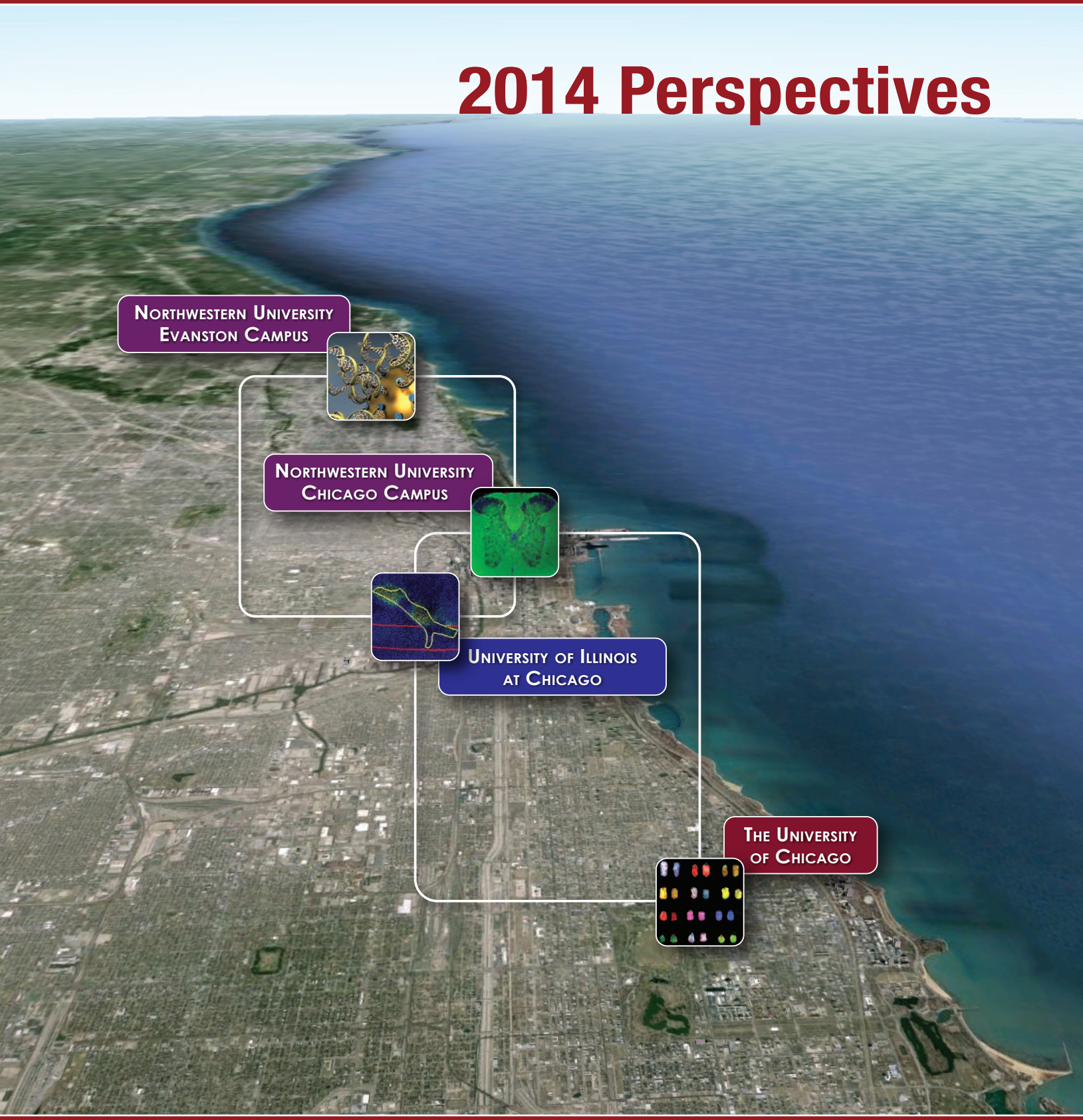
CHICAGO BIOMEDICAL CONSORTIUM

The University of Chicago
University of Illinois at Chicago
Northwestern University

2014 Perspectives



The CBC is funded by the Searle Funds at The Chicago Community Trust

CBC Mission

The mission of the Chicago Biomedical Consortium is to stimulate collaboration among scientists at **Northwestern University** (NU), the **University of Chicago** (UChicago), and the **University of Illinois at Chicago** (UIC) that will transform research at the frontiers of biomedicine.
The CBC works to:

