A*STAR Talent Search 2018 Winners

Award	Name
First Place	Vijayakumar Ragavi NUS High School of Mathematics and Science Project: A humanised hypertrophic cardiomyopathy model to elucidate molecular mechanism in disease pathology
Second Place	Li Jing Tao NUS High School of Mathematics and Science Project: Summation of certain Fourier series and their applications to infinite series
Third Place	Lendermann Markus Paul Zhi-Guang NUS High School of Mathematics and Science Project: Optical analysis of the defocused single lens pinhole telescope
Commendation	Aleena Madathiparambil Saju National Junior College Project: Novel therapy responsive splicing switch for gene therapy
Commendation	Bryan Sow Miaoxuan Raffles Institution Project: Electrically tailored metachrosis in ZnO:C nanowires
Commendation	Colin Chuang Kai Yuan Hwa Chong Institution Project: Regulation of T cell development by TLR9 in systemic Lupus Erythematosus
Commendation	Jovi Koh Li Raffles Institution Project: Functional characterisation of CRSIPR/Mbcpf1 in vitro
Commendation	Kee Jin Wen National Junior College Project: Affinity of aptamers studied by precision ellipsometry

A*STAR Talent Search 2017 Winners

Winners of the competition were announced at the A*STAR Talent Search (ATS) and Singapore Science & Engineering Fair (SSEF) 2017 Awards Ceremony held on Friday, 28 Apr 2017 at the Star Gallery, The Star Performing Arts Centre.

First Prize Winner	
Name	Rachel Qing Pang
School	Raffles Girls Secondary School
Project	The Physics of the Levitron
Mentor	Dr Wee Wei Hsiung (DSO National Laboratories) Dr Tan Guo Xian (Raffles Institution)
Second Prize Winner	
Name	Clement Wong Wai Kit
School	NUS High School of Mathematics and Science
Project	Immunological Profile of Paediatric Patients with Primary Nephrotic Syndrome
Mentor	Prof Yap Hui Kim (National University Hospital)
Third Prize Winner	
Name	Ong Hong Ming Teddy
School	NUS High School of Mathematics and Science
Project	Mr Poh Boon Hor (NUS High School Of Mathematics And Science)
Mentor	Design and Optimization of Acoustic Fresnel Lens using Metamaterials

In no order of ranking:

Commendation Prizes	
Name	Bi Jiaming
School	Hwa Chong Institute
Project	Novel Ruthenium Arene Complexes With Potential Anti-Cancer Properties
Mentor	A/P Ang Wee Han (NUS, Department of Chemistry) Dr Kelvin Tan Yong Leng (Hwa Chong Institution) Dr Haishan Wang (IMCB, A*STAR)
Commendation Prizes	
Name	Keith Loi Jun Xian
School	NUS High School of Mathematics and Science
Project	Characterize The Function Of CACNA1A G40R Mutation Associated With Glaucoma
Mentor	Prof Soong Tuck Wah (NUS, Yong Loo Lin School of Medicine)
Commendation Prizes	
Name	Jazlynn Tan Xiu Min
School	Hwa Chong Institute
Project	Optimisation of Assays for the Measurement of Antibodies and Antibody-producing Cells in Lupus-prone Mice
Mentor	Dr Ann Marie Fairhurst (SIgN, A*STAR)
Commendation Prizes	
Name	Lendermann Markus Paul Zhi-Guang
School	NUS High School of Mathematics and Science

Project	Dynamics and Linear Stability of the Coriolis-Stabilized Lagging Pendulum
Mentor	Dr Yeo Ye (NUS High School of Mathematics and Science)
Commendation Prizes	
Name	Dominic Yap Wei Ting
School	Hwa Chong Institute
Project	Versatile Usage Of Spent Coffee As An Eco-Friendly Water Purifier
Mentor	Mrs Sow-Peh Yoke Keow (Science Department, Hwa Chong Institution)

Schools are awarded points according to the placement of their winning students.

First Prize:	NUS High School of Mathematics and Science
Second Prize:	Raffles Girls' School
Third Prize:	Hwa Chong Institution

A*STAR Talent Search 2017 Finalists

The ATS short-listing interview round took place on 30 Mar 2017. Eight finalists were selected and will proceed to the final judging on 27 April 2017.

Here are the eight finalists of their projects:

Finalist	
Name	Bi Jiaming
School	Hwa Chong Institution
Mentor	Dr Kelvin Tan Yong Leng (Hwa Chong Institution) A/P Ang Wee Han (NUS, Department Of Chemistry) Dr Haishan Wang (IMCB, A*STAR)
Project Title	Novel Ruthenium Arene Complexes With Potential Anti-Cancer Properties
Project Category	Biochemistry
Finalist	
Name	Jazlynn Tan Xiu Min
School	Hwa Chong Institution
Mentor	Dr Ann Marie Fairhurst (SIgN, A*STAR)
Project Title	Optimisation of Assays for the Measurement of Antibodies and Antibody-producing Cells in Lupus-prone Mice
Project Category	Cellular and Molecular Biology
Finalist	
Name	Keith Loi Jun Xian
School	NUS High School Of Mathematics And Science
Mentor	Prof Soong Tuck Wah (NUS, Yong Loo Lin School of Medicine)
Project Title	Characterize the function of CACNA1A G40R mutation associated with glaucoma
Project Category	Cellular and Molecular Biology
Finalist	
Name	Clement Wong Wai Kit (Wang Weijie)
School	NUS High School Of Mathematics And Science

Mentor	Prof Yap Hui Kim (National University Hospital)
Project Title	Immunological Profile of Paediatric Patients with Primary Nephrotic Syndrome
Project Category	Biomedical and Health Sciences
Finalist	
Name	Lendermann Markus Paul Zhi-Guang
School	NUS High School Of Mathematics And Science
Mentor	Dr Yeo Ye (NUS High School Of Mathematics And Science)
Project Title	Dynamics And Linear Stability Of The Coriolis-Stabilized Lagging Pendulum
Project Category	Physics and Astronomy
Finalist	
Name	Ong Hong Ming Teddy
School	NUS High School Of Mathematics And Science
Mentor	Mr Poh Boon Hor (NUS High School Of Mathematics And Science)
Project Title	Design And Optimization Of Acoustic Fresnel Lens Using Metamaterials
Project Category	Physics and Astronomy
Finalist	
Name	Rachel Qing Pang
School	Raffles Girls' School (Secondary)
Mentor	Dr Wee Wei Hsiung (DSO National Laboratories) Dr Tan Guo Xian (Raffles Institution)
Project Title	The Physics Of The Levitron
Project Category	Physics and Astronomy
Finalist	
Name	Dominic Yap Wei Ting
School	Hwa Chong Institution
Mentor	Mrs Sow-Peh Yoke Keow (Hwa Chong Institution)
Project Title	Versatile Usage Of Spent Coffee As An Eco-Friendly Water Purifier
Project Category	Earth And Environmental Sciences

A*STAR Talent Search 2016 Winners

The A*STAR Talent Search (ATS) and Singapore Science & Engineering Fair (SSEF) 2016 Awards Ceremony was held on Thursday, 5 May 2016 at the Matrix Auditorium, Biopolis.

First Prize Winner	
Name	Victoria Emily Hui Ting Buckland
School	National Junior College
Project	Phase Selective Organogelators for Oil Spill Cleanup
Mentor	Dr Ren Changliang (A*STAR, IBN)
Second Prize Winner	
Name	Koh Jin Ming
School	NUS High School of Mathematics and Science
Project	Physical Analysis of the Liquid Film Motor
Mentor	Dr Yeo Ye (National University of Singapore)
Third Prize Winner	
Name	Huang Feiyang
School	NUS High School of Mathematics and Science
Project	Binding Studies of Modified PNAs to Mismatched RNAs
Mentor	A/P Chen Gang (Nanyang Technological University)

In no order of ranking:

Commendation Prizes	
Name	Bruce Wen Ke Zhen
School	Raffles Institution
Project	Tin Based Anodes for Lithium-ion Batteries
Mentor	Dr M V Venkatashamy Reddy (National University of Singapore)
Commendation Prizes	
Name	Li Jiaqi
School	Raffles Institution
Project	Investigating the mutants of chikungunya virus in IFNAR-/- mouse fibroblasts
Mentor	Dr Lisa Ng (A*STAR, SIgN)
Commendation Prizes	
Name	Sim Yu Ki
School	National Junior College
Project	Development of Electrochemically-active Nanoparticles for use in an Electrochemical Lateral Flow Biosensor (ELFB) for Dengue Diagnosis
Mentor	Dr Paul Free Francis (A*STAR, IMRE)
Commendation Prizes	
Name	Tan Yan Quan
School	Raffles Institution
Project	Modelling of Perturbations for Precise Orbit Determination
Mentor	Dr Lou Kok Yong (Nanyang Technological University)
Commendation Prizes	
Name	Wang Yuhang
School	National Junior College

Project	Exploring the Application of Nickel Hydroxide Thin Film in Wastewater Treatment
Mentor	Dr Ren Yi (A*STAR, IMRE)

Schools are awarded points according to the placement of their winning students.

First Prize:	National Junior College
Second Prize:	NUS High School of Mathematics and Science
Third Prize:	Raffles Institution

A*STAR Talent Search 2016 Finalists

The ATS short-listing interview round took place on 4 April 2016. Eight finalists were selected and will proceed to the final judging on 4 May 2016.

Here are the eight finalists of their projects:

Finalist	
Name	Huang Feiyang
School	NUS High School of Mathematics and Science
Mentor	Chen Gang
Project Title	Binding Studies of Modified PNAs to Mismatched RNAs
Project Category	Biochemistry
Finalist	
Name	Sim Yu Ki
School	National Junior College
Mentor	Dr Paul Free Francis
Project Title	Development of Electrochemically-active Nanoparticles for use in an Electrochemical Lateral Flow Biosensor (ELFB) for Dengue Diagnosis
Project Category	Biomedical and Health Sciences
Finalist	
Name	Li Jiaqi
School	Raffles Institution
Mentor	Dr Lisa Ng
Project Title	Investigating the mutants of chikungunya virus in IFNAR-/- mouse fibroblasts
Project Category	Biomedical and Health Sciences
Finalist	
Name	Victoria Emily Hui Ting Buckland
School	National Junior College
Mentor	Changliang Ren
Project Title	Phase Selective Organogelators for Oil Spill Cleanup
Project Category	Chemistry
Finalist	
Name	Koh Jin Ming
School	NUS High School of Mathematics and Science

Mentor	Dr Yeo Ye
Project Title	Physical Analysis of the Liquid Film Motor
Project Category	Physics
Finalist	
Name	Wang Yuhang
School	National Junior College
Mentor	Dr Ren Yi
Project Title	Exploring the Application of Nickel Hydroxide Thin Film in Wastewater Treatment
Project Category	Environmental Engineering
Finalist	
Name	Bruce Wen Ke Zhen
School	Raffles Institution
Mentor	Dr M V Venkatashamy Reddy
Project Title	Tin Based Anodes for Lithium-ion Batteries
Project Category	Chemistry
Finalist	
Name	Tan Yan Quan
School	Raffles Institution
Mentor	Dr Lou Kok Yong
Project Title	Modelling of Perturbations for Precise Orbit Determination
Project Category	Physics

A*STAR Talent Search 2015 Winners

The A*STAR Talent Search and Singapore Science & Engineering Fair 2015 Awards Ceremony was held on Wednesday, 22 April 2015 at the Matrix Auditorium, Biopolis.

First Prize Winner	
Name	Girish Kumar
School	NUS High School of Mathematics and Science
Project	RevUP: Automatically Generating Questions from Educational Texts
Mentor	Dr. Rafael E. Banchs (A*STAR I2R), Dr. Luis F. D'Haro (A*STAR I2R)
Second Prize Winner	
Name	Benjamin Tan Kye Jyn
School	Hwa Chong Institution
Project	Synthesis of Electrospun Nanosilver-Functionalized Nylon 6 Nanofibres for Membrane Water Purification
Mentor	Mrs Sow-Peh Yoke Keow (Hwa Chong Institution), Dr Sim Siang Tze Victor (Singapore Membrane Technology Centre, Nanyang Environmental and Water Resources Institute, Nanyang Technological University)
Third Prize Winner	
Name	Tan Chih Shen Cedric
School	Temasek Junior College
Project	Low Concentration Acidic Electrolysed Water Combined With Mild Heat Treatment for Sanitising Fresh Organic Broccoli
Mentor	Dr Yang Hongshun (National University of Singapore)

In no particular order:

Commendation Prizes	
Name	Chu Kwok Ren Darek
School	Dunman High School
Project	Design of a Novel Bottle in the Production of Potable Water through Photocatalytic Decontamination of Ground Water
Mentor	Mr. Dion Khoo Ki-Min. (Nexus Research and Consultancy)
Commendation Prizes	
Name	Fareed Muhammed
School	Anglo-Chinese School (Independent)
Project	Investigating the use of matrices to obtain solutions to variations of the game of “Lights Out”
Mentor	Mr. Jin Chenyuan
Commendation Prizes	
Name	Goh Wei Ping Jenny
School	Raffles Institution
Project	A Simulation Study of hydrophobin assembly in water and its implications for film formation at the air-water interface
Mentor	Dr Choon-Peng Chng (Bioinformatics Institute)
Commendation Prizes	
Name	Kwok Ling Yi Samantha

School	Raffles Institution
Project	Multifunctional Phosphorescent Conjugated Polymer Nanoparticles for Reactive Oxygen Species Generation and Imaging Applications
Mentor	Assistant Professor Zhao Yanli (Nanyang Technological University)
Commendation Prizes	
Name	Mani Hemaavathi
School	Raffles Institution
Project	Investigation of the Effects of Titanium dioxide Nanoparticles on Differentiated H9c2 Rat Cardiomyocytes
Mentor	Assistant Professor Lin Qingsong, (National University of Singapore) Mr. Lee Yew Mun (National University of Singapore)

Schools are awarded points according to the placement of their winning students.

First Prize:	NUS High School of Mathematics and Science
Second Prize:	Hwa Chong Institution and Raffles Institution

A*STAR Talent Search 2015 Finalists

The A*TS short-listing interview round took place on 31 March 2015. Eight finalists were selected and will proceed to the final judging on 21 April 2015.

Here are the eight finalists and a short write-up of their projects:

Finalist	
Name	Benjamin Tan Kye Jyn
School	Hwa Chong Institution
Mentor	Mrs Sow-Peh Yoke Keow (Hwa Chong Institution), Dr Sim Siang Tze Victor (Singapore Membrane Technology Centre, Nanyang Environmental and Water Resources Institute, Nanyang Technological University)
Project Title	Synthesis of Electrospun Nanosilver-Functionalized Nylon 6 Nanofibres for Membrane Water Purification
Project Category	Environmental Sciences
Membrane biofouling is a common problem in water treatment systems today. It involves the build-up of a biofilm on the membrane surface, degrading membrane performance. In this study, silver nanoparticles were synthesized via a green in-situ reaction and embedded into nylon 6 nanofibrous membranes via electrospinning. These membranes were able to reduce bacterial count by more than 99% and delayed the onset of membrane degradation through the suppression of biofilm formation, while maintaining an extremely low level of silver leaching. These membranes have the potential to be used as an anti-biofouling prefilter in reverse osmosis processes, making desalination and wastewater recycling more affordable and efficient.	
Finalist	
Name	Chu Kwok Ren Darek
School	Dunman High School
Mentor	Mr. Dion Khoo Ki-Min. (Nexus Research and Consultancy)
Project Title	Design of a Novel Bottle in the Production of Potable Water through Photocatalytic Decontamination of Ground Water

Project Category	Environmental Sciences
The presence of contaminants, including natural organic matters (NOMs) and microorganisms, in ground water poses a threat to potable drinking water in 3rd world countries. Current water treatment technologies are either too costly (e.g. reverse osmosis processes), or ineffective in removing a wide range of contaminants in 3rd world countries. Granular activated carbon (GAC) sleeve is often used in bottles to adsorb contaminants, but it is not suited over prolonged usage. Moreover, it is unable to remove most microorganisms and is inefficient in removing larger organic contaminants. In this work, a novel bottle design is proposed to utilise a TiO2-GAC coupled system with improved adsorption of contaminant by-products after photocatalytic degradation of contaminants like NOMs (E.g. humic acids) and disinfection of microorganisms (E.g. Escherichia coli) by a visible light sensitive TiO2 photocatalyst.. Spray coating of D-TiO2 on polyether ether ketone (PEEK) also allows easy separation of the treated water from the photocatlyst after photocatalytic degradation by D-TiO2.	

