Purdue researcher develops new single-molecule imaging system

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A new imaging system has been developed by a researcher at Purdue University so powerful it can view active molecules within a biological motor of the nanometer scale. The researcher has created a single-molecule imaging system to view deoxyribonucleic acid (DNA), ribonucleic acic (RNA) and other tiny biological molecules, according to a release. This imaging technology will have potential application in nanotechnology and nanomedicine, including the diagnosis and treatment of diseases such as cancer, AIDS and influenza. The system is called a single-molecu dual viewing total internal reflection fluorescence imaging system (SMDV-TIRF).

"The microscopes commercially available were not sensitive enough to distinguish individual molecules of this scale," said Peixuan Guo, professor of molecular virology and biomedical engineering and creator of the imaging system. "Our system, through its highly-sensitive detecti system and dual color viewing ability, is capable of distinguishing and counting individual molecules within a nanodevice."

Nanotechnology deals with materials on the nanometer scale, and the most powerful optical microscopes available offer a resolution of 200 nanometers. Anything closer together than 200 nanometers blur together and appear as one.

Electron microscopes can reach a resolution of tenths of a nanometer, but, Guo said, materials that have a versatile or flexible structure but are not electron-dense, such as RNA, are not easily imaged using this type of microscope.

"Many of the molecules involved in the cellular processes of the human body are much smaller than this 200-nanometer diffraction limit," Guo added.

Active molecules performing their functions can be observed in real time using the new system, which can detect the motion of the molecules and also count individual molecules.