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**A Novel Microscope for the Detection of Nano- and Microscale Protein Crystals.** C. Momany<sup>13</sup>, T. Lanier<sup>2</sup>, C.M. Liebig<sup>2</sup>, L. Renfrow<sup>2</sup>, W.M. Dennis<sup>234</sup>, Depts. of Pharmaceutical & Biomedical Sciences<sup>1</sup>, Physics & Astronomy<sup>2</sup>, Nanoscale Science & Engineering Center<sup>3</sup>, Faculty of Engineering<sup>4</sup>, Univ. of Georgia, Athens, GA 30602.

We are developing new methods for *in vivo* and *in vitro* crystallization (self-assembly of nanostructures) that utilize molecular biological approaches. In the past, there was no way to directly "screen" or "select" protein mutants with self-assembling properties independent of molecular modeling (protein engineering) approaches or random mutagenesis (to lesser or greater degrees). We have now developed and constructed a specialized microscope that can visualize protein crystals and can theoretically identify macromolecular crystals in living cells.

Our first successful application of the microscope has been to show that it can detect microscopic crystals (<0.1 mm range). This has direct application to the problem of auto-centering protein crystals in X-ray beams.

When used with bacterial cells containing mutant proteins, the microscope becomes a "screening" system that can be used to identify bacterial cells that produce nanoscale intracellular crystals out of a large background of cells making no crystals. Using this instrument, we should in principle be able to identify proteins that self-assemble *in vivo*. Thus, we have a "genetic screen" for crystallization. In so doing, we expect that the resulting proteins would be more likely to crystallize *in vitro*. Further, the resulting crystals are likely to be more robust. There are applications of the technology to the fields of nanotechnology, biosensor development, and extended-release therapeutics.

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