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Leveraging disorder:
Designed biosensor proteins and protein materials

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Abstract: The largest destabilizing force in biopolymer folding is the inescapable configurational entropy loss in going from a disordered unfolded state to an ordered folded state. One way that the energy is minimized in evolution is through using the minimum degree of order in the folded state that is necessary for a specific function.

Here I will outline first, our experiments utilizing engineered disorder to create high signal sensing platforms for the detection of chemical- and bio-terror weapons, cancer biomarkers, and cytokines central to cytokine storm in covid and Car-T syndrome; and second, our recent NMR and mechanical analyses of the human protein elastin – the protein material responsible for the elasticity of arterial walls whose entropic elasticity is critical to cardiovascular function.

As an extension of this latter project, we have created simplified, highly disordered elastin protein materials that absorb and release high amounts of heat when stretched and relaxed. These are competitive, in terms of energy efficiency, with the best known elastocaloric cooling materials that have yet been observed

Wednesday, October 8th | 2:00pm-3:15pm | Science Hall 126 & Zoom

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