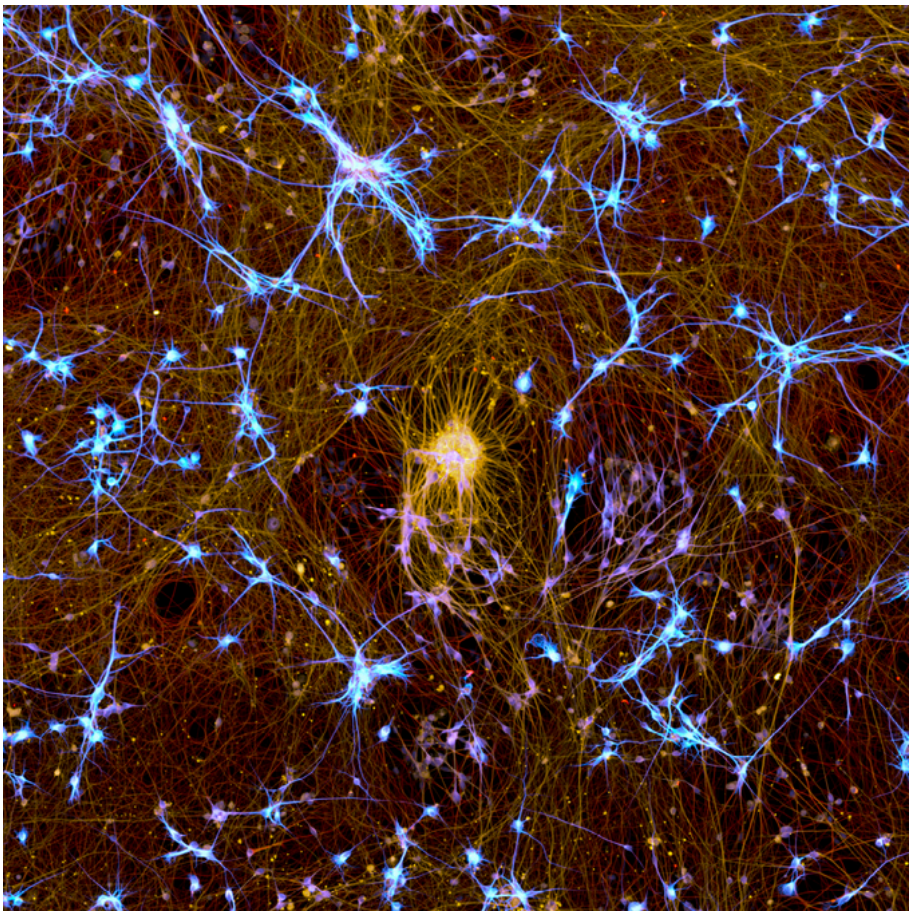
Human neurons reprogrammed from skin cells

