

# The Illinois Science and Technology Roadmap

## Fact sheet

In partnership with:  
**Elsevier**  
**Ocean Tomo**

In collaboration with:  
**Dr. C. Scott Dempwolf,**  
University of Maryland

# Expanding on Illinois' solid foundation of research and innovation

Illinois has a strong legacy of research and innovation—rooted in its world-class research institutions—that has changed society and served as an invaluable economic engine. Among its successes, the state is the birthplace of the mobile phone, the web browser, and numerous medications that improve quality of life. More than \$15 billion is invested annually across research institutions and the private sector in research and development (R&D) to help make Illinois a hub for discovery and a home for products, companies, and jobs. **The Illinois Science and Technology Roadmap** provides an unprecedented look at where the state

has aggregate research strengths with the power to drive competitiveness in key Illinois industries and position Illinois as a magnet for top talent and companies in those industries.

The roadmap responds specifically to community interest—from research institutions, R&D-based corporations, and policy makers in Springfield and Washington, D.C.—in having a more informed and detailed understanding of Illinois' innovation potential. This roadmap is the first in Illinois to focus on technology and research clusters that catalyze new products and processes across multiple industries.

## The roadmap

- Provides new insight for high-potential federal grant targets and public-private partnership opportunities;
- Creates new tools to better connect research institutions and corporations around shared R&D interests; and
- Offers policy and program recommendations to fill existing ecosystem gaps.

### National research impact<sup>1</sup>

**Chemistry**  
98th percentile

**Computer science**  
92nd percentile

**Chemical engineering**  
94th percentile

**Engineering**  
90th percentile

**Materials science**  
94th percentile

### Intellectual property potential

Biomedical patents:  
**27%** average annual growth rate

Chemical compositions and coatings patents:  
**60% higher** quality than the U.S. average

Approximately  
**1 in 10** u.s. energy patents cite Illinois research

### Technology cluster development<sup>3</sup>

Illinois' researchers, inventors, institutions, and companies are linked through more than  
**17,000 connections**

More than **500** companies and research institutions in  
**six technology clusters**

<sup>1</sup>Based on Elsevier field-weighted citation impact, which measures research publication impact.

<sup>2</sup>Based on the Ocean Tomo Ratings™ System, which is used to measure patent quality.

<sup>3</sup>As determined by social network analysis performed by Dr. C. Scott Dempwolf, University of Maryland.

#### Advanced materials: Alloys and metals

A 3-D printed, superalloy-based nuclear reactor component was collaboratively developed by the Quad City Manufacturing Lab, the Department of Energy, and Lockheed Martin.



#### Advanced materials: Polymers

Northwestern University spinoff Polyera developed a flexible microprocessor chip used in mobile and Internet of Things technologies.



#### Batteries and energy storage

New cathode materials for the Chevy Volt battery were developed in partnership with Argonne National Laboratory.



# Identifying technology strengths that align with Illinois industry

## Illinois' technology cluster opportunities

The roadmap analysis revealed six promising technology areas with a demonstrated alignment of academic and industry strength and activity. For each of the six clusters, the roadmap emphasizes key R&D and commercialization areas and additional specific opportunities for Illinois to further strengthen existing industries or lead innovative new ones through federal awards and public-private partnerships.

- Advanced materials: Alloys and metals**  
Additive manufacturing; integrated computational materials engineering (ICME)
- Advanced materials: Polymers**  
Self-healing polymers; electricity-conducting polymers
- Batteries and energy storage**  
Lightweight, high-capacity vehicle batteries; energy storage for power grids; battery manufacturing
- Biofuels and biomass-derived products**  
Bio-energy small business creation; "bio-jet" fuel
- Medical biotechnology**  
Drug discovery and diagnostic platforms; neurological diseases, oncology, and optical medical devices
- Nanotechnology**  
Nanomaterials for the manufacturing industry; nano-enabled biotechnology for the pharmaceutical industry; nanoelectronics

## Defining technology cluster targets

Technology clusters connect researchers, entrepreneurs, investors, and customers across industries to create market-driven innovations. Clusters highlighted in the roadmap were selected based on:

- ▶ Significant opportunity for academic-industry partnership
- ▶ Strong research productivity and intellectual property commercial potential
- ▶ Ability to support competitiveness for one or more key Illinois industries
- ▶ Existing public and/or private technology cluster development activity and investment
- ▶ Significant addressable market for the technology
- ▶ Notable research and commercialization funding opportunities (including from federal sources)

### Biofuels and biomass-derived products

A new process developed by Thermoquatica at Southern Illinois University uses superheated water and oxygen to turn agricultural waste into liquid fuels.



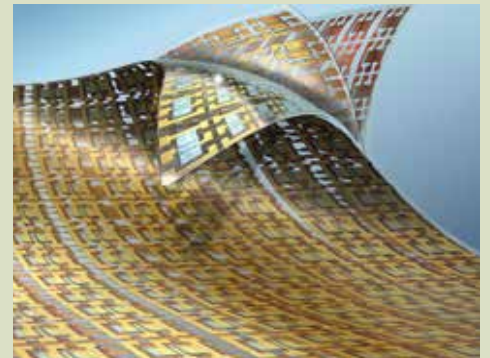
### Medical biotechnology

PhysIQ uses a predictive-analytics tool developed at Argonne and tested at the University of Chicago to reliably identify medical abnormalities earlier than current systems.



### Nanotechnology

Ultra-thin silicon sheets developed at the University of Illinois allow this normally rigid material to be bent and rolled for use in next-generation semiconductors and flexible electronics.



# Capitalizing on technology cluster opportunities

The six technology clusters identified through the roadmap analysis present important opportunities to support innovation and competitiveness in Illinois industries with significant economic output and workforce impact:

## Technology clusters support multiple key Illinois industries

Roadmap technology clusters	Key Illinois industries						
	Advanced materials	Agribusiness, food processing, and technology	Biomedical/ biotechnical	Clean energy	IT and telecommunications	Machinery and fabricated metal products mfg	Transportation and logistics
Advanced materials: Alloys	●	●	●	●	●	●	●
Advanced materials: Polymers	●	●	●	●	●	●	●
Batteries and energy storage	●	●	●	●	●	●	●
Biofuels and biomass-derived products	●	●		●		●	●
Medical biotechnology			●				
Nanotechnology	●	●	●	●	●	●	●

## Cross-cutting innovation policy needs

The roadmap technology cluster analysis revealed three cross-cutting areas where policies and funding can have an outsized impact:

### Driving connectivity between industry and academia

Research institutions and companies share R&D interests and skill in numerous areas. Aligning the state's collective innovation assets requires efforts to connect partners and incentivize collaboration.

### Assisting high-potential technologies and startups

Validating the commercial potential of research discoveries requires funding and support to bridge the “valley of death” and reduce private investors’ risk in supporting the development of new technologies.

### Ensuring resources for capital infrastructure needs

Research centers and place-based innovation hubs—like incubators and research parks—connect ideas and talent with training and mentorship. These communities bring together researchers, entrepreneurs, corporations, and investors to accelerate technology commercialization.

► **Full report:** <http://www.illinoisinnovation.com/science-technology-roadmap>