Finalist	
Name	Fareed Muhammed
School	Anglo-Chinese School (Independent)
Mentor	Mr. Jin Chenyuan
Project Title	Investigating the use of matrices to obtain solutions to variations of the game of “Lights Out”
Project Category	Mathematical Sciences
The Lights Out game features a rectangular board of a lattice of light bulbs randomly lighted up. The objective of this game is to eventually switch off all the light bulbs in the array by pressing a correct sequence of the light bulbs, turning it and the adjacent light bulbs on or off. By representing the puzzle, the individual bulbs and steps, defined as the pressing of a bulb, as binary matrices the puzzle can be converted into a linear algebraic problem with a system of equations to be solved. In my research, I used matrices to obtain general solutions for the puzzle of any configuration. In the process of solving for the puzzle, I formulated a few theorems that are useful for bringing interesting insights into the problem. I propose a novel way to determine solutions of any given configuration of lights out and also for common variations in the puzzle where the rules are edited to make the puzzle harder. To prove the accuracy and effectiveness of the method, I executed my method in a self-coded Mathematica programme where the solutions were shown to be correct.	

Finalist	
Name	Girish Kumar
School	NUS High School of Mathematics and Science
Mentor	Dr. Rafael E. Banchs (A*STAR I2R), Dr. Luis F. D'Haro (A*STAR I2R)
Project Title	RevUP: Automatically Generating Questions from Educational Texts
Project Category	Computer Science
In today's educational systems, a student needs to recall and apply major concepts from study material to perform competently in assessments. Crucial to this is practice and self-assessment through questions. As such, we present RevUP which deals with automatically generating gap-fill questions. RevUP consists of 3 parts: Sentence Selection, Gap Selection & Multiple Choice Distractor Selection. To select topically-important sentences from texts, we propose a novel sentence ranking method based on topic distributions obtained from topic models. To select gap-phrases from each selected sentence, we trained a mathematical model to replicate human judgements on the educational relevance of gaps, achieving an accuracy of 81.0\%. Finally, we propose a novel method to choose distractors that are semantically similar to the gap-phrase and have contextual fit to the gap-fill question. 76% of the distractors selected were found to be good.	

Finalist	
Name	Goh Wei Ping Jenny
School	Raffles Institution
Mentor	Dr Choon-Peng Chng (Bioinformatics Institute)

Project Title	A Simulation Study of hydrophobin assembly in water and its implications for film formation at the air-water interface
Project Category	Computer Science

This project aims to investigate if amino acid sequence conservation maps to monomer-monomer interaction within hydrophobin molecules. Furthermore, we wish to understand the mechanism for tetramer formation from and dissociation to dimers in water. We would like to investigate if we are able to obtain the structure of a HFBI tetramer from two copies of HFBI dimers. We will be making use of multiple sequence alignment, molecular dynamics simulation and molecular visualisation tools to simulate protein activities in water. Following this, quantitative and qualitative analysis of the simulation will be carried out.

In this project, mutations will be carried out to test the effects that individual residues have on overall protein structure. From the results, certain amino acids and bonds were shown to be essential for the hydrophobin to retain its structure. In addition, we have also proposed a theory that an energy barrier is involved when molecules undergo structural changes as we have found that a stabilized mutated molecule resembles the structure of two dimers joined together.

Finalist

Name	Kwok Ling Yi Samantha
School	Raffles Institution
Mentor	Assistant Professor Zhao Yanli (Nanyang Technological University)
Project Title	Multifunctional Phosphorescent Conjugated Polymer Nanoparticles for Reactive Oxygen Species Generation and Imaging Applications
Project Category	Chemistry

Photodynamic therapy (PDT) involves the excitation of a photosensitiser which generates singlet oxygen to kill cancer cells. Nanoparticles deliver photosensitisers to tumours. In most nanosystems for PDT, the polymer, which transfers energy to the photosensitiser, is not chemically linked to the photosensitiser. This reduces the efficiency of singlet oxygen generation. This project thus aims to synthesise a single component photosensitiser platform for PDT and imaging applications.
Polyfluorenes containing iridium complexes (PFO-Ir) contain polymer backbones covalently bonded to iridium complexes. PEG-coated and uncoated PFO-Ir12 nanoparticles were synthesised through nanoprecipitation and characterized. Their reactive oxygen species (ROS) generation abilities were compared using ADMA. Nanoparticle uptake by HeLa cells was explored through confocal imaging.
Results showed uncoated PFO-Ir12 nanoparticles had more efficient ROS production. Interestingly, this study also found that PFO-Ir12 nanoparticles had a greater than expected formation and/ or stability of the β-phase of the PFO main chain, which may be attributed to nanoparticle formation. This resultant increased energy transfer can potentially improve the efficiency of current photoactivable systems. PFO-Ir12 nanoparticles are one of the first single component nanoplatforms for PDT and imaging applications.

Finalist

Name	Mani Hemaavathi
School	Raffles Institution
Mentor	Assistant Professor Lin Qingsong, (National University of Singapore) Mr. Lee Yew Mun (National University of Singapore)
Project Title	Investigation of the Effects of Titanium dioxide Nanoparticles on Differentiated H9c2 Rat Cardiomyocytes
Project Category	Cellular & Molecular Biology

Titanium dioxide (TiO2) is a highly desirable candidate for nanoparticle (NP) formulations. In addition to its current extensive use in consumer products, TiO2 NPs also encompass numerous future medical applications. However, to fully realize the immense potential of TiO2 NPs as envisioned, a thorough understanding of the interactions between NPs and cellular proteins is crucial, so as to avert possible

harmful effects to humans. This study has affirmed that high concentrations of TiO2 NPs induced metabolic alterations, demonstrated by the contrasting trends observed in cell viability for the H9c2 cardiomyocytes. Employing a protein analysis approach, the essential mechanism for the breakdown of cellular function in treated cardiomyocytes was suggested to be cellular oxidative stress. Overall, this study has highlighted that TiO2 NPs potentially induce cardiovascular nanotoxicity and serves as a platform to provide information for safe and improved NP designs, complementing the current rapid progress of medical nanotechnology.	
Finalist	
Name	Tan Chih Shen Cedric
School	Temasek Junior College
Mentor	Dr Yang Hongshun (National University of Singapore)
Project Title	Low Concentration Acidic Electrolysed Water Combined With Mild Heat Treatment for Sanitising Fresh Organic Broccoli
Project Category	Biochemistry
A majority of sanitising methods employed in the organic food-processing industry involves using very high concentrations of electrolysed water (40-90mg/L) to inactivate spoilage microorganisms and prolong shelf-life of organic produce. Electrolysed water, containing NaOCl (similar to household bleach) and Chlorine, is potentially hazardous to human health. However, using lower concentrations of chemical sanitisers is ineffective in inactivating spoilage microorganisms, so produce will spoil easily. As such, I proposed a new sanitation method involving low concentration acidic electrolysed water (4mg/L) combined with mild heat treatment which can ensure effective sanitation and yet reduce chemical use. The effectiveness of this sanitation method was then evaluated in terms of how it affects the overall quality (ie. microbial quality, nutrition, texture, polysaccharide properties) of organic vegetables, with broccoli as the test subject.	

A*STAR Talent Search 2014 Winners

The A*STAR Talent Search and Singapore Science & Engineering Fair 2014 Awards Ceremony was held on Wednesday, 23 April 2014 at the Matrix Auditorium, Biopolis.

First Prize Winner	
Name	Way Tan
School	NUS High School of Mathematics and Science
Project	Iterations of Duals of Polygons
Mentor	Dr Hang Kim Hoo Principal, NUS High School of Mathematics and Science
Second Prize Winner	
Name	Ong Jun Yi
School	NUS High School of Mathematics and Science
Project	Screening for genetic polymorphism in GRIN2B gene in patients diagnosed with bipolar disorder
Mentor	A/P Low Chian Ming Department Of Pharmacology c/o CELS Building, National University of Singapore
Third Prize Winner	
Name	Eliot Lim
School	NUS High School of Mathematics and Science
Project	Solid State Fan
Mentor	Dr Chiam Sher-Yi Office of Research, Innovation and Enterprise, NUS High School of Mathematics and Science

*In no order of ranking:

Commendation Prizes	
Name	Nicole Tan Su Yee
School	Raffles Institution
Project	Differential diagnosis of overlapping childhood human dystrophinopathies and related disorders: The development of a novel targeted, panel for mutation screening through a tiered approach
Mentor	Prof Lai Poh San Yong Loo Lin School of Medicine, National University of Singapore
Commendation Prizes	
Name	Ou Yang Zhong Liang
School	NUS High School of Mathematics and Science
Project	Solid State Fan
Mentor	Dr Chiam Sher-Yi Office of Research, Innovation and Enterprise, NUS High School of Mathematics and Science
Commendation Prizes	
Name	Manish Reddy Vuyyuru
School	NUS High School of Mathematics and Science

Project	Analyses of Strontium-Doped Ceramic – Oxide based Thermoelectric Material and Application to waste heat recovery
Mentor	Dr S.E. Valavan School of Applied Science, Republic Polytechnic
Commendation Prizes	
Name	Yu Shiyang
School	NUS High School of Mathematics and Science
Project	Solid State Fan
Mentor	Dr Chiam Sher-Yi Office of Research, Innovation and Enterprise, NUS High School of Mathematics and Science
Commendation Prizes	
Name	Philip Ong Zheng Yang
School	Anglo-Chinese School (Independent)
Project	Algorithmic solution to Happy Ending Problem via Graph-to-matrix transformation with its implication on intersection minimization
Mentor	Mr Jin Chenyuan Mathematics Department, Anglo-Chinese School (Independent)

Schools are awarded points according to the placement of their winning students.

First Prize:	NUS High School of Mathematics and Science
Second Prize:	Raffles Institution
Second Prize	Anglo-Chinese School (Independent)

A*STAR Talent Search 2014 Finalists

The A*TS short-listing interview round took place on 27 March 2014. Eight finalists were selected and will proceed to the final judging on 22 April 2014.

Here are the eight finalists and a short write-up of their projects:

Finalist	
Name	Ong Jun Yi
School	NUS HIGH SCHOOL OF MATHEMATICS AND SCIENCE
Mentor	Low Chian Ming
Project Title	Screening for genetic polymorphism in GRIN2B gene in patients diagnosed with bipolar disorder.
Project Category	Cellular and Molecular Genetics
Bipolar disorder is a psychiatric disorder with phase of mania and depression. Past studies have implicated a relationship between bipolar disorder and NMDA receptor, a glutamate receptor involved key cognitive function of the brain – synaptic plasticity as well as learning and memory functions. The human GRIN2B gene, made up of 13 exons, codes for one of the 4 heterotetramers in the NMDA receptor. There have been multiple studies in exon 2, exon 13 and UTR of the gene, but little research has been carried out on the rest of the exons. As such, this would be a pilot study carried out on exon 7 – 12 of GRIN2B gene on the Singapore Chinese bipolar disorder patients. Our objective is to locate and determine the frequency of any Single Nucleotide Polymorphisms (SNP) present. 30 bipolar patients have been screened against 30 normal patients and their isolated DNA were amplified via Polymerase Chain Reaction before purified via PCR purification kit. Gel electrophoresis is performed to confirm the presence of PCR amplicon, before they were sequenced and screened for genetic variations. 2 SNPs were identified, 1525G/A and rs1805522 (1806C/T) on exon 7 and 9 respectively where 1525G/A is novel SNP	

not present in the SNP database previously. Both SNP were found to be strongly associated with bipolar disorder (P-value <0.0001 and 0.0208 respectively), signifying GRIN2B having a role in the etiology of bipolar disorder. This study serves as a platform for further studies between GRIN2B and bipolar disorder especially in the Singapore population.

Finalist	
Name	Eliot Lim
School	NUS HIGH SCHOOL OF MATHEMATICS AND SCIENCE
Mentor	Chiam Sher-Yi
Project Title	Solid State Fan
Project Category	Electrical Engineering, Computer Engineering, Controls

A solid state fan is an air propulsion device with no moving parts. This is often achieved using an electrohydrodynamic system that uses corona discharge to ionize air and an electric field to accelerate the ions. Existing electrohydrodynamic accelerators come in single and multi-stage variants, but all designs to date make use of a static electric field for accelerating ionized air molecules. This often makes high voltages necessary for usable flow rates, resulting in large power supplies that are impractical for most applications. We propose a novel implementation using an oscillating field of relatively low voltage amplitude to accelerate ionized air molecules. We perform a theoretical analysis of the operating mechanics behind the use of an oscillating field, and fabricate the proposed design, including the custom driving electronics, to experimentally verify our proposal. Performance is examined, quantified by repeated flow rate measurements taken using a hot-wire anemometer, and analysed. We conclude that an oscillating field is comparably, if not more effective than a static field in accelerating ionized air molecules, and holds great promise for future designs. Due to the reduced voltage requirements on the custom-built driving electronics, the principle of an oscillating field results in a safer, more compact and more robust electrohydrodynamic accelerator. We also constructed and tested a prototype for a practical fan design using ten oscillating stages, and demonstrated that the oscillating field electrohydrodynamic accelerator performs comparably, if not better, than a static field electrohydrodynamic accelerator.

Finalist	
Name	Ou Yang Zhong Liang
School	NUS HIGH SCHOOL OF MATHEMATICS AND SCIENCE
Mentor	Chiam Sher-Yi
Project Title	Solid State Fan
Project Category	Electrical Engineering, Computer Engineering, Controls

A solid state fan is an air propulsion device with no moving parts. This is often achieved using an electrohydrodynamic system that uses corona discharge to ionize air and an electric field to accelerate the ions. Existing electrohydrodynamic accelerators come in single and multi-stage variants, but all designs to date make use of a static electric field for accelerating ionized air molecules. This often makes high voltages necessary for usable flow rates, resulting in large power supplies that are impractical for most applications. We propose a novel implementation using an oscillating field of relatively low voltage amplitude to accelerate ionized air molecules. We perform a theoretical analysis of the operating mechanics behind the use of an oscillating field, and fabricate the proposed design, including the custom driving electronics, to experimentally verify our proposal. Performance is examined, quantified by repeated flow rate measurements taken using a hot-wire anemometer, and analysed. We conclude that an oscillating field is comparably, if not more effective than a static field in accelerating ionized air molecules, and holds great promise for future designs. Due to the reduced voltage requirements on the custom-built driving electronics, the principle of an oscillating field results in a safer, more compact and more robust electrohydrodynamic accelerator. We also constructed and tested a prototype for a practical fan design using ten oscillating stages, and demonstrated that the oscillating field electrohydrodynamic accelerator performs comparably, if not better, than a static field electrohydrodynamic accelerator.

Finalist	
Name	Yu Shiyang
School	NUS HIGH SCHOOL OF MATHEMATICS AND SCIENCE
Mentor	Chiam Sher-Yi
Project Title	Solid State Fan
Project Category	Electrical Engineering, Computer Engineering, Controls

A solid state fan is an air propulsion device with no moving parts. This is often achieved using an electrohydrodynamic system that uses corona discharge to ionize air and an electric field to accelerate the ions. Existing electrohydrodynamic accelerators come in single and multi-stage variants, but all designs to date make

use of a static electric field for accelerating ionized air molecules. This often makes high voltages necessary for usable flow rates, resulting in large power supplies that are impractical for most applications. We propose a novel implementation using an oscillating field of relatively low voltage amplitude to accelerate ionized air molecules. We perform a theoretical analysis of the operating mechanics behind the use of an oscillating field, and fabricate the proposed design, including the custom driving electronics, to experimentally verify our proposal. Performance is examined, quantified by repeated flow rate measurements taken using a hot-wire anemometer, and analysed. We conclude that an oscillating field is comparably, if not more effective than a static field in accelerating ionized air molecules, and holds great promise for future designs. Due to the reduced voltage requirements on the custom-built driving electronics, the principle of an oscillating field results in a safer, more compact and more robust electrohydrodynamic accelerator. We also constructed and tested a prototype for a practical fan design using ten oscillating stages, and demonstrated that the oscillating field electrohydrodynamic accelerator performs comparably, if not better, than a static field electrohydrodynamic accelerator.

