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Inside: A Modern Science Center Opens in Pakistan

Plus: A Brief CAISE History,
and MORE!

In this Issue:

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A Brief "CAISE History"

By Jamie Bell and David Ucko

The Center for Advancement of Informal Science Education (CAISE) will be sunsetting at the close of the 2022 calendar year. Based at the Association of Science and Technology Centers (ASTC), the professional association for North American science centers and museums, with co-PI leadership from around the US, CAISE has served as the resource center for the US National Science Foundation's (NSF) Advancing Informal STEM Learning (AISL) program and its predecessor program, Informal Science Education (ISE) since 2007. CAISE has received 15 years of funding via three NSF awards to support, strengthen and advance the professional field by providing infrastructure, connectivity, and tools for knowledge and capacity-building. However, sunsetting doesn't mean the end of these key functions. CAISE is currently in the process of facilitating the transition of the AISL program's resource center to a new team of partners, hosted at TERC. This inflection point provided an opportunity to recap some of CAISE's history as well as to reflect on how CAISE's efforts and field developments have coevolved. Whenever possible this piece also provides links to InformalScience.org pages that contain resources that CAISE has created and produced over the years, as well as documentation of activities that CAISE has conducted or hosted. InformalScience.org is the website and repository that CAISE has developed and maintained since 2012, which is also in the process of being transferred to the new AISL program resource center who will continue to build on and evolve it.

BACKGROUND/CONTEXT

The 2006 NSF ISE program solicitation requested proposals for an Informal Science Education (ISE) Resource Center that would serve the ISE field writ large, as well as the NSF ISE program and the principal investigators that it funded. That solicitation was part of a series of NSF efforts to build capacity, strengthen infrastructure, and further professionalize the ISE field.

One example of these efforts was the Nanoscale Informal Science Education Network (NISE Net), co-funded by the NSF research directorates, that created a new model for addressing the challenge of engaging the public in current science and technology. NISE Net fostered collaboration at a national scale for sharing programs and exhibits among science centers, along with partnerships between the staff and nanotechnology researchers. Other projects laid the groundwork for using the internet to share resources widely, including ASTC's ExhibitFiles, a dynamic online system for contributing to, using, and communicating about a database of permanent and temporary exhibitions, and the first instantiation of the informalscience.org website at the University of Pittsburgh Center for Learning in Out-of-School Environments' (UPCLOSE) for researchers and practitioners to disseminate knowledge about informal science learning.

Another key project involved an effort led by the National Research Council and the Board on Science Education at National Academies of Science, Engineering and Medicine to conduct a synthesis study of the research underlying informal STEM learning. Its goals were to provide evidence-based guidance for those developing and delivering informal learning experiences, to broaden the definition of ''learning'' beyond that typically used in formal education, to encourage knowledge sharing across the field, and to establish a base for future research. The outcome was the seminal *Learning Science in Informal Environments: People Places and Pursuits* (aka "The LSIE") consensus report published by the National Academies Press.

Internally, the NSF division that housed the ISE program was undergoing a major transition, merging the division of Elementary, Secondary, and Informal Education (ESIE) with the division of Research, Evaluation, and Communication (REC) to form the Division of Research on Learning in Formal and Informal Settings (DRL). This organizational change increased the focus on seeking to fund transformative research and development (R & D), consistent with NSF emphasis on R & D overall.

Externalities, such as the US Department of Education's formation of the Academic Competitiveness Council (ACC) in 2006, also played a role. The ACC goals were to identify all federal programs with a science education focus; assess their effectiveness; determine areas of overlap; and make recommendations to integrate, coordinate, or eliminate programs. Its activities were supported by the Coalition for Evidence-Based Policy, which promoted randomized controlled trials as the quantitative standard for "scientifically-rigorous" independent external evaluation. The

ISE program sought to identify other rigorous means of evaluation by organizing a workshop of informal science education experts. The resulting report, *Framework for Evaluating Impacts of Informal Science Education Projects*, was designed to help awardees think about and articulate project impacts, encourage effective use of evaluators, and increase sophistication of summative evaluations.

These projects, along with other internal and external influences, provided the context for funding an Informal Science Education Resource Center. Its goals were to foster a community of practice and leverage and amplify other related ISE-funded projects; further research and evidence-based guidance beyond the National Academies report; serve as a catalyst for transforming informal STEM learning consistent with the DRL mission; and assist the NSF ISE program in identifying evidence of impact based on the Framework. This Informal Science Education Resource Center would be the next step in an ongoing ISE effort to further advance the field. In the words of CAISE evaluator Mark St. John of Inverness Research Associates, it offered a way to "improve the improvement infrastructure."

FIRST AWARD PERIOD 2007-2012

The first five-year CAISE cooperative agreement award was made to the Association of Science-Technology Centers in partnership with the Institute for Learning Innovation, University of Pittsburgh Center for Learning in Out-of-School Environments, the Visitor Studies Association, and other collaborators. Unlike a regular grant, a cooperative agreement allows for "substantial staff involvement" from NSF with the award, which created the conditions for an iterative collaborative approach to building the Center and identifying and developing structures, activities, and resources that would support the advancement of the ISE field.

An early CAISE effort to identify some of informal science education's field-building needs was a landscape study of how those working in a variety of ISE settings identified with the ISE field with regard to their role and goals. The investigation focused on a sample of professionals working across ISE sectors, e.g., science museums and centers, media, out of school times programs and science journalism, via a survey that asked each respondent the degree to which they saw themselves as being part of the field of informal education and the degree to which STEM understanding was the goal of their work (Fig 1). The resulting report concluded that the ISE field was not yet a functioning community of practice writ large. Instead it had many functioning subsectors, which together with some effort might become a coherent and interacting community of practice.

Other investigations involved the formation of "Inquiry Groups" who were charged with exploring and characterizing the state of the ISE field in areas such as Public Engagement with Science (PES), Public Participation in Scientific Research (PPSR), Collaborations Between Informal Science Organizations and Schools , Informal Science Education Policy, and Inclusion, Disabilities and Informal Science Learning. The topics of inquiry and composition of these groups were identified by the CAISE leadership and steering committee (advisors), in collaboration with the NSF ISE program officers. Each Inquiry Group produced a report that was posted on the CAISE website. Additional inquiry groups that studied field infrastructure and learning, approaches to developing professional online communities and trends in the ISE program portfolio over time, informed internal CAISE activities but did not produce public documents.

Another core activity of the first award period was creating a Leadership and Diversity Fellows program and coordinating the activities of two cohorts of Fellows between 2008-2010. The Fellows program, modeled on ASTC's program for diverse professionals in science centers and museums, included opportunities for emerging leaders from underrepresented groups and states to participate in inquiry groups, attend NSF ISE program principal investigator (PI)

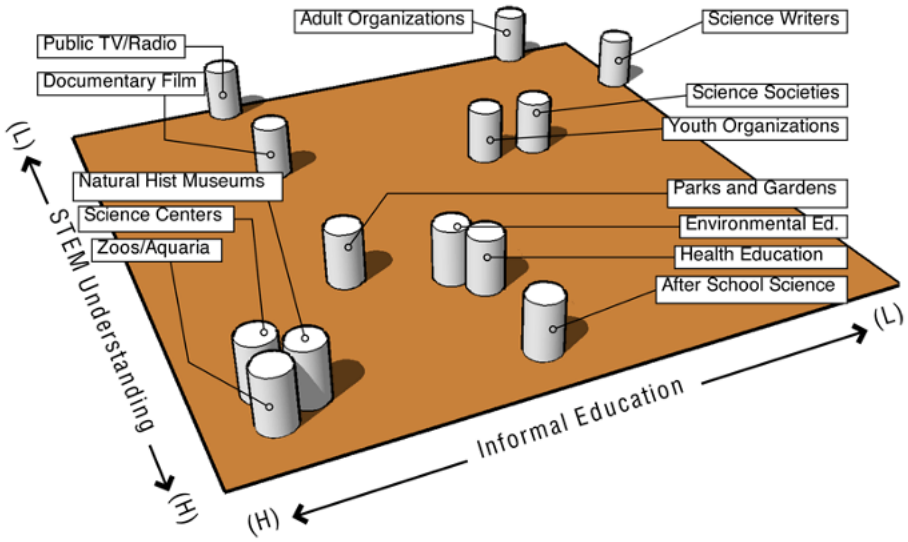

Figure 1: ISE Landscape.

meetings, and engage in NSF proposal development workshops.

