

**Speech by NUS President Professor Tan Eng Chye**  
**University Awards 2018**  
**Monday, 14 May 2018, University Cultural Centre**

NUS Pro-Chancellors, Mr Po'ad Mattar and Mrs Mattar and Mr Chan Sek Keong

NUS Chairman and Trustees

Award Recipients

Distinguished Guests

Ladies and Gentlemen

1. Good evening, and first, my heartiest congratulations to the award winners this evening; I am very proud of each one of you.
2. As President of NUS, many people have asked me: How do we define NUS? NUS is big – there is so much that we do. How do we describe NUS in a nutshell? Well, it isn't easy to put a finger to this, and to sum us up. (This type of summation is beyond Mathematics!) But let me approach this using three simple, fundamental questions.

**What?**

3. First, what does NUS seek to do?
4. We want to become a truly great university that nurtures future-ready graduates, engages in high quality research that transforms lives, and thrives as a vibrant innovation and enterprise ecosystem. Education, research and enterprise are our unchanging core missions through which we seek to serve and impact economy, community and society.

**Who?**

5. Second, who is NUS? Who are we? It is perhaps helpful to think of NUS in three building blocks.
6. As Individuals, each of us is united in spirit. We will live out the organisational core values of Integrity and Innovation; Respect and Resilience.

7. As a Community, NUS is a future-oriented brain trust of talented academics, researchers, staff, students and alumni working together in a spirit of innovation to pursue excellence in education, research and enterprise.
8. And as a University in this globalised world, NUS will be the central node in a thriving and connected ecosystem of talented communities in Asia and the world. Our unique scale, size and connections allow us to reap powerful synergies across people, (students, alumni, faculty, stakeholders and partners), across functions (education, research and enterprise), and across locations (Singapore and beyond). These networks and platforms connect various communities and activities for transformative impact.

### **How?**

9. The third question is, how will NUS move forward?
  - **Chasing the best**
10. For the past two decades, NUS has made rapid progress, by learning from the best. We studied what other top institutions did. We set benchmarks, and modelled after them where suitable. This has worked well for NUS. But we cannot solely rely on what others have done – for we have pretty much caught up with most of the top guns. We have to define our own path ahead.
- **Operational efficiency**
11. Neither is operational efficiency the magic bullet. To be sure, NUS must operate efficiently, and make the best use of our resources. We have thus embarked on an Organisational Excellence journey, to get our administration ready to support our bold academic missions and rapid transformation into a great university.
12. Operational efficiency is necessary but in itself, will not take NUS the next leap forward. There is a point of maximum efficiency and optimisation. (This is a mathematical truth.) Beyond which, we cannot extract further gains.
13. What is it then that will take NUS to its next phase of growth?

## **Innovation for Impact**

14. I believe the answer is in our second core value of Innovation. Innovation holds the key. Innovation is about introducing new ideas, devices, uncovering new ways to do things. It's not just about thinking differently for contrarian's sake, but trying things out.
15. Doing the same things time and again will not yield different outcomes; magic is not created from repetition. By doing something different, one gains irreplaceable knowledge from experiences outside of our comfort zone.
16. Over the years, NUS has innovated several distinctive programmes of our own, such as the NUS Overseas Colleges Programmes, the UTown Residential Programme and the Yale-NUS College. NUS Enterprise, led by Dr Lily Chan, has done pioneering work in building a thriving and teeming network of entrepreneurs and start-up communities in Singapore and several other locations across the world, from Jakarta, Suzhou to San Francisco and Singapore. Moving forwards, we will need to engage in more of such innovative and pioneering endeavours.
17. I would like to encourage us to be even bolder and more innovative, to channel our curiosities and disconcerts into experiments, into trying out new things, new methods, different ways of approaching things. Some of these experiments will bear game-changing outcomes, as the experiences of our award winners have shown.
18. Each of our University Awards winners has demonstrated an innovative dare, and onward resilience in pursuit of improvement and excellence.

## **Educator Award Winners**

19. Dr Soo Yuen Jien has implemented many clever ideas in his teaching. But one of his most visible and impactful innovations is the Archipelago system which he created and developed. Archipelago is an interactive web application that enables large-scale in-class real time interaction with students.

