

PROGRAM SPOTLIGHT: DCB GOES TO CHICAGO!

On the morning of Saturday, October 28, the air was cool and crisp, and autumn leaves crunched underfoot. It was clear. We weren't at the Computer History Museum (CHM) in Mountain View, California, anymore! The Museum's Education team hit the road this fall, to bring our Broadcom Presents Design_Code_Build (DCB) program off-site, in partnership with the Museum of Science and Industry (MSI) in Chicago, Illinois. Brett Nicholas, manager of community initiatives at MSI, was an incredible collaborator, as he and his team welcomed us to the Museum and supported every aspect of the program.



After three and a half years of on-site DCB events at CHM, we are excited to begin exploring how to bring our educational programming to new locations, students, and families across the country. We hope to develop a variety of off-site program options to offer STEAM (science, technology, engineering, art, and mathematics) learning experiences to communities who may not currently have access to tech resources or programs such as DCB. As one of the leading science institutions in the United States, MSI was a wonderful partner to work with as we ventured off-site for the first time. The museum offers an array of incredible programming and works with students from all areas of Chicago, but currently does not lead events or workshops that are specific to computer science or computer history. Most of the students who attended the event had never been exposed to computer programming, and they all took to it immediately.

The event at MSI welcomed students from several



community organizations and schools around the Chicago area and was led by CHM educators Kate McGregor and Stephanie Corrigan along with a team of talented Chicago-based DCB instructors. Energetic and enthusiastic volunteers from Google and Lewis University supported the students and helped to make the event engaging and have lasting impact for all involved.

Throughout the day, activities focused on problem-solving and innovation through the lenses of computer science and computer history. The program introduced students to concepts of computer programming, including hands-on learning with Raspberry Pi computers, writing a program and navigating a life-size maze, and learning about the relevance and impact of computer history through stories and artifacts from both CHM and MSI.

The event also featured Tanya Berger-Wolf as our incredible guest "rock star" speaker. Tanya is a professor of computer science at the University of Illinois at Chicago and heads the Computational Population Biology Lab. She is also the cofounder and director of Wildbook.org, which is, as she describes it, "Facebook for animals!" Tanya shared her personal story and her passion for computer science, wildlife biology, and social sciences and helped to inspire students to follow their own interests and think creatively about how they could use technology to help address real-world issues.

The day was a huge success—thank you to all involved!

*Photo Credit for DCB Photos:
J.B. Spector/Museum of Science and Industry*



PROGRAM SPOTLIGHT: CHM LIVE

CHM offers a variety of programs specifically designed for students, families, and educators, but there are also other programs and learning opportunities here at the Museum. CHM produces live events throughout the year as part of its CHM Live programming. These events cover a wide range of topics that appeal to diverse audiences.

CHM Live offers original productions that explore the ongoing transformation of computing and its impact on society. Series and programs are designed to explore historical and current issues in technology, entrepreneurship and innovation, software, and computing around the world. Topics are considered from multiple angles and intersect countless fields, disciplines, and industries. Speakers and moderators are carefully selected and engage in meaningful, thought-provoking discussions.

Past programming includes CHM's award-winning *Revolutionaries* series. Past speakers include Facebook's Mark Zuckerberg, Twitter CEO Jack Dorsey, Facebook's Sheryl Sandberg, and Google's Eric Schmidt.

This year, we are launching a series of events that focus on the impact of computing on education and learning. Topics will include how education reporters are covering computing in the classroom, Silicon Valley's influence in the classroom, and much more. Our first event will take place on Thursday, February 15 and will explore technology's impact on brain development with Neuroscientist Adam Gazzaley, Professor Mary-Helen Immordino Yang, and Research Psychologist Larry Rosen in conversation with *San Jose Mercury News* science reporter Lisa Krieger.



Twitter and Square CEO Jack Dorsey sits down with the Verge's Senior Technology Editor Lauren Goode.

All CHM Live events are free and open to the public, though advance registration is required. You can learn more about programs and register on our website. We invite all educators to attend the events and join the conversation and also to share them with students, parents, and colleagues. There are also opportunities to bring content into the classroom or share it with those who can't attend as all programs are also distributed worldwide on multiple media platforms.



AAAI President Rao Kambhampati, IBM Research Scientist Francesca Rossi, and Siri Cofounder Tom Gruber discuss artificial intelligence with Museum Historian John Markoff.

