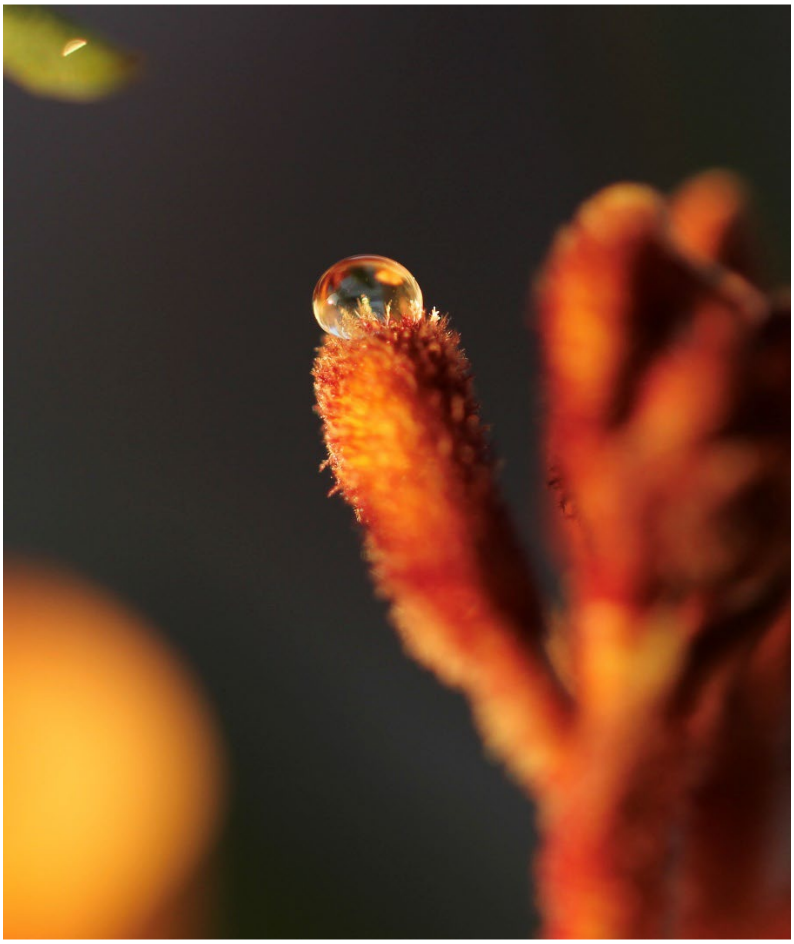
PhD student photo competition winners

WINNER of Best Image Prize

Nature's Cleanser
Anna Curran, Department of Mathematics

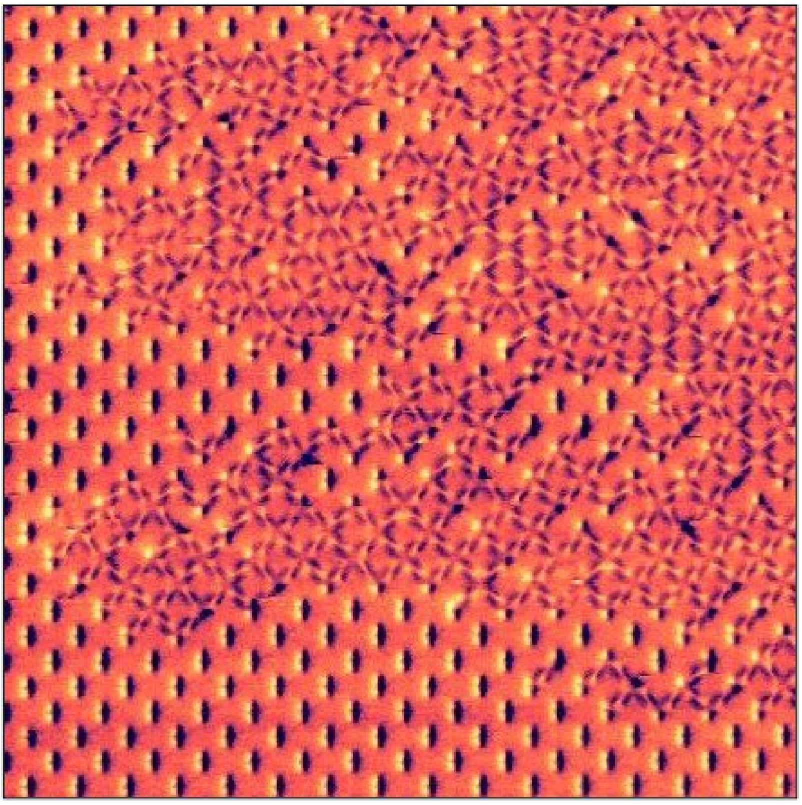
A water droplet resting on a kangaroo paw plant. This is an example of a superhydrophobic surface, which occurs naturally on many different plants and animals, and is nature's way of cleaning itself. The microscopic hairs covering the plant create a textured interface which allows the droplet to be supported perfectly, and as the droplet moves it will collect any dirt and grime lying on the surface. My research focuses on how to model this phenomenon mathematically, in order to replicate it for various industrial applications in pharmacy, technology and medicine.



