

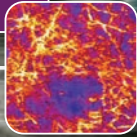
CHICAGO BIOMEDICAL CONSORTIUM

The University of Chicago
University of Illinois at Chicago
Northwestern University

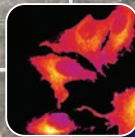
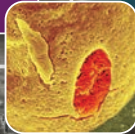


2016 Perspectives

**NORTHWESTERN UNIVERSITY
EVANSTON CAMPUS**

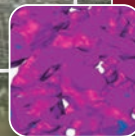


**NORTHWESTERN UNIVERSITY
CHICAGO CAMPUS**



**UNIVERSITY OF ILLINOIS
AT CHICAGO**

**THE UNIVERSITY
OF CHICAGO**



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

CBC Leadership and Staff

Lucy Godley, MD, PhD, *Scientific Director*
Professor, Department of Medicine, Section of Hematology/Oncology,
The University of Chicago

Brian Kay, PhD, *Scientific Director*
Professor, Department of Biological Sciences,
University of Illinois at Chicago

Richard Morimoto, PhD, *Scientific Director*
Bill and Gayle Cook Professor of Biology,
Director, Rice Institute for Biomedical Research,
Department of Molecular Biosciences, Northwestern University

Kathryn Stallcup, PhD, *Executive Director*

Karen Snapp, DDS, PhD, *Senior Associate Director*

Kimberly Corn, *Associate Director, Business Operations and Finance*

Jola Glotzer, MD, *Communications Director*

Corinna Kitcharoen, MBA, *Program Coordinator*

Introducing the New Scientific Director at UChicago

In April 2016, the CBC welcomed the new Scientific Director for The University of Chicago, Lucy Godley, MD, PhD. Dr. Godley is a Professor of Medicine in the section of Hematology/Oncology and maintains an active research laboratory in addition to seeing patients. Her research focuses on genetic changes associated with blood cancers.



Photo credit:
Dr. Lucy Godley

Front Cover

Scientific images overlaid on a Google earth (©2013 Google) image of the Chicago area.

CBC-affiliated researchers contributed the scientific images.

North: Northwestern University, Evanston campus (Daniel Dombeck)

East: Northwestern University, Chicago campus (Peng Ji)

West: University of Illinois at Chicago (Preston Snee)

South: The University of Chicago (Bozhi Tian)

Credits

Photographs: Back cover illustration - adapted from NIH/NCI Genomic Data Commons (GDC) website (<https://gdc.cancer.gov/>); otherwise CBC, or as indicated in the legends.

Written by: Kathryn Stallcup, CBC. Design and layout: Jola Glotzer, CBC.

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CHICAGO BIOMEDICAL CONSORTIUM

The University of Chicago
University of Illinois at Chicago
Northwestern University



2016 Perspectives

The CBC was inaugurated in 2006 with a generous grant of \$5 million per year from the Searle Funds at The Chicago Community Trust. To date, \$50 million has been invested in the CBC. The CBC has strengthened the Chicago biomedical community in a number of ways.

As of July 2016, the CBC has supported:

- **Discovery and cutting-edge research** in many areas -- including antibiotic resistance, cancer, heart disease, drug development, mental health disorders, and diabetes -- through **229 Awards** to faculty members, postdoctoral fellows, and students;
- **Recruitment of 8 outstanding senior and junior faculty members** who have gone on to receive numerous national awards;
- **Acquisition of state-of-the-art instruments** to enable ground-breaking investigations of key biomedical questions;
- **Professional development programs** for graduate students and postdoctoral fellows;
- **Mentoring assistance** for researchers interested in commercializing discoveries;
- **Thirteen Annual Symposia** and over 30 other events showcasing research supported by the CBC and high-end technologies available at CBC universities.

Notable outcomes of CBC support include:

- Publication of over **1550 peer-reviewed articles** based on CBC-funded research;
- Establishment of **six national research centers** at CBC universities;
- Encouragement of a broad array of inter-institutional collaborations, including the **Open Access Initiative**.

Projects launched by the CBC have gone on to earn almost **\$514 million** in additional funding, with a total estimated economic input of over **\$1.8 billion** for the Chicago economy overall.



