NATIONAL RESEARCH FOUNDATION
PRIME MINISTER'S OFFICE
SINGAPORE

Singapore's Top Scientists Honoured at the President's Science and Technology Award Ceremony

Singapore, 20 October 2023 – The 2023 **President's Science and Technology Awards (PSTA)** celebrated top talent in Singapore's material science and space technologies fields earlier this evening. The PSTA is the highest honour conferred upon research scientists and engineers in Singapore whose work has resulted in significant scientific, technological, or economic benefits for the country.

This year, awards from three categories were given out:

- President's Science & Technology Medal (PSTM): Awarded to individuals who have made distinguished, sustained, and exceptional contributions in advancing Singapore's development through the promotion and management of science and technology (S&T).
- President's Science Award (PSA): Awarded to individuals or teams for outstanding contributions that have transformed one or more Science & Technology fields.
- Young Scientist Award (YSA)[1]: Awarded to individuals 35 years or under with demonstrable potential to be world-class researchers in their fields of expertise.

The winners received their awards from **President Tharman Shanmugaratnam** at the Istana.

Singapore's Tech Luminary: Fostering Innovation and Research Excellence

The President's Science and Technology Medal was awarded to **Mr Quek Gim Pew** for his outstanding contributions in shaping Singapore's Research, Innovation, and Enterprise (RIE) ecosystem. These include developing local capabilities in science and technology, particularly in space technology, quantum engineering, artificial intelligence, and high-performance computing, and championing STEM-related initiatives to nurture the next-generation of scientists and engineers.

Over four decades of dedicated service within the Ministry of Defence (MINDEF), Mr Quek has been a driving force behind numerous initiatives. For example, he spearheaded defence research and development, fostered the growth of essential strategic capabilities, and fortified partnerships with international organisations.

As Chief Defence Scientist, he saw the establishment of innovative programmes uniting MINDEF with the local RIE ecosystem. This strategic move intensified the dynamic synergy between these two pivotal communities, propelling Singapore's defence capabilities to new heights.

Transitioning to emerging frontiers, Mr Quek directed his attention towards quantum technologies. During his tenure as Chair of the Centre for Quantum Technologies (CQT), he orchestrated a shift from a primarily fundamental science-focused approach to a nationwide initiative on quantum research.

[1] The YSA is administered by the Singapore National Academy of Science (SNAS) and supported by the National Research Foundation, Singapore (NRF).

He went on to Co-Chair the National Quantum Steering Committee (NQSC), and drove the Quantum Engineering Programme (QEP) for applications, including securing communication systems and financial services networks. A notable example was his contributions to the National Quantum-safe Network, which aims to deliver quantum-safe communications across Singapore.

A staunch advocate for collaboration, Mr Quek actively fostered partnerships with local and international entities, pooling resources for collective quantum research endeavours. This accelerated the growth of Singapore's quantum capabilities and solidified the nation's reputation as a globally recognised hub for quantum research.

Mr Quek's steadfast commitment to nurturing a robust STEM talent pipeline has been exemplary. During his tenure at the DSO National Laboratories (DSO), he championed initiatives encouraging senior staff to actively engage and mentor students through the Young Defence Scientist Programme. Under his leadership, he also initiated a series of engaging competitions for students, offering valuable learning experiences through hands-on activities and friendly contests.

As the Deputy Chairman of Singapore's Office for Space Technology & Industry (OSTIn), Mr Quek provides direction and vision for OSTIn's objectives. With his extensive background in space technologies and capability development, he offers invaluable insights to OSTIn's Space Technology Development Programme. Furthermore, Mr Quek actively steers outreach and student engagement efforts through the Integrated Space Programme. This programme exposes students to the intricacies of space science, engineering, and orbital missions, giving selected students the rare opportunity to design and construct cubesats[2] slated for launch into space.

Currently, he is the Senior R&D Consultant of MINDEF and sits on various boards of agencies, organisations, and Institutes of Higher Learning.