RUNNER-UP Best Image Prize

Magnetic River Delta
Holly Holder, Department of Physics

This is a 16.5μm x 16.5μm image of a system of tiny magnets, each ≈1000 times smaller than a human hair. These nanomagnets generally behave like the bar magnets we encounter at school, with a North and South pole. However, under certain special conditions these nanomagnets can turn into vortex states, where their magnetism forms a whirlpool-like shape inside the bar. These nanomagnets are close enough to interact with each other and can display collective and emergent behaviours. This image was taken in a state where many neighbouring bars have turned into vortices, forming connected patterns. This image shows the strength of the magnetic field across the system.



WINNER People's Choice Award

Powering the future

Theo Hembury, Department of Life Sciences

The key to creating a more sustainable future is below our feet. Soil is home to millions of bacteria that, under the right conditions, can be used to generate electricity. By placing soil in a fuel cell, excess electrons produced by bacteria during growth can be exploited to produce electricity. My PhD research at Silwood park aims to identify how widespread electricity production by bacteria is, which bacteria within soil are best at producing electricity and how bacterial interactions can enhance or hinder electricity production.

SHORTLISTED

Bringing the Cosmos to Earth: Recreating Astrophysical Shocks in the Lab

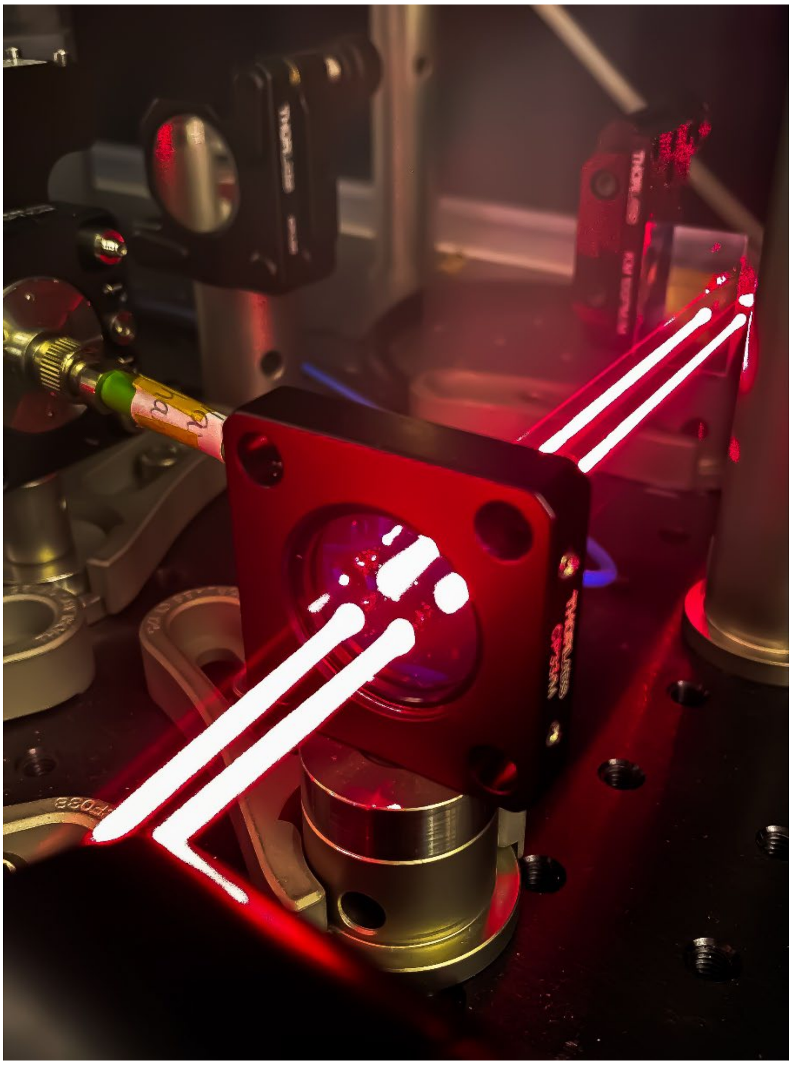
Stefano Merlini, Department of Physics

This long-exposure photograph was captured during an experiment at the MAGPIE pulsed-power generator facility. The experiment was designed to investigate collisionless shocks resulting from the interaction between a supersonic plasma plume and a magnetised ambient plasma. The ambient plasma flow was generated by the ablation of 22 thin-metallic wires in a cylindrical array (on the right side), while the plasma plume was produced by laser ablation of a plastic rod (on the left side). The image reveals multiple shock structures formed when the ambient plasma flow collides with the plastic rod holder.

Laser beams for cooling atoms

Elizabeth Pasatembou, Department of Physics

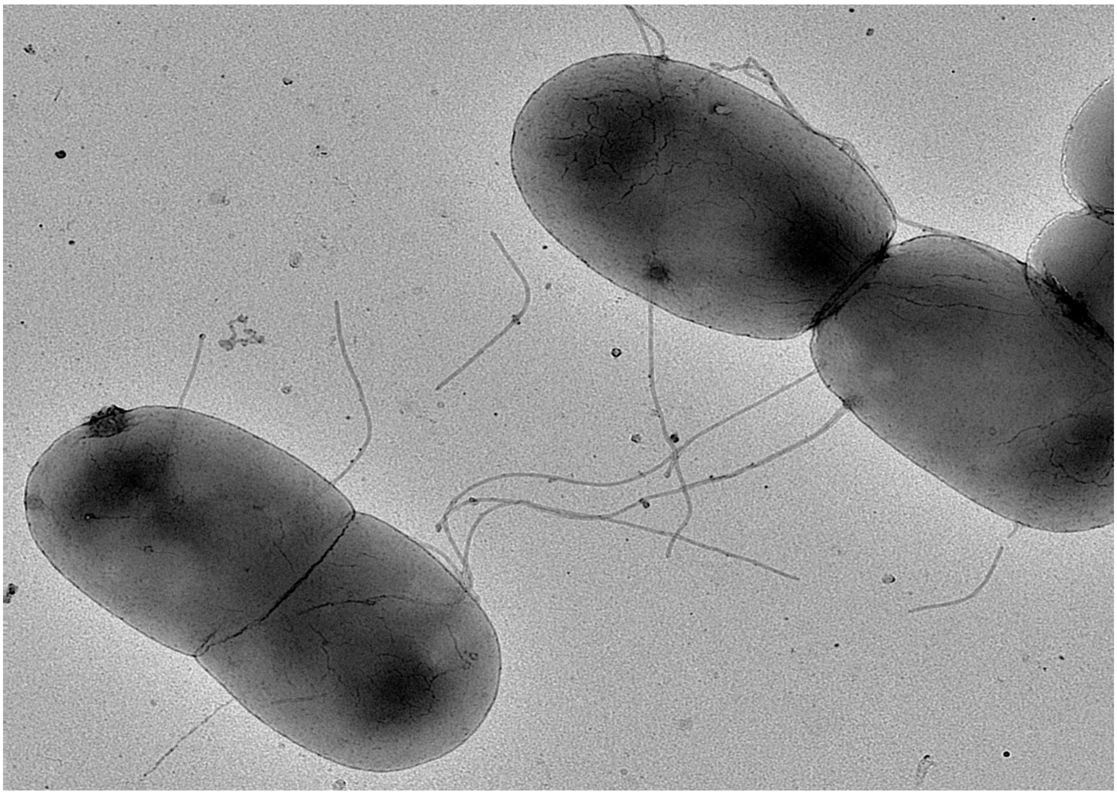
The picture shows some of the equipment used to cool atoms down to extremely cold temperatures and subsequently, enable potential detection of dark matter and gravitational waves. The two beams shown come from a special tool (an acousto-optic modulator) which changes the direction and frequency of part of the input beam. The beams then pass through a lens which is used to make the beams parallel. The prism in the back is used to reflect the beam back towards the lens and the rest of the equipment used to achieve extremely cold atom temperatures.