Lever Still Going Strong Seven Years Later

Lever Award (2009)
Chicago Tri-Institutional Center
for Chemical Methodologies and Library Development
PIs: Sergey Kozmin (UChicago), Jie Liang (UIC), Karl Scheidt (NU)

In 2009, the CBC matched a \$9.2 million NIH P50 grant with a \$2 million Lever Award. The majority of the Lever funding was used to establish the “Hit to Lead” core facility, located in the Center for Molecular Innovation and Drug Discovery (CMIDD) at NU. This resource uses its medicinal chemistry expertise to design and synthesize novel compounds suitable for therapeutic development. CMIDD has collaborated with scores of researchers from across the city and the CBC award has been leveraged over 20-fold. To date, 17 patent applications have been filed and 8 patents have been awarded.



“The CBC Lever award was transformative in establishing a translational platform for therapeutic science in the Chicago area.”

- Karl Scheidt

Photo: Postdoctoral fellow Dr. Neha Malik using the CMIDD ChemCore facility. Credit: CMIDD.



“Another benefit of this project is that it will likely result in additional collaborations and joint proposals...”

- Heather Pinkett

Photo: Dr. Heather Pinkett in her laboratory at Northwestern.
Credit: Steven E. Gross; source: NU Annual Report 2013.

Catalyst to Develop New Research Tools

Catalyst Award (2016)
Spatiotemporal Control of Protein Function:
Ligand Activation of TEV Protease
PIs: Heather Pinkett (NU) and Howard Shuman (UChicago)

Protein complexes carry out essentially all activities of living cells. NU Professor Heather Pinkett (*left*) is building new tools to study and understand the structure and function of protein complexes. She and her collaborator, UChicago Professor Howard Shuman, are taking an innovative approach and designing ways to precisely cut protein complexes, thus revealing their mechanism of action. While risky, this research has the potential to answer many difficult, but important, biological questions.



“I wish to emphasize that the CBC-HTS award was an immense boost to our efforts.” - Michael Federle

Photo: Dr. Michael Federle (*left*) at his lab with his group member. Source: a snapshot from a YouTube video by Federle, June 1, 2016. (<https://www.youtube.com/watch?v=g9FdPhI-JIA>).

HTS Award Leveraged 185 Fold

High Throughput Screening (HTS) Award (2014)
Signal Jamming of Bacterial Communication: an HTS approach
PI: Michael J. Federle (UIC)

Professor Michael Federle (*right*) studies the *Streptococcus pyogenes* bacteria that usually cause common strep throat, but can also trigger life-threatening rheumatic heart disease. Federle develops new antibiotics that disrupt infectious diseases by interfering with bacteria’s ability to coordinate their assault on the human body. Based on the results of his CBC-funded project, Federle has already published three research papers, patented several inhibitory molecules and received follow-on NIH funding that amounts to over \$3.5 million.



“The award provided an interactive platform for the investigators to meet and develop new ideas/projects, which have led to applications for federal funding.”

- Russell Reid

Photo: Dr. Russell Reid with his little patient at the UChicago Comer Children Hospital. Credit: Comer Hospital website.

← Correcting Craniofacial Defects

Catalyst Award (2013)

Craniofacial Tissue Engineering with Citric-Acid Based Nanocomposite Scaffolds

PIs: Russell R. Reid and Tong-Chuan He (UChicago), and Guillermo Ameer (NU)

A limited supply of bone makes it difficult to treat skull and facial irregularities due to birth defects, tumors, or injury. Professors Russell Reid, Tong-Chuan He and Guillermo Ameer combined their knowledge of plastic surgery, cell biology, and biomaterials engineering to design a novel scaffolding substance that, when seeded with appropriate stem cells, can develop into mature bone. The Catalyst team has published five papers and has applied for further funding from the US Department of Defense, which is seeking new ways to treat hard-to-heal head injuries resulting from combat.

Open Access Initiative Pays Off →

Postdoctoral Research Award (2014)

A Synthetic Biomineral Integrated with Silicon Nanowires

PIs: Yucai Wang and Bozhi Tian (UChicago)

The goal of Professor Bozhi Tian (*right*) and Postdoc Yucai Wang is to make new implantable materials that are ‘soft’ like living tissues. An early step in the process required the use of several different powerful microscopes (each located at a different CBC university) to analyze the material. Using a CBC Postdoctoral Research Award granted to Wang and taking advantage of the unique “Open Access Initiative” launched by the CBC, the groundwork was laid for a novel injectable biomaterial with the potential to manipulate organ behavior. The discovery was reported in *Nature Materials*.



