BOUNDless

Front cover:
Students of the Carnegie Mellon University Computer Club (CMUCC) demonstrate their vintage computer reconstructions at the "At the Heart of the Work" event.

Back cover:
2019 3MT Championship Winner Bhuwan Dhingra.

Keith G. Webster
Dean of University Libraries and Director of Emerging and Integrative Media Initiatives

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Andrew Meade McGee

Andrew Meade McGee is the University Libraries' CLIR Postdoctoral Fellow in the History of Science and Computing. An historian by training, he specializes in the political, cultural, technology, and business history of the twentieth century United States, with a particular focus on the history of the information society.

You previously served as visiting faculty in the history department at CMU before going to the Library of Congress. What brought you back to CMU?

Carnegie Mellon has a certain lure to someone who identifies as a computer historian. For three semesters from Fall of 2016 on, I taught technology and business history courses. While down in Washington, DC, as a Kluge Fellow at the Library of Congress in 2018, I had the opportunity to apply to return to the CMU campus as a result of a postdoctoral fellowship in the Libraries, run through the Council on Library and Information Resources (CLIR). Dean Keith Webster had expressed interest in growing the Libraries' role in exploring and preserving the history of computing on the CMU campus. I was drawn to the position by the opportunity to work with CMU's distinctive information technology collections, particularly the Traub-McCorduck machines and the papers of such luminaries as Herbert Simon and Allen Newell.

What is HOST @ CMU?

HOST @ CMU stands for "History of Science and Technology at Carnegie Mellon University" and is an interdisciplinary, cross-campus group of faculty and staff seeking to sponsor and promote activities that highlight historical developments in science, technology, and computing on the CMU campus. The group was formed in the summer of 2018 and has grown from Libraries faculty and staff to include representatives from the History Department, the Simon Initiative, the School of Architecture, and the School of Computer Science. We're interested in emphasizing the University Libraries as a convener space for researchers from all disciplines interested in questions of how historical complexities of science and technology have shaped the present day.

Why did you identify a plaque for the site of the first computer on campus as your first major initiative?

Members of HOST agreed that the campus community would benefit from an event reminding students and faculty of the deep history of CMU's current status as an institution driven by computer technologies. By hosting an event at Carnival commemorating Carnegie Tech's first computer in 1956, we could establish the Libraries as custodian of the institution's memory. If CMU is to continue to shape the future of the information age, it needs to look to its past for context.

Read more from Andrew about the future of HOST and how to get involved:

🔗 tinyurl.com/andrewmcgee

🔗 host.library.cmu.edu

At the Heart of the Work

The Libraries presented a series of events and exhibits in recognition of the impact that the computer has had on CMU.

In August 1956, CMU's first electronic digital computer, an IBM 650 mainframe, was delivered to the basement of the then Graduate School of Industrial Administration (GSIA). Initially used to train business degree candidates in complex decision-making techniques, that machine and the Computation Center that operated it were quickly embraced by faculty, staff, and students.

Over the past six decades, computers and the emerging field of computer science have gone on to shape the trajectory of this university and to radically transform all aspects of modern economic, cultural, and political life. In recognition of the computer's seminal role in society and on campus, the Libraries held an event to unveil a commemorative plaque to be placed at the original site of the IBM 650.

The April 12 "At the Heart of the Work" event, held in the Posner Center, featured remarks from President Farnam Jahanian; James Morris, emeritus professor of computer science and former dean of the School of Computer Science; Lenore Blum, Distinguished Career Professor of Computer Science; and Keith Webster, Dean of University Libraries and Director of Emerging and Integrative Media Initiatives.

During the event, Professor Daniel Cardoso Llach of the School of Architecture and students from his Computational Design Laboratory displayed their reconstruction of a pioneering piece of software for computational urban design, the Computer Implemented Sit Planning Program (CISP). Also at the event were students of the Carnegie Mellon University Computer Club (CMUCC), who demonstrated their vintage computer reconstructions, including a working Apple Lisa and Vectrex Game Console.

Utilizing materials from the University Libraries Special Collections and the University Archives, an exhibit entitled "@ The Heart of the Work: The Electronic Digital Computer at Carnegie Mellon" displayed photographs, equipment and artifacts from the history of computing at CMU in the Posner Center through the month of April. The virtual companion exhibit, "#HeartoftheWork," presented on digital screens in locations around campus, invited the university community to contribute to a shared narrative by contributing stories of how computing shaped their CMU experience.

View more photos from this event:

🔗 **tinyurl.com/heartofthework-photos**

AURAND RECEIVES DISTINGUISHED SERVICE AWARD

The professional organization for Architecture School librarians has recognized Martin Aurand for excellence in his field.

