. But

I had to switch from an easy-going to a fast-paced life with emphasis on competency, excellence and efficiency. The expectations of a top Asian university were just—expected! I also had to get used to things like queuing up for good food, memorising acronyms for almost everything, using zebra crossings and not mixing 'dollar' with 'ringgit'!



↑ John receiving his scroll from the Chancellor of NUS and President of Singapore Dr Tony Tan Keng Yam

My adoptive parents have been very supportive of my studies right from the beginning. Though they never quite understood the physics I was into, never once they demanded that I pursued something that would fetch higher economic returns in future. They would be praying for me come exam or an overwhelming schedule. I was open to share with them my worries and troubles for I knew they would stand by me and encourage me. I have to say rebellion marked my teenage years but my parents never gave up. They molded my character and trained me to be independent, motivated and hardworking. I turned out to be who I am today because of their love. For this, I am indebted to them.

Read more about John from the New Straits Times online: <http://www.nst.com.my/node/11782>

My FYP Journey

Recent honours graduates Chan Xinhui Kim and Aren Tang Minyi shared with *Physics Matters* their FYP (final year project) journey.

Before FYP, I did a UROPS project on Si nanowires (SiNWs) as part of my USP requirements and fell in love with the lab culture. This was the first time I ever worked with advanced instruments and observed things not possible with our naked eye. It was so exciting to see SiNWs fluoresced and changed colours!



So I was all set to pursue similar research for my FYP under the same supervisor and lab. A class of materials called 2D transition metal dichalcogenides was a hot topic then and I thought it exciting to embark on its research.

For a start, being the clumsy one and working with nanoscale samples meant many initial failures. But my UROPS experience helped prepare me for the numerous challenges ahead. Time management was tough. My initial enthusiasm waned as

many things were not within my control and results turned negative due to various technical difficulties. I struggled to manage my own expectations and that of the experiment.

However, I thank God that one by one the hurdles I had were overcome with the support of my supervisor Prof Sow Chorng Haur. Though busy, Prof Sow was patient to discuss my progress and even revised the basic concepts of nanoscience with me. Stressful moments could turn into a talk about life! So I thank Prof Sow for his guidance and also all my friends and mentors who helped to refine my experimental skills.

Through this FYP journey, I learned that passion and curiosity for learning are prerequisites for the success of any task. My passion in Physics helped me to persevere when I felt like giving up. I gained a new perspective of myself and what kept me motivated as well as my ability to handle stressful situations and manage time. I also learned from my friends who are talented in their own way. Truly, curiosity leads you to the door of knowledge, but humility is the key to that door! One should never stop learning and growing!

Chan Xinhui Kim

When asked to write about my experiences with FYP, a host of memories flooded my mind. I recall emotions ranging from jubilation to overwhelming panic and dread. Indeed the most often used acronym in my fourth year was precisely those three letters—F.Y.P.

Choosing a field wasn't difficult for me since I was already inclined towards two particular fields, Particle Physics and Quantum Computing, both of which I took during my semester abroad. I picked the former due to news on the Higgs discovery and my preference for supervisor.

As all stories go, there were ups and downs. One day an idea appealed to me, the next it wasn't a great one to begin with. Then there were the countless hours spent poring over journal papers. Research work was often labourious and at my wit's end at times, I inevitably asked, "Why did I choose to do THIS?"

Spurred by my supervisor A/P Phil Chan, friends, family and ultimately my own fear of failing, I persevered. Discussions with A/P Chan served to guide me at times but more often than not, what worked was simply taking a step back and focused on other things instead. It was more important that I retained my "sanity" and not let the stress overtook me.

Through FYP, I was exposed to situations that I would never ever encounter. I experienced first-hand the process of research—literature review, ideas generation, results computation and analysis, and finally report writing. Research could be murky sometimes when one hypothesis evolved to the next till we grasped a reasonable idea which seemed to describe our world. I was thankful for the chance to attend a Particle Physics School in Chiang Mai during my FYP and learned first-hand from top particle physicists.

All in all, FYP was indeed an eye-opening and enriching experience. The sense of accomplishment I felt when I submitted my thesis definitely outweighed all my past frustration and hard work. FYP is surely not a walk in the park. Demanding and tedious as it may be, it is well worth it!

Aren Tang Minyi

Some Words of Advice about FYP...



