



# SINGAPORE SCIENCE & ENGINEERING FAIR 2022



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# SSEF 2022 Working Committee



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Mdm Lee Lin Yee

MOE

## CO-CHAIRPERSON AND FAIR DIRECTOR

Prof Lim Tit Meng

SCB

## CO-CHAIRPERSON

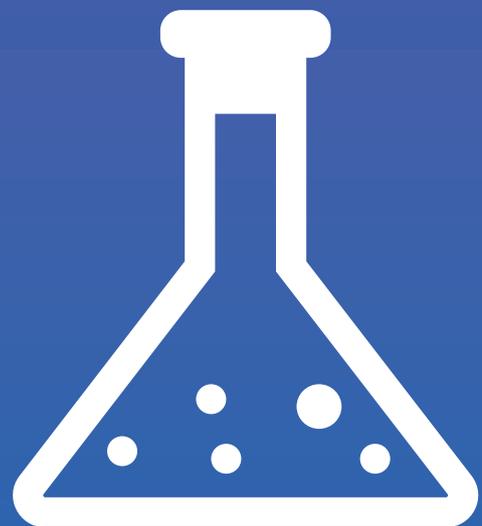
Mr Timothy Sebastian

A\*STAR

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Ms Wang Siew Ping	MOE	Ms Charlene Low	DSO
Dr Lee Song Choon	SCB	Ms Joyce Yao	DSO
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Ms Ng Li Ting	A*STAR	Mr Kel Lee	SCB
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Dr Lau Quek Choon	NP	Ms Loh Zi Yan	SCB
Mr Choi Kuan Meng	RP	Ms Nurdiana Mohd Sinari	SCB
Mrs Koh Siok Im	SP	Mr Ho Kian Tong	MOE
Ms Phuan Siew Khoon	MOE	Ms Gerlynn Yap	MOE
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Mr Tan Teck Chuan	HTX	Mr Jamues Nicholas Ng	MOE
Ms Ivy Lim Zi Jun	DSTA	Ms Chan Xinhui Kim	MOE
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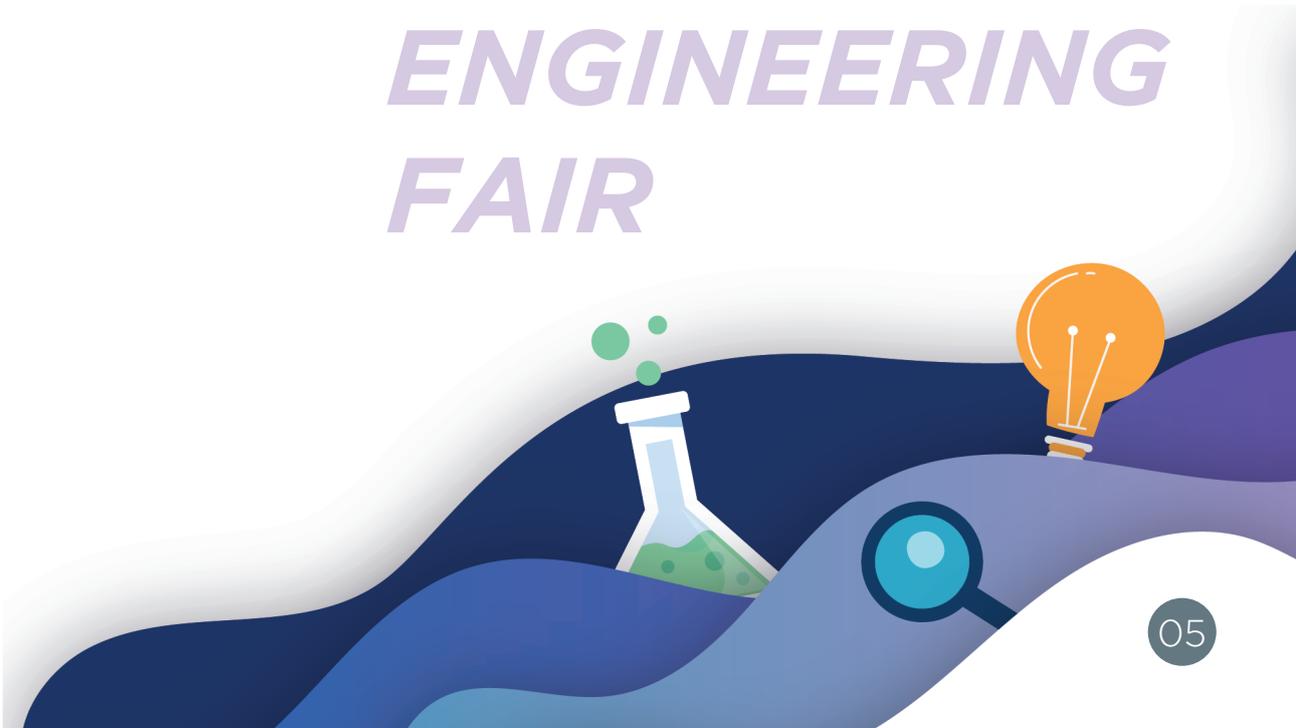
# Background



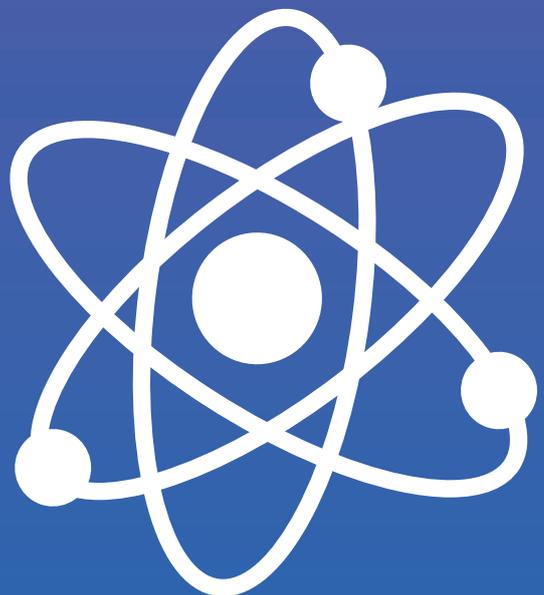
The Singapore Science & Engineering Fair (SSEF) is a national competition organised by the Ministry of Education (MOE), the Agency for Science, Technology & Research (A\*STAR) and Science Centre Singapore. The fair is open to all secondary and pre-university students between 15 and 20 years of age. Participants submit research projects on science, technology, mathematics and engineering. At the project exhibition in the fair, participants are interviewed by judges from organisations and institutions including local universities, polytechnics and research institutes.

The SSEF is affiliated to the highly prestigious Regeneron International Science and Engineering Fair (Regeneron ISEF), which is regarded as the Olympics of science competitions.

# *SINGAPORE SCIENCE & ENGINEERING FAIR*



# Singapore Science & Engineering Fair 2022



# Introduction

2022 marks the 22nd year of SSEF. It is also the second year in which the fair was held virtually. 455 projects registered for the Main Category and 325 of these projects were shortlisted for final judging in March 2022. A total of 130 awards were awarded, comprising 25 Gold, 33 Silver, 35 Bronze and 37 Merit awards. This year, ten organisations (The Electrochemical Society, Singapore Chapter; Institute of Chemical Engineers, Singapore; The Institution of Engineers, Singapore; Singapore Association for the Advancement of Science; Singapore Mathematical Society; Singapore Society for Microbiology and Biotechnology; Singapore University of Technology & Design; Yale-NUS College; James Dyson Foundation and L'Oréal Groupé) sponsored Special Awards, which were awarded to 46 projects.

