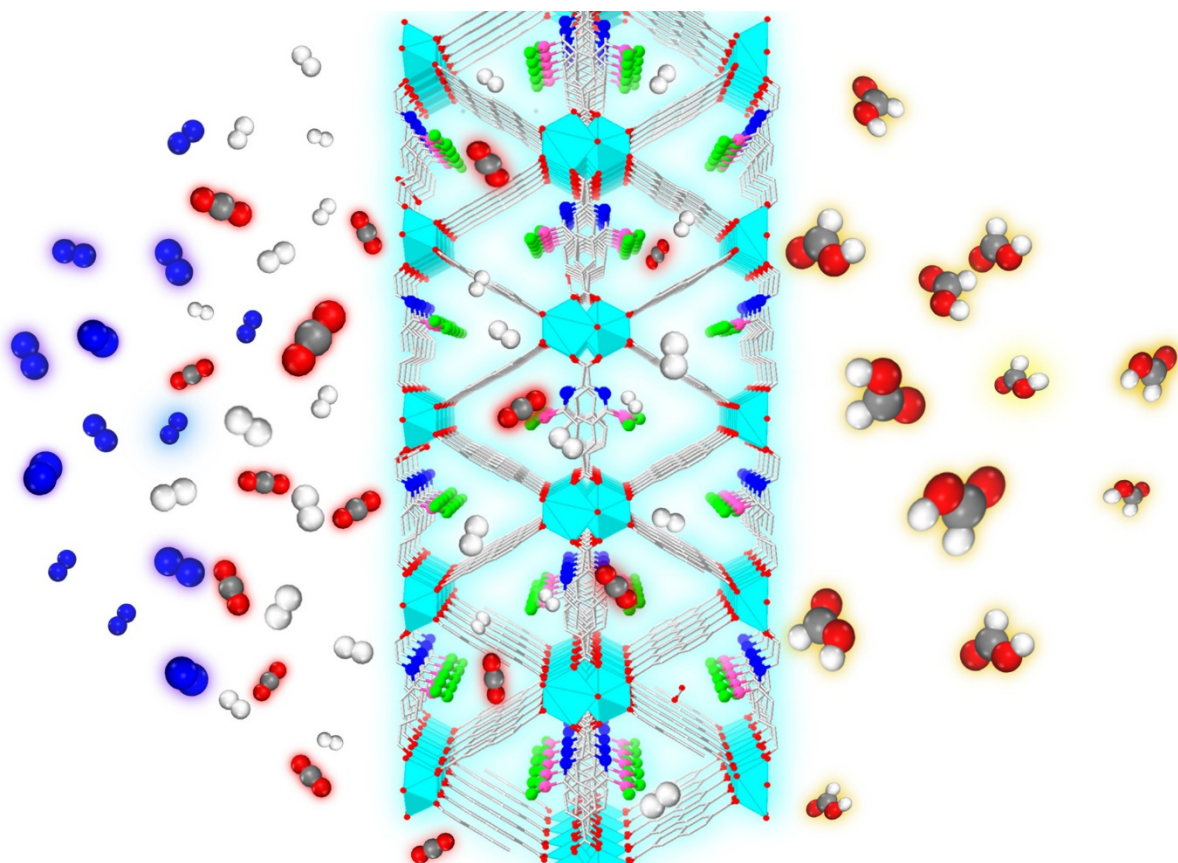


Pitt Research

Center for Research Computing

Research of Impact 2018-2019



CRC enables work in medicine, physical science, engineering, social sciences, and humanities, growing the next generation of researchers who draw on advanced computing to inspire insights and breakthroughs. Here are some of our 2018-2019 achievements.

Supporting, Enabling

- CRC enabled work on more than 133 grants, supported by over \$81 million in outside funding.
- CRC supports 300 faculty accounts representing more than 2,700 individual users, up 27% over last year.
- CRC's usage on our primary system from July-December 2018 was up by 75% over last year.

Diversity, Access

- CRC **supported** users in **54 departments, schools, interdisciplinary programs, and centers**.
- CRC developed services which **made advanced computing accessible** in a familiar desktop environment to researchers **without computing experience**.