Revolutionary Material Science Breakthroughs in Thermal Radiation and Diffusion

Dr Qiu Cheng-Wei was awarded the **President's Science Award** for his contributions to the field of topological thermal diffusion and radiation. His recent breakthrough in material science can enhance thermal conduction better than silver and gold, as well as potentially cool a room down without using any extra power.

By structuring conductive thermal metamaterials into paints and concrete, any surface coated with the special material can channel heat to cooler areas, cooling the overall space in a room. With less energy spent cooling buildings, the discovery would support Singapore's commitment to achieve net zero emissions by 2050.

Using quantum mechanics wave theories, Dr Qiu's research has paved the way for ground-breaking techniques to 'lock up' and dissipate heat. This is a complete departure from prevailing research in thermal diffusion. His research work can be further applied to many technologies that require efficient self-heat removal from overheated chips.

Dr Qiu is currently an Associate Professor and the Dean's Chair Professor at the National University of Singapore's (NUS) College of Design and Engineering. He has received multiple accolades for his research efforts and has published over 480 peer-reviewed papers in top-tier journals.

[2] A CubeSat is a class of miniaturised satellite with a form factor of 10 cm cubes, having a mass of no more than 2 kg per unit.

Young Scientists Awards

Unravelling Unexplored Quantum Potential of Natural Materials

Dr Chang Guoqing from Nanyang Technological University, Singapore (NTU) was awarded the Young Scientist Award for his work in uncovering quantum potential among natural materials. These materials have properties that contemporary physics has yet to fully unearth.

Dr Chang uses advanced mathematical and computation methods to predict and discover hidden quantum behaviours in these special materials. His efforts have identified materials that can sense light in unique ways. This could pave the way towards developing better solar panels and refined light-detection systems.

Pioneering New Cryogenic Electron Microscopy Methods to Improve Drug Development

Dr Tan Yong Zi from NUS was awarded the Young Scientist Award pioneering new techniques in cryogenic electron microscopy to improve the drug development process. His research helps the medical community understand the tiny protein structures in bacteria or diseased cells, and identify specific parts or sites to target for drug development.

Dr Tan has visualised structures of proteins from many diseases such as tuberculosis, malaria, cancer and more recently COVID-19. His research findings illustrated how drug resistance occurs and this resulted in the creation of new therapeutics.

Developing AI for the Future of Computing

Dr Soujanya Poria from the Singapore University of Design and Technology (SUTD) was awarded the Young Scientist Award for his work in developing conversational AI models equipped with multimodal reasoning abilities.

Dr Soujanya and his team have developed AI systems that can understand human intentions and emotions by combining text, audio, and video data from human interactions. This helps AI make better decisions. This will greatly enhance machine-to-human interactions and assist in human-to-human understanding.

Dr Poria and his team's work has led to the development of several multimodal understanding and generative systems, including a text-to-audio AI model that can create sounds from text descriptions, like a dog barking or an audience applauding at a concert.

President’s Science and Technology Awards – Past to Present

2023 bears witness to the transfer of responsibilities as the Agency for Science, Technology and Research (A*STAR) passes the torch of organising the PSTA to NRF. This transition is marked not only by continuity but also by a renewed commitment to the values of research excellence and innovation.

Mr Beh Kian Teik, NRF Chief Executive Officer, said, “My heartiest congratulations to all award winners. The PSTA is a testament to the exceptional talent and groundbreaking work of our top scientists, and a celebration of their impactful contributions to Singapore. It echoes the importance of nurturing scientific talent, and serves as an inspiration for scientists to push the boundaries of what is possible.

He added, “It is also a reflection of Singapore’s vibrant Research, Innovation and Enterprise (RIE) ecosystem, which supports Singapore’s progress by advancing its capabilities in strategic technology areas and unlocking opportunities for growth and good jobs.”