“We would have never pushed the work to this stage without the Open Access Initiative.” - Bozhi Tian

Photo: Dr. Bozhi Tian in his UChicago office. Credit: UChicago Biophysical Sciences website.



Scholars reported that the multi-university interactions expanded their networks and horizons.

Photo: The inaugural class of CBC Scholars (2010) meets the class of 2011 at the Second Annual CBC Scholars Scientific Exchange at the NU Chicago Campus.

← Building Chicago’s Scientific Workforce

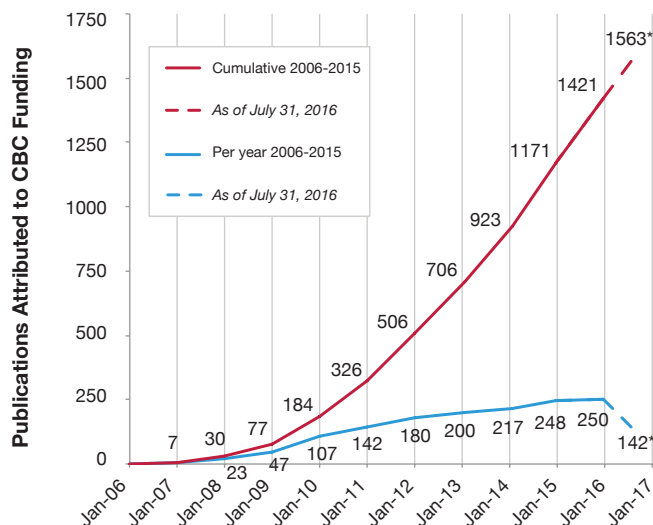
Scholar Awards (2010-2014)

Jackie Shepard (*front row, 2nd from left*), a CBC Scholar from the inaugural class of 2010, graduated from NU in 2012 and went on to MIT as a postdoc to continue her training in bioengineering. In 2014, Jackie returned to Chicagoland and joined Abbott Laboratories to launch a career that would use her expertise in biotechnology. Five other CBC Scholars have also joined Chicago-area Pharma and Biotech Companies, such as Exicure (formerly AuraSense Therapeutics, LLC), and Biotronic. Young scientists from CBC universities are a key component of the Chicago biomedical ecosystem, providing talent to local companies, both big and small.

MEASURES OF IMPACT

Impact on Scientific Discoveries

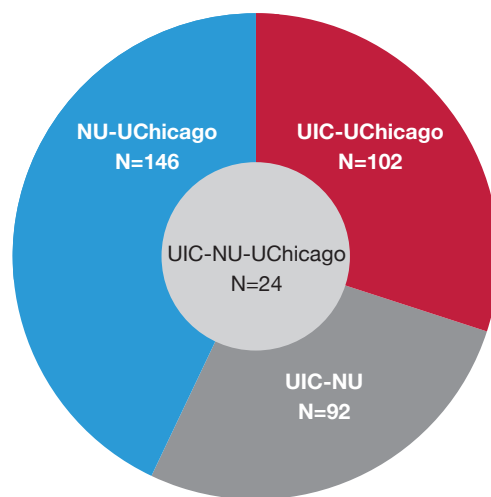
Research funded by CBC award programs has yielded a total of **1563 publications** (as of July 31, 2016*). These papers, most in high-impact journals, report advances in many biomedical subject areas, moving science forward on many fronts from the design of unique instruments and reagents for research to explorations of the basic mechanisms of human biology in health and disease. The graph on the right shows yearly publications (in blue) and cumulative publications (in red).



