Life from beyond

When comets and asteroids hit the Earth during the early history of our solar system – they delivered essential molecules that developed into life as we know it. Kitty’s work explores the idea that life on Earth may have emerged in “terrestrial hot spring” environments whose wet-dry cycles allow the combination of these molecules to form early in life. By studying biosignatures in silica-rich hot spring deposits as analogs of features observed with NASA’s Mars rovers, Kitty’s work can also help direct our search for extra-terrestrial life.
DR AUGUSTO BARBOSA

Effects of space flight to our microbiome

With the prospect of extended duration human spaceflight becoming a reality, studies into the behaviour of the human microbiome in microgravity are vital. Rather than studying the relatively complex case of gut microbiota, Augusto and Yen-kai’s work focuses on understanding how low gravity affects the simpler human vaginal microbiome.

EIRIAN PERKINS

Digital Archival in DNA

How can we safely secure data over years, decades or even centuries? Eirian explores the coding possibilities of DNA as a robust and long-term alternative to traditional digital storage.
Mitochondria and heat stress

Hearts are the first organs to fail in animals exposed to heat stress and for many species, their upper temperature limits are only a few degrees from current environmental temperatures. Tony's work focuses on mitochondria, a link between all multicellular organisms and a source of insight into species adaptation and disease states. Tony discussed the theory that heat-stressed cardiac mitochondria drive heart failure.

Havoc in the Paddock

Director of the Auckland Program for Space Systems, Jim Hefkey shared the idea of developing a national “P-Sat” challenge where university students design and build a payload to be launched a km above the Earth using kitset rockets at the “Havoc in the Paddock” launch event in 2020. These payloads will conduct science experiments as they return to Earth under parachute.
Detecting Earthquakes from Space

The APSS student-designed QuakeTEC satellite launching later this year carries a “Langmuir probe” which will measure the electron density in the ionosphere to determine the feasibility of detecting earthquakes in advance. This project tests a debated theory, that seismic activity in the earth’s crust creates signatures in the ionosphere, a region of the atmosphere between 60 to 1000 kilometers above the earth’s surface.

The role of magma in re-distributing water in Earth’s upper mantle

Michael’s work investigates which dynamic processes are most critical for creating and maintaining heterogeneity in the Earth’s mantle.

By looking at mechanisms which re-distribute water in the mantle, Michael hopes to better understand how localized variations in water control mantle melting and may influence planetary tectonics.
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**STEVEN TURNBULL**

Complex network analysis

How individuals, their characteristics and their actions inter-relate falls within the work that Steven is doing. The complex networks that exist between individuals can be analysed with increasingly sophisticated analysis methods. As part of his PhD research, Steven is utilising these methods to explore why students chose to study in STEM-related fields.

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**The Latest Generation of Climate Models**

Despite their significant influence on climate, clouds still represent the largest source of uncertainty in modern climate models. In an attempt to correct these biases, the research team is using satellite data to identify whether the right amount (and type) of cloud is represented in the climate models relative to satellite observations.

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**DR TRA DINH**
Solving the Space Junk Problem

With the increasing global use of space comes the problem of “space junk” - orbital debris in the form of defunct satellites and rocket parts that cause serious risk of collision for live satellites. The KESSLER team has designed an electrodynamic tether aimed at reducing the de-orbiting time of satellites from potentially hundreds of years down to ten, and if implemented globally, could reduce the currently increasing trend of space junk in Low Earth Orbit.

Seeing Beneath the Sea: Our Marine Megafauna in the 3-D Ocean Space

The 1.2 million hectare Hauraki Gulf marine park is home to a wide range of “megafauna”: birds, whales, dolphins, sharks and their prey. Rochelle’s work explores techniques to more efficiently survey the area, including using large drones to survey the gulf from above. Her work has shown the importance of thinking of the Gulf temporally as well as spatially - what we see in the warm water months is quite different than the cold water months. This new understanding will help humans better manage and protect this important space.
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MAHIMA SETH

Team KOIOS

Mahima Seth is using her experience in the Royal New Zealand Air Force and as an Avionics Technician at Rocket Lab to inspire the next generation of space scientists and engineers through her work with the undergraduate Auckland Program for Space Systems. She and fellow students will design and build an open-source satellite with the aim of engaging NZ school students with STEAM subjects and showing them that their “out of this world” dreams are within their grasp.

HAMISH JELLYMAN

Exploring Antarctica through data

Hamish took us through his journey exploring the classification of geographic regions in Antarctica using statistical techniques and weather data.