The President’s Science & Technology Awards were first given out in 2009. Originally established as the National Science and Technology Awards (NSTA) in 1987, they were elevated to Presidential status in 2009.

Since then, Singapore has seen 18 PTSM winners, 33 PSA winners, 32 PTA winners, and 38 YSA winners.

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About The National Research Foundation

The National Research Foundation, Singapore (NRF), set up on 1 January 2006, is a department within the Prime Minister’s Office. The NRF sets the national direction for research and development (R&D) by developing policies, plans and strategies for research, innovation and enterprise. It also funds strategic initiatives and builds up R&D capabilities by nurturing research talent.

Learn more about the NRF at www.nrf.gov.sg

Chinese Glossary

- PSTM Winner Mr Quek Gim Pew: 郭錦彪先生
- PSA Winner Dr Qiu Cheng-Wei: 仇成伟副教授
- YSA Winner Dr Chang Guoqing: 常国庆博士
- YSA Winner Dr Tan Yong Zi: 陈永谘博士
- NRF CEO Mr Beh Kian Teik: 马健德先生

Annex A: About the PSTA and the Award Categories

About the PSTA

The President's Science & Technology Awards (PSTA) are the country's top honours for research scientists and engineers in Singapore. Given annually, the PSTA recognises individuals and teams that have made exceptional contributions in pushing the boundaries of the science and technology (S&T) landscape in Singapore.

There are three distinct awards – the President's Science & Technology Medal, the President's Science Award, and the President's Technology Award. The PSTA also celebrates the Young Scientist Award. The Young Scientist Award is administered by the Singapore National Academy of Science (SNAS) and supported by the National Research Foundation, Singapore (NRF).

As the highest accolade, the PSTA brand carries prestige, and influence, and most importantly, inspires the next generation. PSTA winners create orbits of impact through their exceptional work, personal ingenuity, and continued search for excellence; they are role models for their peers and aspiring researchers in the science and tech fields.

President's Science & Technology Medal (PSTM)

Awarded to individuals who have made distinguished, sustained and exceptional contributions, and played a strategic role in advancing Singapore's development through promotion and management of science and technology (S&T).

The PSTM is not meant to recognise research accomplishments or contributes to advancing individual technologies, as these are awarded under the PSA and PTA respectively.

Nominees are evaluated on:

1. Impact of Contributions
   - Accomplishments and contributions are acknowledged by the S&T ecosystem as having a significant impact on the ecosystem's capabilities or international stature
2. Examples include, but are not restricted to:
   - Driving or pioneering the establishment of an important field of study in Singapore
   - Providing instrumental leadership in raising a Singapore S&T institution to world-class status
   - Exceptional contributions that boosted the capabilities or international stature of Singapore's S&T

President's Science Award (PSA)

Awarded to individuals or teams for outstanding contributions that have had a transformative effect on one or more S&T fields.

Nominees are evaluated on:

1. Impact of Contributions
   - Accomplishments and contributions are acknowledged by other S&T practitioners as being significant and impactful to their field
   - Contributions need not have led to practical applications or products

2. Includes, but is not restricted to, individual discoveries or a collective body of research work that has led to:
    - Spawning or enabling new avenues of study
    - Revolutionising or significantly advancing the research methodology of a field
    - Significantly advancing or overturning our previous understanding of a field
    - Potential for significant scientific or industrial application

President's Technology Award (PTA)

Awarded to individuals or teams for outstanding contributions that have led to transformative changes in the use or potential of technology.