Martin Aurand, Principal Librarian and Architecture Archivist at the Carnegie Mellon University Libraries, was recently awarded the Distinguished Service Award for distinction in the profession from the Association of Architecture School Librarians (AASL).

The award recognizes outstanding and sustained service to the profession through active participation, advocacy, and leadership in AASL; outstanding and sustained service to a library serving an academic architectural program in a manner consistent with the highest standards of the field; and significant research or publication that demonstrates the value of architecture librarians and their profession.

As the University Libraries' liaison to the School of Architecture, Aurand offers reference and research consultation services, provides curriculum-based research instruction, acquires and manages information resources, and engages issues around scholarly communications. As Archivist, Martin manages the collections and operations of the Carnegie Mellon University Architecture Archives, a repository of architectural drawings and other records documenting the architects and architecture of Pittsburgh and its vicinity, including the Carnegie Mellon campus. He has been with Carnegie Mellon since 1987.

$$prediction = \sum_{i}^{n} f_i(w) \cdot c_{i}$$

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Predicted "Celery"

low

Libraries Convene Community of Scholars

The University Libraries recently hosted a conversation on harnessing the power of artificial intelligence for scientific data discovery.

The AIDR (Artificial Intelligence for Data Discovery and Reuse) 2019 conference took place May 13-15 and brought 150 researchers, computer scientists, librarians and industry representatives from 10 countries and 65 institutions and organizations to CMU May 13-15.

Supported by the National Science Foundation (NSF)'s public access initiative, organized by the Carnegie Mellon University Libraries with the assistance of the Pittsburgh Supercomputing Center, and in-cooperation with the Association for Computing Machinery (ACM), AIDR 2019 focused on innovative solutions that would enable scientists and researchers to extract more value from large, complex datasets.

"With the recent advances in machine learning and AI, it is possible to train computers to find optimal solutions to a problem, such as integrating different datasets and extracting metadata," said Huajin Wang, a CMU librarian and conference chair. "We created AIDR 2019 because it's about time that people working in a variety of disciplines come together to benefit from diverse expertise, and address these mutual challenges together, using the power of AI."

Attendees heard from speakers including Tom Mitchell, the E. Fredkin University Professor of Machine Learning and Computer Science and interim dean of the School of Computer Science; Glen de Vries, a 1994 graduate of the Mellon College of Science and president and co-founder of Medidata Solutions; and Natasha Noy, staff scientist at Google AI and team lead for Google Dataset Search. Discipline-specific presentations and panel discussions rounded out the agenda.

Convening a diverse set of speakers and attendees for this inaugural event was a priority for the conference organizers. As the explosion in the volume of scientific data has made it increasingly challenging to find data scattered across platforms, greater data complexity and lack of consistent data standards across disciplines present new hurdles to evaluating data quality, reproducing results and reusing data for new discoveries.

"Difficulty in scientific data reuse has been an important issue that impedes rapid progress in many disciplines, yet it is a problem that cannot be easily solved by any single discipline alone," Wang said. "University Libraries have played an essential role in connecting the campus community, providing digital tools and services for open science and open data, and fostering collaborations across disciplines, so it is only fitting that we take a leading role in this initiative."

The Libraries will continue to create venues for cross-disciplinary opportunities for CMU scholars with the second Open Science Symposium on Nov. 7, and a second AIDR event in 2020. A newly created AIDR mailing list, is available for anyone who is interested in the topic of AI and data reuse, and is not limited to conference attendees. Sign up for the mailing list at

🔗 **lists.andrew.cmu.edu/mailman/listinfo/aidr-all**

Webster Reappointed as Dean

Provost James H. Garrett, Jr. has announced that Keith Webster has been reappointed as dean of the University Libraries.

In an email to faculty and staff in University Libraries, the provost said Webster will continue as both dean and director of Emerging and Integrative Media Initiatives, posts he has held since 2013 and 2015, respectively.

Garrett called him a forward-thinking and transformational dean.

"Under his leadership, Keith has made substantial progress in elevating key technical infrastructures by implementing a new library management system, and a cluster of digital science products to support research and collaboration," Garrett said. "Keith has also ensured that the University Libraries add value to Carnegie Mellon through enhanced programming, while fostering a culture of engagement and support among the faculty."

Previously, Webster served as Vice President and Director of Academic Relations and Strategy for the global publishing company John Wiley & Sons. He was formerly Dean of Libraries and University Librarian at the University of Queensland in Australia, leading one of the largest university and hospital library services in the southern hemisphere. Earlier positions include University Librarian at Victoria University in New Zealand, Head of Information Policy at HM Treasury, London, and Director of Information Services at the School of Oriental & African Studies, University of London.