When CAISE was funded, there hadn't been an NSF ISE program PI meeting for the previous eight years. Hence, planning, organizing, hosting, and documenting the 2008 PI summit was a key function for CAISE. The Framework for Evaluating Impacts of Informal Science Education Projects was launched at the meeting and CAISE coordinated PI-led workshops on developing evaluation plans and "big ideas" for ISE projects. With the success of this Summit, PI meetings settled into a biennial rotation, beginning with the 2010 Summit which was a "big tent" event to which CAISE and the NSF ISE program invited leading ISE professionals and projects, beyond the NSF ISE portfolio. The event featured Neil deGrasse Tyson as the keynote speaker, and presentations of in-progress inquiry group findings, followed by comprehensive documentation of the Summit by Catherine McEver.

The National Academies/National Research Council's *Learning Science in Informal Environments: People, Places and Pursuits* consensus report, having just been released, figured prominently at the 2010 Summit. The companion *Surrounded By Science* volume for practitioners was also launched at the event. Summit attendees were invited to participate in an activity to create an "ISE Timeline" that tracked the history of events, publications, and people in the field writ large from the 1930's and 1940's until 2010. They used sticky notes to nominate items, as well as to indicate when they became involved in ISE work.

Following on the success of organizing inquiry groups and NSF ISE program PI meetings, CAISE also began holding a series of small convenings, beginning in the summer of 2011 with one on ISE broadcast and internet media, a sector that had- at the time- been receiving almost a quarter of the NSF ISE program funding. In what became a model for follow-up convenings, a group of PIs and evaluators from television, film, and radio came together to share what they were learning from producing and studying their projects, and to discuss potential activities for further knowledge-building. The momentum from that small convening catalyzed a separately-funded second convening, held a day prior to the 2012 PI meeting. A larger group of ISE media professionals discussed the possibility of initiating a professional association for ISE media producers and practitioners, similar to ASTC, for example. A session to promote the idea was conducted at the 2012 (first) Jackson Hole Symposium, Wildlife Film Festival and Media Awards at the Denver Museum of Science and Nature. That organization, later rebranded as Jackson Wild, now also biennial summits, which have become a key US-based gathering for STEM media community -building.

In 2008 CAISE launched its first website, InSci.org, and the first "briefCAISE" newsletter (Fig. 3). The ISE community was invited to submit brief descriptions (called "Sparks") of how their projects and programs were engaging intended audiences, along with a compelling thumbnail image. CAISE compiled and combined the Sparks into the featured r image on the website homepage that portrayed the variety of the field and served as a call to action for sharing knowledge. The newsletter included a "Spotlight" on an in-progress NSF ISE-funded project, updates on funding opportunities, links to recently-released CAISE resources and news about field-relevant events, all of which were also posted on the website. It was the beginning of a documen-

Figure 2: "ISE Timeline".

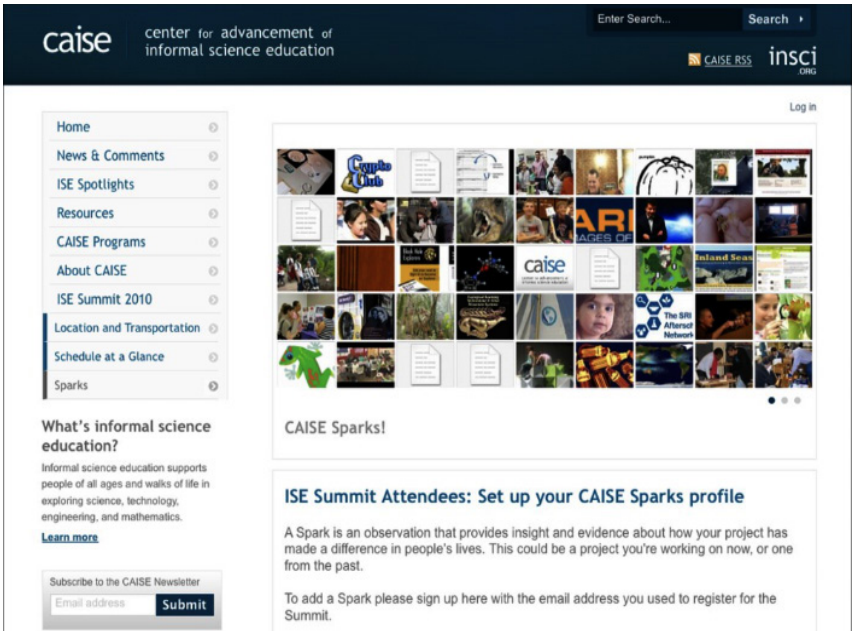

Figure 3: InSci.org homepage with "Sparks" image.

tation and communication model that continued, evolved, and improved through three funding cycles.

In 2010 CAISE invited leaders of 9 other ISE projects and organizations with significant investments in websites to the first Infrastructure Coordination Roundtable. This group met four times to negotiate and develop a metadata standard for tagging and pooling each site's resources into what became an "Informal Commons" website repository of informal science education knowledge. While developing and maintaining that site along with InSci.org, CAISE became aware of the field's need for synthesized summaries of what practitioners, evaluators, and researchers were learning during the implementation of their projects. In collaboration with the Visitor Studies Association (VSA), CAISE prototyped and developed an "ISE Evidence Wiki" site that crowdsourced and organized brief synthesis articles on ISE work that sought to characterize the current state of the field with regard to ISE setting, STEM topic, audience, learning approach, and theoretical foundation.

CAISE also leveraged its partnership with VSA to engage association member practitioners and evaluators in the development of a *Principal Investigator's Guide to Managing Evaluation in Informal STEM Education Projects*. This six-chapter resource document would help those who design informal learning settings and activities better understand and use evaluation as a tool for improvement and knowledge-building, as well to work more equitably and effectively with evaluators.

SECOND AWARD PERIOD 2012-2015

In 2012 CAISE was funded for three years via a non-competitive proposal process. The award period began with the implementation of plans to integrate the InSci.org, Informal Commons, and ISE Evidence Wiki websites within InformalScience.org, the site that then had the largest collection of ISE evaluation reports and other resources for field professionals. The Informal Commons site was folded into what is now the Community Repository on the current InformalScience.org site, with over 9000 resources including project descriptions, evaluation reports, and research articles. The ISE Evidence Wiki became the Knowledge Base, a mixture of 74 articles that were either crowdsourced, commissioned, or contributed as project dissemination strategies. And InSci.org was reorganized to become the place on the new InformalScience.org where Spotlights, Events and Deadlines calendar and other CAISE resources were posted. Beginning in late 2011 and early 2012, CAISE organized small convenings on areas of substantial investment in the NSF ISE portfolio, including topics such as Organizational Networks, Professional Development, and Sustainability Science and Informal Science Education. These convenings, which involved teams of principal investigators and their evaluators, addressed common challenges, sharing successes, and exploring new opportunities. The Topics raised informed session planning for the 2012 NSF ISE Principal Investigator meeting, where participants in concurrent sessions were able to continue and build on discussions from the convenings.

In response to community feedback and input from the NSF ISE program, CAISE also launched and coordinated initiatives on Evaluation Capacity Building (ECB), Practice and Research (PAR), and Broader Impacts and Informal Science Education (BI+ISE). These initiatives focused on areas deemed ripe for professional learning, knowledge-building, and working more closely with STEM researchers and practitioners. The ECB initiative informed new Design Evaluation pages on the website; the PAR initiative resulted in a proposed Roadmap for research and practice, and the collaborators on the BI+ISE initiative wrote a report titled *Informal STEM Education: Resources for Outreach, Engagement and Broader Impacts*. Discussions from these initiatives' convenings informed concurrent and open space sessions at the 2014 AISL PI meeting, the first meeting after the NSF program changed its name to Advancing Informal STEM Learning (AISL). At this time CAISE also began using the term Informal STEM education (still ISE) to refer to the professional field and informal STEM learning to refer to the activities and behavior that practitioners design for and that evaluators and researchers study.

CAISE's success in developing, conducting, and documenting convenings led to the NSF director's office requesting that CAISE, in collaboration with NSF, plan and host the Achieving Scale for Inclusion in STEM convening, which laid the groundwork for NSF's Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (INCLUDES) initiative.

It was during the second award period that CAISE and the other NSF Division of Learning in Formal and Informal Environments (DRL) program resource center staff began meeting quarterly to share resources and discuss challenges and opportunities. During this award period, CAISE was also regularly invited to attend and share resources at meetings of program officers from across federal agencies that fund informal STEM learning activities. They included NIH, NASA, NOAA, IMLS, NEA, NEH, and the departments of Education, Energy, Agriculture, Interior, and the US Patent and Trademark Office.

