

Nanomaterials in Healthcare

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Abstract

The novel architectures and properties of nanomaterials make them extremely useful in many areas of healthcare and biomedicine. We have invented and developed a suite of methods for designing, synthesizing, and investigating a wide variety of nanostructured materials, including those based on bioconjugate chemistry, scanning probe lithography, and stereolithography. Examples include spherical nucleic acids (SNAs), dip-pen nanolithography (DPN) and related cantilever-free techniques (Polymer Pen Lithography (PPL) and Beam Pen Lithography (BPL)), and high-area rapid printing (HARP). These platforms permit exceptional control over 2- and 3-D architecture, sometimes in high-throughput, and they have enabled significant advances in biodetection, gene regulation, and

immunotherapeutics for diseases spanning many forms of cancer and infectious disease (e.g., COVID-19). They also have impacted the development of drug screening, tissue engineering, and cellular analysis and manipulation. Several aspects of medicine and the life sciences have been transformed through the development and application of these techniques, and this presentation will provide a survey of them, from the benchtop to the clinic.

Biography



Dr. Chad A. Mirkin is the Director of the International Institute for Nanotechnology and the George B. Rathmann Professor of Chemistry, and a Professor of Chemical & Biological Engineering, Biomedical Engineering, Materials Science & Engineering, and Medicine at Northwestern University. He is a chemist and a world-renowned nanoscientist, who is known for his discovery and development of spherical nucleic acids (SNAs) and SNA-based biodetection and therapeutic schemes, among many other accomplishments. Mirkin received his B.S. from Dickinson College (1986) and Ph.D. from Penn State (1989). He was an NSF Postdoctoral Fellow at MIT prior to joining the faculty at Northwestern in 1991. He has authored >830 manuscripts and >1,200 patent applications worldwide (>400 issued) and founded eight companies. Mirkin has been recognized with >230 awards, including the UNESCO-Equatorial Guinea International Prize for Research in Life Sciences, Kabiller Prize in Nanoscience and Nanomedicine, Dan David Prize, and NAS Sackler Prize in Convergence Research. He served on the President's Council of Advisors on Science & Technology, and he is one of very few scientists to be elected to all three US National Academies. Mirkin was an Associate Editor of *J. Am. Chem. Soc.* and is a *Proc. Natl. Acad. Sci. USA* Editorial Board Member. He has given >870 lectures and educated >300 graduate students and postdoctoral fellows in the lab, of whom >120 are now faculty members at top institutions around the world.

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