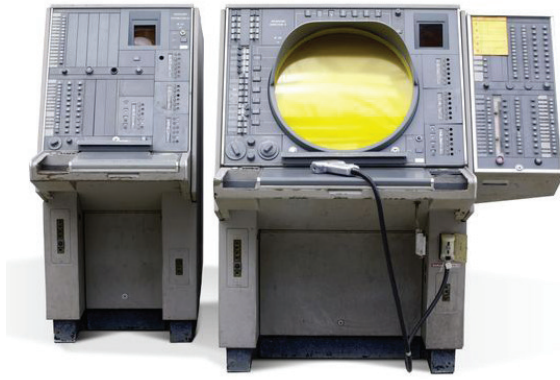
ARTIFACT SPOTLIGHT: SAGE

In September 2017, the Midpeninsula Regional Open Space District opened former US Air Force base Mount Umunhum to the public after a decades-long restoration effort. In addition to trails, views, and a Native American ceremonial space, the former military base features a five-story radar tower, once part of a network of hundreds of similar towers positioned around the USA. These stations fed radar information about their local airspace to an enormously ambitious continental air defense system known as the Semi-Automatic Ground Environment system, or SAGE. At a central location, these radar inputs were combined by SAGE into a continent-wide radar picture of the entire US airspace (including Canada).

SAGE was a response to fear of Soviet nuclear bomber attacks during the 1950s and 1960s. In the event of an attack, time was of the essence and so the SAGE system was designed to detect, track, and direct fighter aircraft toward an incoming bomber and shoot it down before it reached its target. Many advanced hardware and software technologies were developed for SAGE, including techniques such as redundant central processing units, the light pen (precursor to the mouse), real-time software development, air traffic control, networking, and much more. This had massive spinoff effects for the computing industry.

The SAGE system linked 23 sites across the United States (and one in Canada), which collected continuous streams of data from many sources, including weather reports, known aircraft flight schedules, and real-time radar units like the one on Mount Umunhum. The computers operated 24 hours a day and each SAGE installation had two computers to provide redundancy in case one failed.

SAGE computers not only processed radar data but also presented relevant airspace defense information in real-time. Graphical representations of aircraft in specific airspace



appeared on display consoles connected to the computer. Operators watched the airspace for anything out of the ordinary and could begin the process to “scramble” fighter jets if required.

For console operators, the job was mostly waiting, but when something unusual appeared on the screen, it could be terrifying. The system was never really put to the test in an attack scenario, and, though several of the sites remained in service until 1982, the bomber threat SAGE had been designed to address had changed to the much faster rocket-based Intercontinental Ballistic Missiles (ICBMs) threat of the 1960s. Critics have noted that while it could detect a small number of aircraft, it might not have been able to defend the US in the case of a massive bomber attack involving large numbers of Soviet bombers, and it was certainly incapable of countering the ICBM threat.

Whatever the benefits of SAGE, either as an early warning system or a deterrent to attack, the technology developed for SAGE proved useful in future projects, especially for IBM, the project’s main contractor, who earned over \$1 billion in fees from the SAGE contract. The experience gained working with magnetic core memory for SAGE helped IBM in later commercial computers. And graphical displays that allow for immediate interaction between user and computer, groundbreaking in the SAGE systems, eventually became the norm.

CALENDAR OF EVENTS: WINTER 2018

Design_Code_Build: Level 1 Introductory Program: March 10, March 24 (All-girls event in partnership with Girl Scouts of Northern California); Level 2 Intermediate Program: April 7, April 22 (All-girls event in partnership with Girl Scouts of Northern California)

- Weekend program open to 6th through 8th grade students.
- Transportation subsidies available for qualified groups; lunch provided.
- For more information, contact Lily Cordero, lcordero@computerhistory.org.

Field Trip Days: March 20, April 10

- Program for Title I middle schools (6th–8th grade).
- Lunch and transportation reimbursement provided.
- For more information, contact Sarah Bormann, sbormann@computerhistory.org.

Family Workshops

- Saturday, January 20—Lights, Circuits, Action! Family Workshop
- Saturday, February 3—I <3 Software Family Workshop
- For more information, contact Emily Stupfel, estupfel@computerhistory.org.

CHM Live

- Wednesday, January 31—Uber Chief Brand Officer Bozoma Saint John in Conversation with the *Verge*'s Senior Technology Editor Lauren Goode
- Thursday, February 15—Technology's Impact on Brain Development with Neuroscientist Adam Gazzaley, Professor Mary-Helen Immordino Yang, and Research Psychologist Larry Rosen in Conversation with *San Jose Mercury News* Science Reporter Lisa Krieger
- Tuesday, April 3—A Conversation with Atari Cofounder Nolan Bushnell
- For more information, contact Lauren Miyamoto, lmiyamoto@computerhistory.org.



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