- **Stimulate research and education that bridge institutional boundaries**
- **Enable collaborative and interdisciplinary research that is beyond the range of a single institution**
- **Recruit and retain a strong cadre of biomedical leaders and researchers in Chicago**
- **Promote the development of the biomedical industry in Chicago**
- **Execute a plan capable of improving the health of citizens of Chicago and beyond**

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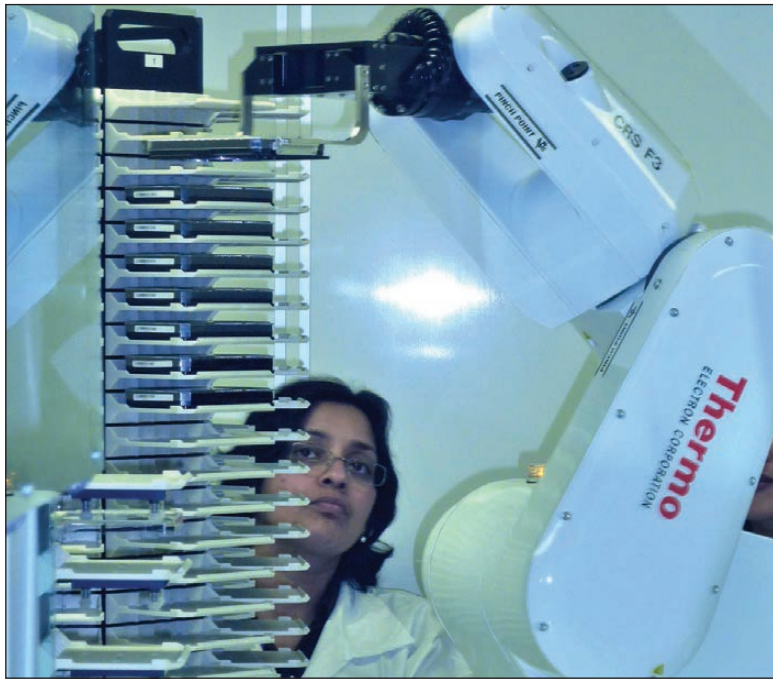


Front Cover
Images of fluorescently-labeled cells overlaid on a Google earth (©2013 Google) image of the Chicago area.

CBC-affiliated researchers contributed the scientific images.
North: Northwestern University, Evanston campus (Chad Mirkin)
East: Northwestern University, Chicago campus (Lonnie Shea)
West: University of Illinois at Chicago (Brenda Russell)
South: The University of Chicago (Fotini Gounari)

Credits
Photos: Peter Barreras, Howard Hughes Medical Institute (Chuan He, p. 4); University of Illinois, Urbana-Champaign, News Bureau/ Stauffer (Neil Kelleher, p. 4); otherwise CBC.

Written by: Kathryn Stallcup, CBC. Design and layout: Jola Glotzer, CBC. Printed: 2014, PSD Graphic Arts, The University of Chicago.

2014 Perspectives

The Searle Funds at The Chicago Community Trust began funding the Chicago Biomedical Consortium (CBC) at the level of $5 million per year in 2006. To date, **$45 million** has been invested in the CBC.

CBC has seeded **96 research projects** that have generated a large and wide body of knowledge in fields ranging from genetics to antibiotic development. This work has been reported in over **950 peer-reviewed publications,** and generated **additional funding in excess of $347 million.** CBC-supported students and faculty have won numerous **prestigious awards.**

The CBC enterprise has built and sustained strong collaborations across many areas of the universities:

- A pathbreaking Memorandum of Understanding, brokered by the CBC and signed by the three provosts, has launched the **Open Access Initiative,** which allows CBC researchers to use state-of-the-art core facilities at any CBC institution for "in-house" rates.
- Infrastructure awards have allowed each university to obtain **cutting-edge instrumentation** for core facilities in a coordinated fashion, avoiding duplication and competition, and fostering an unprecedented level of cooperation.
- Several groups of core facility directors have developed robust working relationships across the universities, thus providing **better local technical services.**
- The Technology Transfer Offices at the three universities work together on numerous projects, from the **Chicago Innovation Mentors program** (supported by the CBC) to consulting and guiding the development of the MATTER biotechnology incubator.

CBC is building the innovation economy in Chicago by identifying, stimulating, and supporting entrepreneurial scientists:

- **32% of CBC-supported researchers have patented inventions.** Many have founded start-up companies at some point in their careers.
- **CBC-seeded projects have already spun out four local start-up companies.**
- **CBC funding has provided jobs for several hundred highly-skilled technical workers,** nurturing the foundation of the innovation ecosystem.

