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**From Quanta to the Continuum: Opportunities for Mesoscale Science**

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Mesoscale science embraces the regime where atomic granularity and quantization of energy yield to continuous matter and energy, collective behavior reaches its full potential, defects, fluctuations and statistical variation emerge, interacting degrees of freedom create new phenomena, and homogeneous behavior gives way to heterogeneous structure and dynamics. Mesoscale architectures form a hierarchy extending from atoms and molecules through polymers, supramolecular assemblies, periodic lattices, multilayers, nanocrystal arrays and multiphase materials. Mesoscale science builds on the foundation of nanoscale knowledge and tools that the community has developed over the last decade and continues to develop. Mesoscale phenomena offer a new scientific opportunity: designing architectures and interactions among nanoscale units to create new macroscopic behavior and functionality. Examples of mesoscale successes, challenges and opportunities will be described.

A more complete discussion of mesoscale science can be found in the BESAC report, *From Quanta to the Continuum: Opportunities for Mesoscale Science*, http://science.energy.gov/bes/news-and-resources/reports/basic-research-needs/

Innovative community input on opportunities for mesoscale science can be found on the *Mesoscopic Materials and Chemistry* website, http://www.meso2012.com/

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