Investing, Growing

- **CRC recruited faculty to invest \$127,353** in grant or startup funds to buy equipment that became part of CRC's shared resources, bringing the total faculty investment since 2016 to \$215,000.
- CRC's Total Hardware Resources in June 2019:
 - 8,268 CPU cores
 - 130 GPU graphics cards
 - 2.5 PB storage

Impact

More than 112 peer-reviewed journal articles, conference presentations, and book chapters, many in prestigious high-impact journals such as *Nature Medicine*, *Journal of the American Chemical Society*, and *JAMA Oncology* depended on CRC resources.

Pitt's Center for Research Computing in 2018-2019 helped save a life, measure biodiversity, design spacecraft computers, tackle climate change, and influence fiscal policy on debt and lending.

Saving a life. Pitt biologist Graham Hatfull worked with CRC resources in sequencing three phages – viruses that attack bacteria – used to successfully treat a teenage cystic fibrosis patient on the verge of dying from a rare bacterial infection. The story was covered in dozens of news outlets in the United States and Europe. Hatfull's team altered two genes to make the phages express the aggressive traits needed to attack the bacteria; CRC resources helped Hatfull's team identify those two genes. Hatfull explains. "We need the RNA sequence analysis supported at the CRC to make sense of the data. Without it we can't compare which genes are responsible for which particular gene expression."

Measuring biodiversity. Biologist Justin Kitzes partners with Barry Moore II, a CRC research assistant professor, to develop an innovative machine learning program to document biodiversity based on recorded bird calls. The project has received a prestigious AI for Earth Innovation grant from Microsoft and National Geographic.

Exploring the solar system. Engineering professor Matthew Barry used CRC resources collaborating with NASA's Jet Propulsion Laboratory to model components of a supercomputer launched on a mission to the International Space Station. His team is conducting thermodynamic simulations of a craft that will tunnel through the ice crust of Jupiter's moon Europa to reach the ocean below.

Tackling climate change. Finding alternatives to carbon-based fuels is a national and global priority. CRC collaborates with researchers developing alternative fuels, advanced fuel cells and technologies for carbon capture and transformation. CRC Associate Director J. Karl Johnson's team at the Department of Chemical and Petroleum Engineering simulated a nanomaterial that causes CO₂ to react with hydrogen to produce valuable fuels and chemicals (see the cover illustration: CO₂ (red and gray) is separated from N₂ (blue), then reacts with hydrogen (white)).

Influencing fiscal policy. Using CRC to process data on credit scores and mortgage defaults, Pitt Economics Professor Stefania Albanesi showed the 2007-2010 credit crisis was not caused by defaulting subprime mortgage borrowers but by defaulting borrowers with high and medium credit scores. Her new narrative is spurring discussion about fiscal policies restricting credit for low-income borrowers.

Faculty Feedback

“Pitt CRC is indispensable. CRC helps you move seamlessly from your laptop into the cluster.”

—Lisa Borghesi, associate professor of immunology and director, Unified Flow Core

“We need the RNA sequence analysis available at CRC to make sense of the data.”

— Graham Hatfull, Eberly Family Professor of Biotechnology

“Parsing 2,500 documents took six days without CRC resources. CRC gave us efficient load balancing and resource management, which were crucial.”

—Michael Colaresi, William S. Dietrich II Professor in Political Science

University of Pittsburgh Center for Research Computing offers every Pitt faculty member free access to advanced computing and user support with workshops and individual consultation for PIs and students.

See how CRC could enhance your research at crc.pitt.edu

Our door is open. Consultants are usually available 9am to 5pm. If an available consultant can't answer your question, we will direct you to a consultant who can. Apply for an account at crc.pitt.edu/UserSupport.

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On the first page: a simulated nanomaterial separates CO₂ (in red and gray) from nitrogen molecules (blue), causing a catalytic reaction of CO₂ with hydrogen molecules (white), producing formic acid, which is used to synthesize valuable fuels and chemicals. The simulation was developed as part of research into technologies for carbon capture and transformation by the team of CRC Associate Director J. Karl Johnson's team at the Department of Chemical and Petroleum Engineering.