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No small change: UT professor lands $625,000 fellowship

An University of Texas chemical engineering professor has received a five-year, $625,000 fellowship to study cell protein behavior and nano-size glassy materials.

He was given the David and Lucile Packard Fellowship in Science and Engineering.

Thomas Truskett's research group will work to develop techniques that will help them study the properties of nano-sized glassy materials, which are used in high-resolution printing and biomedical applications, among other things.

"Economics is now driving the understanding of properties of materials at small length scales," Truskett says.

"If we want to make smaller, faster computer chips, biomedical devices, etc., we have to understand what happens at this tiny scale."

According to Truskett, discovering what makes glassy materials stable and predicting how they will fail under stress at the nano-level is particularly difficult because the atoms in glassy materials are arranged randomly, which makes it difficult to identify potential defects.

Also, the properties of glasses change depending on how they're made, unlike crystalline materials.

So Truskett and his group of researchers will create new theories and models of how the molecules in glasses interact with each other, using what they learn to predict the material's behavior.

"If you understand how a material works in its internal structure, you'll be able to create stronger materials more resistant to failure," Truskett says.

Additionally, Truskett and his research team will create methods of predicting protein behavior for drug development and disease prevention. Researchers will address the time-consuming problem of predicting protein behavior, which is so complex that it requires a year for a supercomputer to model a protein folding into its three-dimensional structure.

Each protein is surrounded by water molecules that vibrate on a different time scale than the protein itself. Therefore, every time the protein moves a detectable amount, each water molecule vibrates many times. Truskett says because of the time this takes, it is impossible to see how millions of them interact in solutions.

In order to solve the problem, Truskett's research team will try to mathematically smear out the water molecules and make a low-resolution type of model that leaves out the unnecessary information while still accurately showing the protein's behavior.

According to Truskett, if done correctly, engineers and scientists could watch processes like protein folding and aggregation within a day or a week, instead of a year.