CBC MISSION:
Promote the development of the biomedical industry in Chicago

Developing technologies for biological discoveries

Milan Mrksich (NU) *(right),* together with Chad Mirkin (NU), David Eddington (UIC), and Joel Collier (UChicago) received the third **CBC Lever Award in 2011,** to build micro- or nano-environments for growing cells. Mrksich also teamed with Eric Weiss (NU) and Brian Kay (UIC) to win a **Catalyst Award in 2012** to study protein-docking interactions. Mrksich's research focuses on the fertile intersection of nanotechnology and biology: he is preparing **a patent application springing from the Catalyst project.**

Mrksich founded a successful **Chicago-based biotech company** three years ago. **SAMDI Tech** performs label-free screening assays for pharmaceutical clients. "The company has been profitable from the beginning," Mrksich says.

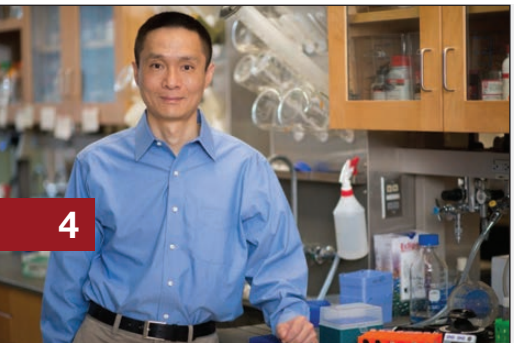
Addressing the mysteries of the proteome

Neil Kelleher (NU) *(left)* received a **CBC Recruitment Award in 2010** when he came to Northwestern as a new senior faculty member. His focus is on "Top-Down Proteomics," the large-scale study of protein structure and function, using state-of-the-art mass spectrometry. Recently, Kelleher was named a **Paul G. Allen Family Foundation Distinguished Investigator** to track the development of single human blood cells over time. This research should illuminate the point where **auto-immune disorders and blood cancers** are initiated and reveal new ways to detect and treat disease.

Prof. Kelleher is a leader in technology development, holds **several patents,** and has **a new start-up company, "Integrated Protein Technologies."**

Catalyzing a biotech start-up

Chuan He (UChicago) *(below)* and Jung-Hyun Min (UIC) joined their complementary expertise in a **2012 Catalyst** project that has truly been transformative. Together they developed a technique to precisely map modifications of the cytosine found in DNA sequences and used this novel method to demonstrate the far-reaching and profound importance of these modifications. Drs. He and Min continue to collaborate and generate new discoveries on the impact of modified cytosine on **cell development and cancer.**



The technique, called **"TAB-seq,"** has been patented by Dr. He, who founded a **Chicago-based start-up company, WiseGene,** to market the invention in 2012. Business has been strong and growing, and with the help of an SBIR grant, WiseGene expanded to 3 employees.

CBC MISSION:
Execute a plan capable of improving the health of citizens of Chicago and beyond

Exploring the genetic roots of leukemia

Fotini Gounari (UChicago) *(right)* and Steven Rosen (NU) collaborated on a **Catalyst Award in 2011.** They studied the molecular basis of genetic instability (a trademark of cancer cells) in **blood cancers such as lymphomas and leukemias.** The mechanism of genetic instability has been poorly understood, but, using mouse cells, Gounari and Rosen identified the overactivity of a protein (β-catenin) as a key contributor to genetic changes and cancer development. With a new grant from the NIH, patient samples will be screened for similar defects.

β-catenin could be a novel target for the **development of innovative anti-cancer treatments.**

Combating bacterial infections

Clostridium difficile *(C. difficile)* is a bacterial species that can cause life-threatening inflammation of the colon. Infections usually occur in people who have taken "broad-spectrum" antibiotics, which leave *C. difficile* unharmed. The **CBC High Throughput Screening Award (2013)** team of Arnon Lavie (UIC), Michael Caffrey (UIC), Wayne Anderson (NU) and **Kiira Ratia (UIC)** *(left)* has identified three new molecules that block an essential metabolic pathway in *C. difficile* – a pathway that is distinct from the pathway found in normal gut bacteria and is absent entirely in human cells.

This finding opens the door to **development of antibiotics that specifically kill *C. difficile*** – an urgent need since *C. difficile* infections have become more frequent, severe, and difficult to treat.