In the Junior Scientist Category (for students under 15 years of age), 42 projects were shortlisted for final judging. Three projects were awarded the Distinction award and four were awarded the Merit award for overall content, while two projects were awarded the Distinction award and six were awarded the Merit award for their videos.

# Foreword



## MDM LEE LIN YEE

CHAIRPERSON

Singapore Science & Engineering  
Fair Working Committee 2022

Director, Sciences Branch  
Curriculum Planning & Development Division  
Ministry of Education

The 21st century has brought many complex global challenges, ranging from climate change to the spread of infectious diseases. As such, research in Science, Technology, Engineering and Mathematics (STEM) plays a critical role in the strive to generate innovative solutions to these challenges faced. One will be reminded of the importance of STEM research when listening to student participants share their research findings at the annual Singapore Science and Engineering Fair (SSEF). From heating fish scales to allow them to adsorb common water pollutants to developing a deep-learning approach that predicts infectious virus variants before their emergence, SSEF 2022 student finalists shared a plethora of potential solutions to both present and future challenges.

**SSEF** is an important platform to nurture students' interest in STEM research and support them in advancing their research dispositions and competencies. The curiosity to seek out real world problems, the heart to seek out solutions as well as the STEM knowledge and skills they develop will enable them to make a positive difference to society in the future as they continue to push the boundaries of innovation.

This year, participation in SSEF returned to pre-COVID levels. 1,099 students from 34 schools submitted 492 research projects for the fair. A total of 130 projects received Gold, Silver, Bronze and Merit Awards. To all student participants, you have done a fantastic job!

As the proverb goes, it takes a village to raise a child. Similarly, the fair was only made possible with the expansive and collaborative efforts of the STEM community. My heartfelt gratitude goes out to teachers, mentors, and partners from research institutes and institutes of higher learning. Your valuable time and expertise in mentoring students form the solid bedrock of their STEM learning. I would also like to thank our sponsor organisations for giving out the SSEF 2022 Special Awards to recognise our students' research efforts. The ten organisations are The Electrochemical Society, Singapore Chapter, Institution of Chemical Engineers Singapore, The Institution of Engineers, Singapore, Singapore Association for the Advancement of Science, Singapore Mathematical Society, Singapore Society for Microbiology and Biotechnology, Singapore University of Technology & Design, Yale-NUS College, James Dyson Foundation and L'Oréal Groupé.

Finally, I extend my deepest appreciation to our sponsors, the Defence Science and Technology Agency (DSTA), DSO National Laboratories (DSO), and HTX (Home Team Science and Technology Agency), and our longstanding partners, A\*STAR and Science Centre Singapore, for their dedication to SSEF and commitment to providing a holistic STEM education for our future generations.

We look forward to the continued support from everyone and meeting you in-person at future editions of SSEF. Continue to be curious, be creative, and be a positive change to better the lives of those around us!



# Regeneron International Science & Engineering Fair 2022



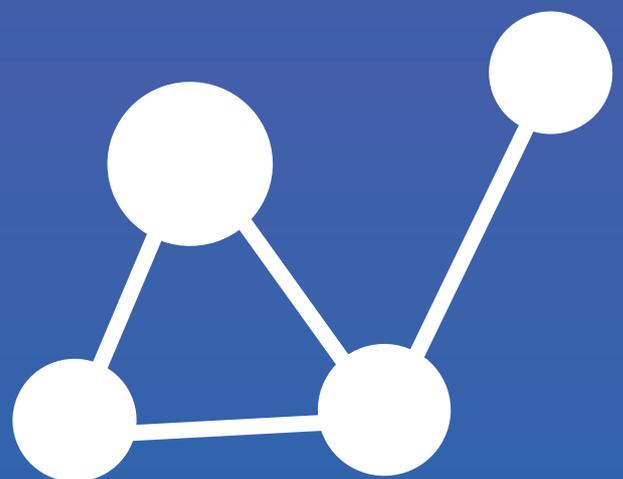
# Introduction

Regeneron International Science & Engineering Fair (Regeneron ISEF), organised by the Society for Science in the United States of America, is one of the world's largest annual pre-college science fairs that provides a platform for top STEM talents to showcase their projects.

The fair was conducted in a hybrid format this year. The physical fair was held in Atlanta at the Georgia World Congress Centre from 7 to 13 May 2022. Finalists who were unable to travel were judged virtually through video conferencing. Eight student delegates who performed well at SSEF 2022 presented two team projects and four individual projects virtually. The Singapore student delegation clinched a total of four awards.



# Team Singapore's Regeneron ISEF 2022 Delegates





**ANSELMO  
KLEMENT CHUA**



**BRANDEN  
ZHAO KANG JUN**

**SCHOOL**  
**CLEMENTI TOWN SECONDARY SCHOOL**

**PROJECT TITLE**  
***METABOLIC ENZYMES AID IN REPAIR OF  
DAMAGED DNA***

When cellular DNA becomes damaged, cell division can become uncontrolled and this can lead to cancer. In their project, Klement and Branden studied how cells repair damaged DNA and identified new functions of metabolic enzymes involved. This better understanding of the mechanisms of repairing damaged DNA will contribute to the possibility of offering more cancer treatment options in the future.

At ISEF 2022, Klement and Branden enjoyed interacting with like-minded youths from around the world, They have also gained valuable insight to research during their discussions with experienced scientists.



**GLENDA  
TAN HUI EN**



**KOAY  
TZE ERHN**

**SCHOOL**  
**RAFFLES INSTITUTION**

**PROJECT TITLE**  
***ANTI-VIRUS AUTOBOTS: PREDICTING MORE  
INFECTIOUS VIRUS VARIANTS FOR PANDEMIC  
PREVENTION THROUGH DEEP LEARNING***

Reactive efforts to develop booster vaccines after COVID-19 variants emerge puts the world on the back foot and brings greater uncertainty to the future. This inspired Glenda and Tze Erhn to explore more proactive approaches. They developed Optimus PPIme, a deep learning approach to predict more infectious virus variants before they emerge. This can help the world expedite vaccine production to prevent new viral outbreaks and save lives.

Glenda and Tze Erhn found their experience at ISEF 2022 to be amazing. Apart from having the opportunity to speak to STEM experts, they also enjoyed interacting with other ISEF participants who were passionate in STEM. On reflection, they had a challenging yet fulfilling research journey. They are thankful to their mentors and teachers who have guided them on this journey.





**MALCOLM SOW  
MIAO GENG**

**SCHOOL**  
**NUS HIGH SCHOOL OF MATHEMATICS AND SCIENCE**

**PROJECT TITLE**  
***HEATED FISH SCALES THAT FLUORESCENCE AND ADSORBS***

Repurposing waste materials to fight environmental pollution contributes to sustainable development. In his project, Malcolm found that heating fish scales on a hotplate enhanced their unique properties (fluorescence and adsorption). This allowed fish scales to be used to better adsorb common pollutants found in water. Malcolm's findings show potential for developing a low-cost and sustainable way for cleaning polluted water.

From his research journey and experience at ISEF 2022, Malcolm learned the importance of several transferable skills, especially communication skills which are crucial for the delivery of scientific findings. He is grateful to his research mentors who have guided him throughout his journey.



**LEE  
RUI XUAN**

**SCHOOL**  
**NANYANG JUNIOR COLLEGE**

**PROJECT TITLE**  
***DETECTION OF SQUID FRESHNESS USING RED CABBAGE***

Rui Xuan's project involves the development of "Sotong"-nidin freshness stickers using red cabbage extract and agar gel. These stickers, which change colour according to pH, are used to detect the freshness of squid. The stickers can potentially be widely used in households and the culinary industry.

Through the project, Rui Xuan had the opportunity to hone her skills in scientific inquiry and communication. In addition, she is thankful for having the opportunity to learn from her research mentors and industry experts while doing and presenting her project.