Finalist

Name	Manish Reddy Vuyyuru
School	NUS HIGH SCHOOL OF MATHEMATICS AND SCIENCE
Mentor	S.E. VALAVAN (Dr)
Project Title	Analyses of Strontium-Doped Ceramic – Oxide based Thermoelectric Material and Application to waste heat recovery
Project Category	Renewable Energies

At present, high-performance thermoelectric (TE) materials play a key role in power-recovery devices, being the most efficient at converting waste heat energy to electrical energy. These thermoelectric materials can also be used in solid-state refrigeration devices. Their efficiency at converting waste energy to electrical energy seal their role as part of our current challenge to develop more alternative energy technologies and to make technologies more efficient so as to help reduce our dependence on fossil fuels and reduce greenhouse gas emissions. Thus, the potential payoff for the development of high-temperature thermoelectric materials for waste heat recovery is great. We first define several key parameters and terminology, going on to providing a brief description of the thermoelectric phenomenon and the challenges that face thermoelectric materials in our report. Our project entails the novel analyses of strontium-doping on a ceramic oxide based thermoelectric material (Ca3$Co4O9$). A literature search has failed to turn up a similar attempt at optimizing the thermoelectric properties of the material in question. Through our experiments, we have discovered that strontium-doping results in a significant increase in the figure of merit of the original thermoelectric material (by up to 16% in the temperature ranges tested). We also attempt to theoretically explain the change in thermoelectric properties of the material by performing an analyses of the crystal structure of the film using x-ray diffraction (XRD) with Cu Kα radiation and analyses of the surface morphology by scanning electron microscopy (SEM). Lastly, we attempt to propose engineering solutions to our novel thermoelectric material to be applied to waste heat recovery in thermo-plants and incinerators.

Finalist

Name	Nicole Tan Su Yee
School	RAFFLES INSTITUTION
Mentor	Professor Lai Poh San
Project Title	Differential diagnosis of overlapping childhood human dystrophinopathies and related disorders: The development of a novel targeted, panel for mutation screening through a tiered approach
Project Category	Molecular Biology of Diseases, Disease Diagnosis and Treatment

Challenges such as phenotypic overlap, relative incidence rate, clinical heterogeneity and genetic heterogeneity impede the diagnosis of muscular dystrophies. Furthermore, current diagnostic techniques requiring gene-by-gene sequencing are expensive. Hence, this research addresses these challenges through development of a high-throughput, low-cost assay for differential diagnosis of childhood muscular dystrophies through mutation screening of a panel using High Resolution Melting (HRM). The designed panel consisted of genes for childhood muscular dystrophies that had phenotypic overlaps with the dystrophinopathies, which are the most common amongst the childhood muscular dystrophies. Diseases in the panel were tiered according to how phenotypically close they were to the dystrophinopathies, and assays would be carried out tier-by-tier until candidate mutations were identified. Tier 1 covers 7 genes (285 primer pairs) while Tier 2 covers another 7 genes (334 primer pairs) and Tier 3 covers 6 genes (299 primer pairs). These primers were self-designed using Primer 3 software based on heuristic parameters for subsequent validation by PCR and HRM. As proof of principle, the assay was used on two anonymized patient samples with unknown mutations. For confirmation, Sanger sequencing was also carried out. Our results identified a p.Q1951* nonsense mutation in DMD gene and a p.Y182C missense mutation in FKRP gene, thus providing putative diagnosis for the two patients. This is the first time a tiered approach

towards mutation screening of a targeted panel through HRM has been attempted for these disorders. This powerful approach will help to significantly lower costs and time needed for molecular diagnosis.	
Finalist	
Name	Philip Ong Zheng Yang
School	ANGLO-CHINESE SCHOOL (INDEPENDENT)
Mentor	Jin Chenyuan
Project Title	Algorithmic solution to Happy Ending Problem via Graph-to-matrix transformation with its implication on intersection minimization
Project Category	Algebra, Algorithms, Data Bases
The Happy Ending Problem aims to identify the minimum number of points *f(N)* required on a plane, for which any set of *f(N)* points in general position must contain a convex N-gon. The closest bound for *f(N)* is $ $1+2^{N-2} \leq f(N) \leq$ (Missing formula) - 1. Also, it has been proven that *f*(3)=3, *f* (4)=5, *f* (5)=9, *f* (6)=17. However, the solution for *f* (7) has not been discovered. In our research, we proposed the Graph-to-matrix (GTM) Transformation that transforms a graph with *M*vertices into a *M* x *M* matrix. This is significant as there is now a finite number of elements for computational analysis. Furthermore, we developed the gradient circle, which generated an exhaustive list of 4 x 4 matrices. The gradient circle was used to prove that the list was exhaustive. We then established that the full column property of a 4 x 4 matrix distinguishes a convex quadrilateral from a concave one. Using this mathematical framework, we developed an algorithm to determine f(N) by combining every two *M* x *M* matrices with the same subset matrices to generate (M + 1) x (M + 1) matrices. This is completed through the process of generation, verification and grouping. This process is repeated until every *k* x *k* matrix generated has at least one convex 7-gon. *k* is the solution for f(7). We have realised the algorithm in Java. The exploration of the happy ending problem is significant as it has been proven to be equivalent to minimizing the number of intersections in a straight-line drawing of a complete graph. This has real life implications, for example: fewer intersections result in less stopping and traffic jams in traffic systems and less interruption in circuit boards.	
Finalist	
Name	Way Tan
School	NUS HIGH SCHOOL OF MATHEMATICS AND SCIENCE
Mentor	Hang Kim Hoo
Project Title	Iterations of Duals of Polygons
Project Category	Geometry
Duals of polygons have not been extensively studied, with presently known results being trivial ones of the similarity of dual triangles and parallel properties of dual quadrilaterals. A single dual has not many special properties. However, when duals are iterated on any polygon, interesting properties result. In order to better characterize the 'shape' of the duals, we scale up each subsequent dual in our proof, which ensures that the duals do not converge to a point, which they otherwise would. We then obtain the interesting result that for (2n+1)-gons, the duals are convergent to a certain self-dual 'shape'. Meanwhile, for 2n-gons, the sequence of odd numbered duals converge to a different 'shape' from the sequence of even numbered duals. We can then scale back the duals to obtain our desired rate of convergence as cos(π/n) in a n-gon. Through obtaining the rate of convergence, we can also approximate trigonometric functions via compass and straightedge.	

A*STAR Talent Search 2013 Winners

The A*STAR Talent Search and Singapore Science & Engineering Fair 2013 Awards Ceremony was held on Friday, 26 April 2012 at the Matrix Auditorium, Biopolis.

First Prize Winner	
Name	Zera Ong Hui Xuan
School	Raffles Institution
Project	Analysis of Mutants Affecting NFkB Signaling in Developing Zebrafish
Mentor	A/P Vladimir Korzh, Institute of Molecular and Cellular Biology, A*STAR
Second Prize Winner	
Name	Lim Xuan Li, Michelle
School	Raffles Girls' School (Secondary)
Project	Project to explore the potential anti-proliferative/pro-apoptotic effects of mangosteen peel extract and alpha-mangostin in triple negative breast cancer cell lines
Mentor	Dr. Gautam Sethi, NUS Yong Loo Lin School of Medicine
Third Prize Winner	
Name	Gregory Adrian Gunawan
School	National Junior College
Project	Metal Membranes with Nano Pores for Water Filtration
Mentor	Kambiz Ansari Mahabadi, Institute of Materials Research and Engineering, A*STAR

*In no order of ranking:

Commendation Prizes	
Name	Tay Wen Zhen Carol
School	National Junior College
Project	Role of miRNAs in the Development of Insulin Resistance in Humans
Mentor	Craig McFarlane, Singapore Institute of Clinical Sciences, A*STAR
Commendation Prizes	
Name	Seah Ying Hang
School	National Junior College
Project	Real-time Optical Monitoring of Heterogeneous Reactions
Mentor	Nikolai Yakovlev, Institute of Materials Research and Engineering, A*STAR
Commendation Prizes	
Name	Vahul Sundar
School	Anglo-Chinese School (Independent)
Project	Effect of ultraviolet b light intensity on the synthesis of alleochemicals in Typha latifolia, which inhibit the growth of Chlorella vulgaris

Mentor	Ruma Banerjee, Anglo-Chinese School (Independent)
Commendation Prizes	
Name	Daryl Jude Lawrence
School	NUS High School of Mathematics and Science
Project	Investigation of Sn Gradient-doped Bi2Te3 Thin Films using Sputter Deposition
Mentor	Dr Sun Ting Nanyang Technological University
Commendation Prizes	
Name	Zhang Jiaheng
School	Anglo-Chinese Junior College
Project	Biomimetic Superhydrophobic Surfaces for Sports Apparels
Mentor	Sandeep Kumar Tiwari, Nanyang Technological University

Schools are awarded points according to the placement of their winning students.

First Prize:	Raffles Institution
Second Prize:	National Junior College
Third Prize	Raffles Girls' School (Secondary)

A*STAR Talent Search 2013 Finalists

The A*TS short-listing interview round took place on 22 March 2013. Eight finalists were selected and will proceed to the final judging on 23 April 2013.

Here are the eight finalists and a short write-up of their projects:

Finalist	
Name	Zera Ong HuiXuan
School	RAFFLES INSTITUTION
Mentor	A/P Vladimir Korzh
Project Title	Analysis of Mutants Affecting NFkB Signaling in Developing Zebrafish
Project Category	Cellular & Molecular Biology
The NF-kB signaling pathway is involved in many biological activities, including, but not limited to, resistance against infection and development of lymphoid system. This signaling is regulated by a key protein Ikk2, which previously based on transient loss-of-function experiments has been implicated in formation of the body axis and in particular the notochord, an important embryonic structure that sets in motion a complex process of whole body morphogenesis. To address the role of Ikk2 in greater detail, mutations were generated at two sites in the ikk2 gene and two sets of mutants (termed +2 and Δ 7 mutants) were studied. In this study, in situ hybridization with gene markers revealed that +2 maternal zygotic mutants exhibited aberrant morphogenesis in terms of impaired dorsal identity formation, atypical yolk syncytial layer formation and defects in primitive haematopoiesis. Furthermore, Δ7 zygotic mutants displayed microbleeds in the trunk, brain and eyes. Taken together, results suggest a strong role of Ikk2 in gastrulation and in maintaining vessel integrity.	
Finalist	
Name	Seah Ying Hang
School	NATIONAL JUNIOR COLLEGE

Mentor	Nikolai Yakovlev
Project Title	Real-time Optical Monitoring of Heterogeneous Reactions
Project Category	Chemistry
The conventional method to measure rate of reactions is done by extracting samples at various period of time, send for analysis and determine the amount of product and initial compound present at each point of time. However, such method is troublesome, complicated and is unable to detect the rate as the reaction proceeds. Real-time monitoring of reactions is usually expensive and requires complicated equipment. We decided to go another way, to immobilize one of the molecules on the surface of the substrate and monitor the reaction with another molecule using precision ellipsometry. Precision ellipsometry is a highly accurate optical technology that is able to detect the change in thickness of an ultra-thin film at the molecular level. With a polarization modulator, the system can measure the rotation of polarization vector with a precision of 10 microradians, which translates to 0.01 nm. With a carefully constructed prism-shaped cuvette, the precision ellipsometry is adopted for liquids for the first time. Bonding of amino silane on silicon oxide substrate and polystyrene sulfonate on amino silane was recorded in real time. In fact, the results obtained are in agreement with the concept that the rate of reaction decreases with lower concentration. This proves the concept of applicability of precision ellipsometry system to measure reaction kinetics.	
Finalist	
Name	Lim Xuan Li, Michelle
School	RAFFLES GIRLS' SCHOOL (SECONDARY)
Mentor	Dr. Gautam Sethi
Project Title	Project to explore the potential anti-proliferative/pro-apoptotic effects of mangosteen peel extract and alpha-mangostin in triple negative breast cancer cell lines
Project Category	Cellular & Molecular Biology
Triple-negative breast cancer (TNBC) lacks hormone and Her2 receptors and thus is unresponsive to hormone therapy. Despite chemotherapy, TNBC has poor prognosis due to its propensity for recurrence and metastasis. STAT3 is a major promoter of breast cancer growth and progression, and thus has become a widely explored target for new drug development. α-Mangostin was shortlisted due to strong bioactivity measured preliminarily in crude mangosteen peel extract. Therefore, this study investigates α-mangostin's ability to inhibit the tyrosine phosphorylation of STAT3 and the transcriptional regulation of STAT3-specific target genes: cyclin D1 (proliferative), Bcl-2, survivin (survival) and VEGF (angiogenic). The study also determines its antiproliferative and pro-apoptotic properties. By conducting Western blotting, we found that α-mangostin suppressed STAT3 phosphorylation and expression of STAT3, as well as down-regulated STAT3-specific target genes. Strong antiproliferative activity (<20μg/ml for 24h and 48h in MDA-MB-231 and BT-549) measured by the MTT assay could be attributed to the down-regulation of COX-2 and cyclin D1 genes. Time-dependent cleavage of PARP and results from the DNA fragmentation ELISA also proposes that α-mangostin induces apoptosis on MDA-MB-231 cells in a time-dependent manner. Down-modulation of caspase-3 suggests that the apoptosis observed was caspase-3 dependent. Overall, this study suggests that α-mangostin mediates its strong in vitro anti-proliferative and pro-apoptotic properties on TNBC through suppression of the STAT3 pathway, STAT3-regulated genes and COX-2 gene. These results are significant in terms of developing a natural complement to chemotherapeutic drugs so as to provide the best and most sustainable improvement to management of TNBCs.	
Finalist	
Name	Zhang Jiaheng
School	ANGLO-CHINESE JUNIOR COLLEGE
Mentor	Sandeep Kumar Tiwari
Project Title	Biomimetic Superhydrophobic Surfaces for Sports Apparels
Project Category	Engineering: Materials and Bioengineering

Superhydrophobic surfaces are of high scientific and technological interest because of their implications for areas ranging from biomedical device, fuel transport and architecture to sportswear. Bioinspirations from non-wetting surfaces such as lotus leaves have led to the development of liquid-repellent textured surfaces. However, little attention is given to their air-retaining properties underwater to achieve extreme non-wettability. Therefore, this project is aimed to create a robust synthetic surface for textile used in sportswear that not only keep athletes dry under water but also improve their performance due to drag reduction under water.

Finalist

Name	Tay Wen Zhen Carol
School	NATIONAL JUNIOR COLLEGE
Mentor	Craig McFarlane
Project Title	Role of miRNAs in the Development of Insulin Resistance in Humans
Project Category	Cellular & Molecular Biology

Type II diabetes mellitus is a chronic and increasingly widespread disease. The recent discovery of microRNAs has offered new insight to the disease. miRNAs are short oligonucleotide sequences that act as post transcriptional regulators, inhibiting the production of their target gene product. Published reports have shown that these miRNAs play a role in cancer, cardiovascular diseases and type II diabetes. However, not much is known about the role miRNAs play in insulin resistance, a precursor to type II diabetes. Through miRNA microarray analysis, 20 miRNAs were found to be differentially expressed in the insulin resistant human myoblast model, suggesting that they might play a role in the pathogenesis of diabetes. In this project, we aim to investigate whether miRNAs have a role in causing insulin resistance in skeletal muscle and how they might influence the development of type II diabetes. Real time quantitative PCR was used to verify the microarray results. The most significantly overexpressed miRNAs (miR-380-3p and miR-145-5p) were used for in silico analysis to find their putative target genes. In particular, those genes that have key roles in either the insulin signaling pathway or the glucose metabolic pathway were focused upon. Through overexpression of miR-145-5p and miR-380-3p in myoblasts, reduction in the expression of some of these predicted targets was found, suggesting that they are regulated by the miRNAs of interest which may contribute to the onset of type II diabetes.