Attacking heart attacks

CPR is able to save less than 5% of heart attack victims who are struck outside a hospital. Cooling can increase survival, but is not practical in most cases. A **Catalyst Award in 2012** has allowed Drs. **Terry Vanden Hoek (UIC)** *(below)* and Alan Leff (UChicago) to design new proteins to magnify the protective effects of cooling in the heart and brain. This work received **national recognition for "Best Science"** in 2013 by the American Heart Association, and Dr. Vanden Hoek has received a **$2.5 million "Heart Rescue State" grant** from the Medtronic Foundation.

The hope is that rapid I.V. administration of the proteins will **improve cardiac arrest survival.**

CBC PROGRAMS

Exploratory Workshops

Up to $ 2,000

Encourages groups of faculty members to make interdisciplinary and inter-institutional connections around cutting-edge research areas. **Five** Workshops have been organized as of July 31, 2014.

Postdoctoral Research Grant

Up to $ 15,000

Funds new work in research core facilities that is conducted by postdoctoral fellows under the supervision of a faculty mentor. To date, **thirty-nine** grants have been approved.

High-Throughput Screening (HTS) Supplemental Grant

Up to $ 20,000

Supports pilot projects to identify small molecules that interact with biomedically-relevant targets, with the hope of discovering molecules with therapeutic potential. Projects must be conducted at an HTS core facility located at one of the CBC universities. CBC university affiliates of any rank (graduate students, fellows, research faculty, tenure-track faculty) may apply. **Twenty** HTS Awards have been made to date.

Catalyst Award

Up to $ 200,000

Launches innovative, high-risk/high-reward research that requires a multi-disciplinary team. Teams must be composed of faculty from at least two CBC universities. **Fifty-four** Catalysts have been awarded to date.

Recruitment Award

Up to $ 1,000,000

Facilitates the recruitment of a distinguished senior professor and two outstanding junior faculty members at each of the CBC universities. **Two senior and six junior faculty** have been hired to date.

Infrastructure Award

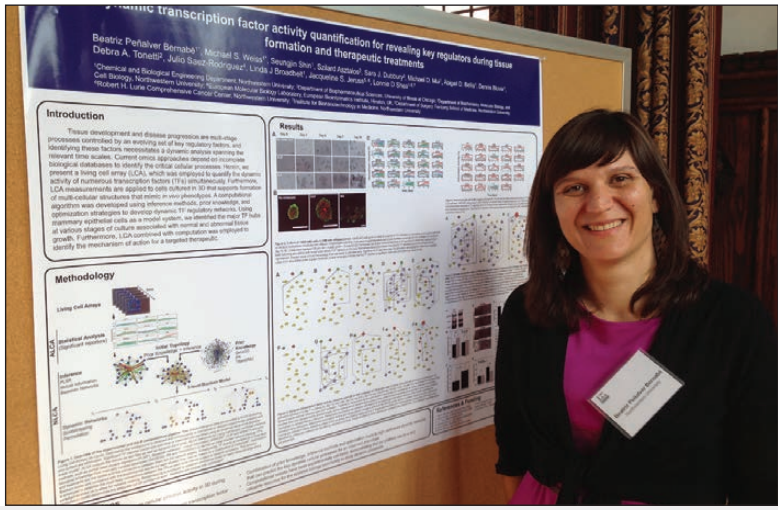
Up to $ 1,000,000

Establishes unique research capabilities through the acquisition of high-end, state-of-the-art equipment. Instruments obtained through this one-time program will be housed in core facilities at CBC universities and will be broadly available through the Open Access Initiative.

Lever Award

Up to $ 2,500,000

Matches collaborative large-scale federal awards for National Centers. To date, **five** National Centers have been established in Chicago with the help of CBC Lever Awards.

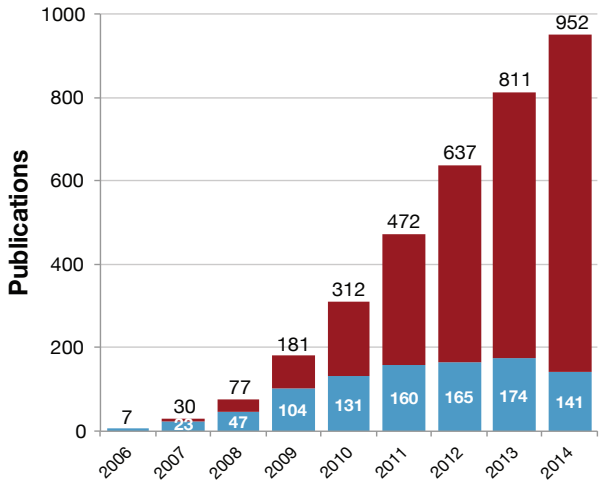


In addition, the CBC supports the **Chicago Innovation Mentors** (CIM); organizes many educational opportunities each year (including seminars, workshops, and the **Annual CBC Symposium**); and curates a website that is a central information source for Chicago-based biomedical researchers.

