



Protein Interaction Captured in Motion

Enhanced understanding of protein interaction may assist researchers in making inroads to solving major societal problems such as cancer and environmental pollution.

PNNL researcher Peter Lu and his team were able to construct, in real time, the position and continuous motion of single proteins for the millisecond they flip-flop against each other. "The ability to capture proteins in motion is unique and adds to our arsenal of understanding as to how these proteins are acting in living cells," Lu says. Lu and his team used a technique called single-molecule photon stamping spectroscopy.

The successful research was conducted in collaboration with staff in EMSL's Instrument Development Laboratory and the Molecular Science Computing Facility. "The expertise and equipment provided at EMSL were highly beneficial and important for us to achieve our scientific results," Lu says.

Lu, along with his team of chemical physicists and the IDL staff, developed a unique instrument for the research. "The scientific problems facing DOE are highly challenging and the technology needed to solve those problems are not commercially available, so we're fortunate to have the expertise within IDL to help push us forward," Lu says.

In the instrument, fluorescent-dye-tagged proteins were embedded in a gel and probed by a continuous-beam laser. The protein fluorescence fluctuated as molecules interacted with one-another. The light emissions and fluctuations from the laser-excited molecules were captured and measured by a fluorescence microscope; individual photons were characterized by a photon-stamping detector that yields key information on each detected photon. "The detection was highly sensitive and precise," Lu says, "which means we can get a more informative picture of the dynamics of protein to protein interaction."

Lu's research was featured in two major scientific journals: *Nature* (http://www.nature.com/cgi-taf/DynaPage.taf?file=/nature/journal/v432/n7014/full/432249a_fs.html) and *The Scientist* (http://www.the-scientist.com/yr2004/nov/tools_041122.html - free registration required).

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