**ANNIKA  
LIU XINAN**

**SCHOOL**  
**RAFFLES INSTITUTION**

**PROJECT TITLE**  
***MINIATURE SOLID-STATE PH ELECTRODES***

pH measurement is essential to everyday processes, such as food production and wastewater treatment. However, existing pH sensors are costly and bulky. Annika's project aims to fabricate miniature pH sensors that are highly sensitive and reproducible on a large scale. These miniature sensors have many applications, such as in the development of affordable wearable health sensors.

Annika's research journey has helped her develop resilience and critical thinking. It also made her realise the importance of staying curious about the world around her. She is particularly grateful for her teachers and research mentor for their unwavering support and guidance, acknowledging that she could not have made it this far without them.



**YEONG  
JUN KAI**

**SCHOOL**  
**NUS HIGH SCHOOL OF MATHEMATICS AND SCIENCE**

**PROJECT TITLE**  
***DIFFERENTIATING LATE FROM ALZHEIMER'S DISEASE IN THE ERA OF ANTI-AMYLOID MONOCLONAL ANTIBODY TREATMENT: A NOVEL MACHINE-LEARNING APPROACH***

Increasing evidence suggest that different subtypes of Alzheimer's Disease (AD) exist. However, there is a lack of ways to differentiate these AD subtypes. Jun Kai developed a machine-learning model that can augment magnetic resonance imaging (MRI) scans in differentiating AD subtypes. This can lead to better treatment of AD patients.

Jun Kai enjoyed interacting with scientists and learning from them at ISEF 2022. He was also excited to be able to share his research work on an international stage with peers who were passionate in STEM.



# SSEF 2022

## Award Winners

### Main Category



## Gold



**Sivakumar Avanthika; Yang Ziqing**  
Raffles Institution; School of the Arts, Singapore  
*Calcium Phosphate/Collagen Ratio in Bone Grafts Influences Bone Repair in a Rabbit Tibial Defect Model*

**Chen Yanlin; Jordan Low Jun Yi; Kuo Hsin Wei**  
NUS High School of Mathematics and Science  
*Minimally Invasive Annuloplasty using Shape Memory Materials*

**Yeong Jun Kai**  
NUS High School of Mathematics and Science  
*Machine-learning Approach to Predicting TDP43, Amyloid and Tau Neuropathology, to Aid in the Detection and Differentiation of LATE from Alzheimer's Disease*

**Balasubramanian Tharoon; Chevy Lim Wei Jun**  
Clementi Town Secondary School  
*The Spike Protein of SARS-CoV-2 Targets the Human PRL Oncogene*

**Branden Zhao Kang Jun; Anselmo Klement Chua**  
Clementi Town Secondary School  
*Turning the TCA Cycle Backwards to Repair Damaged DNA*

**Vincent Yap Yi Fei; Kayden Tan Shen Rong; Wong Jia Wei**  
NUS High School of Mathematics and Science  
*An Investigation into Super Hygroscopic Composite Films and their Applications*

**Annika Liu Xinan**  
Raffles Institution  
*Fabrication and Evaluation of Solid-State Ion-Selective Electrodes for pH Measurement*

**Ong Wee Wen Adrian; Cao Yueran; Sim Jin Heng**  
NUS High School of Mathematics and Science  
*NDDO Methods Revisited: Parameter Optimization and Theoretical Improvements*

**Nguyen Ngoc Bao Han**  
St. Andrew's Junior College  
*QSAR Modelling of the Activity of Anti-colorectal Cancer Agents Featuring Quantum Chemical Predictors and Interaction Terms*

**Seamus Kelly Yi Xuan; Chia Leanne; Sung Yat Lam**  
Hwa Chong Institution  
*3D Design and Construction of a Microbubble Generator and its Application in the Electro-Fenton Process*

**Low Jeen Liang; Yiu Yi Hin Kinsey; Tan Wei An**  
Hwa Chong Institution  
*Investigating the Bioelectric Effect for Treatment and Subsequent Inhibition of Nosocomial Biofilms*

**Lim Hee Lai; Lu Ruolin**  
NUS High School of Mathematics and Science  
*A Cost-Effective and Accessible Construction of Ground Station for Cubesat Applications*



## Gold

### **Mario Tanijaya**

NUS High School of Mathematics  
and Science

*Crossing Number of Join Product of  
Some Graphs*

### **Brandon Ong Jing Jie; Gabriel Goh**

**Hao Xiang; Sun Yuang**

Hwa Chong Institution

*The Moon and the Sixpence*

### **Jamie Wen; Chan Mi Mi Samantha;**

**Kee Xuan Ling Shannon**

Dunman High School

*Effectiveness of Different  
Mouthwash Agents and Herb  
Extracts in Inhibition of  
*Streptococcus mutans* Biofilm*

### **Malcolm Sow Miao Geng**

NUS High School of Mathematics  
and Science

*Styling of Biofluorescence in  
Fish Scales*

### **Lee Rui Xuan**

Nanyang Junior College

*"Sotong"-nidin: The Detection  
of Squid Spoilage Using Red  
Cabbage Extract*

### **Wang Nan**

Hwa Chong Institution

*Interface Engineering of  
MOF-derived MnOx/Ni as an  
Efficient Bifunctional Electrocatalyst*

### **Tan Jun Wei**

NUS High School of Mathematics  
and Science

*Designing Arbitrary Non-Hermitian  
Hamiltonian Spectra via Electrostatic  
Conformal Maps*

### **Qi Tianshi; An Wei Teck**

Hwa Chong Institution

*Effect of Magnetic Anisotropy on  
Spin Current Driven Magnetization  
Auto-oscillation*

### **Sun Xiaoqing**

Raffles Girls' School (Secondary)

*The Physics of a Bead Rolling on a  
Rotating Hoop - A Problem in  
Nonlinear Dynamics*

### **Gareth Chua Rui Jye;**

**Au Heng Hoi Joel**

NUS High School of Mathematics  
and Science

*Design of Cost-effective Metasurface  
for Efficient Broadband  
Polarisation Conversion*

### **Nippani Srisha Murthy**

Anglo-Chinese School (Independent)

*Effect of Different NPK Ratios on the  
Mass and Chlorophyll Content of the  
Kang Kong Plant*

### **Yuan Chenghao**

Hwa Chong Institution

*PaRT: Parallel Learning Towards  
Robust and Transparent AI*

### **Glenda Tan Hui En; Koay Tze Erhn**

Raffles Institution

*Anti-virus Autobots: Predicting  
Deadlier Virus Variants for Pandemic  
Prevention through Deep Learning*



## Silver

**Liu Yueyang; Goh Jun Yu;  
Ang Yi Qing Denise**

**River Valley High School**

*Investigating the Toxic Effects of  
Allicin on Insects as a Potential Alter  
Native to Synthetic Insecticides*

**Daven Wong Swee Yan; Sai Sujan  
Palepu; Rishii Parthasarathy**

**NUS High School of Mathematics  
and Science**

*Engineering Ticks and Mosquitos'  
Salivary Peptides into Potent and  
Uncleavable Hybrid Thrombin Inhibitor*

**Jay Tan Jun Jie**

**National Junior College**

*Discrimination of Extra Virgin Olive Oil  
Adulteration Using Non-Destructive  
Capacitance Methods*

**Xu Rulin; Zhao Xinyue**

**NUS High School of Mathematics  
and Science**

*Investigation of Effects of YWHAB  
Gene on Colorectal Cancer Cell Growth*

**Timothy Chek Jun Hou; Sohan Daniel  
Singh; Lee Zong Heng Nicholas**

**Raffles Institution**

*Developing Copper(II) Ion Sensors  
based on Localised Surface  
Plasmon Resonance and  
Fluorescence Spectroscopy*

