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Method depth corrects cell images without additional measurements FREE

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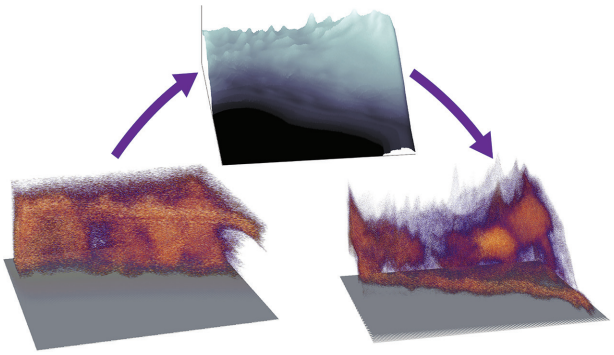
Pixel intensity of secondary electron images can be used to retroactively reshape cell morphology in 3D secondary ion mass spectrometry images.



Depth profiling secondary ion mass spectrometry (SIMS) images can show the locations of biomolecules in a cell, such as lipids. However, cell morphology in 3D depth profiling SIMS images is distorted in the z direction and must be reshaped to match the sample. Existing depth correcting methods either require topography measurements, as in atomic force microscopy, or detection of the substrate, which requires time-consuming sputtering through the sample.

Gorman et al. developed a method for depth correcting 3D SIMS images without performing any additional characterizations or signal collection. The depth-corrected images better match actual cell morphology than uncorrected images, which will facilitate the interpretation of biomolecule distribution in cells.

This method uses the contrast of pixel intensity in secondary electron images to indicate depth and approximately reconstruct cell morphology. The authors demonstrated the method on a previously published mammalian cell NanoSIMS data set.

“Normally, if you are going to try to depth correct your images, you would have to plan ahead. Our method means you don’t have to,” said author Mary Kraft. “If you already collected data and weren’t planning on depth correcting it, you could still do so.”

The method can be retroactively applied to negative-ion SIMS data sets. The authors hope to extend it to other types of SIMS data sets, including positive-ion SIMS, which do not produce a secondary electron image.

The authors plan to improve the accuracy of the method. They assumed a constant sputter rate, which produced small inaccuracies. Next, they will account for the nonconstant sputter rate, as well as quantify the accuracy of the method by comparing it to another technique.

Source: “Depth correction of 3D NanoSIMS images using secondary electron pixel intensities,” by Brittney L. Gorman, Melanie A. Brunet, and Mary L. Kraft, *Biointerphases* (2021). The article can be accessed at https://aip.scitation.org/doi/full/10.1116/6.0001092.