Nominees are evaluated on:

1. Impact of Contributions
    - Accomplishments and contributions are acknowledged by other S&T practitioners as resulting from deep innovative input or ingenuity, marking a turning point for that technology's use or potential, with significant impact on society
    - While the relevant technology need not be fully adopted or deployed at the point of nomination, it must have progressed beyond academic or theoretical potential, and be in the process of translation by industry or adoption by end-users
2. Includes, but is not restricted to, individual breakthroughs or a collective body of R&D work that has led to:
    - Overcoming key obstacles that unlocked an impactful technology's potential
    - Significantly advancing the state-of-the-art performance of an impactful technology
    - Innovative application of existing technology in a new, impactful way
    - Demonstrating a technology that disrupts the industry's status quo

Young Scientist Award (YSA)

Awarded to researchers aged 35 years and below, who are actively engaged in R&D in Singapore, and who have shown great potential to be world-class researchers in their fields of expertise. This award is administered by the Singapore National Academy of Science (SNAS) and supported by the National Research Foundation, Singapore (NRF).

There are two categories of Awards, namely:

- Biological and Biomedical Sciences; and
- Physical, Information and Engineering Sciences

Annex B: Full Citation for PSTM Winner, Mr. Quek Gim Pew

Mr. Quek Gim Pew has made significant impact on the scientific and technological progress of Singapore, particularly in the development of advanced defence technologies and systems for the Singapore Armed Forces and advancement of Singapore's RIE ecosystem in critical areas including space technology, quantum engineering, artificial intelligence and high-performance computing.

Throughout his career, Mr. Quek has been guided by his belief and commitment to harness science and technology to serve national needs and contribute to Singapore's continued success.

During his 40 years with the Ministry of Defence, Mr. Quek drove the masterplanning of defence R&D, development of strategic capabilities, strengthening of partnership with international defence organisations and promotion of STEM to build the pipeline for defence scientists and engineers.

In his 12-year tenure as CEO DSO National Laboratories, he led the organization through a period of significant growth and transformation. His leadership was instrumental to bringing DSO to the forefront of various emerging technologies. He strengthened ops-tech thinking, deepened engineers' and scientists' understanding of the operational needs of the SAF and created an environment where innovative solutions to address those needs flourished.

As CEO, he also established rigorous quality and management systems to ensure the timely delivery of operational capabilities that meet strict performance targets.

As Chief Defence Scientist, Mr. Quek had a major influence in the development of game-changing concepts and disruptive technologies for the SAF. He was a strong advocate for partnership and established collaborative programs between MINDEF and the local RIE ecosystem, strengthening the synergy between the two communities.

As Chairman of the Centre for Quantum Technologies (CQT), Mr. Quek recognised the urgency to restructure the country's approach to quantum research. He shifted the country's primary focus on fundamental research to a nationwide initiative that also harnesses quantum technology to support economic and national imperatives. This includes building sovereign capabilities in quantum computing and elevating the local ecosystem to exploit quantum technology to strengthen our competitive edge. He continues on this effort in his current capacity as co-chair of the National Quantum Strategy Steering Committee.

As Deputy Chairman of the Office for Space Technology and Industry (OSTIn), Mr. Quek has been instrumental in advancing Singapore's space capabilities to meet the nation's needs, secure our access to space and space technologies, maximise economic value capture, and enhance our strategic relevance. Today, the local industry and universities have built and launched more than 20 satellites, including the latest TeLEOS-2 which launched recently in April 2023. An additional 15 satellites are in the pipeline. These satellites support a range of missions from scientific experiments to earth observations to communications.

With his extensive experience in R&D management and capability development, Mr. Quek continues to contribute to various national RIE programs. Being a consensus builder and a strong believer in collaboration with a strong network, he helps to harness synergy across organisations and across RIE domains to enhance the deliverables and outcomes in these programs. The programs that Mr Quek is currently active in include chairmanship of the National Supercomputing Centre, the Singapore Advanced Research and Education Network (SingAREN)-Lightwave Internet Exchange (SLIX), and AISG Scientific Committee. He also sits on various Boards, Management and Advisory Committees, including the CREATE

FScientific Advisory Board, Agency for Science, Technology and Research (A*STAR) Board, Technology Centre for Offshore and Marine, Singapore (TCOMS) Board, and Aviation Transformation Program (ATP) Advisory Committee.