By this time CAISE had fully operationalized its theory of action: Strengthening and advancing the field for practitioners, evaluators, and researchers by convening ISE professionals, making and facilitating connections, characterizing current topics, approaches and trends, and robustly communicating what we were learning through a variety of channels. The cycle of knowledge-building (Fig. 4) had also become an organizing scheme for the community repository during this period. It catalyzed CAISE's development of the InformalScience.org Developing Projects and Discover Research pages, complementing the previously mentioned Design Evaluation pages in service of informing and supporting these processes with resources.

THIRD AWARD PERIOD: 2016-2022

In 2016 CAISE received a new cooperative agreement award for an expanded scope of work. In response to field growth and the 15-593 NSF solicitation that acknowledged science communication as a related and sometimes overlapping area of research and practice with ISE, CAISE began investigating and pursuing opportunities to seek mutual learning opportunities and synergy with organizations, projects, and professionals who identified more with science communication (SciComm) than STEM education.

Figure 4: The ISE development, evaluation, and research cycle.

At the outset of the award period CAISE convened an External Review Board with expertise to help shape and assess the impact of the expanded charge, and designed and conducted two baseline studies of the interaction and awareness of each other's work among ISE and SciComm professionals.

These investigations identified the following as common areas of challenge and interest between the informal STEM education and SciComm fields: integration of research and practice, better understanding and use of evaluation, and new ways of thinking about and enacting approaches to broadening the participation of underrepresented and underserved groups. CAISE also conducted exploratory interviews with ISE and SciComm field leaders to identify potential participants in task forces on evaluation and measurement, research and practice and broadening participation in STEM. Each task force ultimately included members who were practitioners, researchers, and evaluators from both informal STEM education and SciComm. The task forces met regularly over an 18-month period to investigate the current state of the field with regard to their topic area and identify needs, strengths, and opportunities (Fig 5).

The Evaluation and Measurement Task Force, with input from the NSF AISL program, identified learning and communication constructs as an area with a need for resources that would help practitioners better understand the theoretical foundations and practical applications of these constructs. Task force members recorded interviews with leading learning and science communication researchers and practitioners to produce a suite of video clips, full transcripts, and overviews focused on defining, recognizing and measuring STEM identity, interest, and engagement. The audience for these video interviews and the accompanying full transcripts were those who design or study experiences and settings where these constructs are either a learning goal or a consideration to be taken into account.

The Broadening Participation in STEM Task Force, over the course of in-person and online meetings and writing sessions set out to surface critical issues and challenges, including underlying systemic factors, that appeared to be constraining the ISE field's overall progress in broadening participation. The Task Force developed, piloted, and disseminated a toolkit on Broadening Perspectives on Broad-

ening Participation in STEM for institutional and organizational leaders to implement with staff who develop ISE or SciComm programs and activities. The goal was to support reflective conversations about equity and inclusion and identify shifts in practice toward broadening participation in STEM. Task Force members also conducted in-person and online sessions and workshops using the toolkit at both ISE and SciComm conferences.

The Research and Practice Task Force, with input from the NSF AISL program, investigated the range of existing resources, networks, and support for knowledge building and collaborative proposal development, and identified additional needs. Leveraging existing infrastructure and prototyping new content, the task force developed a Project Planner resource for prospective designers and researchers of equitable, collaborative projects that have the potential to build knowledge for the ISE and SciComm fields. The launch of this resource was timed to support those developing proposals for the 2020 AISL solicitation.

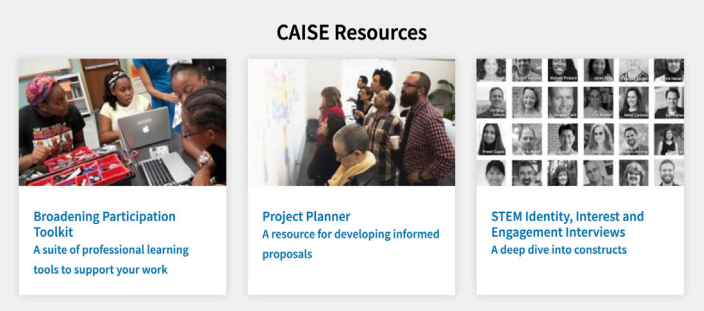

Figure 5: CAISE Task Force-Produced Resources.

In response to increasing requests for broader perspectives on the state of the ISE field and where it was heading, CAISE, with lots of input from advisors, in 2017 launched the first Year in Informal STEM Education resource. In the form of a downloadable slide deck, the "Year in ISE" was a listing of notable publications, events, and trends from each ISE 'sector' (i.e., museums, media, making, SciComm, etc.) over a one-year period. The larger ISE and SciComm communities contributed ideas for inclusion in each report, which CAISE compiled annually through 2020.

In 2016 and 2019 CAISE organized and hosted AISL PI meetings. At the 2016 meeting NSF contractor Westat presented an overview of the AISL Online Project Monitoring System, including findings from data collected from NSF ISE/AISL projects funded between 2006-2014. CAISE, with input from the NSF AISL program, planned the 2019 meeting to coincide with and immediately precede the AAAS annual meeting in Washington, D.C. This was one of many efforts during the third award period to provide opportunities for ISE and SciComm professionals to "boundary-span" and experience each other's meetings and knowledge-sharing events. The CAISE Broadening Participation and Evaluation and Measurement Task Force resources were launched at the 2019 meeting, where throughout the meeting sessions aimed to support discussions on the roles of identity, interest, and engagement in learning and communication in STEM, evaluation and assessment, and on centering equity and inclusion.

In December of 2019 CAISE convened the Research and Practice Task Force in what was to be the last in-person community-wide gathering that CAISE hosted. When the COVID-19 pandemic went global in March 2020, CAISE paused and reassessed its planned activities With input and support from the NSF AISL program, CAISE began compiling, curating, and posting new website pages such as NSF-funded projects with online learning resources and field-wide informal STEM learning resources for COVID-19 and online learning to help the field navigate the disruption of in-person ISE project and program work.

In response to George Floyd's murder in May of 2020 and the subsequent racial reckoning, CAISE began creating, collecting, and sharing resources to support the community in engaging with issues of systemic racism and long-standing societal inequities. These include a regularly updated Anti-Racism Roundup blog, a BIPOC VOICES interview/blog series, and daily social media posts with information and resources chosen to support anti-racist, inclusive, and equitable practices in in ISE and SciComm.

CAISE and the NSF AISL program had decided pre-pandemic that the 2021 PI meeting would include projects' community partners, and would be recast as the 2021 AISL Awardee Meeting. The pandemic required that the meeting be fully virtual, with both synchronous and asynchronous components, which provided opportunities for broader and accessible participation through recorded sessions and an online platform for presenting and discussing posters. After launching and disseminating the Broadening Participation Task force toolkit, CAISE felt it important to turn its attention internally and conducted an equity audit of its current and historical structure, practices, activities and communications. The Awardee Meeting also provided an opportunity to apply some lessons being learned from the audit to plan and conduct the event in more equity-centered ways.

CAISE chose racial equity as the specific focus of the audit and used several strategies to design and conduct the process. CAISE convened an external equity audit committee as critical partners to investigate, reflect on, and help evolve CAISE's practices, activities, products and commu-

nications with the goal of building a race equity culture. Using the Awake to Woke to Work framework from Equity in the Center to ground the work, the audit involved three main focus areas: a) conducting an historical analysis of CAISE work to date (including compiling a database of all participants in CAISE activities from the first award period until present); b) examining CAISE operations and processes; and, c) reflective assessment of the 2021 Awardee meeting. While the audit activity took place during the final two years of the third award period, evidence of its impacts can be seen in the Awardee Meeting documentation and the meeting's summative evaluation report. As of the submission of this article, dissemination of the equity audit findings and outcomes are ongoing at ISE and SciComm conference sessions and meetings.

REFLECTIONS ON IMPACT

I think overall, CAISE has helped ISE become a field. That systematic building on each other's ideas in a field that doesn't have so many great venues for publication has been really important. - an NSF AISL-funded principal investigator with 10 years of experience in the field.

In the fifteen years since CAISE was initially funded, the resource center and the field of informal science education, often now referred to as informal STEM learning, have co-evolved. Throughout the three award periods, CAISE has endeavored to provide access to the most recent findings from scholarship, evaluation and practice; to create, research, and share resources to inform collaborative, equitable work; to track and reflect areas of activity and growth; and to regularly update the professional community on opportunities for funding support and professional learning.