Prof Scarani Valerio, who is in charge of the Final Year Project, has something to share with our undergraduates who will be embarking on their FYP journey.

“The Final Year Project is meant to give a serious taste of research. It's the taste of specialisation, made of extensive literature search, obstinate attack on theorems that refuse to be proved or devices that refuse to work, derivations and observations that (however small in the grand scheme of things) are really new, the secret desire of a publication... There is no bad topic, but there is a bad way of making your choice: leaving it for the last minute. Browse the website of the Physics Department, go and get to know our faculty members, even those that have not taught you a module: you will surely find a good match for your interests and personality!”

Prof Scarani Valerio

Highlights of APhO 2014



↑ At the exam hall



↑ Ready, get set, jump!



↑ APhO, a small "United Nations"



↑ Henna painting, anyone?



↑ Universal Studios, here we come!



“Recognizing, nurturing, and honouring talent is an important aspect of building excellence in education which will in turn greatly accelerate the growth of both economy and culture in a society. The Physics Olympiad could be a powerful means of inspiring young students to study sciences. Through the selection process of nation team, many young science talents can be discovered and nurtured... I am sure that this Olympiad will also give the opportunity for close bonding amongst talented young minds, thus building bridges across national boundaries.”

Prof Lin Ming-Juey, President, APhO

Germany Immersion Trip 2014

The Germany Immersion Trip 2014 was indeed a very eye-opening holiday for me. 17 of us were in Munich and Göttingen from 1–22 June and had a wonderful exposure to the Physics culture there. Both of these places were also hosts to a number of prominent physicists in the past. We were exposed to different presentations from sky observations to Higgs Boson and also how solid interacts with light and electron for instance.

At the Ludwig-Maximilian University in Munich, we were briefed about the Physics education in Germany, which incorporated demonstrations extensively. We also visited a few state-of-the-art laboratories, a pretty old astronomical research centre and a nuclear research facility.

Göttingen, a historical university town of Physics and Mathematics, presented a more unique approach to learning Physics. This could be best depicted by Planetenweg, a scaled-down walkway from Sun to Pluto, along with the scattered myriad of research centres, led by the University of Göttingen and Max Planck Institute.

It was not all Physics though, as the richness of the German history was something not to be missed. We visited castles and palaces in the Bavarian state and came to know about the life of a rich “fairy-tale” king named Ludwig the Second. A visit to the Dachau concentration camp left me the deepest impression with its depiction of life under the Nazi regime which was atrocious.

We were given a lot of freedom to explore the culture and city after our daily activities which made the trip more well-balanced. We took the public transport, watched concerts and theatrical performances, hunted for interesting food, biked around cities,

hiked in the hills and even visited villages. We also enjoyed the beautiful scenery along the German river.

This trip was unlike any I had before, and I think the word “immersion” reflects exactly what GIT has to offer.

*Contributed by
Mr Adrian Nugraha Utama,
Year 3 Physics Major*



⇒ A lab visit



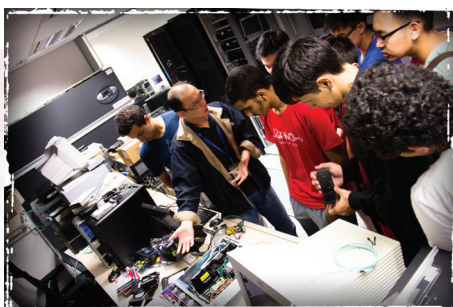
⇒ Demonstrating an old telescope

↓ Group photo taken at the Max Planck Institute, Göttingen





↑ Let there be fire—at the Science Centre



↑ Learning about data storage



↑ Getting a signature from Prof Glauber



↑ Our very happy gold medalists on stage



↑ Ms Indranee Rajah, Senior Minister of State (Law and Education), with the Singapore team



“The objective of any Olympiad need not be overemphasized. It is indeed an opportunity for the best talent in a given discipline to meet, interact, network, compete, and also to learn from one another. More importantly, it is the spirit of friendship, unity and fair play which inspired and motivated all of us to join the Olympiad family in one capacity or other.”

Prof B V R Chowdari, Chairman, 15th APhO Organising Committee

Physics Orientation Camp 2014

The Physics Department has an intake of about sixty to seventy Physics majors every year. With such a small cohort, we hope students could bond well in order to experience an enriching undergraduate life.