Mr. Quek's dedication to building a strong talent pipeline for STEM has been unwavering. While in DSO, he led initiatives to encourage senior staff to engage and mentor students through the Young Defence Scientist Programme. He initiated a series of competitions – under the 'Amazing' umbrella – that provide learning opportunities through hands-on activities and friendly competitions. As Deputy Chair of OSTIn, he continues to push for broad outreach and deep engagement of students through the Integrated Space Programme, where students are exposed to space science, engineering and missions. Selected students will also have a chance to design and build cubesats that will be launched.

Annex C: Full Citation for PSA Winner, Dr Qiu Cheng-Wei

Over the past 15 years, Dr Qiu Cheng-Wei groundbreaking research has laid the foundation for topological thermal diffusion and quantum heat transport. His works established new frontiers in classical fields of thermal diffusion, which circumvent intrinsic limitations of conventional heat transfer laws and yield unprecedented opportunities in ultra-high thermal conductivity, non-reciprocal heat transfer, thermal metamaterials, thermal harvesting and management, advanced cooling technologies, and energy sustainability.

Heat transfer can occur anytime and anywhere. Its fundamentals have been well established for centuries, such as Fourier's law on diffusive thermal conduction, and the Stefan-Boltzmann law on thermal radiation. However, traditional knowledge about thermal diffusion is insufficient to address emerging challenges in the contemporary era, such as global warming, energy crisis, heat waste, and the self-heating of integrated microelectronic chips. These problems largely arise from the limitations of thermal conductivities of natural bulk materials in meeting the demand for rapid heat dissipation and diffusion. As such issues are intrinsic for macroscopic thermal transport and diffusion, both the scientific community and policymakers are urgently calling for game-changing scientific solutions to resolve these fundamental barriers.

Instead of adopting traditional roadmaps, Dr Qiu's discovery of quantum and topological behaviour in thermal diffusion has drastically changed the landscape of thermal science. Dr Qiu has pioneered the fields of quantum thermal diffusion and topological thermal materials, both of which have long been perceived as non-existence in the field of dissipative heat transfer. Some of his groundbreaking discoveries include the quantum anti-parity-time mechanics in heat transfer, thermal zero-index material, phase-transition thermal diffusion, non-reciprocal heat transfer, spatiotemporal thermal lattice, diffusive Fizeau drag, diffusive non-Hermitian Weyl rings, passive ultra-conductive materials, thermal Willis couplings and chiral diffusion.

These notable scientific achievements herald a fresh perspective of controlling the heat transfer and diffusion process, enabled by quantum mechanics and topological physics. Dr Qiu has demonstrated technical capabilities in tailoring thermal energy and overcoming the bottleneck issues in thermal dissipation, conduction and radiation. His research has unlocked new possibilities for applications that exploit ultra-high thermal conductivity, edge-state heat transfer, as well as thermal locking and cooling, among others.

Beyond advancing the boundaries of science, Dr Qiu firmly believes that his technological breakthroughs should also benefit the society and create value for the industry. Indeed, his work has an enormous influence in areas such as microelectronics, chip technologies, thermal imaging, and carbon neutrality.

Thermal camouflaging and cloaking technologies developed by Dr Qiu have profound impacts on infrared monitoring, night vision and infrared deception. His work on sensitive thermography significantly enhances thermal imaging resolution and contrast, and brings about radical disruptions in electronics diagnostics, healthcare monitoring, thermal imaging, and construction defect detection. He has also pioneered a series of innovations in topological thermal diffusion, which constitutes a pool of ready solutions to overcome the rising challenges of heat dissipation, over-heating issues, and low-grade heat upcycling in integrated chips, computing servers for IoTs and other related industries.

Dr Qiu's outstanding contributions extend beyond the pursuit of academic excellence. Under his dedicated mentorship, nearly 30 former members of his lab became CEOs and CTOs of high-tech companies, or held positions as Nanyang Assistant Professor, chair professors,

college deans and vice deans. Many of the scientists supervised by Dr Qiu went on to receive prestigious accolades.