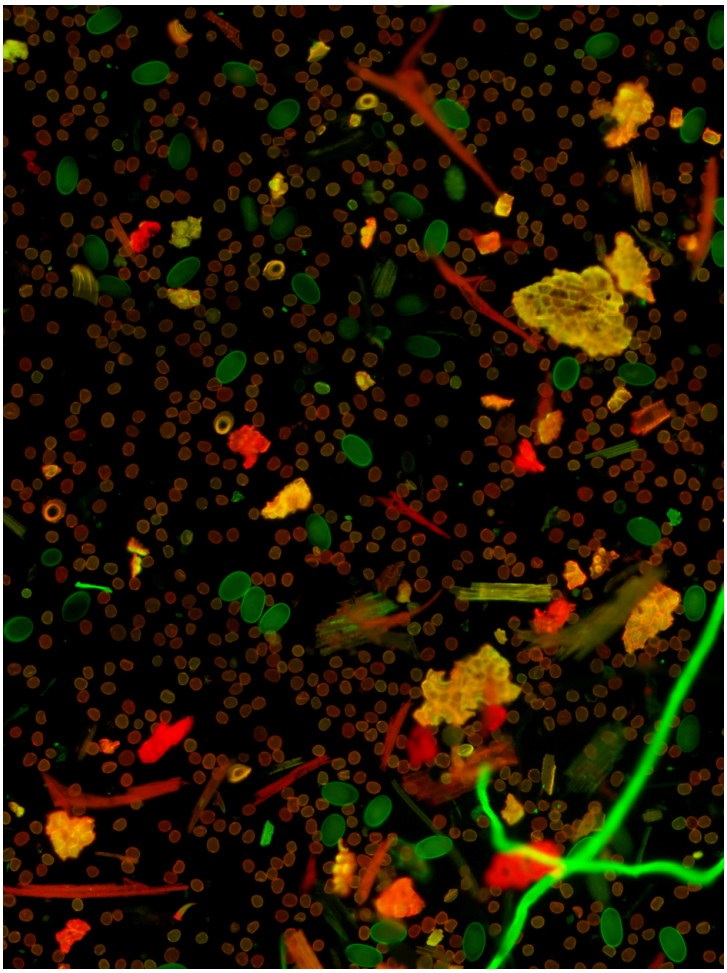
Bruno Cisterna



The image is an immunofluorescence of fixed induced pluripotent stem cells (iPSCs) after 24 days of differentiation. The magenta color represents the microtubule-associated protein 2 (neuronal marker), cyan is the microtubules, and yellow is the nuclei. This reprogramming technique allows human somatic cells, such as skin fibroblasts, to be converted into neurons, providing a powerful *in vitro* system to model neurological development and disease. In the broader context of life science techniques, iPSC-derived neurons enable researchers to study patient-specific neurobiology, conduct drug screening and investigate mechanisms of neurodegeneration using human-relevant cellular models. Such approaches are essential in personalized medicine and the development of targeted therapeutics for disorders like Alzheimer's, Parkinson's and ALS.

Microscope: Nikon CSU-W1 SoRa Spinning Disk Confocal Microscope
Camera: Hamamatsu ORCA-Fusion BT
Objective lens magnification: 40x

Acknowledgement: Department of Neuroscience & Regenerative Medicine at Augusta University (GA, USA).



Sheep fecal sample

Paul Slusarewicz

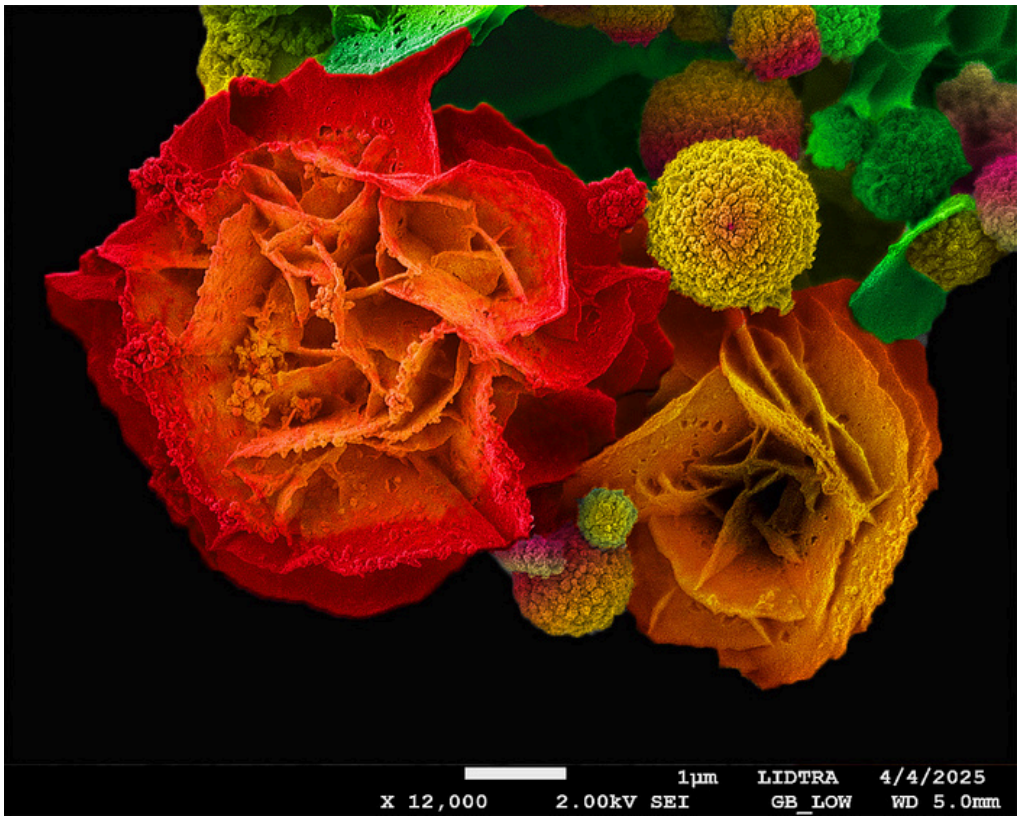
Sheep fecal sample containing fluorescently labeled ova of *Haemonchus contortus*, an internal pathogenic nematode parasite of ruminants. An ovine fecal sample was treated with a fluorescent derivative of peanut agglutinin, which binds only to this particular trichostrongle's egg and allows it to be differentiated from other species. *Haemonchus* infection is a significant cause of death in lambs, and this observation has facilitated the development of a simple, rapid on-site test for this economically important pathogen.