Caught in the act – bacteria propagating antibiotic resistance

Jonasz Patkowski, Department of Life Sciences

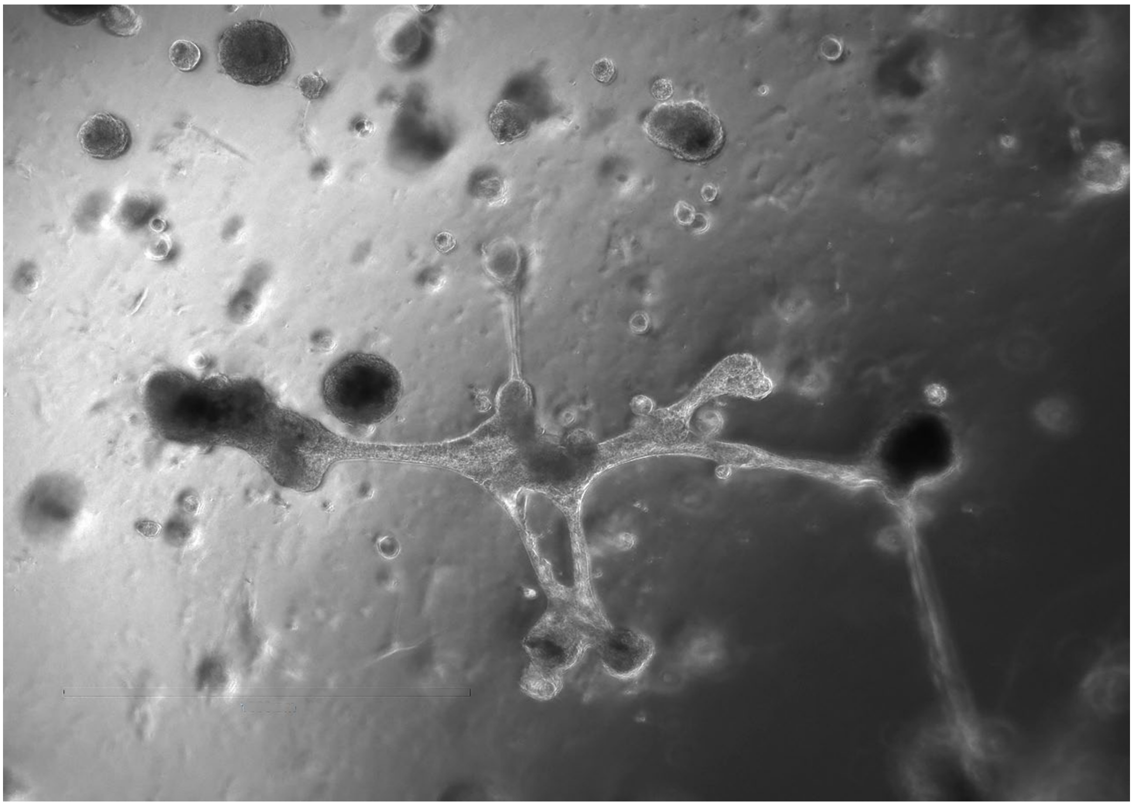
Improper use of antibiotics leads to development of antibiotic resistance among bacteria, which protects them from the action of antibiotics. Resistance mechanisms are encoded on genes, which can then be inherited by daughter cells after bacterial division, a process known as vertical gene transfer. During cell division, E.coli form a Z-ring, which helps to separate dividing cells. Bacteria can also transfer antibiotic resistance genes to neighboring cells (horizontal gene transfer), turning naïve bacteria into antibiotic resistant bacteria. This mysterious process is mediated by the F-pilus, which serves as a conduit for the transfer of drug resistance DNA. In this electron-microscopy image, you can admire both processes occurring simultaneously.