**Eun Chin Sze, Gerald; Lee Chen Xi**

**Hwa Chong Institution**

*Formation and Stability of Gelatin  
Tannic-acid Multilayers*

**Eunice Ho**

**National Junior College**

*Artificial Metalloenzymes by  
Creation of Novel Catalytic  
Sites in DNA Scaffolds*

**Lim Chern Howe Ryan; Koo Jun Yuan;  
Rao Jun Song**

**Hwa Chong Institution**

*Novel Analysis of the Spectrum  
and Pathogenicity of TTN Genetic  
Variants in Neuromuscular  
Disorders and Cardiomyopathies*

**Le Xiping**

**Hwa Chong Institution**

*The Role of Kisspeptin in Regulating  
Macronutrient Consumption in the  
Zebrafish Model*

**Nguyen My Binh An; Tran Phuoc My**

**Catholic Junior College;**

**St. Andrew's Junior College**

*Eikonal Equation-based Grid  
Search Method for Precise  
Earthquake Location*

**Tan Chen**

**National Junior College**

*Detection of Ions in Water  
Through Contact Electrification  
at Water-polymer Interface*

**Zou Jiayue**

**Raffles Institution**

*Heterotrophic Cultivation of  
Microalgae in Food Waste Digestate  
for Simultaneous Biomass Production  
and Nutrient Remediation*

**Park Saeun; Tan Jia Hao;**

**Tan Chok Joo**

**National Junior College**

*Effects of Organometallic Zinc  
Catalysts on the Conversion of CO<sub>2</sub>  
and Epoxide into Cyclic Carbonate*



## Silver

**Han Yijia; Delfina Poernomo**  
National Junior College  
*Production of Proteins from  
Agricultural Wastewater Using  
Algae Chlorella*

**Ryan Chin Rui En**  
Anglo-Chinese School (Independent)  
*Investigating the Relationship Between  
pH and the Stability of Oil-in-water  
Emulsions with Soy Lecithin with  
Critical Coagulation Concentration of  
Potassium Chloride Added via Salt  
Titration, and Conductivity-derived  
Emulsion Stability*

**Wang Jing Rong Daryl**  
Victoria Junior College  
*Continuous Flow Synthesis for  
Rapid Access of Active  
Pharmaceutical Ingredients*

**Lim Huai Kai; Cheng Yi**  
NUS High School of Mathematics  
and Science  
*Automated Classification and  
Identification of Literature on  
Functional SARS-CoV-2 Spike Protein  
Mutations Using Natural Language  
Processing and Machine Learning*

**Gan Kah Shuen; Tan Min Min;  
Cheok Yin Jia**  
Raffles Girls' School (Secondary)  
*Information Gathering by  
Passive SONAR*

**Janson Chia Zuo Min; Wee Zhuo Lin;  
Loh Yi Qing**  
Dunman High School  
*Solving the Rubik's Cube with Robot  
Operating System, Lego and  
Raspberry Pi*

**Nguyen Quang Minh**  
Hwa Chong Institution  
*On Elliptic Curves of The Form  
 $y^2=x^3+Ax+t^2$*

**Tan Kin Ru; Natalie Edna Pak Hou  
Ching**  
NUS High School of Mathematics  
and Science  
*Core Allocations for Vaccine  
Cooperation of Interacting Countries*

**Cui Zeyu; Shi Xinrui**  
Hwa Chong Institution  
*Modelling of Taxi Driver's Decision  
Making and Its Application on  
Optimising Changi Airport Taxi  
Management System*

**Patil Shruti Rahul; Mak Wy-Ning;  
Hesidiya Karis Jonathan**  
NUS High School of Mathematics  
and Science  
*Investigating Singapore's  
Environment for Phages That Attack  
Mycobacteria Fortuitum Bacteria*

**Vera Tham Yen Kei; Jannatara Jannat  
Rokan; Lu Zi Hui**  
Singapore Chinese Girls' School  
*Development of An Autonomous  
Solar Powered Atmospheric  
Water Generator*

**Tan Shaen En Lucas; Pavan Singh  
Sheena; Tan Soon**  
NUS High School of Mathematics  
and Science  
*Water Quality Analysis by  
Precision Ellipsometry*



## Silver

**Wong Yin Leng Angelina; Alexandra Loh Wei Ling**

**NUS High School of Mathematics and Science**

*Data Integrity Detection in Wearable IoT Devices for Cardiac Monitoring*

**Wong Wei Jie Brion**

**Dunman High School**

*Edible Microcapsules from Natural Precursors*

**Goh Siau Tan**

**Temasek Junior College**

*Quantum Transport in Topological Semimetal Tunnelling Nanostructure*

**He Tianyi; Fang Hao**

**Hwa Chong Institution**

*The Use of Rayleigh Disk as a Sound Intensity Meter*

**Kang Yonghyun**

**Anglo-Chinese School (Independent)**

*Comparison of Autotrophic and Mixotrophic Cultivation of Chlorella Sorokiniana Based on Biomass Productivity, Lipid Productivity, and Protein Productivity*

**Nyx Audrey Angelo Iskandar**

**Raffles Institution**

*Manga Layout Analysis via Deep Learning*

**Evan Lim Hong Jun**

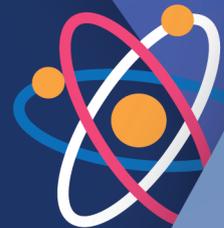
**Raffles Institution**

*Adversarial Attacks Against Detecting Bot Generated Text*

**Kuai En Kai, Ethan; Raghuveer Singh**

**NUS High School of Mathematics and Science**

*Virtual Arm with Multimodal Biased Feedback for Improving EEG Motor Imagery Calibration Training*





## Bronze

### **Jin Yucheng**

**Victoria Junior College**

*Transcriptomic Analysis of the Hypothalamus Loci Involved in Appetite Control*

### **Yap Ray Kai Joel; Evan Poh;**

**Khoo Kai Jun Aloysius**

**Hwa Chong Institution**

*EEG-based Assessment of the Influence of Music-Induced Emotions on Cognitive Task Performance*

### **Heng Mun Ling**

**School of the Arts, Singapore**

*Enzyme Activity Assay Development for Sustainable Bio-manufacturing*

### **Ng Yan Bin Lucas; Peng Zikang;**

**Yang Supeng**

**Hwa Chong Institution**

*Dietary Patterns and Nutritional Intake Among Severely Obese Children with Varying Metabolic Phenotypes*

### **Sean Lim Shi-An; Manivannan Harini;**

**Karis Yuen Xin Er**

**NUS High School of Mathematics and Science**

*Sustainable Nanofibrous Scaffold for Dental Tissue Engineering*

### **Kevin Ong Gheng Seong;**

**Foo Ming Guo**

**Hwa Chong Institution**

*Utilising an Unsupervised Machine Learning Approach to Identify Atopic Dermatitis Trajectories in the First 8 Years of Life in the GUSTO Cohort*

### **Gong Yongjia; Dai Zongxin;**

**Lim Yi Ting, Erica**

**River Valley High School**

*The Significant Impact of Genetic Variants on Plasma Lipoprotein(a) Concentration, which is Associated with Coronary Artery Disease and its Severity in the Singaporean Population*

### **Thia Wan Qing Benecia; Janae Kwan**

**Rae Yann; Shyna Zhuoying Gunalan**

**Hwa Chong Institution**

*The Study of COVID-19 Vaccine Awareness, Concerns and Hesitancy Among the 16-20 Year Old Students in Singapore*