Microscope: OMAX fluorescence microscope
Total magnification: 40x

Acknowledgement: Parasight System Inc. (KY, USA)

Bouquet of apatites

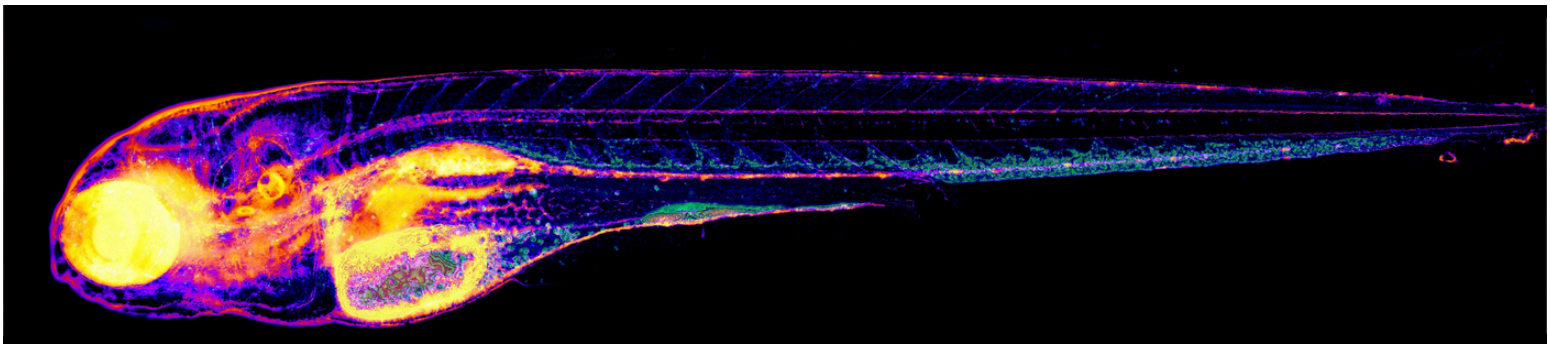
Liliana Naranjo & Juana Yesenia Ramos Martínez



This micrograph illustrates the formation and growth of apatite crystals on the surface of a $Ca_7Si_2P_2O_{16}$/0.6$(Na_{0.5}Bi_{0.5})TiO_3$–0.4$(K_{0.5}Bi_{0.5})TiO_3$ composite (50:50 ratio) after 7 days of immersion in simulated body fluid (SBF), which mimics the ionic composition of human plasma. The image reveals two distinct microstructures: petal-like formations enriched in Ca, Mg and O, and spherical bud-like structures rich in Ca, P and O. These morphologies reflect the biomineralization process crucial for bioactivity assessment. Within the broader field of life science techniques, this test aligns with ISO 23317 standards to evaluate materials for bone tissue engineering. Promoting *in vitro* apatite formation indicates potential for osseointegration, making this composite a promising candidate for regenerative applications. The floral analogy underscores the material's potential to foster new tissue growth, reflecting nature's own regenerative mechanisms.

Microscope: JEOL JSM-7610F Field Emission Scanning Electron Microscope (FE-SEM)
Total magnification: 12000x

Acknowledgement: The synthesis of the ceramic composite and the development of the bioactivity experiments were conducted at the Centro Nacional de Proyección Térmica (CENAPROT), while the micrograph was obtained using Scanning Electron Microscopy (SEM) at the Laboratorio de Ingeniería de Diseño y Tecnología de Recubrimientos Avanzados (LIDTRA). Both facilities belong to the Center for Research and Advanced Studies of the Instituto Politécnico Nacional (CINVESTAV; Mexico City, Mexico), Unidad Querétaro. We gratefully acknowledge the support and infrastructure provided by these laboratories and their research personnel, which made this work possible.



