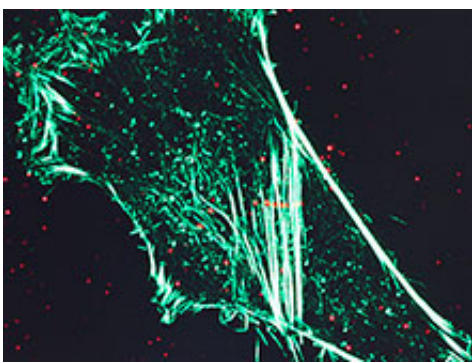


# Fluorescence SIM available at EMSL: A powerful instrument to study molecular cell biology, including synthetic biology

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EMSL's newly installed fluorescence SIM delivers significantly higher spatial resolution imaging than conventional light microscopes.

A new super resolution fluorescence structured illumination microscopy system, or fluorescence SIM, is now available at EMSL as part of the lab's Cell Isolation and Systems Analysis capabilities.

Access to the new instrument is through EMSL's [user proposal process](#). The EMSL Usage System lists it as Microscope: Fluorescence, Super Resolution Structured Illumination.

Classified as a super resolution microscope, the fluorescence SIM delivers significantly higher spatial resolution imaging than conventional light microscopes. The fluorescence SIM's resolving power is about

100-130 nanometers. Light microscopes cannot resolve structures smaller than approximately 250-300 nanometers. To put that into perspective, a water molecule is less than one nanometer, and a typical germ is about 1,000 nanometers.

The fluorescence SIM renders super resolution images in three dimensions. Being able to view samples and their spatial distribution in 3-D provides a greater depth of information for clearer scientific understanding.



According to Galya Orr, senior research scientist and capability lead of EMSL CISA, the fluorescence SIM is a powerful instrument for the study of [molecular cell biology](#), including microbiology. It allows researchers to image live, intact hydrated cells.

"The beauty of the fluorescence SIM is you are working with cells in their native form," said Orr.

"A current scientific challenge in microscopy and imaging is to do

dynamic experiments where we can observe things in real time and under real conditions," said Dave Koppenaal, [chief technology officer](#) for EMSL. "The fluorescence SIM allows us to conduct experiments in situ."

The fluorescence SIM uses standard [fluorescent dyes](#) and staining protocols, unlike some super resolution fluorescence microscopes that require specific fluorescent molecules to stain samples.

"You can resolve [spatial information](#) with a 100-[nanometer resolution](#), which you cannot do with other fluorescence microscopes," said Orr. "If you want to study a specific protein in a bacterium, you can make that protein glow in a different color and use the super resolution imaging system to identify the spatial and temporal expression pattern of the protein in relationship to other molecules and cellular structures to gain a better understanding of the function of that protein."

The fluorescence SIM greatly enhances EMSL's existing biology capabilities. The instrument will help researchers explore questions about bioenergy, bio-production, carbon recycling and other processes involving living cells. The fluorescence SIM will be especially helpful in the study of synthetic biology, the design and construction of new biological functions and systems not found in nature.

"There are only a handful of super resolution microscopy techniques," said Koppenaal. "The [fluorescence](#) SIM is one of the newer ones, so it's not yet widely available. This should have appeal to both PNNL staff and EMSL users because it's a fairly unique instrument. EMSL is proud to steward this capability."

Provided by Environmental Molecular Sciences Laboratory

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