Finalist

Name	Gregory Adrian Gunawan
School	NATIONAL JUNIOR COLLEGE
Mentor	Kambiz Ansari Mahabadi
Project Title	Metal Membranes with Nano Pores for Water Filtration
Project Category	Engineering: Materials and Bioengineering

"The microfiltration industry has growing over the past years. Many researchers have been thoroughly researching microfiltration membrane technology for various applications in the field of biotechnology and water purification industry. Similarly, we too are interested in this new technology and we aim to be able to contribute to this growing industry through our work. This work aims to produce functional nickel membranes with nanopores via the formation of electrolytic hydrogen bubbles during nickel electroplating and using technologies of UV lithography and nickel electroplating to regulate the positioning and frequency of pores formed by altering the substrate morphology that is to be electroplated. Using UV lithography processes, we fabricated substrates with micro-sized bubble-trapping structures that can be used to regulate the formation of pitting due to hydrogen evolution and fabricate an array of uniformly sized through holes in the thin film of nickel to produce strong free-standing nickel filter membranes. Through analysis of the substrate via optical microscopy and SEM imaging, many of the pits formed were found to form on top or in the immediate area surrounding the pillars. We also managed to characterise the pore design created through the hydrogen pitting phenomena as a grooved and conically shaped pore with a ~2.0 microns hole at the tip of the pore. Triangular pits were also seen to be formed, which if replicated, could produce clustered, centralised

triangular pores in the membrane. This work can hopefully add knowledge and ideas to the current microfiltration industry and further research in this sector.	
Finalist	
Name	Vahul Sundar
School	ANGLO-CHINESE SCHOOL (INDEPENDENT)
Mentor	Ruma Banerjee
Project Title	Effect of ultraviolet b light intensity on the synthesis of alleochemicals in Typha latifolia, which inhibit the growth of Chlorella vulgaris
Project Category	Environmental Sciences
"Pristine clear lakes are truly now a thing of the past. Due to enhanced eutrophication, many water bodies in developing countries are undergoing algal bloom. This has knock on effects on food chains and a reduction in biodiversity. Meanwhile, depletion of the ozone in the stratosphere causes higher intensities of incident ultraviolet b radiation. Literature has shown that current physical and chemical methods used to control eutrophication are inefficient and that there are no ramifications from algal inhibition by allelopathy and that the allelochemical in Typha latifolia, cholesteryl cis-9-octadecenoate, inhibits the growth of Chlorella vulgaris. The aim of this essay is to investigate the effect of UVB intensity in the synthesis of allelochemicals in Typha latifolia, which inhibit the growth of Chlorella vulgaris. Cattails were exposed to UVB intensities (20, 40, 60, 80 and 100 W) for 10 hours. Total phenolic and flavonoid content of the ethyl acetate extracts of the leaves were estimated every 2 hours using folin ciocalteu and the aluminium chloride colorimetry. The results show a direct correlation between UVB intensity and total phenols and flavonoids. The effect of the various extracts on Chlorella vulgaris was investigated by manual enumeration (hematocytometer), measurement of the pH of medium, quantification of total chlorophyll content, measurement of carbon dioxide gas uptake through hydrogencarbonate indicator, measuring diameter of zone of inhibition through agar plate diffusion and calculating the rate of 2,6-dichlorophenolindophenol (DCPIP) reduction through the exposure of the isolated chloroplasts of Chlorella vulgaris to the various extracts and DCPIP. The results show that as the UVB intensity increases, the anti-proliferative ability of Broadleaf Cattails on Chlorella vulgaris increases.	
Finalist	
Name	Daryl Jude Lawrence
School	NUS HIGH SCHOOL OF MATHEMATICS AND SCIENCE
Mentor	Dr Sun Ting
Project Title	Investigation of Sn Gradient-doped Bi2Te3 Thin Films using Sputter Deposition
Project Category	Engineering: Materials and Bioengineering
A new class of thermoelectric thin films [1-5] using gradient doping has been introduced and investigated. Films were fabricated using Direct Current (DC) Magnetron Sputtering [13] with Tin (Sn) strips, of low thickness, physically attached to a Bi2Te2.7Se0.3 target. This novel method is quicker and more economical then using several targets of different compositions [15]. Firstly, there was an approximately linear increase in Sn content; $x \approx 0$, $x \approx 0.25$, $x \approx 0.58$ and $x \approx 0.73$ with the addition of zero, one, two and three Sn strips to fabricate each of the Bi2-xSnxTe2.7Se0.3 films respectively. From resistivity (ρ) and Seebeck Coefficient (α) measurements obtained by ZEM-3, $x \approx 0.58$ proved to be best amongst the four films. Next, gradient doped films were successfully fabricated with four layers of increasing Sn dopant concentration (zero to three Sn strips). The gradient doped film yielded significantly lower resistivities than conventional undoped and Sn-doped Bi2Te2.7Se0.3 films and comparable Seebeck Coefficients. Thus, the overall Power Factor (α2ρ-1) values were enhanced by nearly one order in our gradient Sn-doped films (, revealing the immense potential of gradient doping in thin films to harvest more electrical energy from waste heat for green technology application.	

A*STAR Talent Search 2012 Winners

The A*STAR Talent Search and Singapore Science & Engineering Fair 2012 Awards Ceremony was held on Friday, 27 April 2012 at the Matrix Auditorium, Biopolis.

First Prize Winner	
Name	Lydia Liu Tingruo
School	Raffles Institution
Project	Plane curves — An algebraic geometry approach
Mentor	Mr Wang Fei, Department of Mathematics, National University of Singapore
Second Prize Winner	
Name	Low Kay Yi
School	Raffles Institution
Project	Treatment of BRAF(V600E) in Colorectal Cancer
Mentor	Dr Kenneth Hung, Department of Gastroenterology, Tufts Medical Center
Third Prize Winner	
Name	Heng Teng Hiang
School	NUS High School of Mathematics and Science
Project	Studies on the self-assembly properties of a class of ultrasmall amphiphilic peptides by critical micelle concentration (CMC) measurements: Are these peptides able to form micelles?
Mentor	Dr Charlotte A.E. Hauser & Mrs Archana Mishra, Institute of Bioengineering and Nanotechnology, A*STAR

*In no order of ranking:

Commendation Prizes	
Name	Ananya Kumar
School	NUS High School of Mathematics and Science
Project	Generalized Quantum Tic-Tac-Toe
Mentor	Mr. Chai Ming Huang, NUS High School
Commendation Prizes	
Name	Lee Josephine Shih Han
School	Raffles Institution
Project	The Diversity of Symbiodinium in Scleractinian Corals in Singapore
Mentor	Dr Ng Pek Kaye Abigayle , Raffles Institution
Commendation Prizes	
Name	Lee Puay Ling
School	Hwa Chong Institution
Project	Identification Of Candidate Regulators Of Mammary Gland Induction
Mentor	Asst Prof Jacqueline M. Veltmaat & Dr. Sun Li, Institute of Molecular and Cell Biology, A*STAR
Commendation Prizes	
Name	Lim Huisen Jeren
School	National Junior College

Project	Cocrystallization of Ethosuximide and Carbamazepine through green methods in the production of anti-epileptic combination drugs
Mentor	Dr Vangala Venugopal Rao, ICES, A*STAR
Commendation Prizes	
Name	Yong Wei Wei Dayna
School	NUS High School of Mathematics and Science
Project	Role of Transcription Coactivator WBP2 in Drug Sensitivity of Breast Cancer
Mentor	Prof Lim Yoon Pin, NUS department of Biochemistry

Schools are awarded points according to the placement of their winning students.

First Prize:	Raffles Institution
Second Prize:	NUS High School of Mathematics and Science

A*STAR Talent Search 2012 Finalists

The A*TS short-listing interview round took place on 26 March 2012. Eight finalists were selected and will proceed to the final judging on 24 April 2012.

Here are the eight finalists and a short write-up of their projects:

Finalist	
Name	Ananya Kumar
School	NUS High School of Mathematics and Science
Mentor	Chai Ming Huang
Project Title	Generalized Quantum Tic-Tac-Toe
Project Category	Computer Science
Quantum tic-tac-toe (QT3) elegantly extends the popular game of tic-tac-toe based on quan-tum physics principles. Yet, despite the interesting and challenging gameplay, not much research has been done on it. Hence in this paper we explore the game in terms of extension, analysis and solution. We first conjecture and prove a graph theory theorem that enables a generalization of the game (GQT3) to make it a better metaphor for quantum physics. We then show that our generalized game can always be successfully completed in a finite number of moves. Then, we begin game analysis. Firstly, we investigate the game tree size; we find that QT3 has 18 trillion possible games, substantially higher than tic-tac-toe`s 400 thousand. Next, we explore GQT3 games where players play their moves randomly; for a 3-by-3 board the expected score is a player 1 win by 0.417 points. Thereafter, we examine the Nash Equilibrium of the game; the result if two perfect players play the game against each other. We find that in this scenario, the first player will win by 0.5 points. To make the game fairer, we suggest minor variations which make the Nash Equilibrium a draw. Note that standard methods to analyze most of these would take at least a year, but our programs take only a few minutes due to various optimizations. Finally, we extend our programs into an artificial intelligence that is a perfect solution to the game.	
Finalist	
Name	Heng Teng Hiang
School	NUS High School of Mathematics and Science
Mentor	Archana Mishra
Project Title	Studies on the self-assembly properties of a class of ultrasmall amphiphilic peptides by critical micelle concentration (CMC) measurements: Are these peptides able to form micelles?

Project Category	Materials & Bioengineering

Amphiphilic, self-assembling, surfactant-like peptides are interesting as they can spontaneously self-assemble into well-ordered nanostructures and aggregates, such as vesicles and micelles. Therefore they have potential applications in the field of tissue engineering, cosmetics and pharmaceuticals.

A rationally designed class of ultrasmall, amphiphilic, aliphatic peptides (tri-to heptamer) self-assemble to form nanostructures, fibrous scaffolds and hydrogels. These peptides have a characteristic motif: an amino acid tail chain of decreasing hydrophobicity capped by a polar amino acid head group. To further understand their aggregation and surfactant properties due to their amphiphilicity, this project aims to investigate if these peptides are able to form micelles.

These peptides are synthesized by solid phase synthesis and characterized by liquid chromatography-mass spectrometry and thermogravimetry. The hydrogels formed by these peptides are characterized by rheometry. The putative micelle structures are assessed by critical micelle concentration (CMC) measurements: (1) using the fluorescence probe: pyrene and (2) determining contact angles of peptide solutions. The CMC of commercially-available surfactants are also tested to verify the methods. The peptides are dissolved in water and salt solutions that mimic buffers and biological environments to study the peptide potential as biocompatible surfactants. From this class of peptides, it was observed that the trimer could form putative normal micelles.

This study provides insight into the effect of ionic solutions, peptide size and concentration on the peptide self-assembling properties. This study also demonstrates the peptides potential as easily synthesized and less toxic self-assembling surfactants. Therefore, these peptides have possible applications in biomedical, cosmetic and food industries.

Finalist

Name	Lee Josephine Shih Han
School	Raffles Institution
Mentor	Ng Pek Kaye Abigayle
Project Title	The Diversity of Symbiodinium in Scleractinian Corals in Singapore
Project Category	Plant Sciences

A breakdown of coral-Symbiodinium symbiosis causes bleaching and widespread coral mortality. Symbiodinium is largely responsible for corals' resilience towards bleaching and other environmental stresses. This study aims to provide a preliminary survey of Symbiodinium diversity in scleractinian corals in Singapore. Samples of selected common scleractinian coral species were collected from various southern islands in Singapore and the highly-variable internal transcribed spacer 2 (ITS2) region of Symbiodinium was amplified using polymerase chain reaction (PCR). Denaturing gradient gel electrophoresis (DGGE) profiles were compared and analysed. Varying banding patterns observed in the DGGE profiles of Symbiodinium from different coral samples suggest that there is interspecific diversity and that a dominant clade may exist in scleractinian coral communities in Singapore. There is little intraspecific variation, except in P. lutea. Coral hosts likely harbour multiple Symbiodinium clades and possibly have the potential to acclimatise to environmental changes. The results from this study can serve as a useful reference for future studies on corals' resilience towards environmental stresses.

Finalist

Name	Lee Puay Ling
School	Hwa Chong Institution
Mentor	Assistant Professor Jacqueline M. Veltmaat
Project Title	Identification Of Candidate Regulators Of Mammary Gland Induction
Project Category	Cellular & Molecular Biology

The development of functional mammary glands in female mammals is crucial for the survival of their young. To identify molecular markers and candidate regulators for the induction of embryonic mammary gland, genes were screened by microarray. Based on the screening results, some genes were selected for this research. RNA probes for selected genes were constructed for whole-mount in situ hybridisation on E11.5-E13.5 wild-type and Gli3Xt-J/Xt-J (null) embryos. Expression patterns of candidate genes in E11.5 and E12.5 wild-type mouse embryos were observed: genes 100 and 105 are expressed in the somites; gene 101 is expressed in the mammary line and the line dorsal to it, as well as all five mammary buds, hence it is a new marker; and genes 102, 104 and 107 have no interesting expression. Additionally, the expression of gene 101 in mammary rudiments 2 of E12.5 and E13.5 Gli3Xt-J/Xt-J (null) embryos is elevated as compared to the wild-type embryos, suggesting that gene 101 may be involved in the growth defect of mammary rudiment 2. In future, it is of interest to study whether mice mutant for genes 100, 101 and 105 have a defect in mammary gland induction. Past studies reported that genes 100, 101 and 105 are associated with human breast cancer; therefore, since parallels exist in the molecular regulation of organogenesis and tumourgenesis, the embryonic mammary glands of mice may provide a good model to study the role of these genes in cell decisions. Eventually, this research may unravel therapies to eradicate human breast cancer.

Finalist

Name	Lim Huisen Jeren
School	National Junior College
Mentor	Dr Vangala Venugopal Rao
Project Title	Cocrystallization of Ethosuximide and Carbamazepine through green methods in the production of anti-epileptic combination drugs
Project Category	Chemistry

Cocrystals have a great potential and applications in the production of drugs due to the enhanced physical properties (eg. higher solubility, stability, bioavailability) with the retention of pharmaceutical properties of the active pharmaceutical ingredient (API). This project focuses on the cocrystallisation of two APIs instead of the API and GRAS (generally recognized as safe coformer(s) combination. Carbamazepine (CBZ) and Ethosuximide (ESM), two frontline drugs for epilepsy, were cocrystallized to meet the demand of 20% of epilepsy patients undergoing polytherapy. Cocrystallisation of these two drugs seeks to address the key issues such as poor aqueous solubility of CBZ, thermodynamic stability and side effects of ESM concurrently, a potential for breakthrough in epilepsy pharmacology. Results have shown that the cocrystal has lead to a significant 7.3 times increase in aqueous solubility over CBZ as well as improved thermodynamic stability.

With increasing concern over environmental issues, this project takes a step further to produce ESM-CBZ cocrystals using green methods. Conventional methods require large amounts of environmentally-polluting solvents, whilst current solvent-free methods (extrusion) require optimization in cocrystal yield and purity. These methods reduce the viability of environmental-friendly methods in commercial drug production, which strives for cost efficiency and profit maximization. A methodology for solvent-extrusion extrusions was realized, which produced ESM-CBZ cocrystals with significant increase in crystillinity. This novel idea amalgamates the benefits of solvent-drop crystallisation and extrusions, which is crystal purity and environmental-friendly, respectively. This creates an avenue for compromise between efficiency and environmental conservation. Drug industries can go green and remain competitive simultaneously.

Finalist

Name	Low Kay Yi
School	Raffles Institution
Mentor	Dr. Kenneth Hung
Project Title	Treatment of BRAF(V600E) in Colorectal Cancer
Project Category	Medicine & Health Sciences

B-RAF, a frequently mutated protein in cancer, is an attractive target for colorectal cancer (CRC) drug treatment. However, resistance to B-RAF inhibitor drugs has been a significant clinical challenge. Effective strategies to overcome B-RAF inhibitor drug resistance are therefore urgently needed. Here, we identify that drug resistance is perpetrated by the development of Inverse Regulation Cross-Talk between the MAPK and PI3K/AKT signaling pathways. We further find that this cross-talk resistance mechanism can be intercepted by various combinatorial inhibitor-based therapies. Our study not only establishes mechanisms of drug resistance in CRC cells, but also proposes robust strategies to overcome it, thus contributing to our concerted progress towards a cure for CRC.