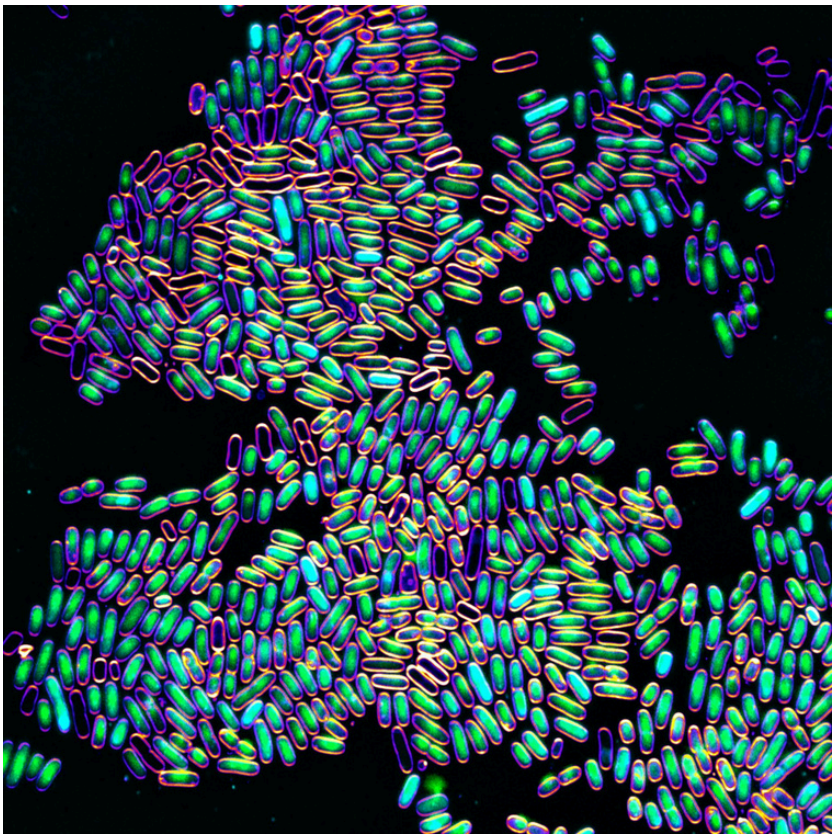
Kaleidoscopic fish

Michelle Novais de Paula

The image shows the whole zebrafish 120 hours post-fertilization after being exposed to a nephrotoxicant in combination with Rhodamine-dextran through the yolk, showing Rhodamine retention and absorption after kidney damage. The impairment of the kidney in the filtration process resulted in accumulation of Rhodamine in the tissues (in green). To release an antibiotic or any drug for patient use is a lengthy and expensive process, with, many times, failures to predict toxicity in the early stages of drug development. Finding new models that are translatable and can predict toxicity at early stages can redirect the research into different strategies to prevent toxic compounds reaching clinical trials. Zebrafish (*Danio rerio*) has shown great potential for toxicity screening, and in this case, kidney injury screening.

Microscope: Zeiss LSM710 BIG confocal microscope
Objective lens used: 10x dry imaging, N.A. 0.45

Acknowledgement: Microscopy was performed at the Institute for Molecular Bioscience (St Lucia, Australia) microscopy facility which was established with the support of the Australian Cancer Research Foundation (ACRF) and incorporates the Dynamic Imaging, Cancer Biology Imaging and Cancer Ultrastructure and Function facilities.



