

# INTEGRATIVE TECHNOLOGY ENGINEERING EMERGENT BEHAVIOR INTO MATERIALS AND SYSTEMS

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## Abstract

Integrative technology, the merging of nanotechnology, biotechnology and informatics offers an opportunity for realizing true advances in the manner in which technology interacts with humanity. Using the power of nanotechnology to manipulate matter, that is the placing of molecule's where we want, when we want, to perform functions that we want. Using the inspiration of biotechnology both to co-opt the tools of molecular manufacturing and to provide a baseline understanding of the way nature manipulates matter and information. And finally, using Informatics to create a robust framework for transforming the information implicit in molecular and larger scale interactions to engineer Complex Adaptive Systems that exhibit embedded higher-order behavior. Collectively these technologies established the basis for Integrative Technology, a new IT. The first examples of the implementation of Integrated Technology are manifested in the synthesis of a new class of smart materials. These materials have the potential to emulate much of the functionality associated with living systems such as the active transport and transformation of matter and information and, the transduction of energy into different forms. We will present the details of the technological demands and the results of efforts associated with the production of these new functional materials. Elements of the discussion will include the genetic engineering of active biological molecules into engineering building blocks, the precision assembly of these molecules into a stable, "active" material and, the promise of embedding intelligent behavior into the matrix of the assembled matter.