Title: Nature of Genetically Engineered Protein/Inorganic Interactions: Novel Molecular Linkers for Nanotechnology

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Description: Organisms can be viewed as fully integrated and mature nanotechnological systems. They are composed of molecular scale components that self-assemble into hierarchical, self-replicating, self-contained systems. Ultimately, nanotechnology must be able to emulate these properties of living organisms if it is to transcend the limitations of traditional materials synthesis. Biological hard tissues are of particular relevance to the focus of most nanotechnological research. The mineral components of living organisms (e.g.: bone, enamel, shells, spicules, magnetic particles) often exhibit extraordinary properties, which arise from the precise control organisms have over the morphology of the inorganic phase and its interface to an organic matrix. Central to formation of biological hard tissues is surface interactions with macromolecules, through which organisms monitor nucleation, growth, and morphogenesis of inorganic crystallites. These macromolecules may be matrix proteins or polysaccharides residing in hard tissues, or genetically engineered polypeptides. For the robust design and manufacturing of protein/nano-inorganic hybrid structures, we must control protein/inorganic interfaces.