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Protein unraveling through a single protein nanopore

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The ability to respond to an external stimulus is a fundamental process in living systems. Based on this principle, we were able to design an unusual temperature-responsive pore-based nanostructure with a single movable elastin-like-peptide (ELP). The peptide is placed within the cavity of the alpha-Hemolysin protein pore. The temperature-dependent properties of single engineered pores were monitored by single-channel current recording in planar lipid bilayers. If a voltage bias was applied, the engineered pores exhibited transient current blockades, the nature of which depended on the length and sequence of the inserted ELP. These blockades are associated with the peptide excursions into the narrowest region of the pore. At low temperatures, the ELP is fully expanded and blocks reversibly and completely the pore. At high temperatures, the ELP is dehydrated and structurally collapsed, thus enabling a substantial ionic flow. Potential applications of this nanostructure in several arenas will be discussed.