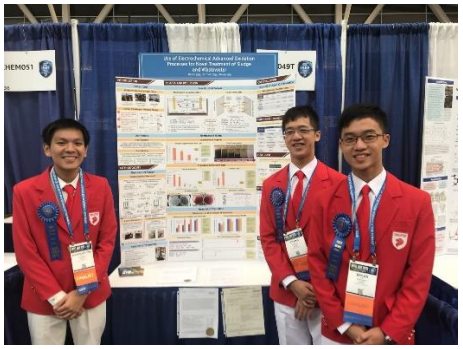
INTEL-ISEF 2018 WINNERS

Full Title of Award	Student	Project
1st Award in the Chemistry Category and a Special Award from Thermo Fisher Scientific	**Dominic Yap, Bryan Lim, and Shawn Lim (IP Year 6)** Hwa Chong Institution 	**Novel Chemical Method for Eco-Friendly Treatment of Sludge** Research on a novel hybrid electrochemical method to treat sludge in an environmentally friendly manner. The team embarked on a research project to remove bacteria and organics from sludge produced by a local farm. Turning to Electrochemical Advanced Oxidation Processes (EAOPs), which is an emerging wastewater treatment technology, the team created a novel hybrid method using two EAOPs - the Electroperoxi-Coagulation and the Electro-Fenton reaction - to treat their sludge samples. Besides removing bacteria and organics from the sludge, the hybrid method was also shown to be environmentally-friendly because minimal use of chemicals was involved in the process. The team hopes that their technology will be scaled up and used by the farming industry in future. They envision an integrated sludge reactor system where sludge samples can be treated in a continuous flow, serving as a more convenient and viable alternative compared to the multi-step treatment processes currently used in the industry. Through the research journey, the team understood the importance of tenacity and learnt more about the industry.

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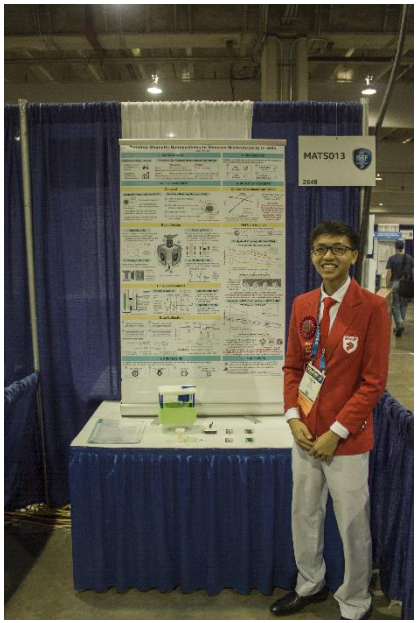
2nd Award in the Materials Science Category	**Koo Wei De (Year 6)** National Junior College  	**Rotating Magnetic Nanoparticles for Measurement of Gel Microviscosity** Developed a new way of measuring gel microviscosity using magnetic nanoparticles. Hydrogels have been widely studied for their application in drug delivery systems, and a key factor in controlling the drug release is the microviscosity of the gel, which is time-consuming to measure. Aiming to devise a novel approach to measure gel microviscosity more efficiently, Wei De constructed a low-cost system can measure gel microviscosity in 10 minutes compared to typical measurements, which minimally takes 30 minutes. This allows for fast indication of drug diffusion rates, which is important for gel development. Wei De conducted his research under the mentorship of Dr Yakovlev Nikolai from Institute of Materials Research and Engineering. Wei De shared that his research journey was a fulfilling one which encouraged him to dive deeper into engineering and joining Intel ISEF was a rare opportunity to meet fellow scientists from abroad.

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3rd Award in the Chemistry Category and a Special Award from Spectroscopy Society of Pittsburgh	**Kee Jin Wen (Year 6)** National Junior College 	**Developing an On-line Optical Biosensor to Monitor Drug Production** Constructed an optical biosensor to monitor drug production. In light of the changing manufacturing processes in the pharmaceutical industry from batch processes to continuous processes, Jin Wen developed an optical biosensor to monitor concentrations of small molecule metabolites in real time. This allows operators to monitor the condition of the cell culture within the bioreactor. Data obtained from his experiments proved that this technique could be applied in the monitoring of bioprocesses on an industrial scale. Jin Wen conducted his research under the mentorship of Dr Yakovlev Nikolai from the A*STAR Institute of Materials Research and Engineering. Jin Wen felt that he has learnt much through interacting with scientists and sharing his project with other like-minded individuals.