Assessing CAISE's impact on these areas of activity is a complex task for which CAISE has engaged Inverness Research (IR) as an external evaluator. From the beginning, IR's approach has been to interrogate what it means to grow and strengthen a field, what it means to be a "center," and what the impacts are of an investment in infrastructure. Inverness drew on the The Bridgespan Group's *Strong Field Framework* released in 2009 for theoretical grounding, and attended, observed, and/or monitored CAISE activities, interviewed participants, and surveyed NSF ISE and AISL program awardees and the ISE field writ large at strategic junctures in CAISE's trajectory.

Over time IR found that the "four C's" of CAISE's theory of action- i.e., convening, connecting, characterizing, and communicating- were overlapping and mutually reinforcing. For example, convening professionals from across the ISE field facilitated connections among them and their work. Making connections made it possible for CAISE to characterize strands of work and communicate more widely about what was being learned. Concurrently, project teams' contributions of findings to the community repository on InformalScience.org expanded CAISE and NSF AISL program knowledge about areas of work that are connected.

In parallel CAISE has monitored web analytics for the InformalScience.org website and the repository that has grown to include 9000+ resources. Among the types of materials and pages that are most visited and accessed are CAISE-created and/or curated resources and tools for understanding and using evaluation and research in the design of projects. Also popular have been the Knowledge Base articles that synthesize and characterize knowledge gained from designing, researching, and evaluating ISE projects in a variety of settings, with a variety of audiences. Other frequently-accessed individual tools and documents include the *Framework for Evaluating Impacts of Informal Science Education Projects* report, the *Broadening Perspectives on Broadening Participation* report and toolkit, the CAISE video interviews on STEM identity, interest and engagement, and the Year in ISE slide decks. Of the early Inquiry Group reports, the *Public Participation in Scientific Research: Defining the Field and Assessing its Potential for Informal Science Education* white paper has continued to be the most cited, as the citizen science community has evolved and grown. InformalScience.org pages on finding funding, blogs with lists of recent AISL-funded projects, and pages with general information about the NSF AISL Program and solicitations also receive lots of traffic, especially in the months leading up to proposal deadlines. With regard to the 4 C's of CAISE's theory of action, a few observations stand out:

Convening:
The community's overall satisfaction with how CAISE has conducted AISL PI and Awardee meetings steadily increased since 2010 as evaluation results informed iterative planning with the AISL program. While the virtual nature of the 2021 Awardee meeting created some challenges and frustrations for participants and CAISE, as they have for so many others conducting similar meetings, it also provided unprecedented opportunities for broader and asynchronous participation, as well as timely, thorough documentation.

Connecting:
It is impossible to know all of the connections among ISE and SciComm professionals and others that CAISE has facilitated over the years. That said, 86% of respondents to the 2019 AISL PI Meeting survey reported that CAISE activities or events have created connections that led to collaborations or professional, mutual-learning opportuni-

ties, a finding that is echoed in data collected from other CAISE events. CAISE task force members reported that a major benefit of their participation was the professional connections they made to a broader array of networks and organizations in other fields. The success of CAISE's efforts to connect related areas of ISE and SciComm work is reflected in the increasing number of professionals who identify as "boundary spanners'' and who are invited or choose to participate in conferences, meetings and symposia across the wider community.

Characterizing:
CAISE has solicited and/or written hundreds of blogs and project Spotlights that share findings, lessons learned and themes that arise in the implementation of ISE work, crowdsourced or curated 74 articles in the Knowledge Base, and sought out and curated literature reviews for inclusion in the community repository. Analytics have shown that these types of syntheses are more frequently accessed than individual articles or papers.

Communicating:
CAISE expanded its communication channels during the third award period to post daily on Twitter, where it garnered 4,499 followers and has had 1,870,000 tweet impressions (engagements with tweets) since opening the account. The CAISE Newsletter 32% open rate has been consistently higher than the education industry average of 28.5%, and 58% of the summative evaluation survey respondents reported accessing CAISE communication channels to stay current on developments and opportunities in the field.

Overall, in terms of field-building, the ISE field continues to grow by varying degrees along the dimensions of shared identity, standards of practice, knowledge base, leadership and grassroots support, and funding and supporting policy- components outlined in *The Strong Field Framework*. There are now more professional associations, networks, and resource centers who support ISE-related work by creating resources and providing forums than there were when CAISE began its work.

CAISE has particularly focused on supporting an evidence-based **standard of practice**, **engaging leaders who are dedicated to advancing the field**, and developing a rich, accessible **knowledge base**. More indirectly, others, such as ISE and SciComm professional associations have used what CAISE has collected, characterized, and communicated to advocate for and gain support for the field's place in the larger STEM education community ecosystem. Increasingly, science or STEM **engagement** has also become an umbrella term for a wider community that is inclusive of informal STEM education and science communication, a development that CAISE has worked to advance. It is CAISE's hope that going forward the convergence of STEM engagement, education, learning, and communication will continue to result in knowledge and capacity-building and an ever-growing sense of **shared identity**.

The current and past CAISE co-PI, staff, and advisory teams are deeply grateful to the community and the NSF-AISL program for the privilege and pleasure of serving the field in a resource center capacity since 2007. CAISE-created resources and the InformalScience.org website will live on in the capable hands of the new AISL equity resource center as we as a field continue to work together to build and share knowledge and capacity to advance equitable and inclusive informal STEM learning. To subscribe to the new equity resource center's communications going forward, click here and to contact the center directly use their equity@informalscience.org email. Other entities whose resources and communications may be useful to the informal STEM education community include the National Informal STEM Education Network, the center for Advancing Research Impact in Society, and the NSF-INCLUDES National Network, as well as the CADRE, CIRCLS, and STELAR NSF DLR-funded resource centers.

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Using Near-Peer Subject Matter Experts in Library Programming: Part I

By Stephanie Vierow-Fields, Carrie Liston and Sky Reid-Mills

This is the first part of a two-part series about the use of undergraduate and postgraduate students from NASA-funded universities as Subject Matter Experts in public library programming.

INTRODUCTION

Public libraries, once seen as quiet places of independent learning, have become areas of messy creativity and loud exploration. Libraries have embraced the concept of "do it all" learning, and opened the gates for their communities to interact, investigate, and discover in new and exciting ways. Much of this new focus has been on increasing programming in STEM (Science, Technology, Engineering, and Math) or STEAM (with the added "A" for Art).

While STEM programming is prominent in informal learning environments such as museums or science centers, many public libraries still view STEM programs as a new, and often daunting, challenge. Most library staff members do not have an educational background in a STEM field and have reported feeling uncomfortable providing programming around unfamiliar topics (FINAL_STEM_LibrarySurveyReport.Pdf, n.d.). The NASA@ My Library project seeks to address this challenge by providing 60 public libraries across the country with regular trainings and access to NASA informational resources. While the formal learning outcomes of NASA@ My Library are aimed at familiarizing diverse communities with a variety of NASA STEM concepts, the project takes seriously the need to support library staff in their own understanding of STEM topics and giving them the tools to create a fun learning environment, suitable for a public library. One question the project team asked was how do we support library staff on these complex STEM topics, such as NASA science, while still creating a fun learning environment to fit a public library program (or to attract/engage a public library audience)?

One way we sought to address this need was the introduction of "near peer" Subject Matter Experts (SMEs). These were university students in STEM or STEM education majors recruited from NASA funded universities, with "near-peer" referring to their being within a generation of current youth patrons at public libraries.

This paper explores how NASA@ My Library utilized these university students as near peer Subject Matter Experts (SMEs) to aid library staff with their NASA STEM programming, while also giving younger library patrons the ability to interact with students like themselves who are pursuing careers in STEM fields at the university level. Additionally, we will discuss why SMEs are important in library settings, the challenges of using a STEM professional as a SME, how NASA@ My Library developed and piloted a model to use near peers as SMEs, what the SMEs' library programs looked like, and the experiences of student SMEs and library staff with the model.