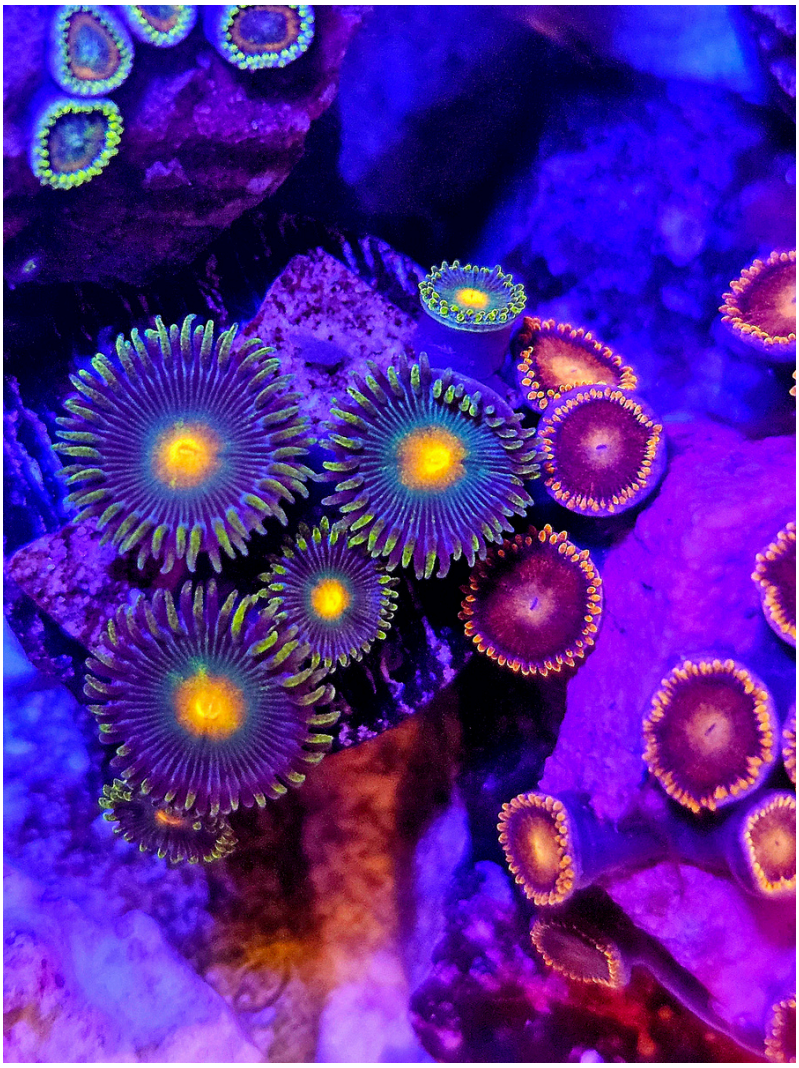
Rods of the micro-world

Glen Lamb

Klebsiella pneumoniae treated with a fluorescent octapeptin antibiotic derivative (cyan), synthesised in our lab, to study the antibiotic mode of action and identify uptake and localization between sensitive and resistant strains. Complete with fluorescent membrane labeling and a DNA dye (green). Fluorescent antibiotic derivatives such as these are powerful tools that broaden the range of assays we can perform to study antimicrobial resistance and activity. We can also use these as rapid diagnostics for infection and resistance detection. With the rising threat of antimicrobial resistance, it is important to utilize every option we have access to, both in fundamental research and clinical diagnostics.

Microscope: Zeiss Axiovert 200 Inverted Microscope Stand with LSM 880 Confocal Scanner with Fast Airyscan Detector
Objective lens used: 63x magnification + 1.4 N.A.

Acknowledgement: Microscopy was performed at the Institute for Molecular Bioscience Microscopy Facility (St Lucia, Australia), which was established with the support of the Australian Cancer Research Foundation (ACRF) and incorporates the Dynamic Imaging, Cancer Biology Imaging and Cancer Ultrastructure and Function Facilities.