The Physics Orientation Camp organised by the Physics Society aims to forge a closer senior-junior friendship over leisure activities and a one-night stay-in, as well as to brighten freshmen's life by having them mingle with a dynamic range of personalities.

This year's camp, held in July over a two-day one-night period, saw a total participation of 40 seniors and freshmen. The programme started with a short welcome address by the vice president of Physoc Mr Tham Yap Fung and also the head of Physics Department Prof Sow Chong Haur.

Themed “Martians vs Zombies”, the freshmen were divided into two teams to play competitive games around campus that followed a cartoonish post-apocalyptic storyline. The second day started with a morning cycling trip at the East Coast Park. Participants became keen photographers as they were soaked in the dawn scenery. There was also a visit to the Jurong AMPED Trampoline Park where our freshmen and seniors enjoyed a time of jumping fun while

getting some light exercise at the same time. After this was a nice buffet dinner.

The feedback of the camp was overwhelmingly positive. The freshmen enjoyed the outdoor activities besides bonding among themselves, while the seniors had the opportunity to hone their leadership and event management skills. This was also a team building time, with everyone in the team displaying their individual talent. Truly the camp would not be a success without the support from the Physics Department and the students themselves.

Contributed by Mr Gob Qi Xuan Benjamin, Year 2 Physics Major



↔ Cycling at East Coast Park



↑ At the trampoline park



↔ A game with paper cups



↑ The organisers

IPS Meeting 2014

This year, the Institute of Physics Singapore (IPS) Meeting was held from 26–28 Feb at the University Town, NUS. The annual meeting, which attracted over 200 participants, provided a platform for mainly local scientists to meet and share their expert knowledge. It is hoped that the physics community would benefit greatly from the interaction.

There were four plenary sessions and over 70 technical talks, both invited and contributed. The spectrum of topics covered ranged from two-dimensional materials, laser to the physics of batteries. A number of physics suppliers also showcased their latest equipment and research resources.



↑ Some participants at a talk

⇒ IPS Meeting 2014 at UTown

Physoc Calling

The Physics Society (Physoc) organises a number of events every academic year which it hopes could connect students and staff. Physoc extends a warm invitation to all staff and undergraduates, whether it's festive celebration like the lunar new year get-together or mid-autumn mooncake tasting cum tea, a game of futsal or the more academic student forum Spark the Gap.

Current president of Physoc Alpin Novianus Tatan welcomes all staff to their activities. "We believe any engagement students have with staff during these events will help them develop and enhance their academic learning as budding physicists."



↑ Getting ready for a game

⇐ Spark the Gap publicity poster

A Day in the Life of...



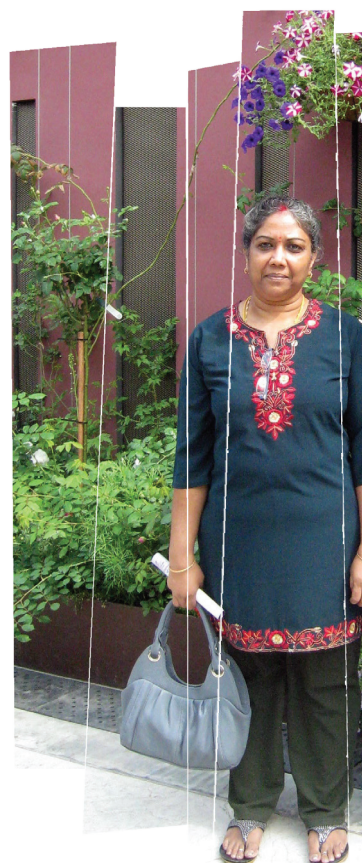
Mrs Gracey Segran was all smiles after the results of the culinary challenge in one of the recent departmental events were announced. Her group had won a prize. Indeed cooking up dishes was no worry for Gracey but with limited ingredients and utensils and a fire from the stove that was snuffed out easily, it became more trying. It was not the prize that mattered of course. It was rather the fun bonding with colleagues this way which Gracey enjoyed most. So she tries not to miss any of the staff events organised by the Department.

An experienced Management Assistant, Gracey thinks her workplace is akin to family where people help one another out. It is team effort that counts.

Gracey has varied job duties in the Physics General Office. She issues keys and transponders to staff and students who need daily access to offices and labs and makes sure that they understand their responsibility of being granted access to a section of the Department. She also has to submit the financial statements for any cash collected to the Office of Finance and duplicate keys wherever necessary.