Finalist

Name	Lydia Liu Tingruo
School	Raffles Institution
Mentor	Mr Wang Fei
Project Title	Plane curves — An algebraic geometry approach
Project Category	Mathematical Sciences

This paper is an exploration of introductory topics in algebraic geometry, focusing on plane curves. It contains a brief on projective space and on the group law on cubic curves. The key research objective is developing an algebraic relation for the 9 points of intersection of 2 or more cubics.

This leads to some original results (Theorem 3.2 and Corollary 3.3) for the case of degenerate cubic curves. Conjecture 3.4 relating the algebraic sum of 9 general points on a cubic to the number of cubics passing through the 9 points can be derived from these results. A construction of the homeomorphism of a nonsingular plane cubic in P2C and a torus over real numbers, with self-programmed graphics showing the transformation, is
included in the appendix.

Finalist

Name	Yong Wei Wei Dayna
School	NUS High School of Mathematics and Science
Mentor	Dr Low Kai Leng
Project Title	Role of Transcription Coactivator WBP2 in Drug Sensitivity of Breast Cancer
Project Category	Cellular & Molecular Biology

WW domain binding protein 2 (WBP2) expression was found to be low or undetectable in normal breast epithelial cells but overexpressed when breast cancer progresses from pre-neoplastic lesion to high grade tumor, implying a potential role of WBP2 as oncogene involved in initiation, progression and metastasis of breast cancer. Moreover, WBP2 protein expression was evidently higher in triple-negative breast cancer (TNBC) subtype. TNBC expresses high levels of Epidermal Growth Factor Receptor (EGFR) and WBP2 was identified as a downstream tyrosine phosphorylation target of EGFR. Previous works indicated tyrosine phosphorylation of WBP2 activates Wnt pathway downstream and Wnt pathway was found to be preferentially activated in TNBC. We are therefore interested to assess whether WBP2 could act as a novel molecular therapeutic target and/or a biomarker for predicting drug response in TNBC patients. In combination with drugs that target the signaling axis of WBP2, such as the Wnt pathway, knockdown of WBP2 in MDA-MB231 or WBP2 overexpression in MCF7 was assessed for their effects on the drug sensitivity to FH535/Sulindac, the Wnt pathway inhibitor. We discovered that downregulation of WBP2 led to lower sensitivity to FH535 while presence of higher phosphorylated WBP2 resulted in higher sensitivity to Sulindac. In conclusion, WBP2 could serve as a new predictive biomarker for personalized treatment in TNBC via screening of WBP2 expression and phosphorylation status prior to Wnt-pathway-targeted therapy.

A*STAR Talent Search 2011 Winners

The A*STAR Talent Search and Singapore Science & Engineering Fair 2011 Awards Ceremony was held on Friday, 29 April 2011 at the Matrix Auditorium, Biopolis. During the ceremony, a total of 133 awards were given out, in the presence of their mentors, teachers and parents. We would like to commend the students for their time and effort in their scientific work.

First Prize Winner	
Name	Cheng Herng Yi
School	NUS High School of Mathematics and Science
Project	Composing Right Frusta to fold Axial Symmetric Origami
Mentor	Mr. Cheong Kang Hao from NUS High School of Mathematics and Science
Second Prize Winner	
Name	Jin Chentian
School	Raffles Institution (Junior College)
Project	Molecular alteration of the TRPM5 channel in pancreatic β-cells and its effect on glucose tolerance
Mentor	Dr. Liao Ping, National Neuroscience Institute
Third Prize Winner	
Name	Alan Aw Jin
School	Raffles Institution (Junior College)
Project	The covering radius problem for sets of perfect matchings
Mentor	Dr Ku Cheng Yeaw, Department of Mathematics, NUS

**In no order of ranking*

Commendation Prizes	
Name	Li Xuanji
School	NUS High School of Math and Science
Project	State Merging for Automatic Test Generation
Mentor	Mr Tan Jiaqi from DSO National Laboratories
Commendation Prizes	
Name	Chan Yarn Kit
School	Hwa Chong Institution (College SSection)
Project	Methods for Generating High-Fidelity Synthetic DNA
Mentor	Huang Mo Chao, A*STAR, Institute of Bioengineering and Nanotechnology
Commendation Prizes	
Name	He Zhiyuan
School	Raffles Institution
Project	Synthesis and Characterisation of Co-polymer with High Charge Mobility for Application in Organic Field-Effect Transistors
Mentor	Dr. Li Jun, Institute of Materials Research and Engineering
Commendation Prizes	
Name	Xiong Siyi
School	Raffles Institution
Project	Design of an Anti-Pyretic Dosage Form with a Temperature-Mediated Drug Release Reservoir for Fever Management
Mentor	Associate Professor Heng Wan Sia, Paul, Dr. Celine Valeria Liew, Department of Pharmacy, National University of Singapore
Commendation Prizes	

Name	Low Jia Zhen
School	Dunman High School
Project	Analysis of the phytoremediative ability of macrophytes and a phytofiltration design for Singapore's waterways
Mentor	Mrs Serene Chu & Mr Nigel Koh, Dunman High School

Schools are awarded points according to the placement of their winning students.

First Prize:	Raffles Institution (Junior College)
Second Prize:	NUS High School of Mathematics and Science

A*STAR Talent Search 2011 Finalists

The A*TS short-listing interview round took place on 31 March 2011. Eight finalists were selected and will proceed to the final judging on 26 April 2011.

Here are the eight finalists and a short write-up of their projects:

Finalist	
Name	Jim Chentian
School	Raffles Institution (Junior College)
Mentor	Dr. Liao Ping, National Neuroscience Institute
Project Title	Molecular alteration of the TRPM5 channel in pancreatic β-cells and its effect on glucose tolerance
Project Category	Cellular and Molecular Biology
Diabetes mellitus is caused by a combination of insulin resistance and ineffective insulin secretion by pancreatic β-cells. TRPM5, an ion channel in the membrane of β-cells, plays a critical role in mediating the glucose-induced membrane potential and calcium ion oscillations that trigger insulin secretion, with TRPM5 knock-out mice secreting 50% less insulin and maintaining elevated glucose levels for a prolonged duration. By including or omitting certain exons in forming the mature mRNA product, alternative splicing changes the amino-acid sequence of proteins, which may lead to an alteration of function, influencing the insulin-secreting ability of β-cells. We thus investigate the changes in splicing patterns of TRPM5 in β-cells, and we unexpectedly discover higher proportions of the functional isoform and lower proportions of putatively truncated TRPM5 channels in diabetic models as compared to non-diabetic β-cells, highlighting the important role of alternative splicing and suggesting a novel compensatory mechanism to cope with diabetes.	
Finalist	
Name	Cheng Herng Yi
School	NUS High School of Mathematics and Science
Mentor	Mr. Cheong Kang Hao from NUS High School of Mathematics and Science
Project Title	Composing Right Frusta to fold Axial Symmetric Origami
Project Category	Computer Science
An original and novel method has been derived to use origami to fold three-dimensional solids which have rotational symmetry. Using geometry, the pattern of lines on the paper after unfolding the solid is predicted based on the target solid and drawn on paper. The paper is then folded on those lines and collapsed to produce the final solid. A computer program has been written, allowing users to specify a target solid and generating the pattern of lines that folds into that solid. Potential applications include folding nanostructures out of graphene and folding programmable matter into tools that mechanically shapeshift according to the needs of different situations.	
Finalist	

Name	Li Xuanji
School	NUS High School of Math and Science
Mentor	Mr Tan Jiaqi from DSO National Laboratories
Project Title	State Merging for Automatic Test Generation
Project Category	Computer Science
In this work, techniques to explore the capabilities of multi-walled carbon nanotubes (MWNTs) in sorting nanoparticles (NPs) were presented. Quantum dots (QDs), which are nanoparticles that are able to fluoresce under light, were deposited onto MWNTs surface using a syringe. Photoluminescence (PL) and fluorescence microscopy (FM) revealed that MWNTs are able to sieve in both the lateral and vertical direction. QDs with different chemical properties were used to explore whether the effects of chemical properties on the sieving capability of MWNTs. Results also suggested that micro-patterning, the use of laser to create micro-patterns on the MWNTs, could aid in separation of QDs and thus improve sieving capability of MWNTs. A multi-colored display of MWNTs and QDs could be achieved through the removal of desired amount of QDs decorated MWNTs using a controlled laser power.	
Finalist	
Name	Chan Yarn Kit
School	Hwa Chong Institution (College SSection)
Mentor	Huang Mo Chao, A*STAR, Institute of Bioengineering and Nanotechnology
Project Title	Methods for Generating High-Fidelity Synthetic DNA
Project Category	Engineering: Materials and Bioengineering
My project, Methods for Generating High-Fidelity DNA, focuses on the *de novo* synthesis of genes (that means from scratch!) at base-level precision, which allows for the creation of genes of any length and sequence. Such genes can be used to yield gene products, such as proteins, that are not found naturally; this method can also be applied to produce novel organisms or molecules that are beneficial to the environment, for example, organisms that contribute towards efficient biofuel production or carbon sequestration, or for the research of viruses without the need for the actual, infectious viral particles (virions). However, modern methods of gene synthesis still require substantial cost, time and labour, and synthesised DNA is prone to errors. This bioengineering project sought to overcome these limitations by developing rapid and economical methods for generating high-fidelity synthetic DNA that can be further assimilated into automated, lab-on-a-chip technology for increased convenience and accessibility.	
Finalist	
Name	He Zhiyuan
School	Raffles Institution
Mentor	Dr. Li Jun, Institute of Materials Research and Engineering
Project Title	Synthesis and Characterisation of Co-polymer with High Charge Mobility for Application in Organic Field-Effect Transistors
Project Category	Engineering: Materials and Bioengineering
The objective of this project is to design an organic polymer-based transistor to be applied in flexible electronic devices. Organic semiconductors are noted for their greater mechanical stability and ease of processability compared to conventional silicon-based ones. A main factor to determine their performance is the ease of charge transport, or hole mobility in this case. By maximising the electronic interaction between adjacent layers of the polymer and yet ensuring that the polymer is soluble, this project has achieved one of the best hole mobility reported to date. Furthermore, the polymer was found to be stable to heat and oxidation and has potential in commercial applications. Further work is carried out to try to achieve a polymer with minimal processing steps for greater ease of incorporation into electronic products.	
Finalist	

Name	Xiong Siyi
School	Raffles Institution
Mentor	Associate Professor Heng Wan Sia, Paul, Dr. Celine Valeria Liew, Department of Pharmacy, National University of Singapore
Project Title	Design of an Anti-Pyretic Dosage Form with a Temperature-Mediated Drug Release Reservoir for Fever Management
Project Category	Medicine and Health Sciences

To manage fevers in more effectively and efficiently, an intelligent pharmaceutical dosage form with sequential release of two separate doses of antipyretic drug, ibuprofen, was designed. The first dose is released immediately upon administration of the dosage form. The second is temperature-mediated and will release only if fever persists; otherwise, it is minimally released and subsequently excreted. Temperature-mediated release properties of the second dose were achieved via encapsulation in a matrix of thermotropic liquid crystals. 2 prototypes were fabricated – a tablet-in-tablet and a capsule-in-capsule. As the liquid crystal matrix could not be fully solidified into tablet form and subsequent compression coating of the immediate release layer onto the tablet resulted in drug leakage, the tablet-in-a-tablet idea proved infeasible. In comparison, the capsule-in-a-capsule faced no process problems. Subsequent dissolution studies showed that this prototype only resulted in full drug release in response to heightened temperatures, highlighting clear potential for such a dosage form.

Finalist

Name	Alan Aw Jin
School	Raffles Institution (Junior College)
Mentor	Dr Ku Cheng Yeaw, Department of Mathematics, NUS
Project Title	The covering radius problem for sets of perfect matchings
Project Category	Mathematical Sciences

An important problem studied by mathematicians working in the field of combinatorics is the following question in extremal combinatorics: given a collection of structures, what is the maximum size of the collection such that we can find a structure that shares at most c elements with each structure in the collection? In our research, we studied collections of a particular graph-theoretic structure known as a perfect matching. We proved that in any collection of perfect matchings, as long as each edge[1] of the graph does not appear too frequently in our collection, then we can always _nd another perfect matching that does not share too many elements with each perfect matching in our collection. This has potential applications in coding theory, in which the result could be used to optimize the size of any collection of perfect matchings to minimize cost.

[1]A graph is a set of points and lines. Often, we refer to the points as vertices, and the lines as edges. A perfect matching in a graph is a set of non-adjacent edges (i.e. the edges do not share a vertex) such that each vertex of the graph is contained in exactly one edge.

Finalist

Name	Low Jia Zhen
School	Dunman High School
Mentor	Mrs Serene Chu & Mr Nigel Koh, Dunman High School
Project Title	Analysis of the phytoremediative ability of macrophytes and a phytofiltration design for Singapore’s waterways
Project Category	Environmental Science

Nitrates and phosphates are pollutants when present in high concentrations. PUB, Singapore's National Water Agency, aims to achieve a reduction in N and P concentrations in storm waters.

In this project, we aimed to use aquatic plants to reduce N and P concentrations. The N and P uptake capabilities of five tropical aquatic plants, namely Typha angustifolia, Cyperus haspan,

Hydrilla verticillata, Cabomba aquatica and Lemna minor were studied. Their uptake kinetics, N and P removal rates as well as growth rates were analysed. These plants were subsequently evaluated for growth in different areas, and these results can be applied to constructed wetlands or in our proposed phytofiltration system.

The phytofiltration system which makes use of existing float booms to attach enclosures containing specific submerged aquatic plants to waterways was also designed. Specific macrophytes can be planted at different bands of the float booms, thus maximising the phytoremediative abilities of each macrophyte.

A*STAR Talent Search 2010 Winners

The A*STAR Talent Search and Singapore Science & Engineering Fair 2010 Awards Ceremony took place on Friday, 23 April 2010 at the Matrix Auditorium, Biopolis. During the ceremony, a total of 188 students received award(s) from the Guest-of-Honour, Mrs Yu-Foo Yee Shoon, Minister of State, Ministry of. Community Development, Youth and Sports, in the presence of their mentors, teachers and parents. We would like to commend the students for their time and effort in their scientific work.

First Prize Winner	
Name	Ramyiadarsini Indira Elangovan
School	Raffles Institution (Junior College)
Project	Novel Applications of Aminoglycosides and Poly-Aspartic Acid for gene repair in Duchenne Muscular Dystrophy
Mentor	A/Prof Lai Poh San, National University of Singapore, Yong Loo Lin School of Medicine
Second Prize Winner	
Name	Lee Chen Feng Gary
School	NUS High School of Mathematics and Science
Project	A Study of Optical Parameters for Resolution Enhancement in a Solid Immersion Lens System
Mentor	Asst Prof Chen Xudong, National University of Singapore, Department of Electrical and Computer Engineering
Third Prize Winner	
Name	Zhang Aidi
School	Raffles Girls' School (Secondary)
Project	Applications of Spidrons
Mentor	Dr Tay Tiong Seng, National University of Singapore, Department of Mathematics

*In no order of ranking:

Commendation Prizes	
Name	Chen Jingjie
School	Raffles Girls' School (Secondary)
Project	EGCG mitigates Parkinson's Disease-associated mutant LRRK2-induced Neurotoxicity via protein Translation Modulation
Mentor	Dr Lim Kah Leong, National Neuroscience Institute
Commendation Prizes	
Name	Lim Mingjie Kenneth
School	NUS High School of Mathematics and Science
Project	A Study of Optical Parameters for Resolution Enhancement in a Solid Immersion Lens System
Mentor	Asst Prof Chen Xudong, National University of Singapore, Department of Electrical and Computer Engineering
Commendation Prizes	
Name	Chew Yi Hui Nicole
School	Dunman High School
Project	Effects of Mircopatterning on the Nanosieving Capabilities of Vertically Aligned Multi-walled Carbon Nanotubes Array
Mentor	A/Prof Sow Chorng Haur, National University of Singapore, Department of Physics
Commendation Prizes	
Name	Ong Jing Han

School	Raffles Girls' School (Secondary)
Project	Glucose, Lactose and Fructose Fermentation by Intestinal Bacteria in a Continuous Culture System
Mentor	A/Prof Lee Yuan Kun, National University of Singapore, Department of Microbiology
Commendation Prizes	
Name	Tan Wei Quan Bryce
School	NUS High School of Mathematics and Science
Project	The Interplay Between Iron and Alpha-synuclein in Neuroinflammation
Mentor	A/Prof Soong Tuck Wah, National University of Singapore, Department of Physiology

Schools are awarded points according to the placement of their winning students.