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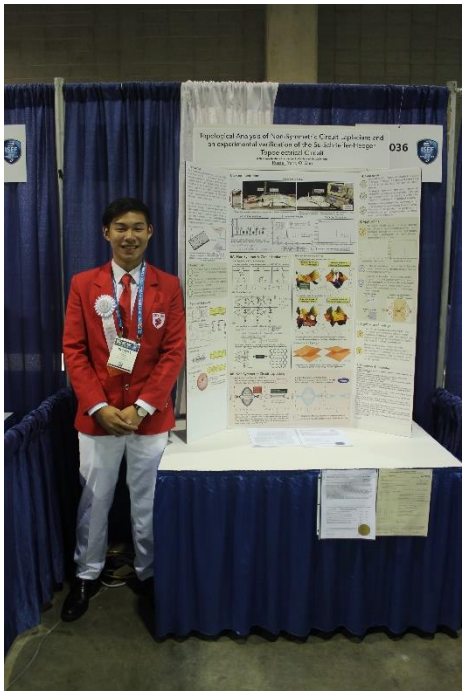
3rd Award in the Physics and Astronomy Category	**Russell Yang (Year 6)** NUS High School of Math and Science 	**A Topological Perspective on Electrical Systems** Created an inexpensive way of using electrical circuits to study the properties of exotic materials, such as graphene, and other topological insulators. Studying real materials is typically very abstract, and require sophisticated equipment costing millions. For his project, Russell used electrical circuits to mimic the structures of real materials, to create an inexpensive and intuitive way of studying the phenomena exhibited by exotic materials such as graphene and other topological insulators. Through his research, he created what could be the most inexpensive demonstration of topological insulators in the world, potentially slashing costs by over 99%. This project provides a bridge between electrical engineering and material science, where the scalability and accessibility of electrical circuits allows one to intuitively study real materials. Russell conducted his research under the mentorship of Dr Lee Ching Hua from A*STAR Institute of High Performance Computing. Russell experienced what it was like to push the forefront of scientific knowledge, which was both rewarding and enlightening. Russell felt that the most exciting part of ISEF was interacting and sharing research experiences with students of a similar interest on an international platform.

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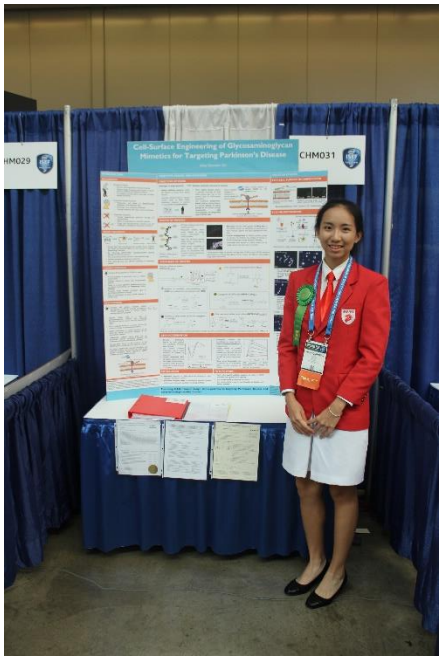
4th Award in the Biochemistry Category	**Vicky Qu (Year 6)** Raffles Institution  	**A Synthetic Molecule with Potential in Targeting Parkinson's Disease** Synthesised a molecule that targets neurons in the brain, which may lead to a new noninvasive treatment for Parkinson's disease. Vicky's project could lead to the development of a new method for treating Parkinson's disease through the stimulation of mid-brain neurons. She synthesised a molecule that was able to be incorporated into a cell membrane and attract the proteins to the cell surface, stimulating neurite outgrowth. This material, if transplanted in the brain, could potentially allow neuron differentiation and dopamine production, effectively treating Parkinson's without requiring open surgery. Vicky conducted her research under the mentorship of Dr Song-Gil Lee from the A*STAR Institute of Bioengineering and Nanotechnology. Vicky felt that the Intel ISEF was a great platform for students to interact with friends from all over the world who share a passion for science.

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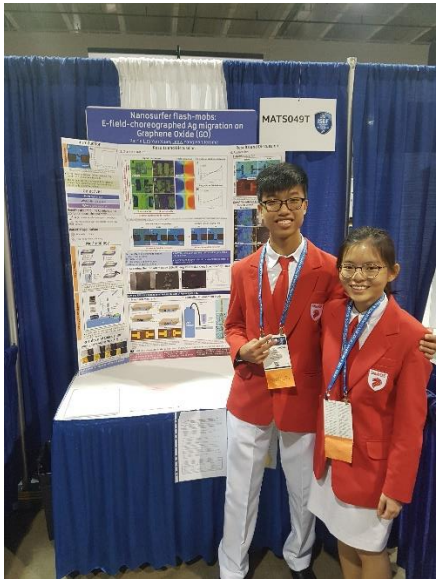
	Jerome Leow Yong Han **Patria Lim Yun Xuan (IP Year 6)** Dunman High School  	**Nanosurfer Flash Mobs: E-field-choreographed Silver Migration on Graphene Oxide** Jerome and Patria embarked on an in-depth study of the migration of silver nanoparticles under the influence of an electric field on graphene oxide, a two-dimensional material. The team titled their project Nanosurfer Flash Mobs as the silver nanoparticles move across graphene oxide quickly through water, and can appear and disappear in seconds. After understanding its mechanism, they were able to control silver migration on graphene oxide successfully. This could pave the way for alternative simple nanoparticle assembly methods. They conducted their research under the guidance of Dr Sharon Lim Xiaodai and Prof Sow Chorng Haur from NUS Nanomaterials Research Lab. Jerome felt that their research journey was very enriching and is especially grateful for this meaningful experience. Patria shared that meeting and interacting with other students who are passionate in very diverse fields made Intel ISEF an exceptionally eye-opening experience for her.