After the exam results are released, students could approach Gracey for assistance if they need an exam review. She is careful to follow through all such requests and then informs the respective student of the outcome. Gracey also prepares the nomination form for graduate students and drafts the letter that accompanies their thesis reports to the internal examiners concerned. Staff would appreciate Gracey for helping them with the archival and disposal of any past exam and test scripts as well as keeping stock of the stationery supply and postage for their mails.

A day in the life of Gracey may sound like routine work but to Gracey, she has this to say. "It is up to the individual to derive pleasure from his or her work. My greatest job satisfaction is being able to do my work with sincerity and to the best of my ability." Besides cooking, Gracey also enjoys playing computer games. She takes up brisk walking as a regular exercise.



An Interview with Prof Feng Yuan Ping

The former Head of Physics Department Prof Feng Yuan Ping shared his views and thoughts with *Physics Matters*.



It must have been a weighty task steering the Physics Department in the last seven years. Share with us what keeps you going.

The Physics Department is one of the most active in research on NUS campus. Under the leadership of previous heads, the Department has made tremendous progress in research and education. To maintain the momentum and further develop the Department was a challenge not only to me but also all colleagues in the Department and our stakeholders. Fortunately, we have a pool of talented and experienced faculty members and passionate students which made my job easier.

I saw myself here mainly to create a conducive and fair environment to support everyone than pushing for changes and new initiatives (I was no Obama). I believe this was the right strategy since the Department had just gone through a strategic review when I became head. The Visiting Committee was here, new faculty just joined and CQT was being established. Of course, this did not exclude the setting up of new programmes when the opportunities came. Helping everyone a step closer to their dreams had been my motivation and what kept me going. I wished for a strong department where everyone's potential could be developed fully.

Where do you think the Physics Department currently stands internationally and what are your aspirations for it in the next decade?

The Physics Department enjoys a good reputation internationally. We have strong research programmes such as quantum information, graphene and two-dimensional materials, phononics, organic electronics, biophysics, proton beam applications, materials physics and etc. Over the years, we have recruited many top-notch faculty members and also high quality students.

There are many university ranking systems and even subject rankings these days which go up and down. This cannot be the only way to evaluate a university or academic department. The impact of its research work, reputation of its faculty members, marketability of its graduates and success of its alumni are also factors to examine. Given the short history of NUS as a research university, we have done well and are on an upward trajectory.

We do have some strengths. For example, we now have many talented faculty members on board and some of them are already among the top in their fields. Our research activities are well

supported and our undergraduate programmes attract some of the best talents in Asia and the world. Though we face challenges both regionally and globally, we could strive to become one of the best by building on our strengths. Being a large department and with many of us involved in various research institutes makes us less homogenous. We need to understand and help one another and work together as a team to achieve our goal.

Share with us some of your most satisfying moments in the Department.

My most satisfying moments have been to witness our staff and students succeed and recognised for their achievements which I consider more important than my personal recognition. Being an educator, I rejoice in seeing every batch of talented students graduating.

How do you think an academic could strike a good balance between teaching and research?

Teaching and research are not mutually exclusive but complement each other. Most of us choose to work in a university because we enjoy teaching and interacting with students. History tells us many new ideas and discoveries sprung from students. Professors who bring research frontiers to a classroom not only inject excitement and increase students' interest in a subject, but also allow students to learn about research from active researchers. This is important as many students have a scientific career in mind.

Besides classroom teaching being an official load, a professor also engages students by way of supervision of research projects and mentoring them. While a teaching plan ensures duties are covered, an academic should balance his/her time between teaching and research comfortably. Many outstanding researchers are also excellent educators in our Physics Department.

What are some things you like to instruct our Physics graduates today?

Physics training is a rigorous one and there are unlimited opportunities for physics graduates. Some may pursue their studies further and eventually hold positions in universities, laboratories or industries. But many also find success in management positions, entrepreneurship, engineering, business and etc. There may still be misconceptions about what a physics education could offer. I hope that our graduates are aware of the various opportunities available to them. Find out your passion, strengths and weaknesses before embarking on a career that suits you most. You may not start off as skillful but given your training to think critically and analytically, you will shine wherever you are.