Dr Qiu has published over 480 papers with more than 39,000 citations to date. He is a Fellow of ASEAN Academy of Engineering and Technology. He is also a Fellow of esteemed professional societies including Optica (US), SPIE (US) and The Electromagnetics Academy (US). For his achievements, Dr Qiu has received numerous awards, such as the URSI Young Scientist Award (2008), NUS Young Investigator Award (2011), MIT TR35@Singapore Award (2012), Young Scientist Award by Singapore National Academy of Science (2013), Faculty Young Researcher Award in NUS (2013), SPIE Rising Researcher Award (2018), Young Engineering Research Award (2018) and Engineering Researcher Award in NUS (2021), and World Scientific Medal by Institute of Physics, Singapore (2021). He was named by Clarivate as one of the Highly Cited Researchers from 2019 to 2023. He was most recently conferred the Achievement in Asia Award 2023 by the International Organization of Chinese Physicists and Astronomers, US.

Annex C: Full Citations for YSA Award Winners

Dr. Tan Yong Zi

Dr. Tan Yong Zi's research focuses on using cryogenic electron microscopy (cryo-EM) to solve structures of biologically relevant proteins to high resolution. The atomic models elucidated are critical to understanding how biological processes work, how diseases progress and how drugs can be designed against these proteins. In particular, his Singapore lab now focuses on human membrane proteins, which make up only 20% of known proteins but constitute 60% of drug targets.

In terms of structures solved, Dr. Tan had been involved in the expression, purification and cryo-EM structure elucidation of a variety of proteins such as AftD and EmbB involved in tuberculosis; PfCRT involved in malaria; spike protein antibodies involved in COVID-19; ribosomal biogenesis intermediates involved in antibiotics development; and V-type ATPase involved in human diseases like cancer. These works are critical in understanding how the proteins contribute to or help treat these various diseases.

To uncover these structures, Dr. Tan helped develop cryo-EM methods, which in turn allows him to have the most cutting-edge tools. He has developed sample vitrification tools (Back-it-up and Spotiton device), camera software (EER camera output format), data collection methods (tilted data collection) and data processing methods (showing Ewald sphere curvature correction). These have not only helped him solved multiple structures but have benefited the international cryo-EM community.

These works have been published in journals like Nature, Cell, Nature Methods, Molecular Cell and Nature Communications, and with a total of 2335 citations to these publications, highlight the extent of scientific influence his research has had. Dr. Tan's contributions, both methodological and biological, in turn has been recognised internationally by the awarding of the George Palade Award in 2021 by the Microscopy Society of America.

In addition to his research work, as an Assistant Professor at NUS, Dr. Tan strongly believes in education. He helps run the International Biology Olympiad training for team Singapore with Professor Beverley Goh from NIE and Singapore Institute of Biology (SIBiol). He was a co-jury member for team Singapore at the 2022 International Biology Olympiad at Armenia, where the students came in 4th internationally with 2 golds, 1 silver and 1 bronze medal. He actively teaches modules at NUS, and trains various students from different levels.

Dr. Soujanya Poria

A large share of the data posted on social media is multimodal. This wealth of information is highly valued by businesses for use in a variety of ways including enhancing user engagement for better recommender systems and AdSense. However, effectively utilising such data requires aggregating information from constituent modalities, posing significant technical challenges to AI agent development. Dr. Soujanya Poria's research is dedicated to advancing AI by devising state-of-the-art techniques to tackle intricate multimodal tasks, including emotion recognition.

Dr. Poria's primary focus has been on overcoming the challenge of fusing multimodal information, achieved through multimodal representation learning and information-theoretic methods like mutual-information maximisation. Dr. Poria's work shows that amalgamating data from complementary modalities yields superior performance as compared to single-modal systems. The open-source code developed by Dr. Poria's team has gained widespread adoption in both academic and industrial spheres.

