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Nanotechnology Integration[1]

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Interest in nanoscience – and derivative nanotechnologies – has grown explosively because of the perceived potential to beneficially impact almost every aspect of our lives. The remarkable scientific discoveries obtained by working at the molecular length scale will disappoint humankind if they cannot be exploited by integration into technologies providing unprecedented functionality and performance. To bridge the gap between nanoscience discovery and technology, we must tackle the intrinsic science challenges of integration. This talk examines three such challenges: the fundamental limits and principles for the use and integration of nanoscale structures to detect, transfer, and harvest energy with extreme efficiency or sensitivity; the principles of transduction events in natural systems and how these may be incorporated into artificial systems to convert single molecular events into large scale responses; and the collective properties of composite nanoscale systems that cannot be predicted in terms of the individual constituents. Success in solving such nanoscience integration challenges will change not only what is expected of future technologies, but also the way in which they accomplish ever more complicated tasks.

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