Recombinant DNA technology has made it possible to prepare artificial macromolecules with essentially complete control of molecular architecture. Intermolecular interactions can be programmed into such systems, and can be used to engineer supramolecular organization and macroscopic mechanical behavior. Most recently, we have begun to explore more complex “living materials,” in which mixtures of bacterial cells and artificial proteins acquire the capacity for self-repair, regeneration, mineralization and responsiveness to environmental conditions.

Bio: David A. Tirrell is the Ross McCollum-William H. Corcoran Professor of Chemistry and Chemical Engineering, Provost, and holder of the Carl and Shirley Larson Provostial Chair at the California Institute of Technology. Tirrell was educated at MIT and the University of Massachusetts at Amherst, where he earned his Ph.D. for research done under the supervision of Otto Vogl. After a brief stay with Takeo Saegusa at Kyoto University, Tirrell accepted an assistant professorship in the Department of Chemistry at Carnegie-Mellon University in the fall of 1978. Tirrell returned to Amherst in 1984 and served as Director of the Materials Research Laboratory at the University of Massachusetts before moving to Caltech in 1998. He served as chairman of the Division of Chemistry and Chemical Engineering at Caltech from 1999 until 2009. Tirrell's research interests lie in macromolecular chemistry and in the use of non-canonical amino acids to engineer and probe protein behavior. His contributions to these fields have been recognized by his election to the American Academy of Arts and Sciences, the American Philosophical Society, and all three branches (Sciences, Engineering and Medicine) of the U.S. National Academies.