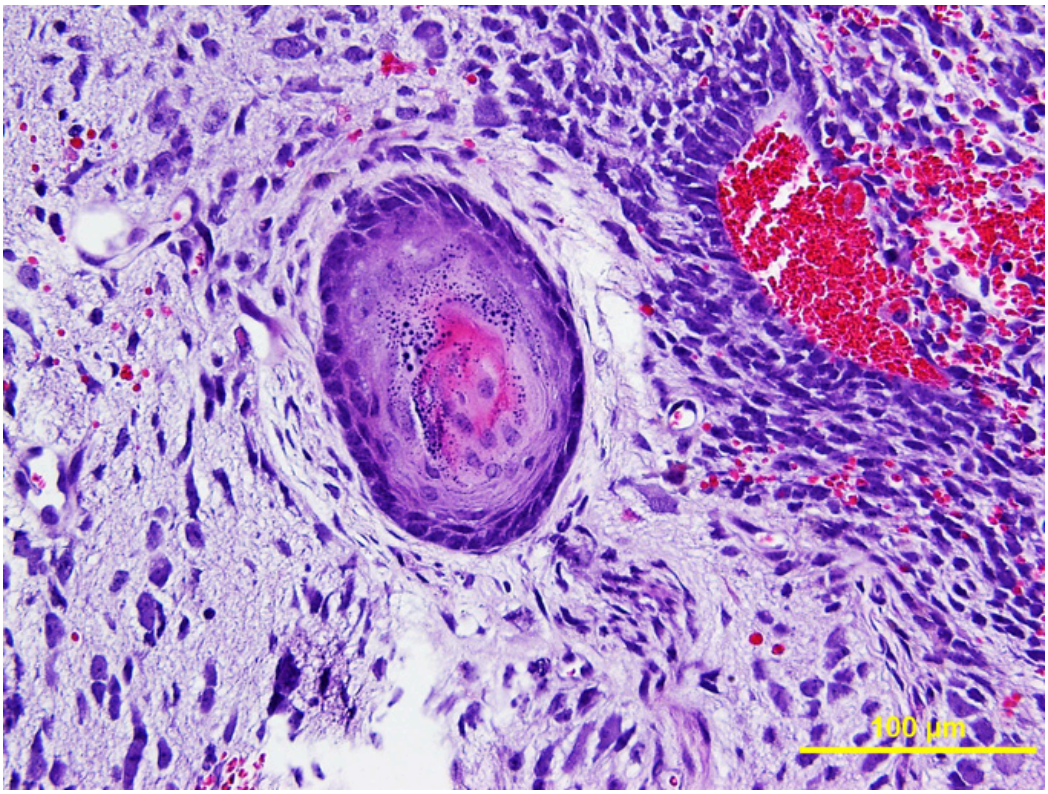


Zoanthid garden

Mike Crump

Green fluorescent protein was first isolated from jellyfish, and since then biologists have worked to develop a huge number of fluorescent molecules across the spectrum of visible light. But jellyfish are not the only marine animals which display fluorescence. Corals, like the zoanthids pictured here, achieve this with the help of *Zooxanthellae dinoflagellates*, which inhabit their tissue. It is these microorganisms that act symbiotically with the zoanthid polyps and allow them to generate energy through photosynthesis and give the coral their incredible color and personality. Coral-based fluorophores are still relatively unused for labeling in cell biology. But at the other end of the size spectrum, reef fluorescence is being studied as a mechanism to measure ecosystem health in nature. *Zooxanthellae* respond to stress by reducing in brightness. Brightly colored polpys like those in the image show a thriving symbiosis between the animal and the zooxanthellae.

Camera: Samsung S23 camera



Validation of iPSC pluripotency via teratoma formation assay

Waqas Ahmad

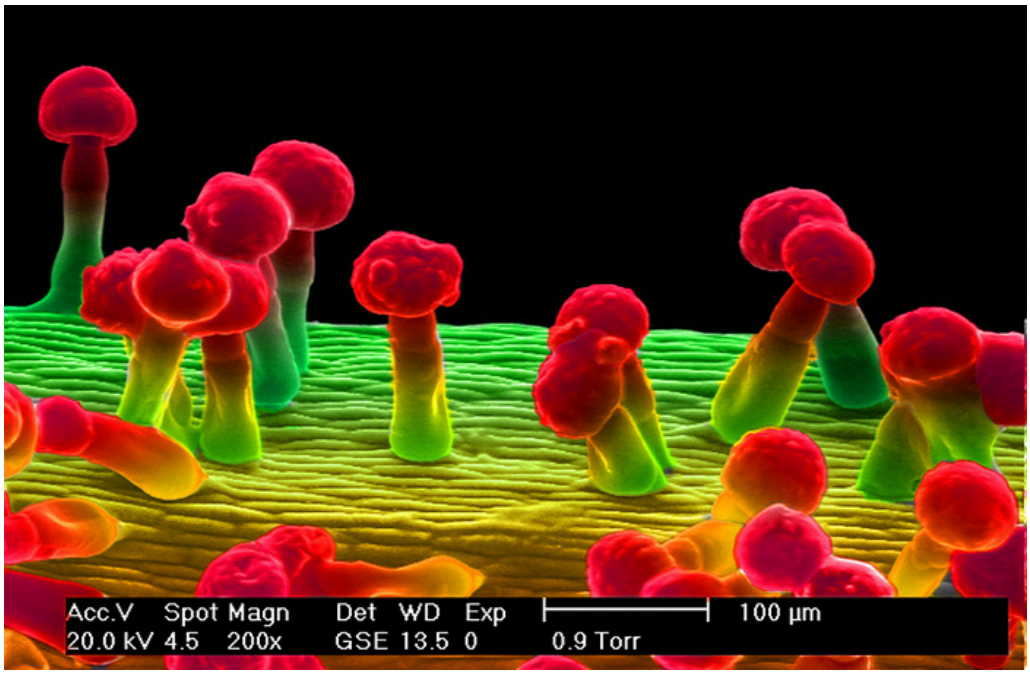
The teratoma formation assay is a gold-standard *in vivo* technique for assessing the pluripotency of induced pluripotent stem cells (iPSCs). In this study, the differentiation potential of an established iPSC line was validated by subcutaneous injections into immunodeficient (null) mice. The resultant teratomas were examined for the presence of tissues representing all three germ layers—mesoderm, ectoderm and endoderm—confirming the cells' pluripotency. This method situates the work within a critical quality-control step in regenerative medicine and stem cell biology, ensuring that iPSC lines are capable of broad lineage differentiation before their application in disease modeling, drug screening or therapeutic development.