### **Koo Min Seo; Nicole Tang Shu Ying**

**NUS High School of Mathematics and Science**

*CRISPR-Deaminase-Mediated Multiplex Genome Editing for Enhanced Microbial Biochemical Production*

### **Lee Bao Yu; Yeong Yi Heng;**

**Alagammai Lavanya Muthiah**

**Raffles Institution**

*Characterization of Pomelo and Grapefruit Peel Biochars Synthesized under Low Temperature and Air Atmosphere in Removal of Pb(II), Cu(II) and Microplastics*

### **Valerie Wang Yi En**

**Hwa Chong Institution**

*Enzyme Activity Assay Development for Sustainable Bio-manufacturing*



## Bronze

### **Chen Zhi Ning Ronn**

**NUS High School of Mathematics and Science**

*Photocatalytic Degradation of Pharmaceutical Pollutants by Radical Polymer*

### **Purushothaman Sanjai; Timothy Tan;**

**Benedict Chua Wei An**

**St. Joseph's Institution**

*Using Machine Learning to Train A Model that Is Capable of Identifying the Amphibians Belonging to the Hylidae Family Based on Their Advertisement Calls*

### **Niveydithaa Saravanan**

**National Junior College**

*Deep Learning Based Cardiac Ventricle Segmentation Using Cardiac Magnetic Resonance (CMR) Scans*

### **Ku Shang Chu; Peh Qi Jie Jonathan;**

**Fu Xiang Tai Nigel**

**Dunman High School**

*HeatScout: Near-eye Display for Hot Object Detection*

### **Isabelle Ong Li Xin**

**Raffles Girls' School (Secondary)**

*Investigation of Flow Resistance and Blast Propagation through Ventilation Pathways*

### **Tan Ying Liang Torance;**

**Koon Wei Pheng**

**St. Joseph's Institution**

*Effects of Repeated Cycles of Sleep Curtailment and Recovery on Glucose Tolerance and Insulin Sensitivity*

### **Vanniyarajan Kailaashnaath**

**NUS High School of Mathematics and Science**

*Characterization of Mitochondrial Permeability Transition Pore Components*

### **Sun SiTong; Wong Ching Whee**

**Dunman High School**

*Coolish Housing: Maximising Natural Ventilation for Sustainable Living in Established HDB Units*

### **Qiu Yahan, Olivia**

**Raffles Institution**

*Power Supply System for Smart Contact Lens*

### **Tee Ren Wey; Darius Lim Xiang Wen**

**Dunman High School**

*Carbonised Broccoli for Solar Steam Generation of Seawater*

### **Ryan Thaddeus Shi-Eng Chio; Tan Ee**

**Hsuen Conan; Nicole Pang Xe Wen**

**National Junior College**

*Mathematical Modelling of Dengue Fever in the 2020 Lockdown Break*

### **Chek Ze Chan; Dylan Wong Yee Kin**

**NUS High School of Mathematics and Science**

*Investigation of Machin-like Formulas*

### **Kannan Manu; Ayan Sarker;**

**Pradeep Thangavelu**

**Raffles Institution**

*Investigation of Liquid Polyurethane Viscosity on Surface Glossiness and Heat Retention Capabilities When Hardened*



## Bronze

**Koh Wen Jie Justin;**  
**Quek Shao-Yen Joseph**  
NUS High School of Mathematics  
and Science  
*Unusual Irreversible Behavior of  
Low-Voltage Electrowetting on  
Si-TiO<sub>x</sub>-Silane Substrate*

**Pan Jinxia; Cheong Hoh Ian, Reuben;**  
**Lee Min Yii, Jemimah**  
Hwa Chong Institution  
*Development of a 3D-Printable  
Hydrogel-based Antimicrobial Film*

**Lim Li Xin Jed**  
NUS High School of Mathematics  
and Science  
*An Investigation on The  
Aerodynamics of Flight  
of A Hand Helicopter*

**Chen Guangyuan**  
Raffles Institution  
*The Rebounding Capsule: A Novel  
Hertzian Contact Approach to the  
Collision of Rotating Bodies*

**Deng Chunyi; Yang Jingxiang**  
NUS High School of Mathematics  
and Science;  
River Valley High School  
*Investigation of Properties of  
Patterned Dielectric Superlattice  
Using Computational Methods*

**Hilary Chee Xin Yi; Chloe Liow Yi Yin;**  
**Yin Yue**  
Raffles Girls' School (Secondary)  
*Simulating Plasma Fusion in  
Magnetic Mirror and Tokamak*

**Chen Ye Kai Trevor; Wu Dechun;**  
**Ang Hran Jie Joe**  
Anderson Serangoon Junior College  
*Extracting Cellulose from  
Commonly Consumed and  
Wasted Asian Vegetables*

**Rachel Yeo Hui Min; Zhu Tianyi;**  
**Du Yitian**  
Hwa Chong Institution  
*Examining the Impact of  
COVID-19 Pandemic on Personal  
Mobility Sharing: A Machine  
Learning Approach*

**Huang Juncheng; Jiang Xinnan;**  
**Xia Yi Fei**  
Hwa Chong Institution  
*Deceiving Traffic Sign Recognition  
with Physical One-Pixel Attacks*

**Hong Eungi; Mirdhini Shri Rajaram**  
Raffles Girls' School (Secondary)  
*Identification of Mosquito Larvae in  
Drains Using Deep Learning*

**Treruangrachada Anantaya Kylin**  
Raffles Institution  
*Analysis of Chemical Transport by  
iPSC-derived Proximal Tubular Cell  
(PTC)-like Cells and other Emerging  
Human Kidney Cell Models for  
Nephrotoxicity Testing*

# Merit



**Max Tan Kia Lok; Eddrick Livando**

Anglo-Chinese Junior College

*Detection and Classification of Chromosomal Mutations in Metaphases for Radiation Damage*

**Chudasama Manasa Indrajitsinh;**

**Tan Shim Yean**

NUS High School of Mathematics and Science

*Fabrication of Multi-Layer Tubular Structures for Vascular Graft Application via 3D-Bioprinting*

**Yip Yong Sen Ryan; Chow Zi Yong**

NUS High School of Mathematics and Science

*Investigating The Role of Emotions in Moral Judgement and Reasoning*

**Kerine Sim Yee Teng; Hoo Rae En**

Hwa Chong Institution

*Effectiveness of Videos and Infographics on Education of Lower Back Pain*

**Zhang Minyue; Liu Yiwei**

Hwa Chong Institution

*Quantification of Butyrates in Locally-produced Vegetables Using High-Performance Liquid Chromatography (HPLC)*

**Lim Kar Ern, Samuel;**

**Ang Kang Yu Daniel**

Hwa Chong Institution

*Chalcone-ligated Molybdenum Carbonyl Complexes: Synthesis, Cytotoxicity and Quadruplex DNA Binding Studies*

**He Donghang**

Hwa Chong Institution

*Determination of  $\text{Eu}^{3+}$  and  $\text{Tb}^{3+}$  Concentrations in  $\text{SiO}_2$  Films Embedded with ZnO Nanocrystals to Produce Desired Light*

**Jovyn Lee Zhuo Ying; Ong Jing Jie;**

**Vjan Yeo Zeng Hee**

National Junior College

*Strength Of Detergents Analyzed By Precision Ellipsometry*

**Lee WENZE; Jonathan Lee Beng**

**Fong; Lok Ting Yuan**

Hwa Chong Institution

*Intricate Studies of Citric Acid Coated Bismuth Sulfide Nanoparticles for The Removal of Organic Dyes and Heavy Metal Ions*