OVERVIEW OF THE NASA@ MY LIBRARY PROJECT

Through the NASA@ My Library project, NASA, 60 public libraries, state library agencies, and five universities work together to generate STEM learning opportunities for millions of library patrons throughout the nation. NASA@ My Library is made possible through the support of the National Aeronautics and Space Administration (NASA) Science Mission Directorate (SMD) as part of its STEM Activation program. The project is designed to promote access to NASA scientific discoveries, provide learning opportunities to persons of diverse backgrounds, and to create access to local programs, STEM tools, activity kits, and other resources that public libraries may not have easy access to. Librar-

Nationwide Map

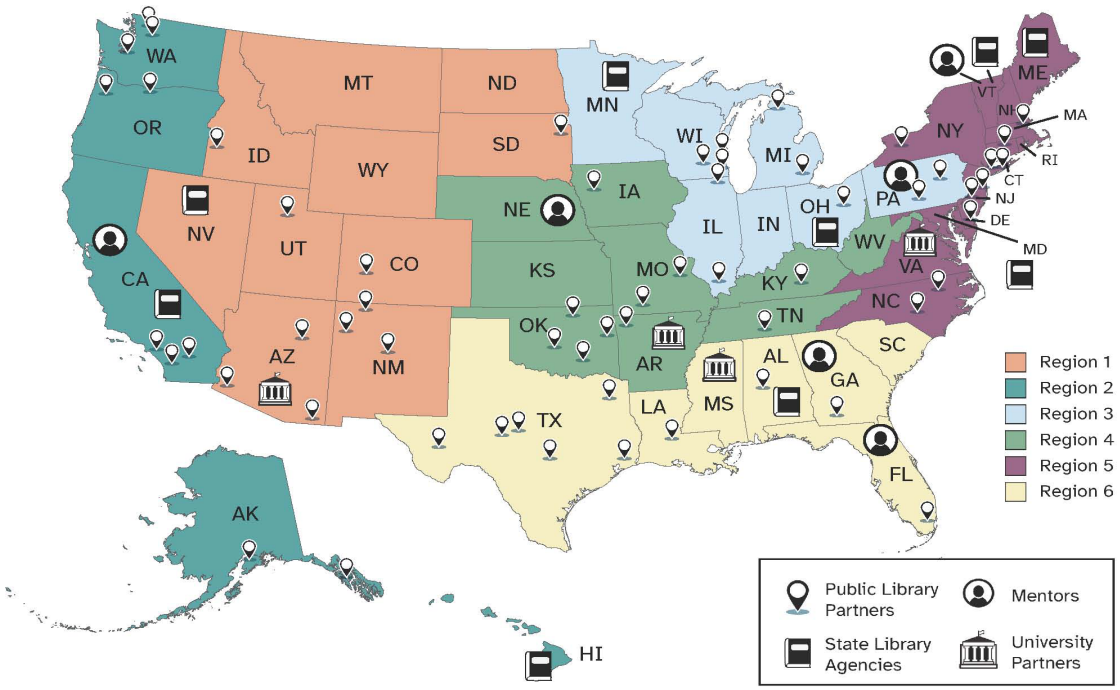

Figure 1: Map of Regions for NASA@ My Library. Credit: SSI/NCIL.

ies selected to participate in the project are in rural and/ or geographically isolated areas or serve underrepresented groups. Groups underrepresented in STEM fields include Hispanics and Latinos, Black people, Indigenous Americans, Pacific Islanders, the economically disadvantaged, people with disabilities, and women and girls.

WHY LIBRARIES?

Public library programs and services continue to evolve to meet the needs of learners, including in STEAM. In 2016, there were 1.4 billion in-person visits to the 16,560 public libraries and 647 bookmobiles in the U.S., the equivalent of about 4 million library visits each day. In the same year, public libraries offered 4.70 million programs across all age bands and on a variety of topics, which were attended by over 113 million people.

For over a decade, the National Center for Interactive Learning has facilitated STEAM programming in public libraries for a number of reasons. Libraries serve their communities in ways science centers or museums do not, with typically no or low-cost access and closer proximity to their communities. While a smaller, rural town may not have a museum or science center close by, with over 19,000 locations, they are more likely to have a public library nearby. Since libraries already act as community resource centers and family learning hubs, branching into STEM programming is a natural extension.

Library patrons include an array of people with "different backgrounds, different ages, different learning abilities, as well as different educational and income levels" (Dusenbery et al., 2020). A recent Gallup poll found that "visiting the library remains the most common cultural activity Americans engage in," far surpassing going to a movie theater or a concert. The poll also found that women were nearly twice as likely to visit a library than men, and low-income Americans visited more often than those with higher incomes (Gallup, 2019).

While the COVID-19 pandemic did drastically affect the number of library visitors and programs, it also solidified the importance of libraries as community resources. According to a Public Library Association survey conducted between March 24 - April 1, 2020, 98% of libraries said they were closed to the public at the time (2020). And although many libraries remained closed during the pandemic, some until well into 2021, others shifted their offerings to meet local needs, with 76% of libraries adding extended online renewal, 74% expanding online checkout services, and 61% adding virtual programming (Public Library Association, 2020).

Now, as of the end of 2022, almost all libraries have fully

reopened, though with budget limitations and often workforce issues, requiring them to do more with less. While programming, collections, and expectations for library staff members have increased steadily since 2010, operating expenditures have remained stagnant. As shown in Figures 2 and 3, library staff members are hosting more programs for more patrons, but are not receiving increased wages, operating costs, or programming expenses. Lack of staff time, funds, and resources are significant barriers to libraries ability to offer STEM programming. By providing a SME, the NASA@ My Library Project supports library staff with their programming while not adding to their overhead.

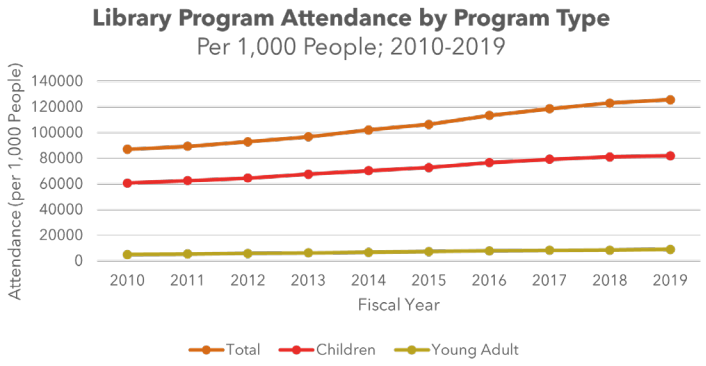

Figure 2: Credit Brooks Mitchell.

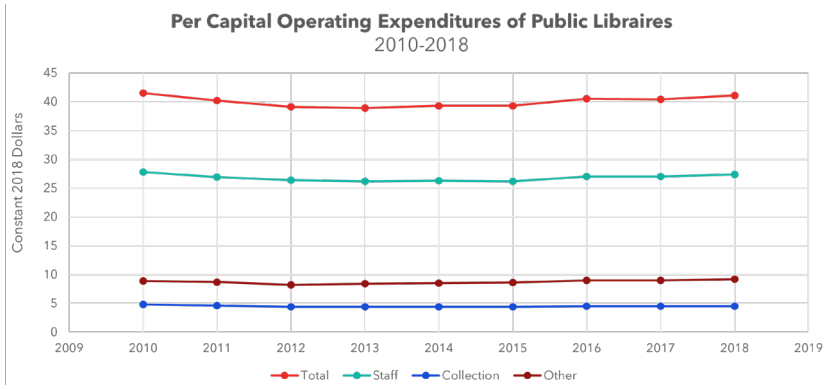

Figure 3: Credit Brooks Mitchell.

Another advantage of public libraries as an avenue for STEM engagement is their ability to offer a broad range of resources to patrons free of charge, allowing easy access to what, for many from marginalized or disadvantaged groups, might be too costly to obtain otherwise. These include physical items, such as books, kits, and computers, as well as informational and community resources (Durik et al., 2021). When patrons want to learn more about a new topic of interest, libraries offer access to free resources along with library staff to help them find additional information (Durik et al., 2021)

SUBJECT MATTER EXPERTS

Being introduced to a Subject Matter Expert (SME) can help make a library staff member feel confident about offering STEM programs and learning opportunities, including such as a STEM-related exhibits, hands-on programs, take-home kits, or lectures. Librarians appreciate the value of SMEs not just for their content expertise, but also for the chance to expose patrons to career opportunities and possible educational pathways. A key element of NASA @My Library project was connecting libraries not just to SMEs in STEM, but specifically to NASA-funded SMEs to ensure their ability to convey information on NASA-related topics in Earth and space science. For example, NASA@ My Library required libraries to offer programs focused on the James Webb Space Telescope, so having experts from engineering, data science, physics, chemistry and others could help library programming explain the technical achievements of the telescope from its creation and launch, up to the first images it sent back.