MEASURES OF IMPACT

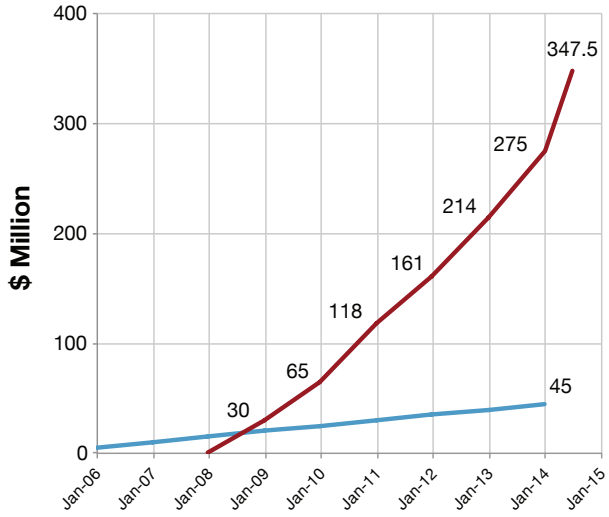
CBC Impact on Scientific Discoveries

Research funded by CBC award programs has yielded a total of **952 publications** *(as of July 31, 2014)*. These papers, most in high-impact journals, report advances in many biomedical subject areas, moving science forward on many fronts. The graph on the right shows yearly publications *(in blue)* and cumulative publications *(in red)*.



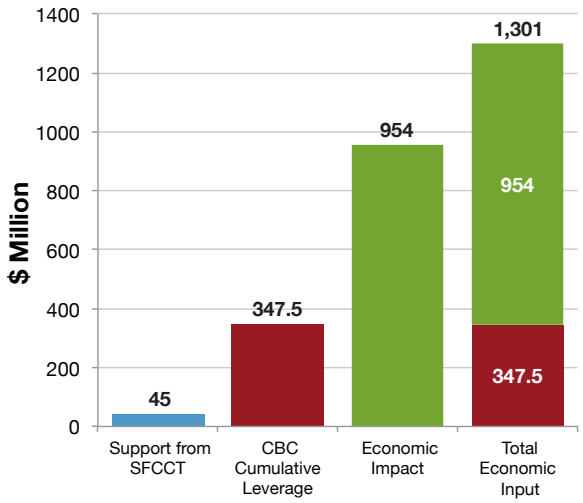
CBC Impact on Universities

Between 2006 - 2014, the Searle Funds at The Chicago Community Trust (SFCCT) awarded **$45 million** to the CBC *(right, blue line)*. The CBC used SFCCT funding to support cutting-edge basic biomedical research projects that have gone on to win additional funding from external sources, primarily the NIH. By July 31, 2014, this additional funding totaled close to **$347.5 million** *(red line)*, leveraging the SFCCT support almost 8-fold.



CBC Economic Impact on Chicago

Economists have calculated that, in Illinois, each biomedical research dollar increases business activity by $2.43[1,2]. Using this multiplier, the **Economic Impact** of the combined SFCCT *(right, blue bar)* and NIH research funding *(red bar)* is **$954 million** *(green bar)*. Thus, CBC activities (Cumulative leverage + Economic Impact) have provided **a total economic input of over $1.3 billion** to the Chicago economy during the last 8 years *(red/green bar)*.



[1]Ehrlich E. 2011. "An Economic Engine: NIH Research, Employment, and the Future of the Medical Innovation Sector." P. 11. United for Medical Research.
[2]Clinch R. 2012. "Presentation on Measuring the Economic Impact of R&D Investments." International Symposium on Assessing the Economic Impact of Nanotechnology.

CBC: HELPING TO BUILD CHICAGO'S INNOVATION ECONOMY

"The unique collaboration among Chicago's top research universities – Northwestern University, the University of Chicago, and University of Illinois at Chicago – …has made an indelible impact upon the local economy and continues playing an active role in the transformation of Chicago into an international biomedical research hub.

I have no doubt that the CBC is an important element in the fabric of our city as it strengthens its ability to revolutionize and contribute to a diversified and future-directed economy.

I endorse the work of the CBC in the strongest way possible…"

Chicago Mayor Rahm Emanuel, May 20, 2014

www.chicagobiomedicalconsortium.org