20. How does Archipelago empower our educators? In one of Yuen Jien's lectures, students were tasked as hardware designers to come up with the control signals for a microprocessor. Using Archipelago, the answers from 150 students were collated and fleshed out to the class in real time. Yuen Jien then discussed the popular approaches, especially the most commonly chosen incorrect answers to highlight the potential pitfalls in one's thinking. As one student puts it, "Yuen Jien takes us step by step through the learning process, as if we're designing the machinery, instead of telling us to memorise the concepts."
21. Many NUS educators have deployed Archipelago to enhance their lessons; over 10,000 students have experienced Archipelago.
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22. Likewise, Associate Professor Kelvin Foong has also harnessed technology innovatively, to teach students to fish, rather than to fish for them. Through a NUS LIFT project, Kelvin and his team developed a suite of learning tools comprising an Apple iBook application for online learning of dental anaesthesia, a stereoscopic virtual reality anatomic model of the human oral cavity to guide the placement of the injection needle as well as a 3D-printed lower jaw simulator for training undergraduates to deliver the inferior alveolar nerve block anaesthesia. (So, if future generations of dentists are able to administer anaesthesia more accurately, we must all thank Kelvin and his team for the innovative use of available technology in clinical training.)
23. Beyond these gadgets and devices, in his former capacity as Vice Dean of Academic Affairs and currently as Programme Director of the Master of Dental Surgery Orthodontics Programme and undergraduate module coordinator for Orthodontics, Kelvin has revamped Dentistry education. The educational model moved from a treatment-focussed approach to a diagnostic-focussed approach. The undergraduate general dentistry curriculum now features better integration between basic and dental sciences, and postgraduate specialty trainee students in Orthodontics are trained to seek solutions to clinical problems from a ground-up approach through the use of effective questioning. Students are better prepared for independent learning and practice upon graduation.

## Researcher Award Winners

24. The innovative dare is also evident in our research award winners, whose work have profoundly shaped the direction of scholarship in their respective fields. They are thought leaders, because they have uncovered something different. They did not aim for incremental work, but dared to take on challenging problems, head on. As a result, the impact of their work is significant and lasting.
25. Dr Zhao Dan designs and synthesises advanced porous materials and membranes, and pursues their innovative applications to solve current challenges in clean energy and environmental sustainability. His work is well published and cited, and has high potential for translation. He now holds 13 patents and patent applications and is leading a project to commercialise his lab's gas sensing technology.
26. Professor Toh Kim Chuan is always looking for different ways to solve programming problems with millions of variables and constraints. He is a world leading figure in semidefinite programming, which is an important technique in optimisation. Beyond shedding new theoretical insights, Kim Chuan's research produced SDPT3, a Matlab software package, which solves convex optimisation problems involving linear equations and inequalities, second-order cone constraints, and semidefinite constraints. First developed in the 1990s, SDPT3 has been repeatedly updated to incorporate new algorithmic and programming features. It remains in wide use today.
27. Professor Henry Yeung had done pioneering work on globalisation, informing and shaping debates in economic geography. His work on globalisation, uneven development, global production networks and the rise of East Asian firms has generated new knowledge about the dynamic processes reshaping the contemporary world economy and their profound socio-spatial consequences. Henry's innovation is in marrying the key concepts of Geography, with cognate disciplines, like international political economy and business – after some gestation, a special child is born. There are no geographical boundaries to Henry's stellar academic acclamation - from the Atlantic to the Pacific – Henry has been conferred top awards from the Royal Geographical Society in the UK, and the American Association of Geographers.

## Service Award Winners

28. Our Service award recipients also had great foresight and innovation; they were men ahead of their times.
29. As Permanent Secretary of the Ministry of Education, Mr Lim Chuan Poh oversaw the transformation of publicly-funded universities into Autonomous Universities, which receive strong Government support in terms of resourcing, yet with the flexibility to pursue initiatives and programmes that will propel the institutions to become world-class. NUS and NTU rose to the challenge. This autonomy allowed Singapore institutions to move quickly, to raise quality dramatically, and to make rapid progress. Today, NUS and NTU have earned a very strong reputation internationally; we have put Singapore on the world academic stage.
30. One of Chuan Poh's perhaps lesser known contributions, is the instrumental role he played, in pushing for the establishment of Research Centres of Excellence, or RCEs. In a short span of 10 years, the three RCEs at NUS have successfully built a reputation of research excellence for NUS and Singapore, and established themselves as leading research centres for quantum technology, cancer science and mechanobiology.
31. The RCEs are magnets of global research talents, and they have created an environment for high standards of research, as evidenced by the publications, student achievements, and collaborations. New knowledge created through the RCE's research have opened up exciting translational opportunities, which have led to the creation of new start-up companies and new jobs.
32. Professor Chong Chi Tat too, was a visionary leader. He was the pioneer architect of the NUS modular system, which underpins our education system today. Prior to the modular system, NUS inherited a British university system. Courses for each degree programme were largely offered as a fixed bundle on a year-long basis. The system served well in instilling disciplinary drilling and depth. But it was rigid - students could not proceed to the next level until they passed all courses.