First Prize:	Raffles Institution (Junior College)
Second Prize:	NUS High School of Mathematics and Science
Third Prize:	Raffles Girls' School (Secondary)

A*STAR Talent Search 2010 Finalists

The A*TS short-listing interview round took place on 1 April 2010. Eight finalists were selected and will proceed to the final judging on 20 April 2010.

Here are the eight finalists and a short write-up of their projects:

Finalist	
Name	Ramyiadarsini Indira Elangovan
School	Raffles Institution (Junior College)
Mentor	A/Prof Lai Poh San, National University of Singapore, Yong Loo Lin School of Medicine
Project Title	Novel Applications of Aminoglycosides and Poly-Aspartic Acid for gene repair in Duchenne Muscular Dystrophy
Project Category	Medicine & Health Sciences
Duchenne Muscular Dystrophy (DMD) is a neuromuscular disease arising from the lack of dystrophin, a crucial muscle protein. Approximately 15% of all DMD patients suffer from nonsense mutations, where full-length dystrophin cannot be produced due to a premature stop signal in the dystrophin gene. This project investigates the use of 5 different aminoglycosides, in synergy with Poly-Aspartic Acid (PAA), to induce the readthrough of nonsense mutations. We have demonstrated for the first time that an aminoglycoside called Ribostamycin can produce readthrough sufficient for the therapeutic production of protein in DMD patients. In fact, the readthrough of 41.28% for Ribostamycin is the highest ever reported in literature thus far and has enormous potential in the treatment of DMD as well as other nonsense-mediated diseases such as Cystic Fibrosis and Thalessemia. We also discovered that the co-administration of PAA is able to increase readthrough induced by aminoglycosides, allowing lower doses of aminoglycosides to be used for treatment.	
Finalist	
Name	Chen Jingjie
School	Raffles Girls' School (Secondary)
Mentor	Dr Lim Kah Leong, National Neuroscience Institute
Project Title	EGCG mitigates Parkinson's Disease-associated mutant LRRK2-induced Neurotoxicity via protein Translation Modulation
Project Category	Cellular & Molecular Biology
Parkinson's disease is a neurodegenerative movement disorder afflicting more than 6 million people worldwide with debilitating symptoms such as resting tremor, gait difficulty and slowness in	

movement. No treatment is available today that can halt, impede or reverse the degeneration process. Although the majority of cases are sporadic, a number of genetic mutations associated with inherited forms of the disease have been identified, of which mutations on the LRRK2 protein are the most prevalent. This study aims to investigate, via a protein translation pathway, the mitigating effects of EGCG (a compound from green tea) and related antioxidants against LRRK2 mutant-induced neurotoxicity. Furthermore, their neuroprotective effects were studied using our LRRK2 mutant fruit fly model. EGCG and CGA (a compound present in coffee) are shown to exert potent neuroprotective effects on Parkinson's disease-associated characteristics in the fly model, representing a discovery with much therapeutic significance for the disease.	
Finalist	
Name	Chew Yi Hui Nicole
School	Dunman High School
Mentor	A/Prof Sow Chorng Haur, National University of Singapore, Department of Physics
Project Title	Effects of Mircopatterning on the Nanosieving Capabilities of Vertically Aligned Multi-walled Carbon Nanotubes Array
Project Category	Physics & Astronomy
In this work, techniques to explore the capabilities of multi-walled carbon nanotubes (MWNTs) in sorting nanoparticles (NPs) were presented. Quantum dots (QDs), which are nanoparticles that are able to fluoresce under light, were deposited onto MWNTs surface using a syringe. Photoluminescence (PL) and fluorescence microscopy (FM) revealed that MWNTs are able to sieve in both the lateral and vertical direction. QDs with different chemical properties were used to explore whether the effects of chemical properties on the sieving capability of MWNTs. Results also suggested that micro-patterning, the use of laser to create micro-patterns on the MWNTs, could aid in separation of QDs and thus improve sieving capability of MWNTs. A multi-colored display of MWNTs and QDs could be achieved through the removal of desired amount of QDs decorated MWNTs using a controlled laser power.	
Finalist	
Name	Zhang Aidi
School	Raffles Girls' School (Secondary)
Mentor	Dr Tay Tiong Seng, National University of Singapore, Department of Mathematics
Project Title	Applications of Spidrons
Project Category	Mathematical Sciences
My research aims to reveal and discuss several findings related to the tessellations and space-fillings of an extremely unique and relatively new geometrical shape- spidrons. Spidrons are irregularly-shaped geometrical figures created out of numerous triangles according to a system of rules. The first section deals with a planar spidron, in which the convexity and conformity of angles allows only some spidrons- the square and hexagonal spidrons, to be tessellated into the two-dimensional space. Upon tiling, the planar system generates a dynamic, regular geometrical construction with extraordinary features. Following that, we probe into the investigation of space-filling of the 3-dimensional space with spidronal polyhedrons, which can be formed by spidrons that are creased to be assembled into three-dimensional structures in a process called deformation. Research done here on spidrons, with its remarkable planar and spatial properties, strives to open up new possibilities in the realm of geometrical design and artistic expression.	
Finalist	
Name	Lee Chen Feng Gary
School	NUS High School of Mathematics and Science
Mentor	Asst Prof Chen Xudong, National University of Singapore, Department of Electrical and Computer Engineering
Project Title	A Study of Optical Parameters for Resolution Enhancement in a Solid Immersion Lens System
Project Category	Physics & Astronomy

The Solid Immersion Lens (SIL) is a high-resolution system used for data storage, creating circuits or identifying defects on microchips. The advent of new technology necessitates systems with higher resolution if progress is to be made. We conduct theoretical analysis and simulation of the parameters determining the resolution of the SIL system, in which we rectify shortcomings of existing literature. By adjusting the parameters and characterizing the result, we are able to propose an optimal configuration that will improve the resolution beyond current standards. Our work provides a foundation for practical realization and commercialization of such a system.	
Finalist	
Name	Ong Jing Han
School	Raffles Girls' School (Secondary)
Mentor	A/Prof Lee Yuan Kun, National University of Singapore, Department of Microbiology
Project Title	Glucose, Lactose and Fructose Fermentation by Intestinal Bacteria in a Continuous Culture System
Project Category	Microbiology
Fructose and Lactose intolerance affect an extremely large number of people. An over-neglected area of research would be the specific causes of the symptoms of discomfort which people face, when they have lactose and fructose intolerance. There are probably different secondary reasons for the various symptoms. The most obvious symptom of lactose/fructose intolerance was the occurrence of diarrhea, bloating and flatulence and hence it was decided to tackle these symptoms as the main concern. An occurrence known as small intestinal bacterial overgrowth (SIBO) resulted in similar symptoms. In SIBO large numbers of gas-producing bacteria are present in the small intestines which compete with the body for sugars and carbohydrates. This interesting connection lead to the hypothesis that lactose and fructose intolerance actually could have indirectly lead to SIBO as the unnaturally large amounts of undigested sugar presents bacteria with huge food resources.	
Finalist	
Name	Tan Wei Quan Bryce
School	NUS High School of Mathematics and Science
Mentor	A/Prof Soong Tuck Wah, National University of Singapore, Department of Physiology
Project Title	The Interplay Between Iron and Alpha-synuclein in Neuroinflammation
Project Category	Medicine & Health Sciences
In patients with Parkinson's Disease (PD), iron accumulation, the aggregation of □-synuclein and an increase in the immune response in the brain, or neuroinflammation, are observed, suggesting a link between iron, □-synuclein and neuroinflammation in the progression of PD. Using a transgenic mouse model overexpressing a metal transporter to transport iron into the brain, we hope to recapitulate the iron accumulation we see in PD. By crossing this "iron mouse" with another transgenic mouse model overexpressing human mutant □-synuclein, we generate the bigenic mouse model that recapitulates both iron accumulation and the presence of □-synuclein-synuclein observed in PD patients. The results show that iron alone is able to elicit a neuroinflammatory response and aggravated in the presence of □-synuclein, and the chronically sustained response results in the dysfunction of biomolecules, which may contribute to the progression of PD.	
Finalist	
Name	Lim Mingjie Kenneth
School	NUS High School of Mathematics and Science
Mentor	Asst Prof Chen Xudong, National University of Singapore, Department of Electrical and Computer Engineering
Project Title	A Study of Optical Parameters for Resolution Enhancement in a Solid Immersion Lens System
Project Category	Physics & Astronomy
The Solid Immersion Lens (SIL) is a high-resolution system used for data storage, creating circuits or identifying defects on microchips. The advent of new technology necessitates systems with higher resolution if progress is to be made. We conduct theoretical analysis and simulation of the	

parameters determining the resolution of the SIL system, in which we rectify shortcomings of existing literature. By adjusting the parameters and characterizing the result, we are able to propose an optimal configuration that will improve the resolution beyond current standards. Our work provides a foundation for practical realization and commercialization of such a system.

A*STAR Talent Search 2009 Winners

The A*STAR Talent Search and Singapore Science & Engineering Fair 2009 Awards Ceremony took place on Friday, 24 April 2009 at the Matrix Auditorium, Biopolis. During the ceremony, a total of 155 students received award(s) from the Guest-of-Honour, Mr Heng Chee How, Minister of State, Prime Minister's Office, in the presence of their mentors, teachers and parents. We would like to commend the students for their time and effort in their scientific work.

First Prize Winner

Name:	Chen Fang Yew Nicholas
School:	NUS High School of Mathematics and Science
Project:	Berry's Phase for the Imaging of Micromagnetics System
Mentor:	Dr Tan Seng Ghee, A*STAR, Data Storage Institute

Second Prize Winner

Name:	Tan Zhong Ming
School:	NUS High School of Mathematics and Science
Project:	Engineering Topology and Structural Folding of DNA G-Quadruplexes
Mentor:	Asst Prof Phan Anh Tuân, Nanyang Technological University, School of Physical & Mathematical Sciences

Third Prize Winner

Name:	Lu Yongquan
School:	Hwa Chong Institution
Project:	Physical Construction of Surfaces with Mesh Optimisation
Mentor:	Ms Gwee Hwee Ngee, Hwa Chong Institution

Commendation Prizes:

(In no order of ranking)

Name:	Chen Hongjie
School:	National Junior College
Project:	Optical and Magnetic Anisotropy in Cobalt on Calcium Fluoride Thin Films
Mentor:	Dr Nikolai Yakovlev, A*STAR, Institute of Materials Research and Engineering

Name:	Lim Mingjie Kenneth
School:	NUS High School of Mathematics and Science
Project:	A Novel Non-Iterative Perfectly Flat Histogram Equalization Algorithm
Mentor:	Prof Jacob Phang, National University of Singapore, Department of Electrical and Computer Engineering

Name:	Lim Soon Wei Daniel
School:	Raffles Institution (Junior College)
Project:	Association of a Novel HSP70 Species with Aging and Proteasome Dysfunction
Mentor:	Dr Lim Kah Leong & Dr Jeanne Tan May, Duke-NUS Graduate Medical School & National Neuroscience Institute

Name:	Ng Chien Wei Benjamin
School:	Dunman High School
Project:	A Novel Approach of Engineering Functionality of Primary Hepatocytes in Three-Dimension
Mentor:	Mr James Hsieh Tseng Ming, A*STAR, Institute of Bioengineering and Nanotechnology

Name:	Roderica Ng Rui Ge
School:	National Junior College
Project:	Membrane Development for Application in Bioartificial Organs
Mentor:	Dr Jeremy Teo Choon Meng & Dr Edwin Chow Pei Yong, A*STAR, Institute of Bioengineering and Nanotechnology

Schools are awarded points according to the placement of their winning students.

First Prize:	NUS High School of Mathematics and Science
Second Prize:	Hwa Chong Institution
Third Prize:	National Junior College

A*STAR Talent Search 2009 Finalists

The A*TS short-listing interview round took place on 27 March 2009. Eight finalists were selected and will proceed to the final judging on 21 April 2009.

Here are the eight finalists and a short write-up of their projects:

Finalist	
Name	Chen Fang Yew Nicholas
School	NUS High School of Mathematics and Science
Mentor	Dr Tan Seng Ghee ,A*STAR, DSI
Project Title	Berry's Phase for the Imaging of Micromagnetics System
Category	Physics and Astronomy

The geometric phase, also known as Berry's phase, has invoked activity in both theoretical and experimental aspects. When a particle has its spin, a vector which defines its intrinsic angular momentum, taken around a closed loop, the particle returns to its original form with an additional Berry's phase. We exploit Berry's phase in detecting different kinds of patterns of magnetic fields. These patterns are useful for data storage, as they have desirable characteristics for data storage elements. Previously it is not possible to measure the patterns three dimensions, and also it takes a very long time.

Finalist	
Name	Chen Hongjie
School	National Junior College
Mentor	Dr Nikolai Yakovlev, A*STAR, IMRE
Project Title	Optical and Magnetic Anisotropy of Thin Cobalt on Calcium Fluoride Films
Category	Physics and Astronomy

The properties of thin films may be very different from their bulk counterparts; hence they potentially have many useful applications. Optical anisotropy is one such property. Even if it turns out to have no direct use, the information gleaned from studying it may be used to develop better thin film

characterisation techniques, which may uncover more potentially useful properties. For example, it would an important magnetic property, magnetic anisotropy (the dependence of magnetisation of the material on direction), which is gaining popularity as a new form of non-volatile data storage.

Finalist

Name	Lim Mingjie Kenneth
School	NUS High School of Mathematics and Science
Mentor	Prof Jacob C. H. Phang, National University of Singapore
Project Title	A Novel Non-Iterative Algorithm for Perfectly Flat Histogram Equalization
Category	Computer Science

This paper details an automated computer algorithm for use with images captured by a Scanning Electron Microscope (SEM). Many SEM images often require post processing - a time consuming process - to render important details visible. Many commercial algorithms invoke a method called Histogram Equalization (HE) to enhance images, but its performance is inherently limited. We report a novel method for achieving a perfectly consistent distribution of blacks and whites in the image, a 'Perfectly Flat' HE capable of enhancing most grayscale images without deterioration. This result was previously thought impossible by industry experts. This paper will be submitted for international review.

Finalist

Name	Lim Soon Wei Daniel
School	Raffles Institution (Junior College)
Mentor	Dr Lim Kah Leong, National Neuroscience Institute
Project Title	Association of a Novel Hsp70 Species with Brain Aging and Proteasome Dysfunction
Category	Cellular and Molecular Biology

Several physically and mentally debilitating diseases which our elderly suffer from today, such as Alzheimer's or Parkinson's disease, are characterized by the presence of insoluble protein masses within brain cells. For unknown reasons, these are built up from normally soluble proteins, thereby suggesting that cellular systems responsible for ensuring proper protein functioning go awry with age. Our project seeks to investigate these age-related changes, and hopefully, help to develop therapeutic strategies that will mitigate lifestyle problems the afflicted face, such as learning, memory and movement defects.

Finalist

Name	Lu Yongquan
School	Hwa Chong Institution
Mentor	Ms Gwee Hwee Ngee, Hwa Chong Institution
Project Title	Physical Construction of Surfaces with Mesh Optimisation
Category	Mathematical Sciences

Visualisation of mathematical surfaces is an important tool in research and education. However, conventional techniques involving computer-generated imagery may be inadequate in several instances. In this project, I have proposed a new low-cost, easy and versatile procedure for physical construction of surfaces. Computational techniques and existing scripts are applied to optimise a

given mesh, which may then be interpreted for physical realisation. Several models such as a torus and Boy's surface have been constructed with different media to illustrate this process.