Webster has held professorships in information science at Victoria University of Wellington and City University, London. He is a Chartered Fellow and an Honorary Fellow of the Chartered Institute of Library and Information Professionals (UK), and has served on government advisory boards, journal editorial boards, and as an officer in professional and learned societies around the world.

Webster's professional interests include research evaluation, learning space design and trends in scholarly communication. He is a regular speaker on topics such as the future of research libraries and the impact of open science on publishing and libraries.

Insight

Looking ahead to the beginning of a new academic year, I am thankful for my reappointment to another five-year term as Dean of University Libraries. I extend my appreciation to the review committee for their efforts and Provost Garrett for his support. It's a privilege to lead the Libraries at this time at this remarkable institution.

Since I arrived on campus in 2013, the Libraries have made impressive strides towards our goals of cultivating and empowering an innovative workforce, ensuring that our services and physical spaces enhance the quality of the student experience, and supporting the changing needs of researchers. But there is still work to be done and that work continues to evolve. As we step into this new academic year and beyond, we are defining what it means to be a library of the 21st century.

Our 21st century library is forward-thinking, while appreciative of its past. With this in mind, we're growing the Libraries' role in exploring and preserving the history of science and technology on the CMU campus, with the creation of HOST @ CMU, an interdisciplinary group of faculty and staff. In this issue, you'll hear Andrew Meade McGee discuss these efforts in more detail and read about the first HOST event, which recognized the first computer on campus.

Our 21st century library recognizes collaboration as a necessary component of scholarship. You'll read about our first AIDR conference, which connected various areas of the campus community to address the challenges of large, complex datasets. This diversity of opinions and experiences strengthens our work and we will continue to create venues for cross-disciplinary opportunities.

At the heart of it all are the people. The faculty and staff of the Libraries make each of these goals possible. It is a privilege to have a librarian like Martin Aurand on our staff. Martin, who has been with Carnegie Mellon since 1987 was recently awarded the Distinguished Service Award for distinction in the profession from the Association of Architecture School Librarians for his outstanding and sustained service to the profession. You can read more about this honor and Martin's professional achievements.

It is a challenge with each issue to capture the scope of our work in these ten pages. There are so many stories to tell, projects to recognize, collections to highlight, and scholars to feature. This is the joy of working in the Libraries and I look forward to another five years.

Keith G. Webster
Dean of University Libraries

KiltHub Hosts Groundbreaking BOLD5000 Dataset

The BOLD5000 collection is one of the most downloaded items in KiltHub, with over 2,700 downloads.

A groundbreaking new dataset of functional MRI brain scans that will significantly impact researchers' ability to apply machine learning techniques to understanding how the brain processes information can be found in the University Libraries' KiltHub repository. Collected over multiple sessions, the project gathered over 20 hours of MRI data from each of four subjects. It is named BOLD5000 for the 5000 images that participants viewed over the course of their sessions.

KiltHub is one of two repositories, along with Open Neuro, a discipline-specific repository, that host the dataset and support downloads from the BOLD5000 website. When it came to the process of uploading the dataset to the cloud, the large and complex files required special attention. Ana Van Gulick, Librarian and Program Director, Open Science, advised the interdisciplinary project team on how to make the dataset publicly available and facilitated support for the data deposit between the researchers, the KiltHub team, and figshare, the platform that powers KiltHub.

"Since the dataset is intended for reuse by both neuroscientists and computer scientists, it was important to provide the documentation in ways that would be useful to both communities," Van Gulick said. "This meant putting the dataset in multiple repositories and in multiple formats, including raw data and pre-processed data. I provided recommendations on issues such as data structure, versioning, and licensing."

Hosting BOLD5000 in the Libraries' repository is a demonstration of the collaboration and support that the Libraries' research liaisons and data services team can bring to CMU researchers to support open science practices. The availability of KiltHub – which includes dataset citations with a DOI and metrics on views and downloads, among other features – free of charge to CMU scholars to disseminate the products of their research is a critical element of the research infrastructure of the university. And CMU's strategic development partnership with figshare via its parent company Digital Science, means that Libraries faculty like Van Gulick have a direct line to developers who can implement new features and functionality to support the evolving research needs of the CMU research community.

"The BOLD5000 dataset was an interesting use case for the growth of the figshare platform to support large and complex datasets within institutional repositories," Van Gulick said. "As science becomes more collaborative and computational and large datasets such as BOLD5000 become the norm, the Libraries and figshare are committed to providing the infrastructure to support data discoverability and reuse."

Contact us at **UL-dataservices@andrew.cmu.edu** to learn more about how the University Libraries can support your research data needs.