Microscope: Olympus BX43F
Objective lens magnification: 20x

Acknowledgement: The Wang Lab and the University of Cincinnati (OH, USA) for providing the facility.

Microscopic garden: the sculpted surface of a pistil

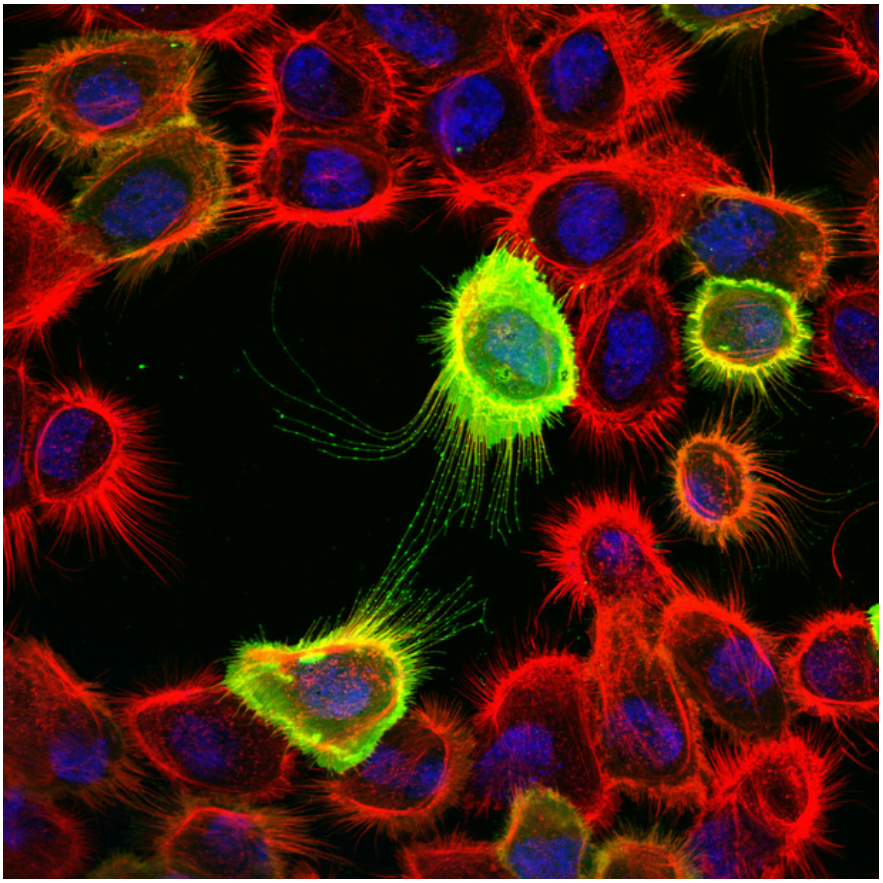
Liliana Naranjo & Juana Yesenia Ramos Martínez



This colorized scanning electron micrograph reveals the intricate surface morphology of a flower pistil at 200x magnification. The image shows the pistil's papillae—small, rounded protuberances involved in pollen capture and fertilization. Captured under low vacuum conditions using secondary electron detection, the vibrant false-coloring emphasizes the topographical contrast of the reproductive structures. In plant biology, understanding pistil surface features is essential for elucidating mechanisms of pollination and species-specific fertilization strategies. This image contributes to the broader field of life science techniques by highlighting the power of electron microscopy in botanical research, where fine morphological details at the microscale are crucial for reproductive biology, taxonomy and evolutionary studies.