Finalist

Name	Ng Chien Wei, Benjamin
School	Dunman High School
Mentor	Mr Hsieh Tseng Ming, A*STAR, IBN
Project Title	A Novel Approach of Engineering Functionality of Primary Hepatocytes in Three-Dimension
Category	Engineering: Materials and Bioengineering

According to the World Health Organization (WHO) 350-400 million people are suffering from Hepatitis B which causes inflammation and cirrhosis to the liver. Therefore, the need for liver transplant to provide relief for patients suffering is indispensible. However, it is plagued with problems like lack of donors and high rejection rate by our immune system. This research aims to provide a non-immunogenic and bioartificial scaffold for engineering functionality of primary liver cells. With this research, it brings us a step closer to providing a bioartificial liver, using liver cells differentiated from the patients' stem cells and with our scaffold.

Finalist

Name	Roderica Ng Rui Ge
School	National Junior College
Mentor	Dr Jeremy Teo & Edwin Chow, A*STAR, IBN
Project Title	Membrane Development for Application in Bioartificial Organs
Category	Medicine and Health Sciences

Development of bioartificial organs for complete organ replacement has been hindered by the lack of an appropriate material for supporting cells. A novel porous polymeric membrane has been developed for artificial kidney devices. Firstly, the ability of these membranes for mechanical filtration was examined to replace current commercial filtration membranes. Next, the best cultivating conditions and substrates in which cells can grow on the porous membranes were studied. Finally, biological reabsorption function of cells seeded on the membranes was tested to replace functions of the kidney. Results have shown the potential of these novel porous membranes for application in membrane-based bioartificial organs.

Finalist

Name	Tan Zhong Ming
School	NUS High School of Mathematics and Science
Mentor	Asst Prof Phan Anh Tuan, NTU, SPMS
Project Title	Engineering topology and structural folding of DNA G-Quadruplexes
Category	Biochemistry

Deoxyribonucleic Acid (DNA) is the genetic material found in all living things. DNA can adopt many structures. A lesser known variant, the G-Quadruplex, is a three dimensional structure, that involves four DNA subunits (guanine) bonded intramolecularly into layers; with many structural variations depending on the DNA sequence. In this project, we aim to engineer the quadruplex, into a "3+1" fold. With the use of various spectroscopic techniques such as Nuclear Magnetic Resonance and

Circular Dichroism spectroscopy, we can gain an understanding of the structure of the engineered quadruplex.

A*STAR Talent Search 2008 Winners

The A*STAR Talent Search and Singapore Science & Engineering Fair 2008 Awards Ceremony took place on Saturday, 26 April 2008 at the Matrix Auditorium, Biopolis. During the ceremony, a total of 131 students received award(s) from the Guest-of-Honour, Mr S Iswaran, Senior Minister of State, Ministry of Trade and Industry, in the presence of their mentors, teachers and parents. We would like to commend the students for their time and effort in their scientific work.

First Prize Winner

Name:	Chua Meng Shuen
School:	Dunman High School
Project:	Study of Boundary Layer for Differing Viscous Cylinder Flows
Mentor:	Dr Tai Chin Hoe Jonathan, DSO National Laboratories

Second Prize Winner

Name:	Zhao Ye
School:	NUS High School of Mathematics and Science
Project:	Nanofabrication with Focused Sunlight
Mentor:	A/P Sow Chorng Haur, National University of Singapore, Dept of Physics

Third Prize Winner

Name:	Chew Tian Wei
School:	Victoria Junior College
Project:	Transcription Factor Binding Sites in Mammalian Genomic Repeats
Mentor:	Dr Guillaume Bourque, Genome Institute of Singapore

Commendation Prizes

(In no order of ranking)

Name:	Anish Agarwal
School:	Anglo Chinese School (Independent)
Project:	Mutational Analysis of NPHS2 Polymorphisms in South-east Asian Chinese Children with Steroid-resistant Nephrotic Syndrome and Correlation with Clinical Outcome
Mentor:	Prof Yap Hui Kim, National University Hospital

Name:	Kok Xiu Ling Florence
School:	NUS High School of Mathematics and Science
Project:	Screening of Natural Compounds for Induction of Melanogenesis in Murine B16 Melanoma Cell Line
Mentor:	A/P Chang Chan Fong, National University of Singapore, Dept of Biochemistry

Name:	Seah Wei Ling
School:	NUS High School of Mathematics and Science
Project:	Synthesis and Characterization of Gold Nanotubes
Mentor:	A/P Chin Wee Shong, National University of Singapore, Dept of Biochemistry

Name:	Teo Ruijie Darius

School:	Raffles Junior College
Project:	Development of Mesoporous Polymer Particles and their Applications
Mentor:	Dr Zhang Yugen, Institute of Bioengineering and Nanotechnology

Name:	Yin Jianyang, David
School:	Raffles Junior College
Project:	Synthesis of Mesoporous Carbon Nanofibers
Mentor:	Dr Han Yu, Institute of Bioengineering and Nanotechnology

Schools are awarded points according to the placement of their winning students.

First Prize:	Dunman High School
Second Prize:	NUS High School of Mathematics and Science
Third Prize:	Victoria Junior College

A*STAR Talent Search 2008 Finalists

The A*TS short-listing interview round took place on 19 March 2008. Eight finalists were selected and will proceed to the final judging on 24 April 2008.

Here are the eight finalists and a short write-up of their projects:

Finalist	
Name	Anish Agarwal
School	Anglo Chinese School (Independent)
Mentor	Prof Yap Hui Kim, National University Hospital
Project Title	Mutational Analysis of NPHS2 Polymorphisms in South-east Asian Chinese Children with Steroid-resistant Nephrotic Syndrome and Correlation with Clinical Outcome
Category	Medicine and Health Sciences

Nephrotic Syndrome is a common kidney diseases affecting filtration of the kidney by allowing leakage of proteins. 20% of the patients do not respond to traditional treatment as they have a structural defect in their kidney barrier. These patients may have genetic mutations in the NPHS2 gene. There is a scarcity of such genetic research in Asians. Thus we studied Singaporean Chinese patients with resistant disease to identify mutations and found that they differed substantially from Europeans in their mutations. Some polymorphisms were related to clinical outcomes. This study encourages further research into the different ethnicities and the relation with clinical outcomes.

Finalist	
Name	Chew Tian Wei
School	Victoria Junior College
Mentor	Dr Guillaume Bourque, Genome Institute of Singapore
Project Title	Transcription Factor Binding Sites in Mammalian Genomic Repeats
Category	Cellular & Molecular Biology

Repeats are short DNA sequences which appear many times in the human genome. While once mistaken to be 'junk' DNA, recent findings have revealed that repeats probably play a regulatory role

as transcription factor binding site, controlling protein transcription and gene expression. The purpose of the project is to find the number of overlaps between repeats and transcription factor binding site motis to determine whether repeats regulate protein transcription and gene expression.

Finalist

Name	Chua Meng Shuen
School	Dunman High School
Mentor	Dr Tai Chin Hoe Jonathan, DSO National Laboratories
Project Title	Study of Boundary Layer for Differing Viscous Cylinder Flows
Category	Energy & Transportation

This research is aimed at increasing energy efficiency of new generation vehicles. Most cars are reducing their weight to increase performance and reduce fuel needs. As such, aerodynamic forces play an important part once weight is reduced. For the vehicle to remain stable at high speeds, it must be ensured that any lift generated must be minimized. The use of spoilers, though effective, increases fuel consumption. An integrated shape that minimizes lift and drag would be the best design for use in such vehicles, and this is what this research will try to show

Finalist

Name	Kok Xiu Ling Florence
School	NUS High School of Mathematics and Science
Mentor	Prof Chang Chan Fong, National University of Singapore, Department of Biochemistry
Project Title	Screening of Natural Compounds for Induction of Melanogenesis in Murine B16 Melanoma Cell Line
Category	Biochemistry

Melanin protects against ultraviolet radiation's (UV) harmful effects - the primary cause of skin cancer. Food sources with UV-B absorption abilities that increase melanin content in skin cells can provide natural protection against UV damage. They can supplement sunscreen usage, help achieve safe tans, or treat hypopigmentation. In this study, dragonfruit, galangal, leek and chives were screened for their ability to induce melanogenesis using murine B16 melanoma cells. Results showed increased melanin content with galangal and leek without toxic effects. These results indicate that leek and galangal possess potent stimulatory effect on melanogensis and have applications in skin protection creams.

Finalist

Name	Seah Wei Ling
School	NUS High School of Mathematics and Science
Mentor	Prof Chin Wee Shong, National University of Singapore, Department of Chemistry
Project Title	Synthesis and Characterization of Gold Nanotubes
Category	Engineering: Materials & Bioengineering

Gold nanotubes have been fabricated through electrochemical templating, and control over the morphology of these was achieved by tuning the duration of electrochemical deposition and pore-widening. These were obtained upon exposure of Polypyrrole-Au composite core-shell structure to dimethylsulfoxide. A second technique involves pore-widening without exposure to polypyrrole, a

method useful in synthesizing short nanotubes (? 500 nm). Scanning Electron Microscopy revealed morphology dependence of gold nanotubes on synthesis conditions. Conductive Atomic Force Microscopy measurements show semiconductor behavior in the gold nanotubes, a finding useful in the applications in electrical components.

Finalist

Name	Teo Ruijie Darius
School	Raffles Junior College
Mentor	Dr Zhang Yugen, Institute of Bioengineering and Nanotechnology
Project Title	Development of Mesoporous Polymer Particles and their Applications
Category	Chemistry

Catalyst supports are physical materials that support catalysts by increasing their surface area. These catalyst supports are heavily used in industries today to aid in the catalysis of various reactions. However, existing catalyst supports poses many problems. Although the mesocellular foam (MCF) can minimize the diffusion limitation problem, it consists of surface silanol groups that tend to interact strongly with catalytic complexes. In this project, a new class of catalyst supports known as the Mesoporous Polymer Particles (MPPs) has been developed for the first time. These MPPs posses all the important properties, such as ultralarge pores, uniform spherical particle morphology, and clean/inert surface.

Finalist

Name	Yin Jian Yang David
School	Raffles Junior College
Mentor	Dr Han Yu, Institute of Bioengineering and Nanotechnology
Project Title	Synthesis of Mesoporous Carbon Nanofibers
Category	Engineering: Materials and Bioengineering

Repeats are short DNA sequences which appear many times in the human genome. While once mistaken to be 'junk' DNA, recent findings have revealed that repeats probably play a regulatory role as transcription factor binding site, controlling protein transcription and gene expression. The purpose of the project is to find the number of overlaps between repeats and transcription factor binding site motis to determine whether repeats regulate protein transcription and gene expression.

Finalist

Name	Zhao Ye
School	NUS High School of Mathematics and Science
Mentor	Prof Sow Chorng Haur, National University of Singapore Physics Department
Project Title	Nanofabrication with Focused Sunlight
Category	Engineering: Materials and Bioengineering

We report an environmentally friendly and economical technique that facilitates the modification of CuO nanorods on a silicon substrate. Sunlight was collected and focused onto CuO nanorods by a hybrid device comprising of a refracting telescope coupled with a microscope lens aligned along the principle axis of a telescope. The burnt CuO nanorods samples display a variety of morphologies at regions which was expose to sunlight with different illumination periods and intensities. Localized conversion of nanomaterial from CuO to Cu2O after irradiation with focused sunlight was also achieved and further investigative work will be conducted.

A*STAR Talent Search 2007 Winners

The A*STAR Talent Search and Singapore Science & Engineering Fair 2007 Awards Ceremony took place on Wednesday, 18 April 2007 at the Matrix Auditorium, Biopolis. During the ceremony, a total of 137 students received award(s) from the Guest of Honour, RADM (NS) Lui Tuck Yew, Minister of State, Ministry of Education, in the presence of their mentors, teachers and parents. We would like to commend the students for their time and effort in their scientific work.

A*TS First Prize Winner

Winner:	Hang Hao Chuien
School:	Hwa Chong Institution
Project	Reflection Within Conics
Mentor:	Dr. Roger Poh Kheng Siong, Department of Mathematics, National University of Singapore

A*TS Second Prize Winner

Winner:	Teh Ming Hwang
School:	National Junior College
Project	Novel Miniaturized, Single-mode, and Zero-birefringence Silicon Ring Resonator
Mentor:	Dr. Lim Soon Thor, Institute of High Performance Computing

A*TS Third Prize Winner

Winner:	Sim Jingwei
School:	Raffles Junior College
Project	Glutaraldehyde & Oxo-lactose: Cross-linking Gelatin Microspheres for Hep3B Culture Systems
Mentor:	Asst Prof Tong Yen Wah, Department of Chemical & Biomolecular Engineering, National University of Singapore

A*TS Commendation Prize Winner

(In no particular order)

Winner:	Jiang Ling Fan
School:	Raffles Junior College
Project	Helical Mesoporous Silica from Achiral Cationic Surfactant Template
Mentor:	Dr. Han Yu, from the Institute of Bioengineering and Nanotechnology (IBN)

Winner:	Navin Brian Ramakrishna
School:	National Junior College
Project	Cdc42 Binding to IRSp53 Induces Filopodia Formation and Causes Localization of IRSp53 to the Leading Edge of Motile Cells
Mentor:	Dr Edward Manser, Institute of Molecular and cell Biology (IMCB)

Winner:	Wee Liang En, Ian
School:	Hwa Chong Institution
Project:	Elucidating the functional diversity of BCH/SEC14 domains
Mentor:	Associate Professor Low Boon Chuan, Department of Biological Sciences, NUS

Schools are awarded points according to the placement of their winning students.

First Prize:	Hwa Chong Institution
Second Prize:	National Junior College
Third Prize:	Raffles Junior College

A*STAR Talent Search 2007 Finalists

The A*TS short-listing interview round took place on 28 March 2007. Eight finalists were selected and will proceed to the final judging on 16 April 2007.

Here are the eight finalists and a short write-up of their projects:

Finalist	
Name	Chang Nong Shin Amelia
School	Raffles Junior College
Mentor	Dr Gil Alterovitz, Harvard Medical School / MIT
Project Title	Determination and Quantification of Functional Biofluid Proxies
Category	Medicine and Health Sciences

Biological fluids (biofluids) contain a wealth of prospective biomarkers, giving them vast potential for use in disease diagnosis and drug monitoring. While the accessibility and diverse range of proteins in biofluids make them an attractive option, an imperative concern is the loss of information when testing biofluids instead of actual tissues. As such, there is a need to establish which biofluids experience the least information dissipation for particular tissues, and are hence the most accurate proxies. This study utilizes an information theoretic approach to quantify the degree of information loss when examining specific biofluid proxies, identifying those with significantly informative profiles and compiling a reference set. Using this technique, novel and uncharacterized tissue-biofluid relationships were elucidated, expediting the search for biomarkers through narrowing the focus for clinical validation. This investigation has therefore laid the foundations for future work on biomarker discovery, serving as a biofluidome framework for more extensive investigations.

Finalist	
Name	Choo Yun Song
School	Hwa Chong Institution
Mentor	Dr Pemakorn Pitukmanorom, Institute of Bioengineering and Nanotechnology
Project Title	Cu 2+ ions immobilized in bisphosphonate-Cu 3 (PO 4) 2 nanoparticles can adsorb urea
Category	Engineering - Materials and Bioengineering

The common states in which Cu 2+ ions exist do not allow effective urea adsorbance. The insoluble copper salt is impermeable to urea, while the aqueous Cu 2+ ion is not easily separated from the aqueous medium upon binding to urea, since the resultant complex is also soluble in water. In this project, I have incorporated alendronate ions (under a class of osteoporosis drugs known as bisphosphonates) into an insoluble particulate copper phosphate foundation. The alendronate ion has several Cu 2+ -binding sites, which can bind to free Cu 2+ ions. These Cu 2+ ions that are bound to the particles can then bind to urea molecules. Thus, what I have done is to attach urea-binding Cu 2+ ions to an insoluble foundation, and this allows for easy removal of urea.