Getting Back to Fundamentals at 3MT

Language Technology Institute's Bhuwan Dhingra takes first place prize in the annual Three Minute Thesis Competition.

Eight doctoral students explained their years of research and its importance in under three minutes during the finals of Carnegie Mellon University's Three Minute Thesis (3MT), held March 26 in the College of Fine Arts' Kresge Theatre.

First place went to Bhuwan Dhingra from the Language Technologies Institute. Second place and the People's Choice Award — selected by the audience in the theater — went to Rachel Niu, who is studying biomedical engineering and third place went to Dipanjan Saha from the Department of Mechanical Engineering. Biomedical engineering student Sahil Rastogi was selected as the Alumni Choice Award winner by online votes from alumni watching the Facebook feed.

The event, in its sixth year at Carnegie Mellon, started at the University of Queensland in 2008 and has been adopted by hundreds of institutions. University Libraries Dean Keith Webster, who brought the competition to CMU, served as host of Tuesday's finals.

Rastogi, a doctoral student in the College of Engineering, whose research involves the development of nano-bioelectronics platforms to investigate the electrical activity of brain and heart tissues, competed in the championship for the second year in a row. He also won the Alumni Choice Award last year.

"The first time I did 3MT because my friends wanted me to, but I ended up loving the experience and immediately planned to come back the following year," Rastogi said. "I always tell professors and advisors to encourage their students to participate. Our head of department was very supportive and three people from our department made it to the finals!"

Niu, who is Sahil's classmate in the Department of Biomedical Engineering in the College of Engineering, also presented on brain research. In addition to her two awards, she walked away from her 3MT experience with practice in areas that reach beyond public speaking.

"In preparing for this event, I developed a lot of skills — from speechwriting to public presentations, and even what to wear for a presentation," Niu said. "Going forward, I can use what I've learned here for interviews, business pitches and dissertations."

With stripped down presentations that only made use of a single slide, Dhingra and the other presenters focused on connecting with the audience — with either an interactive element or humor — and presenting a basic summary of their work.

"As researchers we get lost in the details but it's good to step back and take a look at the bigger picture of how our work fits in the world," Dhingra said. "Explaining to a lay audience can bring us back to the fundamental issues our research is trying to achieve and this competition helps us do that."

3MT First Place Award Winner Bhuwan Dhingra is working on building artificial intelligence models that can read and understand natural language text.

A Breath of Fresh Air

Three IDeATe classes presented their projects in "Pushing Air," an event featuring music, soft-sculpture and textile robotics.

Last spring, a breath of fresh air could be found in Carnegie Mellon University's College of Fine Arts building as students in three IDeATe classes presented their projects in "Pushing Air," an event featuring music, soft-sculpture and textile robotics.

"This has been very rewarding for the students from these different classes to join forces and see how their work can support one another and create an experience that on their own would not have been possible," said Jesse Stiles, an assistant professor in the School of Music, who directs the Exploded Ensemble, which is a hybrid music and research group/course that fuses traditional live performances with experimental techniques. "Music can transform a visual installation and being surrounded by architectural installations completely changes the music."

The Integrative Design, Arts and Technology (IDeATe) Network connects technology and arts expertise from diverse Carnegie Mellon disciplines to advance education, research and creative practice.

As musicians of Exploded Ensemble played student composed pieces on instruments such as guitar, synthesizers, violins and omnichords, they were joined onstage by robotic performance sculptures designed by the students in Kinetic Fabrics that explored concepts of creating animate expression by activating textile media with mechanism and movement.

Garth Zeglin, an instructor and project scientist in the Robotics Institute, said that the Kinetic Fabrics course is developing a new medium.

"There are long histories of both textile art and puppetry, but relatively little at the intersection of automation and abstract textiles," Zeglin said. "The interdisciplinary nature of IDeATe gives us an opportunity to guide our diverse groups of students into creating new crafts and forms."

Olivia Robinson, instructor for Inflatables & Soft Sculptures and co-instructor for Kinetic Fabrics, said students drawn to the courses came from disciplines such as engineering, humanities, computer science and design. For Inflatables & Soft Sculptures, students learned about sewing machines, working at different scales and collaboration to turn flexible, flat materials into 3D forms.

Robinson said showcasing large-scale architectural works for an audience is an important component of the course.

Not everyone in the class identifies as an artist or designer," Robinson said. "But what they are creating is an aesthetic, multi-modal experience that many would recognize as art."

The expressive and complex soft sculptures from Robinson's course and the "Pushing Air" event are on display in the first-floor exhibit cases at Hunt Library as part of the "Doppelgänger" exhibit through August 30, 2019.

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