The crux of breast cancer organoids

Claudia Sanchez Cabanillas, Department of Chemistry

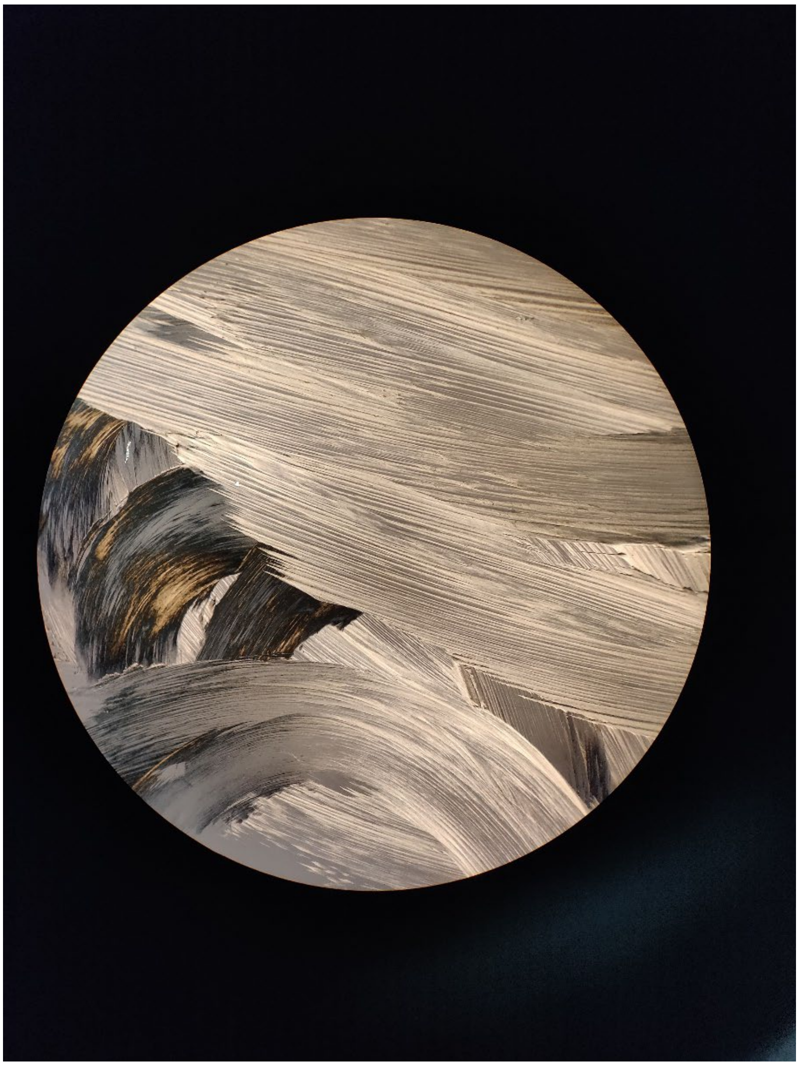
Creating disease models for breast cancer is an onerous task. To make organoids, we take breast cancer biopsies from patients, isolate single cells, and grow them on plates with a mix of proteins that keep them alive and transform them into patient-specific models of disease. Organoids are 3D cultures of living cells, and they can recapitulate the living environment of cancer cells better than ever before. However, they present with many technical challenges, and they turn into organisms that we first need to get acquainted to. Much work is left to do, but the applications of organoids are immense.