**Nguyen Duc Minh Anh;**

**Nguyen Thien Minh Tuan**

St. Joseph's Institution

*Research on The Effects of Microclimate on Emotion and Health*

**Shawn Ng En Young**

Raffles Institution

*Water Rectenna*

**Lin Hongyi; Yin Duoyi;**

**Davin Khor Wen Ning**

Hwa Chong Institution

*Project UltraCount: Design and Implementation of an Integrated System for Real-time Pedestrian Monitoring with Ultrasonic Sensors*

# Merit



**Nam Poh Chuan, Charles; Ong Jun Xi;  
Subramanian Vishwa**  
NUS High School of Mathematics  
and Science  
*NUSHSat (Payload)*

**Tan Yi Xin Geri; Adele Lim Yu Qing;  
Tan Sze Qi**  
Raffles Girls' School (Secondary)  
*Behaviour of Sustainable Recycled  
Aggregate Concrete Structures*

**Randall Tan; Kaegen Teo Wee Teck**  
Victoria Junior College;  
Victoria School  
*Design & Development of Delta Wing  
with Loitering Capability*

**Joseph Chan Chern En;  
Robert Livando**  
Anglo-Chinese Junior College  
*Analysis of a Two-Terminal  
All Perovskite Tandem Solar  
Cell Through Neutral  
Network-based Application*

**Angeline Wong Li Ning;  
Christie Chong Wei Ling**  
River Valley High School  
*Application of Queueing Theory to a  
School Canteen Stall: A Study of The  
Chinese Delights Stall*

**Xie Yu**  
National Junior College  
*Basic Properties of Incomplete  
Hurwitz-Euler Eta Function*

**Isabelle Aeryn Chong; Sophie Elyse  
Toh Zhili; Tsang Wan Xuan Isabelle**  
Methodist Girls' School  
*Investigating the Optimal Conditions  
of The Pirouette's Preparation Stage*

**Cheng Hao; Hayley Lim Hui En**  
National Junior College  
*Investigation on Effectiveness of  
Different Types of Solvents to  
Extract Out Antibacterial Compounds  
in Garlic Against Escherichia Coli  
Strain K12*

**Aayush Arya; Joseph Poon Mu Jie**  
NUS High School of Mathematics  
and Science  
*Determining Effects of Urea on The  
Structure of Dengue Virus Serotype  
2 Using Fluorescence Spectroscopy*

**Medha Shridharan**  
NUS High School of Mathematics  
and Science  
*Developing a Modelling Tool for  
Hydrothermal Deposition of  
Yttrium-Stabilized Zirconia (YSZ)  
Thin Films*

**Cheng Xi Jodi**  
National Junior College  
*Hybrid TCO-Silver Metasurfaces for  
High Visible Transmittance and  
Selective Near Infrared Reflection*

**Soh Kai Xuan**  
Victoria Junior College  
*Development of Optical Models for  
Managing Light in Modern Agritech*

**B.Lathika; Jared Wong Ka Yik;  
Ramit Rahman**  
National Junior College;  
Kranji Secondary School;  
Kranji Secondary School  
*3D Printed Acoustic Metamaterial for  
Noise Mitigation*

# Merit



**Rao Zhehong; Yong Rei En, Kera Ruth**  
National Junior College  
*Optimisation of Anodisation of Aluminium by Electrolysis*

**Shanay Jindal; Ong Shao Aik**  
NUS High School of Mathematics and Science  
*Numerical Analysis of Heat Equation Governing Fusing of a Straight Wire*

**Li Xin Rui; Darius Lee Jia Jun; Teh Guang Yu**  
Hwa Chong Institution  
*Investigating The Dynamic Movement of Liquid Droplets On A Moving Plane*

**Charmaine Goh; Kiattikhunphan Nuafa; Evlynn Alisantoso**  
National Junior College;  
Kranji Secondary School;  
Kranji Secondary School  
*Effects of Antioxidant Levels Present in Compost of Food Waste*

**Huang Sikai; Hu Buyan; Cheryl Koh**  
Hwa Chong Institution  
*Artificial Intelligence Analysis of Thyroid Ultrasound Images for Early Cancer Detection and Risk Management*

**Lu Xinyu**  
Victoria Junior College  
*Automated AI Based Segmentation of Neuroblastoma*

**Lin Thik Win**  
Eunoia Junior College  
*Investigation of Data Augmentation Techniques on The Performance of Autonomous Robots*

**Song Yiyang; Tan Sean Linus**  
Raffles Institution  
*Learning Policies Through Monte Carlo Tree Search to Find Unsat Cores*

**Javier Lim**  
NUS High School of Mathematics and Science  
*Multimodal Sentiment Analysis of Memes*

**Christopher Koh Jie En**  
St. Joseph's Institution  
*Python-based X-ray CT Data Visualisation Tool*

**Lim Zhi Sun**  
National Junior College  
*Can Computers Understand Singlish?*

**Jessie Chin Kit Hey; Chia Sin Jie**  
Nanyang Girls' High School  
*Geolocation of Street View Images*

**SSEF 2022**  
**Award Winners**  
**Junior Scientist**  
**Category**



# Project Award

## *Distinction Award*

**Lim Hao Yu Olivier; Aklen Chua Wee Kai; Ang Gedeon Kusuma**

**Raffles Institution**

*Potential for Biodiesel Production and Growth Rates of 4 Microalgae Strains in 3 Commonly-Used Algae Growth Media*

**Solomon Lim Jun Hui**

**NUS High School of Mathematics and Science**

*Synthesis of A Hyper-Porous Fluorinated COF With Customisable Sites*

**Sayli Omkar Bapat; Thiraviaganesh Kirthika; Sanjoli Kansal**

**Cedar Girls' Secondary School**

*Effectiveness of Alternatives to Silica Gel in Removing Moisture From Earphones*

## *Merit Award*

**Lai Yin Wen; Pan En-Hui Allyson Joy; Sarah Lam Ling Yian**

**Methodist Girls' School**

*Micropropagation of Plant Calli as an Alternative Food Source*

**Maeve Teo Yuumi; Rachel Goh Rui En; Hiranya Sai Priya Balireddy**

**Raffles Girls' School (Secondary)**

*Factors Affecting The Mode of Nutrition of Chlorella and The Ability of Chlorella to Switch Between Its Modes of Nutritions*

**Lai Li Hang Damien; Huang Yaomin**

**Raffles Institution**

*Regeneration of Carbonized Durian Derived Powder as an Environmentally Friendly Bio-absorbent*

**Jhala Hraday; Xie Yundi; Ankit Rathi**

**Raffles Institution**

*Using Machine Learning to Accelerate Quantum Dot Production for The Development of Next-Generation Green Technology*

# Video Award

## *Distinction Award*

**Lai Yin Wen; Pan En-Hui Allyson Joy; Sarah Lam Ling Yian**

**Methodist Girls' School**

*Micropropagation of Plant Calli as an Alternative Food Source*

**Sayli Omkar Bapat; Thiraviaganesh Kirthika; Sanjoli Kansal**

**Cedar Girls' Secondary School**

*Effectiveness of Alternatives to Silica Gel in Removing Moisture From Earphones*



## *Merit Award*

**Wong Yiqi; Goh Jia Yu; Kavuturu Venkata Ajay Satwik**

**Northbrooks Secondary School**

*Evaluating the Suitability of Household Materials for Making a Mask*

**Tepase Alden Marcus Deguangco; Ruiz Shaina Nero; Kwok Zheng Xian Matthew**

**Ngee Ann Secondary School**

*Investigating The Feasibility of Producing Environmentally-friendly Eggshell Plates*

**Nainika Gupta; Clarisse Chee Qian Ying; Tessa Yap**

**Raffles Girls' School (Secondary)**

*Investigating the Effect of Adding Antioxidants to Kiwi Juice Under Different Temperatures on Reducing the Degradation of Vitamin C*