In addition to working on multimodal AI techniques, Dr. Poria is actively addressing the challenge of commonsense reasoning in natural language processing. Language models often struggle in this area, prompting Dr. Poria and the team to develop AI models and tasks tailored for context-aware commonsense reasoning. They endowed deep learning models with commonsense knowledge, improving performance on commonsense-oriented tasks like emotion recognition, dialogue understanding, and sentence ordering. The research also introduced a unique commonsense reasoning task where AI models answer causal questions using in-context speculation and creative thinking, with the goal of creating human-like AI assistants.

In recent years, Dr. Poria and his team have played a significant role in advancing dialogue understanding. They have focused on important issues within this field, including the extraction of implicit knowledge triplets from conversations and emotion recognition in conversations (ERC). These tasks hold particular significance for businesses that employ chatbots for customer interactions, as they enhance comprehension of conversations, leading to better customer engagement. To address these challenges, Dr. Poria's team has created a range of open-source algorithms for modelling dialogue context, utilising advanced techniques like transformers and graph neural networks. Additionally, Dr. Poria has curated extensive datasets, which have been instrumental in establishing this research area as a crucial subset of dialogue system studies. Importantly, this research bears practical implications in areas such as mental health assessment, grasping student behaviours, and enhancing engagement in online education.

Currently, Dr. Poria is actively working on Large Language Models (LLM) to make them explainable, accessible, trustworthy, responsible, multimodal, and resource-efficient by design. His research efforts have led to the creation of holistic evaluation benchmarks of LLMs, safety checking of LLMs, and parameter-efficient adaptation of LLMs in diverse Natural Language Processing (NLP) tasks.

Dr. Poria nurtures the future generation by advising a number of postdoctoral fellows, researchers, and students. Some of his students have won significant research awards or established their careers at top AI companies. Dr. Poria also encourages young researchers to join AI research by participating in different mentorship programs. He motivates them to research AI techniques that can directly benefit societal issues.

Dr. Chang Guoqing

Dr. Chang Guoqing is a renowned physicist who is at the forefront of the intriguing world of quantum materials. Besides being deeply committed to uncovering the underlying fundamental physics of quantum materials, Dr. Chang also orchestrates a comprehensive database of materials. His cutting-edge computational techniques enabled him to make powerful predictions of many new next-generation quantum materials.

Imagine materials so unique that they could revolutionise our daily gadgets, like making solar panels dramatically more efficient or inventing light sensors with unmatched sensitivity. This is one of the main unique advantages of quantum materials discovered by Dr. Chang. His prediction of colossal and quantised photocurrents in an extensive array of chiral materials has attracted the intensive attention of the international scientific community. Dr. Chang’s group recently introduced an innovative methodology capable of amplifying photocurrents exponentially by tuning the structure of quantum materials.

Dr. Chang has made significant efforts to promote collaboration between top experimental groups both locally in Singapore and globally in the world. These close networks established by Dr. Chang have, in turn, helped make his research more impactful. A lot of exciting

predictions and theory proposed by Dr. Chang has been successfully realised in the lab in a short time, which paved the way for the next step in industrialisation.

For Dr. Chang, it's not just about high-end research. He's equally passionate about lighting up young minds and has been guiding undergraduate students in the fascinating fields of physics and materials science. Dr. Chang also participates in both local and international science forums frequently, eager to share his findings and ignite curiosity.

Dr. Chang is a recipient of the 2021 National Research Foundation Fellowship. In addition, he has been continuously recognised as a global highly cited researcher by the Web of Science since 2019. To date, Dr. Chang has published over 80 papers in top-tier scientific journals including Science, Nature, Nature Materials, Nature Physic, Nature Communications, Science Advances, and Physical Review Letters with an H-index standing at an impressive 47 and boasting over 16,000 citations.