For those interested in a scientific career, go for your passion. It sounds glamorous to be the next Albert Einstein or Stephen Hawkins but do not forget what Feynman said, "there are plenty of rooms at the bottom". It is research "at the bottom" that often leads to new technologies. Today, solutions are needed urgently to solve the many challenges facing the world such as the energy, water and environmental crises. As a physicist, you can make a difference.

Alumni are our important stakeholders. As the department advances, I hope our physics graduates stay connected to us as their involvement and contributions are essential.

Congratulations Class of 2014!

Bachelor of Science

Anam Hussain
Go Kay Liang Garry
Heng Kuan Wu
Johnathan Tan Hong Lin
Kanakarajh a/l Raman
Koh Chiak Chiang
Kok Jinhui
Laurentcia Arlany
Li Tiefu
Low Ji Xiong
Nasution bin Nadimoh

Neo Zhong Hao
Ng Cai Zhi
Ng Guo Xiong Kenneth
Ong Le Yun
Peng Yihui Valery
Shazed Mohammad Tashrif
Soh Chong Wee
Sumaiya binte Suleiman Syed
Tan Pengshi Alvin
Tan Seng Poh
Tan Yinghan
Tay Teck Han Raeger

Wong Sze Kai
Yang Chong Yi
Yap Yong Jian Marcus



Bachelor of Science with Honours

Abul Lais s/o Abul Khair
Amanda Rachael De Souza
Aren Tang Minyi
Arifin (SPS)
Bong Kok Wei
Brigitta Septriani
Chan Xinhui Kim (USP Scholar)
Chen Yingjie
Chong Yau Loong
Edwin Tan Yu Hang
Fernaldo Richtia Winnerdy
Goh Koon Tong
Guan Yilun (SPS)
Jacqueline Lie (SPS)
John Soo Yue Han
Kirsten Wong Pik Soon
Lee Chern Hui (Lijen Industrial Development medal, SPS)
Li Jiang

Li Shiying
Lin Mao
Liu Zhihao
Low Ying Hong Theodore
Lu Jiahui
Mo Lan
Muhammad Jamil bin Agus Rizal
Nguyen Duy Quang (SPS)
Nicholas Sebastian
Priscilla Mariani
Raditya Weda Bomantara
Raymond Santoso (Jurong Shipyard Prize, SPS)
Sandoko Kosen (SPS)
Seah Yi-Lin
Song Sheng Yang Clovis
Soo Hin Whye Melvin
Tammy Jing Yee Chin (SPS)
Tan Ee Cheng
Tan Guang Ting Ryan

Tan Mao Tian
Tan Tee Hao
Tang Dongjiao
Tay Shengyu
Tay Xiu Wen
Teo Meng How (IPS medal, Jurong Shipyard Prizes)
Tham Zhen Hong Benjamin
Theo Arianto
Wan Yin Chi
Wang Sihao (Jurong Shipyard Prize, SPS)
Winson Tanputraman
Wong Yi Hong Eugene
Yeo Cheng Xun
Yeo Guang-Hui Timothy
Yong Zixin
Zhang Hongji
Zhu Feiyu



Double Degree Programme

Jiang Xiaoning
Tan Huiyong

Master of Science

Abdul Malek bin Razali
Bao Haomin
Len Yink Loong
Manukumara Manjappa
Musawwadah Mukhtar
Nan Nan
Ng Kah Fee
Ng Tien Tjuen
Sarabjit Singh s/o Harbans Singh
Saw Thuan Beng
Seah Chu Perng
Shi Weili
Sim Joo Huang
Tao Ye
Wu Run
Yin Hao
Yoann Andre Attal
Zhang Yi
Zhao Xiangming
Zhu Zhanglin

Doctor of Philosophy

Ahmet Avsar
Anil Annadi
Bablu Mukherjee
Chen Zhili
Cheng Juan
Chuah Boon Leng
Dang Zhiya
Du Yuanmin
Gong Li
Gong Zong Ying
Ho Yew Hung Derek

Hong Chong Ming, Kenneth
Hu Zhibin
Jayakumar Balakrishnan
Li Huanan
Li You
Liang Haidong
Liu Hongwei
Liu Zhiqi (Materials Research Society of Singapore medal)
Lu Junpeng
Poh Chee Kok
Pranjul Kumar Gogoi

Qu Yuanyuan
Song Jiao
Toh Guoyang William
Vanga Sudheer Kumar
Wang Hailong
Wang Yinghui
Xu Wentao
Zhao Yongliang