Impact on Collaboration in Chicago

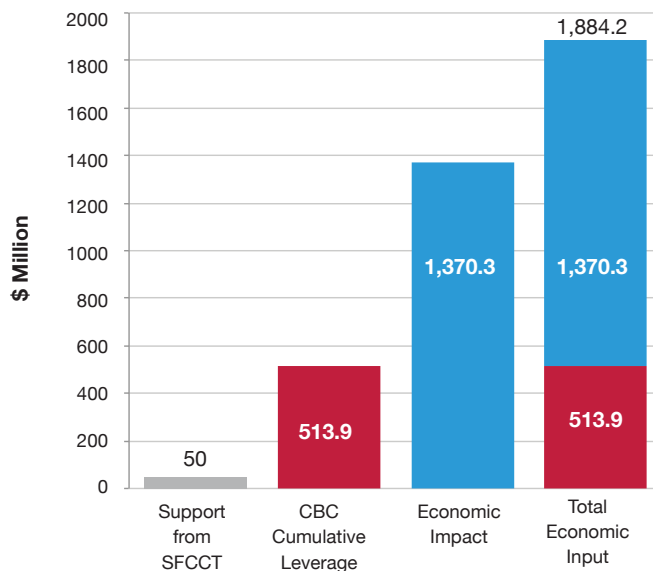
The CBC has inspired a range of inter-institutional collaborations. For example, **364 inter-institutional teams** applied for Catalyst Awards to undertake new projects (right). Teams have been comprised of over 560 faculty members from all three CBC universities. Many teams have been partnerships of junior and senior faculty. While most applications have come from teams representing two universities, about 7% of the teams have included faculty from all three universities. Many of the teams continue to collaborate after Catalyst funding ends.

Collaborative Catalyst Teams 2006-2016 (N=364)



Economic Impact on Chicago

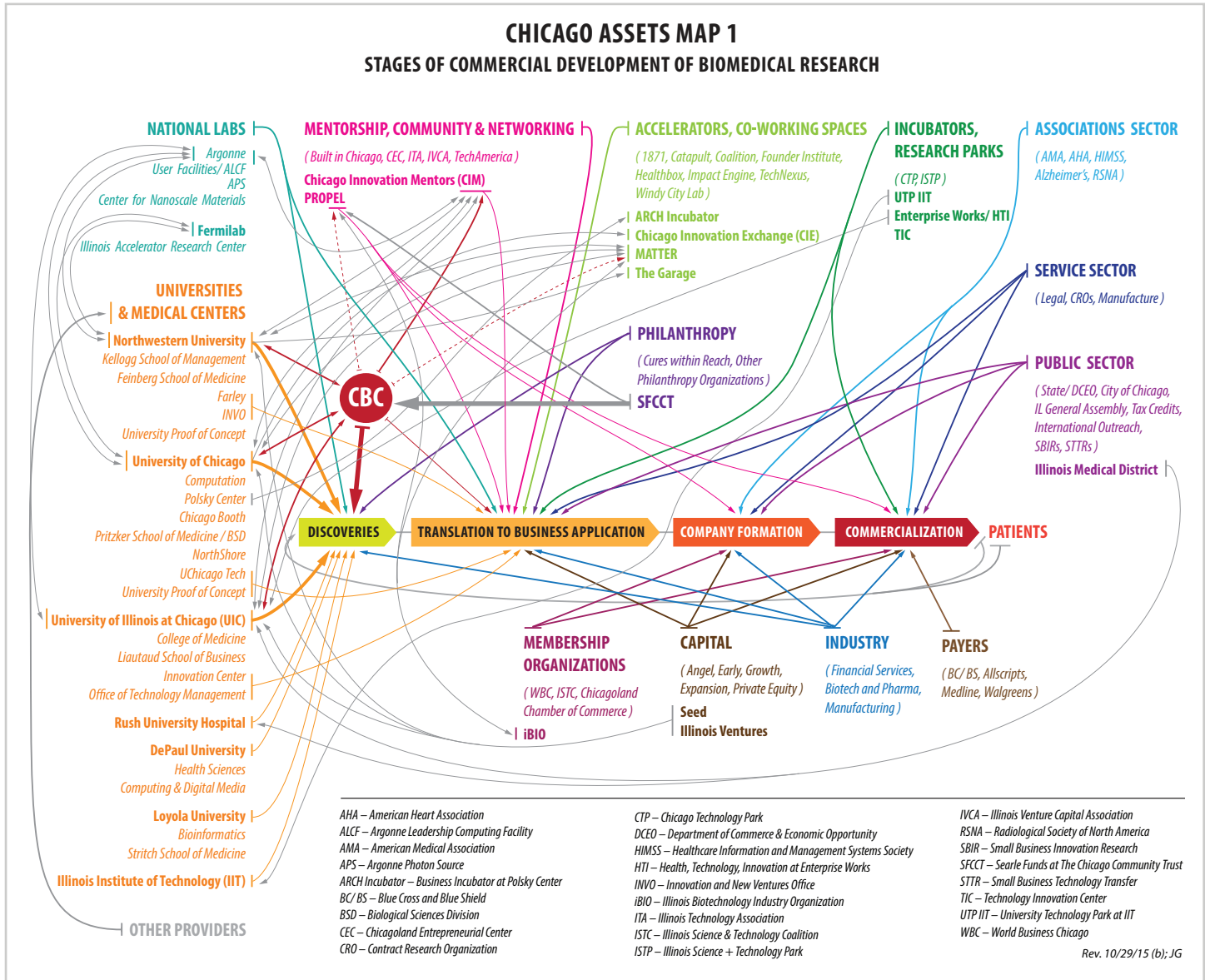
From 2006 to 2016, the Searle Funds at The Chicago Community Trust (SFCCT) awarded \$50 million to the CBC (right, grey bar). The CBC used SFCCT funding to support cutting-edge basic biomedical research projects that have gone on to win additional funding from external sources, primarily the NIH. To date, this additional funding totals almost **\$514 million** (red bar). Economists have calculated that, in Illinois, **each biomedical research dollar increases business activity by \$2.43^{2,3}**. Using this multiplier, the Economic Impact of the combined SFCCT and NIH research funding is **\$1.370 billion** (blue bar). Thus, CBC activities (Cumulative leverage + Economic Impact) have provided a total economic input of over **\$1.8 billion** to the Chicago economy since 2006 (red/blue bar).



