Research highlights

SOFT X-RAY IMAGES CAPTURE DANCE OF THE ORGANELLES

An imaging technique that uses X-rays can reveal in 10 minutes not only the 3D structure inside a cell, but also how its organelles interact with each other.

Techniques such as electron microscopy can produce high-resolution images of cells' interiors. But these methods are typically used on non-living cells and require researchers to perform time-consuming steps such as cutting, staining or dehydrating the cells.

Instead, Kate White at the University of Southern California in Los Angeles, Carolyn Larabell at the University of California, San Francisco, and their colleagues used soft X-ray tomography (SXT), which harnesses low-energy 'soft' X-rays to capture images of an intact cell at multiple angles from around the entire cell, similar to a computed tomography (CT) scan. The sample is then computationally reconstructed.

When the authors peeked inside living pancreatic cells with SXT, they could quantify the shape, chemical composition and relative position of various organelles including mitochondria, which provide the cell with energy, and vesicles that hold insulin. The team could also observe interactions between the two.

The same technique could be useful for quantifying changes inside a cell in response to drugs, the authors argue.

Structure https://doi.org/hg9j (2022)

WHAT HAPPENS WHEN SALARY DETAILS GO PUBLIC

The pay gap between men and women tends to shrink after workers learn what their colleagues earn.

Some activists have suggested that implementing pay transparency — when employees know each other's salaries — might help to close the gender pay gap by putting pressure on employers to provide equal wages. To understand pay transparency's effects, Tomasz Obloj at HEC Paris in Jouy-en-Josas, France, and Todd Zenger at the University of Utah in Salt Lake City assembled a data set of roughly 100,000 academics in 8 US states.

The researchers compared the salaries of men and women working at institutions that transitioned to transparent pay sometime between 2008 and 2013. They found that pay transparency was associated with a rise in the wages of underpaid women relative to men after the policy was implemented — and with the gender pay gap closing by 2–6 percentage points.

The researchers also found that the relationship between academic performance, such as numbers of papers published, and salary weakened after the transition to pay transparency.

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SOLID NANOFOAM PROTECTS POLLEN AS IT RIDES THE WIND

Tasked with the survival of their species, many pollen grains must drift with the wind and endure harsh conditions. Advanced imaging methods reveal that they do so thanks to exterior shells made of a tough material riddled with nanometre-sized pores — the first known example of a solid biological 'nanofoam'.

Pollen grains are hardy things; scientists have found fossilized specimens that remained intact for 425 million years. But because a grain's outer wall is only about 1 micrometre thick, most efforts to study this structure have damaged or destroyed it.

Stephen Stukins at the Natural History Museum in London and his colleagues turned to high-resolution imaging techniques to examine fossilized pollen and pollen from modern pine trees. The imaging revealed that the wall contains numerous irregular, nanometre-sized pores, creating a structure called a nanofoam (pictured). Other solid biological foams, such as cork, have pores that are micrometre-scale or larger.

The authors propose that this structure keeps pollen grains light while thermally insulating their interiors. The findings could shed light on the origins of pollen's hardiness and inspire tough new biomimetic materials.

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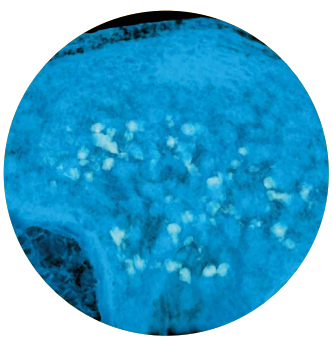

THE UNEVEN SWEEP OF BLACK DEATH'S ASSAULT ON EUROPE

The historical pandemic known as the Black Death might not have been as devastating as was previously thought, an analysis of ancient pollen suggests.

Historians estimate that a wave of bubonic plague in the mid-1300s killed about half of the people in Europe, at a time when most lived in rural areas. To investigate the Black Death's true toll, Alessia Masi at the Sapienza University of Rome and her colleagues analysed ancient pollen from 261 lakes and wetlands across Europe (pictured, a sampled bog in Poland). By assessing the varieties of pollen, the team determined whether fields and pastures had been abandoned after the plague and eventually replaced by forests.

Levels of pollen from species common in agricultural lands were much lower in many places, including France and central Italy, between 1350 and 1450 than during the previous 100 years. This suggests high mortality rates. But in other regions, including Ireland and much of eastern Europe, agricultural activities were stable and even expanded, suggesting that populations there were growing.

Factors such as weather and local economies might have caused the pandemic's course to vary, the authors say.

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