As part of the NASA@ My Library cohort, the participating public libraries were given connections to experts that others would have difficulty accessing from NASA. As we learned in the first iteration of the NASA@ My Library project, library programming with a SME provided both a “wow” factor but was difficult to obtain, especially for SMEs more closely tied to NASA. With the start of their next grant, the NASA@ My Library team looked for ways to address this deficiency of NASA SMEs in library settings.

What does “near-peer” mean and how is that different from traditional SME?
When we developed this component of the NASA@ My Library project, we decided to create a model utilizing “near-peer” SMEs instead of a traditional career researcher/ scientist from NASA. This approach opened a larger field of SMEs from which to pull and also provided opportunities for newer SMEs to be involved in public outreach and explore different areas of science away from their academic focus. NASA and National Science Foundation have both committed to their research programs having broad impacts beyond the academy, and future researchers will need to be familiar with outreach and education practices for their programs (Andrews et al., 2005). One project goal was to provide such an opportunity for young SMEs to develop and learn facilitation techniques, practice public speaking, and engage with audiences of different ages and backgrounds. The students who decided to participate were also motivated by their passion for STEM and the desire to share their interest and knowledge.

We classified "near-peer" as those students seeking undergraduate or recent post-graduate degrees at an accredited four-year institution. While oftentimes graduate students are the ones first receiving training in facilitation of public programming, undergraduates offer a closer connection to the ages of youth in library programming. We felt having students closer in age created a better opportunity to connect and see themselves in the students presenting in front of them.

The project aimed to create opportunities for students from underserved communities to facilitate programs, and to create a connection between the libraries and students in their region. The project provided student SMEs with funding for their participation, since students are often not paid for their outreach work. We wanted to create an equitable opportunity for students, especially those from historically marginalized communities who may not have had opportunities to do paid outreach.

WHY ENGAGING WITH SMES IN A LIBRARY SETTING IS DIFFERENT AND IMPORTANT

Programming in libraries differs from those than in a museum or other informal learning environment. Even library staff without STEM experience are trained in helping patrons access information and resources. Patrons expect when they show up to a library to be connected with specific knowledge they are seeking. In a library setting, it is typically a multi-age audience learning together and exploring with hands-on activities. "From decades of discovering how the brain works and how people learn, we now understand that the families don't simply need 'the answer' given to them. For learning to occur, people must experience a scenario, context, or investigation that calls for them to interact and process concepts, facts, and ideas in a meaningful way" (Mitchell et al., 2020). Libraries thrive when offering hands-on exploration of a topic. SMEs help them with that exploration by adding context, adding deeper information when relevant, answering questions, and adapting their messaging to coincide with multiple ways of engagement and learning.

The SME takes the pressure from library staff members to provide the content information of a program. An example of this could be the library staff member reading the story of a caterpillar in a program where a biologist SME explains the cycle of a butterfly. Or, in the case of the NASA@ My Library, a presentation was given over Zoom about the engineering behind the mirrors of the James Webb Space Telescope, followed by the families painting on hexagonal canvas what they think the telescope might see. The connection between an SME and a library program fit well beyond the ideas of a single lecture-type event.

Figure 4: Program activity of painting JWST Mirrors. New Brunswick Public Library Credit: SSI/NCIL.

"The biggest value is that librarians don't (and can't) always have the necessary knowledge in order to lead specialized programs. Sure, we can learn, but we'll never have the same comfort level or knowledge to fully engage participants in the same way. Not only did SMEs bring a level of expertise that we simply can't replicate at this library, but they also brought passion and experience to their work. Participants were able to ask more personalized questions about their careers and their paths, for example, that they wouldn't otherwise have the opportunity to ask." - Library staff member from NASA@ My Library

Libraries are often a 1:1 match to their community demographics, and their programs reflect that are offered to specific youth age group, families, multi-generational, or adults. For the NASA@ My Library project, libraries could tailor three required programs to fit their communities. Some libraries hosted a program for whole families, others had community-wide events, while some focused on individual age groups like early elementary or teens. This ability to target specific groups can help an SME tailor their program and make it more inclusive to the group to which they are speaking. Instead of an adult lecture, they were able to be creative and find new ways of conveying NASA science.

As previously mentioned, the COVID-19 pandemic impacted library programming and forced libraries to increase virtual programs in order to continue to provide learning opportunities for their communities. Virtual programs allowed libraries to feature more SMEs who may not be local. For libraries in more rural areas who did not otherwise

have great access to SMEs, the increase in online programs provided great opportunities to connect their patrons with SMEs. A staff member at a NASA@ My Library partner library said, *"We live in a rural [area], but we are not foreign to the love for space and NASA. Having the opportunity to "bring" SME over to our community is absolutely wonderful, and the interview offered by our SME guest in our local public radio was a total success."*

PROGRAM OUTLINE AND STRUCTURE

Why did we engage with universities instead of directly with university students?

Working with NASA-funded SMEs was a core component of the first iteration of the NASA@ My library project (between 2017-2020). However, libraries experienced numerous challenges in getting SMEs to offer programs at their libraries. Many of the libraries were in poor, rural areas of the country without professional NASA-funded SMEs nearby. Offering online programming helped ameliorate the challenge of distance, but issues still remained around identifying professional SMEs with time and skills for public outreach efforts. Librarians needed to make sure SMEs could engage a mixed-age audience and talk about their career and education path and decisions and not all professional SMEs were trained to talk about their work to a public audience.

When the project was continued, the NASA@ My Library project team re-evaluated who could be a SME. The use of university students was an avenue previously unexplored. Not only were there more to choose from, but students bridged an opportunity for a connection between library patrons and STEM careers.

The five NASA-funded universities who participated in this project included University of Michigan, Harding University, Old Dominion University, Mississippi State University, and Embry Riddle Aeronautical University. We decided to engage at the university level rather than directly contacting university students for a number of reasons. Each university provided at least one advisor to oversee the project, and the advisor recruited students from their classes, groups, or programs. We felt starting from the top-down would bolster our ability to recruit students. Embry Riddle focused on their "PUP-er" Design team, a group of engineering focused students. Mississippi State harnessed their Diverse Student group. Michigan did an open call through their physics department. Advisors recruited between three to fifteen students each to participate in the program. This provided a large group of students to coordinate with the libraries and also made it possible for each student to only do a few programs as to not be overwhelmed.

Coordinating with the universities rather than individual students or SMEs was also prudent for funds distribution. Instead of thirty-five to forty contracts, only five contracts needed to be issued with each university deciding, based on their own internal procedures, how each student was to be paid and the amount. We emphasized to advisors that the majority of awarded funds should go to the students, and trusted advisors to do so in the manner they felt best fit their university. This helped to minimize staff hours and let the universities do what they do best by interfacing with students.

WHAT DID THE MODEL LOOK LIKE?

Implementation of the project was divided into three sections: Recruitment and Training, Matchmaking, and Programming. Breaking the project down into these sections made it easier to onboard students and libraries that may be offset in timing.

Recruitment and Training

Recruitment began in the early fall of 2021 as students returned to attend their fall semester classes. While a large percentage of the students were undergraduates, we worked with the advisors to utilize juniors and seniors who had more experience in their chosen fields. Within only a couple of weeks, we had over thirty students interested in participating in the project as a SME to facilitate STEM programs for libraries.

Since many of the student SMEs had no experience with outreach in a library setting (and in some cases none at all), NASA@ My Library provided them with foundational trainings on facilitating learning in a library, using virtual settings like Zoom, and holding science conversations with the public.

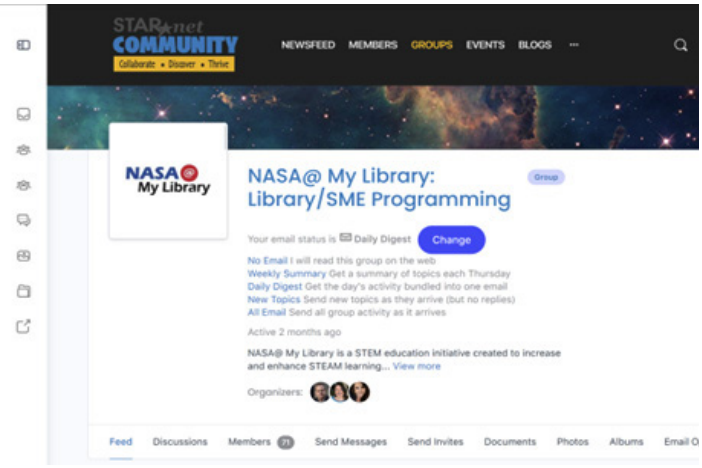

Figure 5: Screenshot of the Student Community. Credit: SSI/NCIL.