Finalist	
Name	Hang Hao Chuien
School	Hwa Chong Institution
Mentor	Dr Poh Kheng Siong Roger, National University of Singapore, Department of Mathematics
Project Title	Reflection within Conics
Category	Mathematical Sciences

In this project, I proved the theoretical observations of the behaviour of light paths that do not pass through the focus/foci within reflecting conics - ellipse, hyperbola and parabola. Within an ellipse, the light paths are tangent to either a confocal ellipse or a confocal hyperbola. Similarly, in the case of a hyperbola, the light paths are tangent to either a confocal ellipse or confocal hyperbola. For the reflecting parabola, the light paths were found to be tangent to a confocal parabola. The conditions for each of the different cases to happen were determined and confirmed. The challenge in using an analytical approach to prove the results was the complexity involved. The proofs to these results turned out to be non-trivial; a neat and elegant approach, in my opinion, was found using only elementary mathematics to prove these results.

Finalist	
Name	Jiang Ling Fan
School	Raffles Junior College
Mentor	Dr Han Yu, Institute of Bioengineering and Nanotechnology
Project Title	Helical Mesoporous Silica from Achiral Cationic Surfactant Template
Category	Chemistry

The synthesis of helical mesoporous silicas possessing chirality has attracted great attention, because this can give rise to new potential applications such as chiral catalysis. This project aimed to synthesize helical mesoporous silicas using a simple synthetic method involving only the achiral cationic surfactant template and silica source in a highly concentrated ammonia solution. This study also aimed to systematically control the particle morphology and helical conformation of the helical silicas by changing the concentration of ammonia solution as well as adding trimethylbenzene. The results showed that the simple system could successfully synthesize helical mesoporous silicas with well-defined morphologies. The morphology and the pitch length of the particles could also be controlled by changing the ammonia concentration. The addition of trimethylbenzene could further increase the compactness of the particles' helical conformation. These findings may be important for future fundamental studies and technical applications.

Finalist	
Name	Navin Brian Ramakrishna
School	National Junior College
Mentor	Dr Edward Manser, Institute of Molecular and Cell Biology
Project Title	Cdc42 Binding to IRSp53 Induces Filopodia Formation and Causes Localization of IRSp53 to the Leading Edge of Motile Cells
Category	Cellular and Molecular Biology

This project focuses on two proteins, IRSp53 and Cdc42 that play a part in regulating the cytoskeleton and hence essential for cell movement; in wound healing or the spread of cancer. To provide information about these proteins, HeLa cells, a well-studied cancer cell-line and NIH-3T3

fibroblasts were used. Results indicate interaction of Cdc42 with IRSp53 plays a role in regulating the cytoskeleton, and hence an important signaling molecule in this process. Furthermore, a proline-rich motif in IRSp53 is shown to be involved in proper scaffolding of IRSp53. These results allow better understanding in the processes controlled by IRSp53, such as events occurring during cancer metastasis or tissue restoration after an injury

Finalist

Name	Sim Jingwei
School	Raffles Junior College
Mentor	Dr Tong Yen Wah, National University of Singapore, Division of Bioengineering
Project Title	Glutaraldehyde & Oxo-lactose: Cross-linking Gelatin Microspheres for Hep3B Culture Systems
Category	Engineering- Materials and Bioengineering

Cells can be grown outside the body, attached to tissue culture substrates, until they are mature enough to replace damaged liver tissue in patients. Gelatin strands can be grouped and shaped into small, spherical structures called microspheres. While gelatin microspheres are advantageous as substrates, they are seldom explored for this purpose as they degrade quickly under culture conditions. While we can chemically bond or cross-link gelatin strands to slow down microsphere dissolution, common cross-linkers such as glutaraldehyde are toxic. This study demonstrates that gelatin microspheres can be made viable as tissue substrates if cross-linked by oxo-lactose, apparently biocompatibly. Extensiveness of cross-links formed in oxo-lactose- and glutaraldehyde-treated microspheres was similar. However, glutaraldehyde induced better particle morphologies, durability, by a different reaction mechanism. Cell performance on highly-cross-linked microspheres generally surpassed that on flat tissue substrates. Prior to degradation, cell performance on oxo-lactose-treated gelatin microspheres was still comparable to that on glutaraldehyde-treated microspheres.

Finalist

Name	Teh Ming Hwang
School	National Junior College
Mentor	Dr Lim Soon Thor, Institute of High Performance Computing
Project Title	Novel Miniaturized, Singlemode, and Zero-birefringence Silicon Ring Resonator
Category	Engineering- Electrical and Mechanical

Silicon photonics holds the key for data traveling at light speed and expansion to nearly limitless bandwidth. In a silicon photonics super chip, a Silicon-on-Insulator ring resonator is a crucial component in tuning to specific channels from this stream of data. In this paper, we introduced novel modifications into conventional ring resonators towards device size reduction, meeting the trend for high density integration and miniaturization. The two components of waveguide bends and directional couplers are addressed. The addition of waveguide bends on the concave region of the bends are found to have an effect of lowering bend losses rather than pulling apart the mode. In the area of directional couplers, a two silicon slice model have been invented to control modal overlap while maintaining polarization independence. This potentially creates a better methodology for designing ring resonators in increasing the capability of the ring resonator while maintaining low losses.

Finalist

Name	Wee Liang En, Ian
School	Hwa Chong Institution
Mentor	Prof Low Boon Chuan, National University of Singapore, Department of Biological Sciences
Project Title	Elucidating the functional diversity of BCH/sec14 domains
Category	Cellular and Molecular Biology

BCH (Bnip-2 and Cdc42GAP homology) domains are a novel class of protein-interacting domains. Canonical BCH domains have been implicated in various protein-protein interactions that confer upon them the ability to regulate cell dynamics. However, this domain is currently classified under lipid-interacting SEC14/CRAL-TRIO domains due to low sequence identity (~20%). We present findings on the classification of the BCH/SEC14 domain family, suggesting that BCH domains form a distinct class of protein-interacting domains from SEC14. However, residual lipid-binding in BCH domains may control their membrane localization and their regulation of cell morphology. In particular, we suggest a potential protein-interacting role for the BCH domain of the RasGAP neurofibromin; a finding that may be of value in elucidating the mechanisms of neurofibromatosis, one of the most common autosomal dominant disorders (1 in 3500 incidence).Taken together, these findings offer new insights into the complex role of BCH domains in cell dynamics and human disease.

A*STAR Talent Search 2006 Finalists

The A*TS short-listing interview round took place on 29 March 2006. Ten finalists were selected and will proceed to the final judging on 19 April 2006.

Here are the ten finalists and a short write-up of their projects:

Finalist	
Name	Sng Weizhong Jonathan
School	Raffles Junior College
Mentor	A/P Lim Tit Meng, Department of Biological Sciences, National University of Singapore
Project Title	Transient Expression of Mutant and Wild type forms of a-synuclein in Two Different Cell Lines Affects Cell Viability
Category	Biochemistry

The pre-synaptic protein, a-synuclein, has been associated with the pathogenesis of Parkinson's disease, as well as it being a major feature found in Parkinson's disease. The present study indicates that a-synuclein, but not its mutants can protect CNS dopaminergic cells from the parkinsonism-inducing drug 1-methyl-4-phenylpyridinium (MPP +), whereas MPP+ has no effect on non-dopaminergic neural blastoma cells. The study also indicates that the mutants have a greater neurotoxic effect on cells without MPP + challenge to a much larger extent then wild type (WT) a-synuclein.

Finalist	
Name	Wee Liang Yi Justin
School	Raffles Junior College
Mentor	Dr Liou Yih-Cherng, Department of Biological Sciences, National University of Singapore
Project Title	Biochemical and Structural Characterisation of the Prolyl Isomerase hPin1
Category	Biochemistry

Human Pin1 protein (hPin1) is a protein that encourages other proteins to change their 3-D shape. It is linked to cancer, especially breast cancer, and Alzheimer's disease. By understanding the structure and function of hPin1, better and more efficient drugs and therapies can be designed. This project aims to genetically engineer bacteria that produce hPin1 and two other equivalents of this important protein found in other organisms. The hPin1 protein is then filtered out and purified. The structure of pure hPin1 will then be determined at various temperatures and salt concentrations using a technique known as Circular Dichroism.

Finalist	
Name	Liew Jia Ren
School	Raffles Junior College
Mentor	Dr Toshiro Ito, Temasek Life Sciences Laboratory
Project Title	Creating Post-Translational Switches from Various Steroid Receptors
Category	Botany

The action of the three classes of ABC homeotic genes determines the organs that develop at each location of the flower. However, the cascades downstream of the ABC genes leading to floral organ expression remain unknown. To investigate downstream targets of ABC genes, we aim to create a system of independent switches utilizing various mammalian steroid hormone receptors. We obtained plasmid constructs containing cDNA clones encoding for various Ligand Binding Domain (LBD)-coding regions of the steroid receptors and a Green Fluorescent Protein (GFP) gene. These plasmids were bombarded into leek cells. From our results, Androgen Receptor and Estradiol ?N?C Receptor both demonstrate high potential as switches.

Finalist

Name	Gao Guangyan
School	Raffles Junior College
Project Title	Design and Construction of a Dual Rail Electro-magnetic Acceleration System
Category	Engineering

This project is about the design and construction of an acceleration system which uses the power of electro-magnetism to accelerate a vehicle, down two parallel conductive rails. A system was successfully designed which was demonstrated to be workable and controllable. The results of this study are useful for acceleration systems utilizing electromagnetism, such as alternative transportation systems, entertainment rides, and other military or commercial uses.

Finalist

Name	Oon Jian Sara
School	Raffles Junior College
Mentor	A/P Lee Loh Hay, Department of Industrial and Systems Engineering, National University of Singapore
Project Title	The Impact of Ordinal on Response Surface Methodology
Category	Engineering

Traditionally, Response Surface Methodology (RSM) is cardinal in nature. Ordinal optimization was only introduced recently. Since ordinal optimization has been proven to be successful in certain applications, this paper aims to investigate whether ordinal optimization improves RSM by developing ordinal RSM and comparing it with cardinal RSM in terms of efficiency, accuracy and consistency. Assuming that the performances of systems can be expressed as functions of their parameters, both ordinal and cardinal RSM are simulated for several simple multivariable mathematical functions and the effectiveness of ordinal RSM evaluated. It was found that ordinal does not always improve RSM, especially in functions which exhibit a large gradient change over a small region.

Finalist

Name	Hang Hao Chuien
School	Hwa Chong Institution (College)
Mentor	Mr Hang Kim Hoo, Ministry of Education
Project Title	Approximation and Mathematical Induction in Ellipses
Category	Mathematics

This project focuses on using some simple properties of an ellipse to investigate two related problems. The first investigation confirmed the accuracy of an age old practice of constructing an approximate ellipse in isometric drawings using arc of circles. The significance of the results lies in

paving the way for the development of further knowledge in analytic and differential geometry. The second part of this investigation confirmed a well-known observed property of ellipses, the proof of which is not available. The significance of this proof is the inherent beauty of the approach itself, mathematical induction that is used. This also indicates a nice mathematical structure that underlies ellipses.

Finalist

Name	Zhao Yan
School	Raffles Junior College
Mentor	A/P Tay Tiong Seng, Department of Mathematics, National University of Singapore
Project Title	List T r -colouring of Graphs
Category	Mathematics

Radio and television signals are known to interfere and may be disrupted, thus it is essential that the frequency you are broadcasting at will not interfere with existing signals. In the increasingly crowded air space, it is important to conserve frequencies available. This project examines a mathematical model of it using graph colouring with a set that represent the interfering frequencies. Specifically, we search for the minimum value of frequencies each station must be able to transmit for which we can choose such they will not interfere. This problem is still not solved generally and we proved some important results.

Finalist

Name	Low Wen Xi Aylwin
School	Hwa Chong Institution (College)
Mentor	Dr Ning Wang, Harvard School of Public Health
Project Title	Mitochondrial Movement Responses to Local Mechanical Forces
Category	Physics

Mitochondria are the energy-producing units within the cell and their movements ensure the efficient delivery of energy. Using a fluorescent-delivery method, we observed the motions of mitochondria when the cell was subjected to mechanical forces and found out that there was an increase of 32.5% in mitochondrial movement. This result suggests that mechanical forces can be used to stimulate mitochondrial movement so as to prevent diseases (such as Alzheimer's, a neurodegenerative disease) which result from insufficient energy being delivered such that cell functions and cell growth are not optimum.

Finalist

Name	Koh En Da Matthew
School	Hwa Chong Institution (College)
Mentor	Prof Ip Yuen Kwong, Department of Biological Sciences, National University of Singapore
Project Title	The Climbing Perch, Anabas testudineus, is capable of Active Transport of NH 4 + against a Concentration Gradient
Category	Zoology

This project aimed to determine if the climbing perch, Anabas testudineus (Bloch, 1792), was capable of excreting NH 4 + against a concentration gradient through active transport. It was shown

that A. testudineus was capable of doing so for at least up to 3 days when exposed to an initial NH 4 Cl concentration of about 13 mmol l -1 . Over the 3-day period, the average ammonia excretion rate rose from 8.53 µmol day -1 g -1 fish on day 1 to 46.3 µmol day -1 g -1 fish on day 3. The ambient ammonia concentration doubled to an average of 26.6 mmol l -1 at the end of the 3-day period. By contrast, urea concentration only rose from 0.005 mmol l -1 at 0 h, to 0.060 mmol l -1 , which indicates that A. testudineus did not detoxify ammonia to urea for excretion, and therefore it is primarily ammoniotelic in water or in NH 4 Cl solution.

Finalist	
Name	Soh Zhi Qi
School	Raffles Junior College
Mentor	Mr Ng Thiam Poh Daniel
Project Title	Modelling and Fusion of Animal Sensory Systems of Vision and Echolocation for Target Tracking
Category	Zoology

Animals have developed a keen sense of vision and hearing for various reasons, one of which is to track and hunt down prey. This project aims to mimic the well-developed senses in animals so that scientists and engineers can harness the benefits of these senses to develop and enhance artificial target tracking system, which are less efficient and accurate than animals' senses. These target tracking systems are important in civilian uses such as tracking traffic during peak hours or tracking commercial planes taking off and landing to ensure safety.

A*STAR Talent Search 2006 Winners

The A*STAR Talent Search and Singapore Science & Engineering Fair 2006 Awards Ceremony took place on Friday, 21 April 2006 at the Matrix Auditorium, Biopolis. During the ceremony, a total of 151 students received an award from the Guest of Honour, Mr Gan Kim Yong, Minister of State for Education and Manpower in the presence of their mentors, teachers and parents. We would like to commend the students for their time and effort in their scientific work.

This year, 86 secondary and junior college students participated in A*STAR Talent Search. Of these, 10 finalists were selected for the final judging where they faced a panel of distinguished judges, which were led by the Chief Judge, Prof Barry Marshall, a Nobel Laureate in Medicine in 2005.

After much consideration, the winners of the A*TS 2006 emerged:

First Prize Winner

Winner: Zhao Yan

School: Raffles Junior College

Project: List Tr-colouring of Graphs

Second Prize Winner

Winner: Wee Liang Yi Justin

School: Raffles Junior College

Project: Biochemical and Structural Characterisation of the Prolyl Isomerase hPin1

Third Prize Winner

Winner: Soh Zhi Qi

School: Raffles Junior College

Project: Modelling and Fusion of Animal Sensory Systems of Vision and Echolocation for Target Tracking

A*TS Commendation Prize Winner

(In no order of ranking)

Winner: Hang Hao Chuien

School: Hwa Chong Institution (College)

Project: Approximation and Mathematical Induction in Ellipses

Winner: Low Wen Xi Aylwin

School: Hwa Chong Institution (College)

Project: Mitochondrial Movement Responses to Local Mechanical Forces

Winner: Oon Jian Sara

School: Raffles Junior College

Project: The Impact of Ordinal on Response Surface Methodology

A*TS Special Mention Prize

Winner: Gao Guangyan

School: Raffles Junior College

Project: Design and Construction of a Dual Rail Electro-magnetic Acceleration System

Schools are awarded points according to the placement of their winning students.

First Prize: Raffles Junior College

Second Prize: Hwa Chong Institution