**Yang Zi Yan; Toh Shiong Enn, Sean; Raphael Teng Zhi Xiang**

**NUS High School of Mathematics and Science**

*Fermat's Point*

**Dedee Sai Vadapalli; Bhatia Priyansh; Soo Cheng Hao**

**NUS High School of Mathematics and Science**

*The Vaccum Bazooka*

**Chua Ling Ying; Tan Lok Suan**

**Ngee Ann Secondary School**

*Investigating The Strength of Paper Made From Different Fruit Peel Waste For Sustainable Packaging*

# **SSEF 2022**

## **Award Winners**

### **Special Awards**



# Special Awards

## *The Electrochemical Society, Singapore Chapter (ECS) Award*

**Keerthana Kailasam; Cheong Jian Wei**

**Temasek Junior College**

*Comparing the Effect of Different Yeasts on Microbial Fuel Cell Performance*

**Shirleen Tan; Michelle Tan Mui Qi**

**Victoria Junior College; Dunman High School**

*Investigating Use of Electron Mediators from Herbal Plants in Microbial Fuel Cells*

**Lizanne Lim Yinnqi; Dominic Chua Yong Chen**

**National Junior College**

*Designing a Solar Powered Evaporative Cooling System for Outdoor Space*



## *Institution of Chemical Engineers Singapore (IChemE) Award*

**Qiu Yahan, Olivia**

**Raffles Institution**

*Power Supply System for Smart Contact Lens*

**Lizanne Lim Yinnqi; Dominic Chua Yong Chen**

**National Junior College**

*Designing a Solar Powered Evaporative Cooling System for Outdoor Spaces*

**Tee Ren Wey; Darius Lim Xiang Wen**

**Dunman High School**

*Carbonised Broccoli for Solar Steam Generation of Seawater*



# Special Awards

## *The Institution of Engineers, Singapore (IES) Award*

**Ma Shujun; Wang Junzhe; Christy Agustha Imanuela**

**Dunman High School**

*Un-slippers: Fall Prevention and Detection for The Aged*

**Lin Hongyi; Yin Duoyi; Davin Khor Wen Ning**

**Hwa Chong Institution**

*Project UltraCount: Design and Implementation of an Integrated System for Real-time Pedestrian Monitoring with Ultrasonic Sensors*



## *James Dyson Foundation (JDF) Award*

**Valerie Wang Yi En**

**Hwa Chong Institution**

*Enzyme Activity Assay Development for Sustainable Bio-manufacturing*

**Tan Yi Xin Geri; Adele Lim Yu Qing; Tan Sze Qi**

**Raffles Girls' School (Secondary)**

*Behaviour of Sustainable Recycled Aggregate Concrete Structures*



## *L'Oréal Special Award for Innovation in Dermatology and Cosmetology*

**Mahendran S/O Ravindran; Ethan Lim Heng Rwei; Kuan Ming Jie**

**Hwa Chong Institution**

*Evaluation of Antimicrobial, Radical-Scavenging and Toxicity Properties of Heliconia Psittacorum and The Development of A Green and Topical Delivery Method For It*



# Special Awards

## *L'Oréal Special Award for Innovation in Sustainability*

**Lee Wenze; Jonathan Lee Beng Fong; Lok Ting Yuan**

**Hwa Chong Institution**

*Intricate Studies of Citric Acid Coated Bismuth Sulfide Nanoparticles for The Removal of Organic Dyes and Heavy Metal Ions*



## *Singapore Association for the Advancement of Science (SAAS) Award for Science Communication*

**Daven Wong Swee Yan; Sai Sujan Palepu; Rishii Parthasarathy**

**NUS High School of Mathematics and Science**

*Engineering Ticks and Mosquitos' Salivary Peptides Into Potent and Uncleavable Hybrid Thrombin Inhibitor*

**Yeong Jun Kai**

**NUS High School of Mathematics and Science**

*Machine-learning Approach to Predicting TDP43, Amyloid and Tau Neuropathology, to Aid in The Detection and Differentiation of LATE from Alzheimer's Disease*

**Ethan Tew Kee Ern; Ong Chi Juay; Ong Shi Jie**

**Hwa Chong Institution**

*Single Cell Immune Profiling for Allergic Rhinitis Gene Candidates and Pathways*

**Sun Si Tong; Wong Ching Whee**

**Dunman High School**

*Coolish Housing: Maximising Natural Ventilation for Sustainable Living in Established HDB units*

**Tee Ren Wey; Darius Lim Xiang Wen**

**Dunman High School**

*Carbonised Broccoli for Solar Steam Generation of Seawater*

**Mario Tanijaya**

NUS High School of Mathematics and Science

*Crossing Number of Join Product of Some Graphs*

**Patil Shruti Rahul; Mak Wy-Ning; Hesidiya Karis Jonathan**

NUS High School of Mathematics and Science

*Investigating Singapore's Environment for Phages that Attack Mycobacteria Fortuitum Bacteria*

**Malcolm Sow Miao Geng**

NUS High School of Mathematics and Science

*Styling of Biofluorescence in Fish Scales*

**Krishnan Akash; Ngui Jianjia, Edison; Darryl Chin Kai Xian**

NUS High School of Mathematics and Science

*Chemically Functionalized Cellulose for Micro- and Nanoplastics Removal From Water*

**Nguyen My Binh An; Tran Phuoc My**

Catholic Junior College; St. Andrew's Junior College

*Eikonal Equation -Based Grid Search Method for Precise Earthquake Location*

**Han Yijia; Delfina Poernomo**

National Junior College

*Production of Proteins from Agricultural Wastewater Using Algae Chlorella*

**Alphonsus Low Khee Ern; Miguel Simon Chin Kejun**

NUS High School of Mathematics and Science

*Scintillation-Based Detectors For High-Accuracy Proton Beam Characterisation*

**Clarisse Cheong; Ngu May Xi; Natalie Ong Rui'En**

National Junior College

*Effect of The Type of Pond Water in The Growth of Kang Kong*

**Glenda Tan Hui En; Koay Tze Erhn**

Raffles Institution

*Anti-virus Autobots: Predicting Deadlier Virus Variants for Pandemic Prevention Through Deep Learning*

**Chan Shu Zhen, Venus; Hiuk Yuh Wen; Zixuan Yeo**

River Valley High School

*Genetic Variability of Survival Motor Neuron (SMN) Genes in Spinal Muscular Atrophy (SMA): Unusual Observations Among Singapore Cohorts*

# Special Awards

## *Singapore Mathematical Society (SMS) Award for Ingenuity*

**Nguyen Quang Minh**

Hwa Chong Institution

*On Elliptic Curves of The Form  $y^2=x^3+Ax+t^2$*

**Mario Tanijaya**

NUS High School of Mathematics and Science

*Crossing Number of Join Product of Some Graphs*

**Chek Ze Chan; Dylon Wong Yee Kin**

NUS High School of Mathematics and Science

*Investigation of Machin-like Formulas*



## *Singapore Society for Microbiology and Biotechnology (SSMB) Special Award*

**Jamie Wen; Chan Mi Mi Samantha; Kee Xuan Ling Shannon**

Dunman High School

*Effectiveness of Different Mouthwash Agents and Herb Extracts in Inhibition of Streptococcus Mutans Biofilm*



## *Singapore University of Technology & Design (SUTD) Research and Innovation Award: Artificial Intelligence*

**Yuan Chenghao**

Hwa Chong Institution

*PaRT: Parallel Learning Towards Robust and Transparent AI*

**Shen Zihan**

National Junior College

*A Dataset Generation Algorithm to Improve Meta-learning over Random Forest Models*