Microscope: PHILIPS XL30 Scanning Electron Microscope
Total magnification: 200x

Acknowledgement: The image was acquired at the Laboratory of Engineering Design and Advanced Coatings Technology (LIDTRA), part of the Center for Research and Advanced Studies of the Instituto Politécnico Nacional (CINVESTAV; Mexico City, Mexico), Querétaro Unit.



Bladder cancer tunneling nanotubes

Alessia D'Aloia

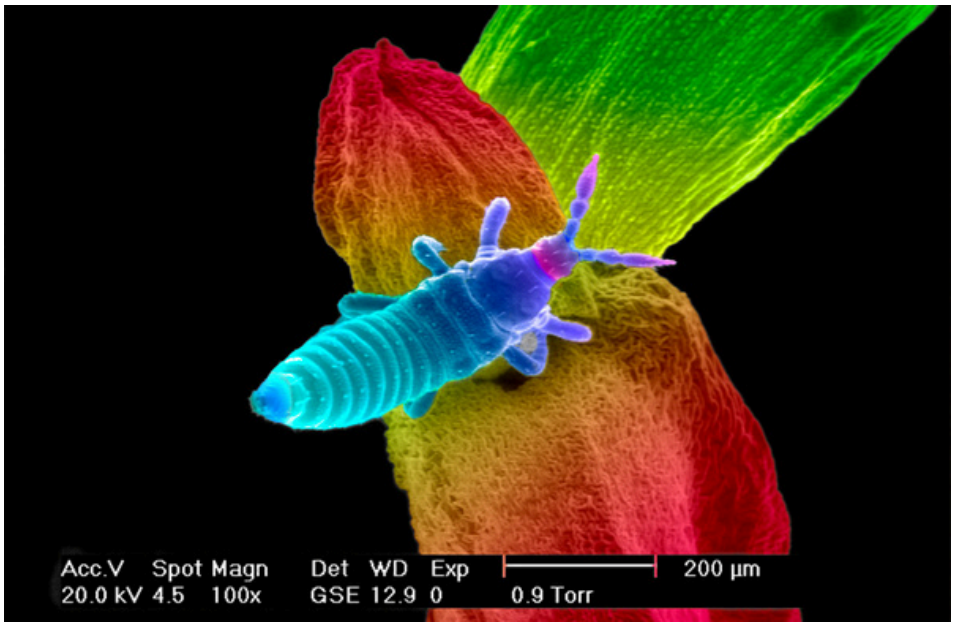
5637 bladder cancer cells transiently transfected with RalGPS2 PH domain (green). Transfected cells were stained with TRITC-phalloidin (red) to detect actin filaments. This image illustrates one of the ways in which cancer cells can communicate with each other and can exchange organelles, proteins, prions, viruses and microRNA. Image was acquired via confocal microscopy.

Microscope: Leica TCSSP2 confocal microscope
Objective lens used: 63x/1.4 NA Plan-Apochromat oil immersion objective

Acknowledgement: The instrument used to take the image belongs to University of Milan-Bicocca Department of Biotechnology and Biosciences (Italy).

Inhabiting the microscopic garden: insect–pistil encounter

Liliana Naranjo & Juana Yesenia Ramos Martínez



This color-enhanced scanning electron microscopy (SEM) image shows a small insect resting on the pistil of a flower. Captured at 100x magnification using a PHILIPS XL30 SEM, the image reveals fine structural details of both the insect and the plant surface. The visualization allows appreciation of the insect's segmented body and appendages, as well as the texture of the plant tissue, which may be involved in pollination or other ecological interactions. This image exemplifies the power of SEM in life sciences, especially in entomology and plant-animal interaction studies, where morphology and surface analysis provide insights into ecological roles, reproductive strategies and species identification. Enhanced with false coloring to emphasize contrast and morphology, this micrograph highlights the intricate complexity of biological surfaces at the microscale.

Microscope: PHILIPS XL30 Scanning Electron Microscope
Total magnification: 100x

Acknowledgement: The image was acquired at the Laboratory of Engineering Design and Advanced Coatings Technology (LIDTRA), part of the Center for Research and Advanced Studies of the Instituto Politécnico Nacional (CINVESTAV; Mexico City, Mexico), Querétaro Unit.