In total, we hosted three different trainings (each held two or three different sessions and recorded to accommodate students' schedules). On average, we had around fifteen students at a time, a group size which allowed for deep discussions, opportunities for questions and clarifications, and chances for role-playing to get ideas of how to facilitate. We created a closed community group (Figure 5) for the students with links to the recorded trainings, sample PowerPoints, slide templates, as well as a place for discussions between them and some of the libraries. This resource helped them work with students from their own university and gave them an opportunity to network with others. In a reflective survey, about 80% of SMEs indicated they felt moderately or very prepared for their role.

Matchmaking

We used multiple modes of engagement to connect the students and partner libraries. Using a Google Form (Figure 6), libraries interested in having a student SME help with a program identified the topics they would like featured, who the audience would be, and their preferred timing of the program. This helped project staff match student SMEs to libraries based on their areas of expertise or interest and libraries' topics of interest.

The students met with the NASA@ My Library team to review libraries' requests and students volunteered to contact a library based on the topics of interest, their availability, and their proximity. The libraries were also invited to the student group in order to organically create connections, which several libraries and students were able to do.

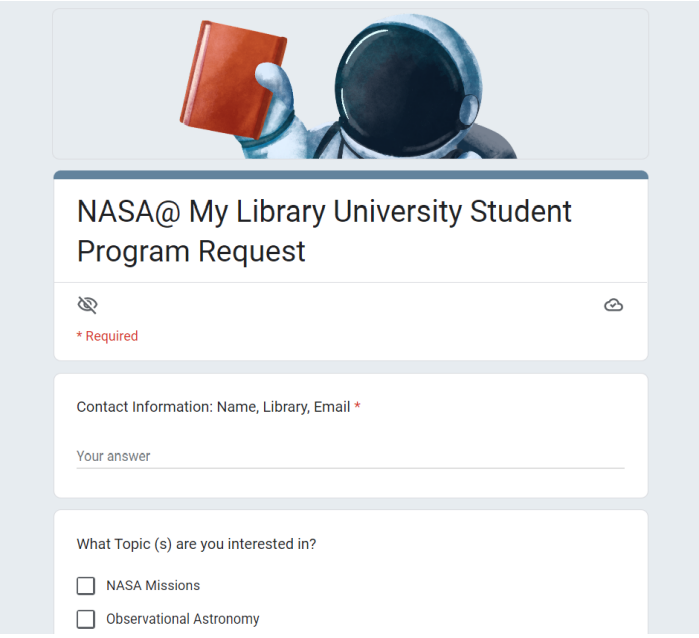

Figure 6: Google Form used to match libraries to students Credit: SSI/NCIL.

Programming

Because of the structure of the new project, the original plan was to have the students host live Q&As for libraries as their program. But as we met with and spoke to the students, we realized their creativity and innovation for STEM topics and the interest of libraries in more different types of programming. Student SMEs ended up offering in-person story-times, hands-on activities, video resources, recorded activities, live one-on-one chats in stations, and more. Several of the students' helped the staff develop Take-and-Make kits, especially for those who had "Zoom fatigue" or limits on in-person programming due to the continued COVID-19 pandemic. Libraries in the NASA@ My Library project were able to work with SMEs to create programming based on their capacity and community needs rather than "one size fits all" programming. That kind of dynamic programming that responds directly to community needs is why libraries are a great place for collaborative STEM learning

Most of the programs took place in the spring and summer of 2022 and the majority were focused on the James Webb Space Telescope or Earth Sciences for the Oceanography themed summer reading challenges. One program included information on the space telescope and then led attendees in an opportunity to learn to code.

Libraries were very appreciative of the programs and of the connections to student SMEs: *"The value is incalculable! The university students SMEs did amazing jobs and the children who participated in the programs they planned and/or led loved them. They really engaged with both children and parents in a live virtual chat, and the programs they planned for the elementary school we worked with were among the most popular for both students and teachers. The NASA Solar System Ambassador who did our telescope night was wonderful, and patrons requested that we ask him to do another program for the library."*

NEAR-PEER SME-LED LIBRARY PROGRAMS

Below are examples of the programs that the students completed with their library partners. All student SMEs worked with at least one or two libraries with some working as many as six. Each student spent coordinated with the library staff, developed their program, and worked with NASA@ My Library staff to make sure their programs were library appropriate.

"During the Fall semester of 2021 I was selected to be a part of the NASA @My Library program. I worked on the program for the rest of the semester and through the summer. I had many preparatory meetings with the libraries and with Stephanie Vierow-Fields…. I worked with five libraries in total. For each library, we met multiple times

and discussed the scope of the program. Specifically for Newbern Public Library, I went in-person and did a hands-on in-person STEAM program. I read 'Eight Little Planets' and afterwards we created shaving cream planets. For the Cherokee Public Library, we decided to have a take-home STEAM activity. For the Port Arthur Public Library, I read them the 'Life of a Monarch Butterfly' and afterwards we created a butterfly life cycle. For the Schleicher County Public Library, I read them a book, discussed the James Webb telescope, and created LED wands. For Olympia Timberland Public Library, I created a take home program." Leah Vaughn, Mississippi State.

Figure 7: Leah Vaughn reads 8 Little Planets before hosting a hands on activity. Credit: Leah Vaughn, Mississippi State.

A group of students from Old Dominion University worked together to coordinate a program between multiple libraries that incorporated The James Webb Space Telescope with a basic understanding of coding through Python.

"We agreed on an hour-long program in three parts, around twenty minutes each, intended for families with children aged 6th grade and below, generally themed around the James Webb Space Telescope:

1. Activity for young children: Life Cycle of a Massive Star (JWST)
2. Q&A: 5Ws about JWST
3. "Advanced" activity/demo: a quick demonstration of Python.

"For the third part/"advanced" activity, we will be adapting the activity from the first section to a short programming demonstration. The idea is to use an online Python editor to give a short programming lesson which prints out the colors of the stellar life cycle (from the activity) in the correct order, among a few other very basic programming concepts TBD. The idea would be that during the presentation, we would work together, soliciting input from the patrons to complete the task, and then send folks home with a link to the editor and some activities they can try themselves that build on the topics we discussed."

The program was hosted between four different libraries with a total attendance of over 150 patrons. This type of work highlights how innovative near-peer SMEs can be. They are able to meet the patrons where they are in their communities, expand their knowledge and create spaces that are inclusive.

Figure 8: Flyer for Coding program hosted through Old Dominion University.

WHAT WILL BE COVERED IN PART 2

Part II of this paper will examine the successes and challenges of the model created to work with the students, the evaluation and lessons learned from the work, and recommendations should someone else try to coordinate with near-peer SMEs.

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New Modern Science Center Opens in Pakistan

By Robert Mac West

On September 21, 2021, the first full-service science center opened to the public in Karachi, Pakistan. The interestingly named MagnifiScience Centre (MSC) is in the @16 million population city of Karachi in the southeastern part of the country. It is the largest city in Pakistan and now it holds the only full-blown dedicated science center in the country. The other city with a science-emphasis museum is Lahore (National Museum of Science and Technology, opened in 1965 and to the public in 1976). Also in Karachi is the Interactive Science Gallery at the Pakistan Maritime Museum, opened shortly after the full building's 1997 opening.

I must point out that this discussion of the new science center is impacted by my personal experience with them. From 2018 to 2022 I was a contracted advisor to the project and provided them with international contacts, appraisals, and recommendations, and at the very end a full assessment of the MagnifiScience Centre project.

The contrasts in this part of Asia are notable. To the east India has at least 25 science centers all within the government agency National Council of Science Museums. To the west Afghanistan has a children's museum in Kabul that opened 2017 and the 2,012 square foot Field Assistance in Science & Technology Center opened in 2011 by the US Army and part of the US occupation of Afghanistan. And Iran has its Iran Science and Technology Museum in a 1937 building supervised by the Ministry of Science.

The initiative in Pakistan is led and funded by The Dawood Foundation (TDF), the charitable arm of the Dawood Hercules Corporation. The MagnifiScience Centre is the most recent and largest of its initiatives stimulating and supporting formal and informal education, largely focused on science, across the country. Planning for the MSC started in the teen years with TDF sponsoring several day Magnifi-Science Exhibitions in 2016 and 2017. These events, aimed at children and families, were very well received and

clearly led to the initiation of the MSC project in 2018. As the project got underway, formal position and objective statements for the MSC were developed and publicized. They are presented as Vision, Mission, Values and Goals:

Vision: Science is for everyone!

