

**THE NSF NANOSCALE SCIENCE AND ENGINEERING CENTER FOR INTEGRATED NANOPATTERNING
AND DETECTION TECHNOLOGIES**

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Tuesday, December 6, 2011, 8:00 am

Opening Session: Celebration of Graduating NSECs

The NSF Nanoscale Science and Engineering Center for Integrated Nanopatterning and Detection Technologies (www.nsec.northwestern.edu) was founded in September 2001 at Northwestern University (NU) in collaboration with the University of Illinois at Urbana-Champaign (UIUC), and the University of Chicago (UC). Since its inception the Center has provided substantial contributions to nanotechnology scholarship, infrastructure, and interdisciplinary education. The overarching research goal of the Center is to develop new and powerful detection technologies for biological and chemical analytes, based on nano-engineered materials. Some key accomplishments include:

1. Development of new techniques and advanced fabrication methods (polymer pen lithography, electrochemical dip pen nanolithography, liquid phase nanolithography, field-induced oxidation, soft interference lithography, cathodic electrografting, laser-assisted embossing, soft e-beam lithography, phase-shifting photolithography, etching, electron-beam deposition, and lift-off).
2. Development of new substrates, surface chemistries, and materials for nanopatterning (e.g., sol gel templates, complex shapes, DNA and protein nanoarrays, cylindrical nanostructures, conducting polymers, polymer brushes silicon nanostructures, single nanoparticles, and multifunctional oxides).
3. Substantially increased the density, throughput, and spatial resolution of scanning probe molecular printing techniques.
4. Development of novel receptors and high throughput methods (e.g., nanodiscs, nanoflares, supramolecular structures, microfluidic bio-barcode assays, multiplexed detection).
5. Advanced sensing capabilities (detection of Alzheimer's HIV, cancer markers, influenza, prostate cancer, sepsis, cholera, biowarfare agents, carbohydrates, calmodulin, human cyt P450).
6. Created new methods for the targeted injection of therapeutics at the single cell level.
7. Developed novel approaches to multiplexed gas sensing at ppm sensitivity.

Major Center outputs include: nanostructures that optimize and amplify detection events in the context of many important chemical, biological, and medical analytes; flexible, massively parallel nanofabrication systems now used in 23 countries and hundreds of laboratories; and the first nanotechnology based point-of-care medical diagnostic system, now with 5 FDA cleared assays. All currently used commercial forms of scanning probe molecular printing techniques utilize discoveries and inventions from this NSEC. Collaborations have been developed with 36 academic institutions, 6 national labs, 70 industry partners, and in 19 countries.

In addition to original research, the Center has achieved knowledge transfer through prolific publication (>850 to-date, invention disclosures (151 to-date), patent filings (75 to-date) and presentations (1,607 to-date). The Center has initiated several innovative programs that significantly enhance knowledge transfer and collaboration including the Nanotechnology Corporate Partners program and the Small Business Evaluation and Entrepreneurs program through which 18 successful start-up companies have been launched.

The Center also provides training for the next generation of scientists, engineers, and teachers. Students and postdocs are vital members of the research community and have a voice through the NSEC Board of Student and Postdoctoral Researchers. Over 250 undergraduates from around the country have participated in the Center's REU program. The Center's DiscoverNANO web site has over a million visitors a year. Eighty-eight science teachers from area schools have participated in the Center's RET program and the curriculum projects they have developed have impacted >11,000 precollege students.