# Special Awards

## *Singapore University of Technology & Design (SUTD) Research and Innovation Award: Aviation*

**Ng Hui Jun, Regina; Celeste Tan; Lim Kae Sophie**

**Raffles Girls' School (Secondary)**

*Communication Antenna Design On A Portable Device*

**Randall Tan; Kaegen Teo Wee Teck**

**Victoria Junior College; Victoria School**

*Design & Development of Delta Wing with Loitering Capability*

---

## *Singapore University of Technology & Design (SUTD) Research and Innovation Award: Cities*

**Vera Tham Yen Kei; Jannatara Jannat Rokan; Lu Zi Hui**

**Singapore Chinese Girls' School**

*Development of An Autonomous Solar Powered Atmospheric Water Generator*

**B.Lathika; Jared Wong Ka Yik; Ramit Rahman**

**National Junior College; Kranji Secondary School; Kranji Secondary School**

*3D Printed Acoustic Metamaterial for Noise Mitigation*

---

## *Singapore University of Technology & Design (SUTD) Research and Innovation Award: Healthcare*

**Chen Yanlin; Jordan Low Jun Yi; Kuo Hsin Wei**

**NUS High School of Mathematics and Science**

*Minimally Invasive Annuloplasty Using Shape Memory Materials*

**Janessa Valencia Guo Jiaxuan; Francis Anand Patrick**

**Raffles Institution**

*D-Pen - Personalised Practice with Assistive Pen for Young Dyslexic Learners  
Using Machine Learning*

# Special Awards

*Singapore University of Technology & Design  
(SUTD) Research and Innovation Award:  
Multi-Disciplinary*

**Saravanan Manobharathi; Sendur Pandian Samiksha Kiran; Senthilvel Kunashree**  
NUS High School of Mathematics and Science  
*Bubbleless Ozonation of Organic Pollutants in Wastewater*

**Gan Kah Shuen; Tan Min Min; Cheok Yin Jia**  
Raffles Girls' School (Secondary)  
*Information Gathering by Passive SONAR*



*Singapore University of Technology & Design  
(SUTD) Research and Innovation Award:  
Sustainability*

**Krishnan Akash; Ngui Jianjia, Edison; Darryl Chin Kai Xian**  
NUS High School of Mathematics and Science  
*Chemically Functionalized Cellulose for Micro- and Nanoplastics Removal From Water*

**Lizanne Lim Yinnqi; Dominic Chua Yong Chen**  
National Junior College  
*Designing a Solar Powered Evaporative Cooling System for Outdoor Spaces*



# Special Awards

## *Yale-NUS College Special Award*

**Lim Kar Ern, Samuel; Ang Kang Yu Daniel**

**Hwa Chong Institution**

*Chalcone-ligated Molybdenum Carbonyl Complexes: Synthesis, Cytotoxicity and Quadruplex DNA Binding Studies*

**Ryan Chin Rui En**

**Anglo-Chinese School (Independent)**

*Investigating The Relationship Between pH and The Stability of Oil-in-water Emulsions with Soy Lecithin with Critical Coagulation Concentration of Potassium Chloride Added via Salt Titration, and Conductivity-derived Emulsion Stability*

**Mu Chuping; Jovern Teo; Joshua Cheong Yao Hong**

**NUS High School of Mathematics and Science**

*Modelling Singapore's Covid Pandemic Using Hybrid AI, Causal, and SEIRQV models*

**Chen Guangyuan**

**Raffles Institution**

*The Rebounding Capsule: A Novel Hertzian Contact Approach to The Collision of Rotating Bodies*

**Sun Xiaoqing**

**Raffles Girls' School (Secondary)**

*The Physics of A Bead Rolling on A Rotating Hoop - A Problem in Nonlinear Dynamics*

**Chek Ze Chan; Dylon Wong Yee Kin**

**NUS High School of Mathematics and Science**

*Investigation of Machin-like Formulas*

**Lum Ji Yu Jeslyn; Baskaran Akshay Kumar**

**Raffles Institution**

*Removal of Copper and Microspheres from Wastewater Using Electrocoagulation*

**Tee Ding Ping John; Isaiah Tan Kai Ze; Zhang Yezhou**

**Hwa Chong Institution**

*Light Links*

**Swetha Sivakumar; Ng Ren Yu**

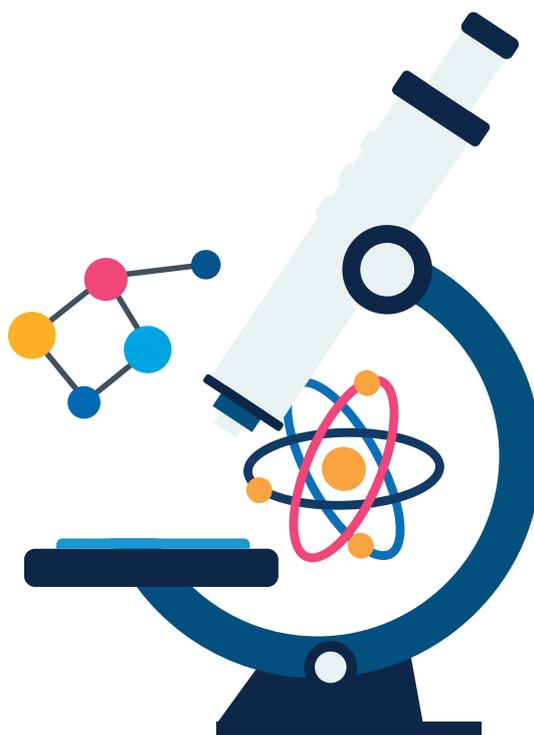
**Methodist Girls' School**

*Investigating the Process of Adding Knots when a Bacteriophage Injects Tangled DNA into a Bacterium*

**Shanay Jindal; Ong Shao Aik**

**NUS High School of Mathematics and Science**

*Numerical Analysis of Heat Equation Governing Fusing of a Straight Wire*



# Acknowledgements



# THANK YOU

We would like to thank the following organisations and institutions that have contributed their domain experts to serve as judges for the Singapore Science and Engineering Fair 2022.

- Agency for Science, Technology and Research
- Central Narcotics Bureau
- DSO National Laboratories
- Duke-NUS Medical School
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- Health Sciences Authority
- HTX (Home Team Science and Technology Agency)
- IEEE Singapore Section
- IPOS International
- James Cook University
- JTC Corporation
- KLA-Tencor
- Ministry of Education
- Ministry of Home Affairs
- Nanyang Polytechnic
- Nanyang Technological University
- National Environment Agency
- National Institute of Education, Singapore
- National Neuroscience Institute
- National Parks Board
- National University Health System
- National University of Singapore
- Nazarbayev University, Kazakhstan
- Newcastle University in Singapore
- Ngee Ann Polytechnic
- Orison QEHS LLP
- Prime Management Services
- PSB Academy
- Punggol 21 CCMC
- Republic Polytechnic
- Science Centre Singapore
- Seeds Capital
- Singapore Association for the Advancement of Science (SAAS)
- Singapore Civil Defence Force
- Singapore Food Agency
- Singapore General Hospital
- Singapore Institute of Manufacturing Technology
- Singapore Institute of Technology
- Singapore Management University
- Singapore Mathematical Society
- Singapore Police Force
- Singapore Polytechnic
- Singapore Prison Service
- Singapore University of Social Sciences
- Singapore University of Technology and Design
- Singtel
- Tan Tock Seng Hospital
- Temasek Life Sciences Laboratory
- Temasek Polytechnic
- University of Glasgow Singapore
- Thermo Fisher Scientific
- Yale-NUS College



# 22<sup>nd</sup>

## **SINGAPORE SCIENCE & ENGINEERING FAIR 2022**

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