Seeing the nanoworld: Nanotechnology through the eyes of the microscopist

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For years electron microscopes have studied the nanoworld. Without a unifying name, however, the nanoworld remained a fragmented and poorly defined place. With the label "nanotechnology" the concepts of using very small entities to generate useable and useful devices, materials, and structures become unified into a single scientific and engineering field. Nanotechnology includes fine particles, nanotubes, nanofabrication, self-assembly of structures from subunits, biomemetics, and a variety of other small world entities. The electron microscope is needed to study the structures, morphologies, chemistries, assembly mechanisms, and mechanical properties of these various small things. Engineering at the nanolevel is every bit as challenging and profound as is the engineering needed to complete massive and awe-inspiring, manmade structures like the seikan tunnel in Japan. Numerous examples of the present state of nanotechnology will be presented with a special emphasis on the use of microscopes to understand and reveal the real nature of the nanoworld.