Carbon nanotube dispersion in ionic liquid

Zoyia Kamora, Department of Chemistry

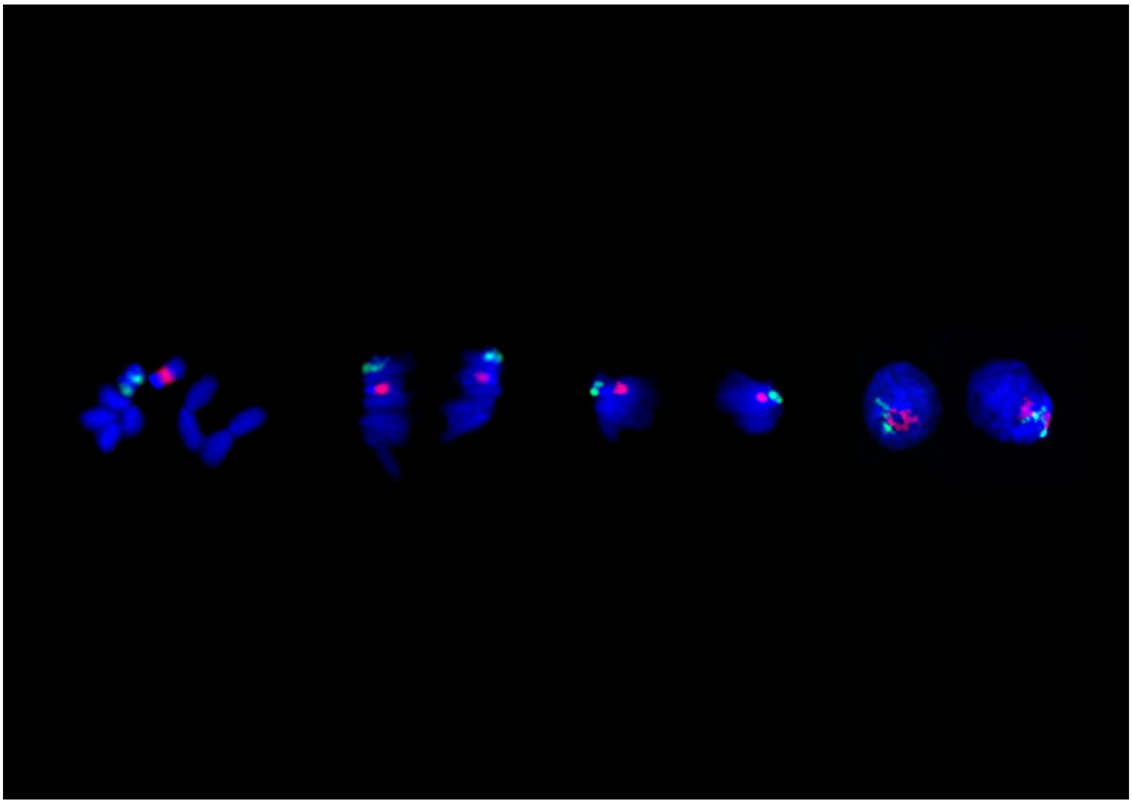
The phenomenon that is displayed is known as birefringence. The smooth streaks could be mistaken for paint brush strokes flowing in the same direction. Here we see interesting environments that are exactly opposite in colour and can be seen by using a polariser on a microscope. The carbon nanotubes formed a liquid crystal phase which is apparent by the presence of colour or 'silver'. The streaks would otherwise appear completely dark or black. Two polarisers crossed at a certain angle will enable birefringent properties.



Shedding light on cell division of the main malaria vector

Matteo Vitale, Department of Life Sciences

This series of photographs depicts different stages of cell division obtained from the stem cells of Anopheles gambiae mosquito' testis. Every year, this species is responsible for more than 500 000 malaria deaths only in Sub-Saharan Africa and it's considered one of the most dangerous animals on earth. Anopheles mosquitoes have 3 pairs of chromosomes: 2 pairs of autosomes and a pair of sex chromosomes called X and Y. In our lab, we use Fluorescent In Situ Hybridization (FISH) to stain the sex chromosomes and study sperm development process. This knowledge could help the development of novel strategies based on genetic modification to control mosquito populations



Light and Matter

Sumer Jaitly, Department of Physics

Theoretical physics research is not the most straightforward subject to capture in a still image. For most who research the subject, the main tools of the trade are all depicted here, in one still, chalky and sunny corner of the Huxley offices. Whilst enjoying the warmth of the morning, one can’t help but appreciate that the dazzling light, it’s interaction with the board and the star from which it was born, were all first described and understood in dull offices much like this one, by people who stared at blank chalkboards.

FINESSE'd

Sanjeevani Panditharatne, Department of Physics

Pictured here is the Far-INfrarEd Spectrometer for Surface Emissivity (FINESSE) at the ALOMAR Observatory in Andøya, Norway. This instrument is measuring downwelling infrared radiation in the presence of high-altitude ice clouds. These clouds absorb, scatter, and reflect infrared radiation based on the properties of the ice crystals that compose them. An aircraft flies through the cloud to measure these properties directly, its contrail is in the top right corner as it flies away. Using these, we can link the nature of the cloud to its impact on the Earth’s Radiation Budget.