*Data collected through July 31, 2016 (2016 data refers to January 1 - July 31 period only). ¹Biomedically-relevant inter-university publications were counted for the CBC universities. Data came from the Web of Science database, courtesy of Luis Amaral, et al., NU. ²Ehrlich E. 2011. "An Economic Engine: NIH Research, Employment, and the Future of the Medical Innovation Sector." P. 11. United for Medical Research. ³Clinch R. 2012. "Presentation on Measuring the Economic Impact of R&D Investments." International Symposium on Assessing the Economic Impact of Nanotechnology.

DELIVERY LAB (DL): THE CHICAGO BIOMEDICAL ECOSYSTEM

In the fall of 2015, the CBC assembled a diverse group of 40 individuals to discuss the process and local support system for translation of biomedical discoveries into treatments for patients. In addition to the CBC Scientific Directors, the DL group included Technology Transfer Officers from the CBC universities, representatives of local biotech companies (large and small), government entities, and not-for-profit organizations such as iBIO and MATTER. An “Asset Map” was prepared, describing a sizable, interconnected, and evolving* community offering assistance and support to entrepreneurs at most points in the commercialization process.



The CBC’s focus on supporting basic research places it at the beginning of the process: where discoveries are made. The DL group agreed that there is an on-going need to provide research funding at that first, highest risk step in the process. In addition, the group identified several ways that the CBC, capitalizing on its unique relationship with researchers and the universities, could further foster translation, building on the significant investments that universities have made to encourage commercialization.

*The DL group noted that the ecosystem is evolving rapidly. The Asset Map prepared in October 2015 does not include recent changes, such as CIM merging with MATTER, and the reorganization of the UChicago Polsky Center for Entrepreneurship and Innovation to include UChicagoTech.



Wise investments in research yield world-wide dividends: CBC's first Lever Award builds the foundation for a Presidential Initiative!

"I can't tell you how excited I am about this," said Vice President Joe Biden as he toured the Genomic Data Commons (GDC) when it opened at UChicago on June 6, 2016.

An initiative of the National Cancer Institute, GDC will be a centralized database and information system for cancer-related genomic and clinical data. It is a key part of the ambitious **Cancer Moonshot Initiative**, led by Biden, that aims to make more therapies available to more patients, while also improving the ability to prevent cancer and detect it at an early stage.

UChicago Professor Robert Grossman is principal investigator for the GDC. He began working with massive biological datasets in 2008 as a principal investigator on the Chicago Center for Systems Biology Lever Award. **The CBC Lever Award provided funding for the development of the "Bionimbus Protected Data Cloud" in 2010** -- the first cloud-based, accessible data storage system approved by the NIH to hold cancer genomic data.

Six years later, Bionimbus has evolved into the GDC, the \$19.2 million project that is the hub of the Cancer Moonshot.



Vice President Joe Biden talks with the CBC Lever Award recipient Professor Robert Grossman at the launch of the NCI Genomic Data Commons. (Photo by Robert Kozloff).

To quote Professor Grossman: "We couldn't have done it without support from the CBC, so thank you!"