33. The NUS modular system was introduced as a new degree structure in 1994. The academic year was reorganised into semesters. Academic courses were converted into self-contained courses known as modules, evaluated on a grade point average system.
34. The modular system dramatically opened a whole new world for students. From a set meal, to a buffet, with culinary specialties from around the world! The modular system allowed for options and diversity in the courses students read, which could come from other Faculties. Students could complete their degree requirements earlier, depending on their ability and pace. Academically stronger students could concurrently enroll in a second degree or pursue a Masters degree. NUS could internationalise its courses - our undergraduates could go abroad for a semester or two while obtaining overseas credit transfers.
35. Thanks to this transformative initiative, NUS students are now able to combine different learning experiences, such as entrepreneurship and residential college programmes, with their majors.
36. The benefits of the modular system are still keenly felt today and it will serve us well as NUS embarks on a new education model that embraces continuing education and lifelong learning. NUS is agile and ready to deliver bite-sized modular courses for adult learners.
37. Chi Tat was also instrumental in setting up the Promotion and Tenure (or P&T) System at NUS. It is a key tool in raising the academic standards at NUS. Tenure is awarded on the basis of an appropriate level of performance in teaching, research and service. Implemented in 2001, our P&T system follows global standards of leading universities, and features independent and rigorous reviews by multiple parties within and outside of the University. We now have an institutionalised quality assurance check in the P&T system.

## **Resilience**

38. While we encourage innovation, our fourth core value of Resilience, is as important. Nobody gets it perfect the first time. This evening, we are celebrating Excellence, not Jackpots!

39. Thomas Edison's most memorable invention is the light bulb. It purportedly took him 1,000 tries before he developed a successful prototype. A reporter once asked "How did it feel to fail 1,000 times?" "I didn't fail 1,000 times," Edison responded. "The light bulb was an invention with 1,000 steps."
40. Trying, failing, trying again – along the way, we learn, discover, fine-tune. Failures are essential stepping stones for future success. Yet, failures can sometimes break a person. It is the quality of **resilience** that tides us through failures and turns them into learning opportunities.
41. At NUS, we have been creating opportunities for students to 'fail forwards'. Students on the NUS Overseas Colleges programme intern at start-ups, many of which might not eventually succeed. Through the Undergraduate Research Opportunities Programme, students experience multiple failures in their experiments; they learn to fine-tune and calibrate, so as to achieve good outcomes.
42. Yuen Jien's lessons also emphasise 'learning from failures', in an unusual way. He is known by students as one of the "evil profs in SoC". Yuen Jien frequently crafts tasks that set students up for a certain kind of failure. The intuitive solution to the assigned task may turn out to be grossly inefficient or simply wrong. In one of his courses, students discovered to their horror that getting a two wheeled robotic vehicle to travel in a straight line is actually much harder than it appears. On paper, we just need to supply the same power to both motors and they should drive the wheels in unison with the same speed. Unfortunately, the real world disagrees. Low cost motors have a large range of tolerance in their manufacture specifications; surface traction, load distribution et cetera, all contribute to variation in wheel revolution speed. After cracking their heads for a while, students start to programmatically compensate for variability of wheel movements. This is how Yuen Jien introduces the idea of simple control theory to his students, through "mis-adventures" that motivate students to rethink their approach and to explore further afield.

## **Concluding Remarks**

43. This evening, I have shared some thoughts on what NUS is as an institution, who we are what we aspire towards, and that innovation and resilience are vital in our journey to become a truly great university. Our University Awards winners exemplify the NUS values. They have pursued their passions at NUS, with an indefatigable spirit, bold imagination for betterment,, and an assiduous quest for excellence. Their achievements give us a peek into the boundless possibilities of what we can each reach for at NUS, if only we dare.
  
44. Once again, my heartiest congratulations to all winners this evening. Thank you.