Mission: To establish a contemporary and interactive science center that provides the public with an opportunity to engage with science, irrespective of gender, age, socio-economic, cultural, religious, or demographic barriers. To develop interest in scientific thinking, scientific literacy, scientific knowledge, and scientific methodology by interacting and engaging with the exhibits and programmes at the centre.

Science popularization will be pursued through the centre, or in the form of travelling exhibitions, school outreach programmes, and event management interventions.

Values:
1. Character and Good Manners
2. Diversity
3. Build Capabilities
4. Inclusion
5. Curiosity

Goals:
1. Science Literacy for All
2. Developing a Culture of Science and Informal Learning
3. Promote Indigenous Science and Technology in Pakistan
4. Encourage Investment in Science

This array of values and objectives are traced back to Ahmed Dawood, founder of the foundation in 1960. Over the years it became broader and broader, with the recent focus being formulating inclusive and informal spaces of learning for everyone. Thus, the efforts devoted to completing the MSC always had inclusivity, accessibility, and germane science and technology at the front.

From the beginning, and firmly held in the formal statements, there were lists of themes and topics that are the core of the centre. In no particular order they are energy transition, water allocation, food security, natural resources utilization, pollution, climate change, technology, disease control, and mass extinction.

The next decision was where to locate the center which required careful assessment of numerous different properties. It is located in the Railways Quarter of Karachi which originally held a warehouse. Development of the center replaced the warehouse with a very modern building, but the larger property enables there to be outside activities as well as a flourishing array of magnolia plants. Figure 1 shows the original view of the site which clearly is now very different. Local architects designed the new building – an accomplishment for the first dedicated science center in the country.

Figure 1. The unused space in the Railway District which is occupied by the MSC. Note both the exterior fence wall and the flourishing vegetation.

TDF staff were very aware of the need for high-quality exhibition and program research and development. To ensure this ILE provided them with a list of internationally experienced design firms who were invited to submit preliminary proposals. After review of multiple proposals and on-site and online interviews the team selected Hüttinger of Nuremburg, Germany. They worked well from a distance and were onsite in Karachi many times. They were very pleased to be engaged with this first science and technology center in Pakistan and proudly displayed it online.
https://www.youtube.com/watch?v=wFg2eIfL-zw
https://www.youtube.com/watch?v=pAbbhyCzIxU

As the role of the center became more focused, mor individuals were assigned to work with their specific areas of the MagnifiScience Centre and, after being introduced, were pleased to learn from their international colleagues. We had several multinational online sessions that had ASPAC and ICOM members offering their suggestions and recommendations for various elements of the center. Unfortunately, some of the connections that were ready to be in-person either in Karachi or in the partner museums didn't mature to their initial objectives. Nonetheless, ASPAC institutions and many professionals stood by to be of assistance if called upon.

As the development of the approximately 80,000 square foot center progressed, the project leaders worked diligently to locate and engage people with the appropriate skills, etc., to join the staff. As time passed, the organization chart evolved in several directions reflecting the attempts to have attention focused on different aspects of

Figure 2: The MagnifiScience Center is a stunning modern building that replaced the abandoned warehouse.

Figure 3: The MSC building is visible from the street flanking the site.

the soon-to-open center. The roles of the supervisory staff of The Dawood Foundation changed frequently, and as opening approached increased attention was paid to staff members who would be the public face of the center. Just before opening, The Dawood Foundation assigned an experienced person, Christoph S. Sprung, to be the director. His previous experience has been in several Dawood Hercules offices and evidence to date says that this was a very good corporate decision, despite his lack of science center experience.

Sprung's assignment seems to be rather typical of the staff configuration. Given the absence of large science centers in Pakistan, there were few people who had extensive experience working with the particular array of visitors in a series of highly interactive exhibits. Fortunately the development team was able to locate skilled and knowledgeable new staff members. Later in this overview we will see some of the visitor comments that were posted online. The center opened over a year ago and from the beginning it has offered a diverse set of hands-on activities as well as the magnolia forest and various outdoor physical experiences. The architecture of the building, with a wide opening extending through all four floors, is very encouraging. Watching what is happening below from the top floor confirms in people's mind that there are indeed many interesting things to do inside and outside from the beginning. Also multiple floors are visible in middle of the building which do stimulate longer stays and more engagement.

Further, there are regular weekend programs in the auditorium, restaurant, and demonstration sites in the exhibits. Many of them are free, while some are modestly priced at PKR200. This charge is in addition to the entry charges which are PKR700 on weekdays and 800 on weekends. (current value of one Rupee is $0.0044). MSC's prices are small in contrast with the other Karachi institutions.

The site, while rather distant from other cultural facilities, enables a very broad array of activities. The open vegetated areas serve an interesting dual purpose; full-body activities and an introduction to the diverse biology of the mangrove trees and the local environment. The mangroves are a link to the indoors and also extend the intellectual scope with the garden un the middle of the lower floor of the building. The presence of prominent and growing plants inside the building certainly catches peoples' attention and does draw them to the outside area that many did not expect. It is another way in which the center is locally relevant.

The MagnifiScience Centre has now been open for fifteen months, long enough that early issues with physical, labeling, and staff training issues have been resolved. The following quoted online comments indicate that the centre is indeed impacting it's desired audience and has become a significant resource for Karachi and all of Pakistan. Here are several of the online reviews/comments made by the public after their initial experience.

"An incredible experience for kids and adults, alike. I went there around 11am and before I even realized it was 4:30pm as we were leaving. MagnifiScience has 3 floors full of cool activities and exhibits that teach you a lot about science and math, whilst keeping you entertained! 10/10 would highly recommend, and visit again!"

"Excellent place for children above age 6 for learning and fun. Lots of science invention activities and games that involves engineering, medical and normal life experience concept. Will definitely invite more people to visit with kids for them to learn and enjoy. 10/10"

"Indeed it is a magnificent science centre for everyone. Amazing learning and recreational place for kids and adults. State of the art facilities along with beautifully

maintained old structures and natural habitats. The place is clean, ample of scientific learning opportunities, rest rooms and ptayer areas. A very nice n cozy restaurant on-site. A full day fun activity for everyone in the family."

"An absolutely outstanding place! Made at an internation-al standad. Interactive scientific activities. Great fo kids' learning and fun for adults too. Every person, adult or child can enjoy. Has 3 big floors and takes over 3 hours to ex-plore everything. One should go 10 am to avoid long lines."

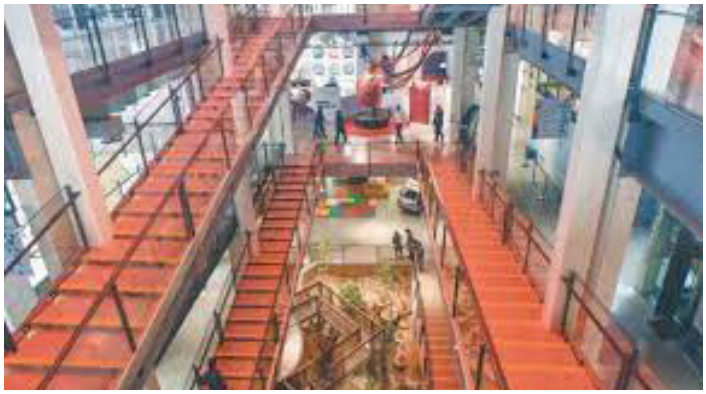

Figure 4: The interior of the building as one looks down past exhibition floors toward the magnolia garden at the base of the building.

Figure 5: The interactive exhibitions range from semi-stat-ic to very detailed and instructive about various scientific principles. Note the aquatic area in the front of the picture.

Now in its second year, the MagnifiScience Centre is devel-oping statistics that are at least somewhat endorsed by the public comments as well as demonstrating more broadly its impact and likely sustainability. The September 2022 Performance Report provides month-by-month attendance data, both in terms of full numbers and data on visitor origins, compositions, and ages/grades. The bottom line right now is an annual attendance of over 180,000. There also are some interesting numbers that refer to numbers of contacts on the web as well as on specific sites. These all suggest a good penetration of the region's residents and suggests that we can wait several years and see if these trend or others can be resourced.

Now we all watch from a distance to see how they succeed with their mission, what is done to both measure their success with youngsters and response to increasing desire for them to reach to other parts of Pakistan.

A final element of the progressive nature of the Magbi-fiScience Center is its community connections. It started out with the Dawood Foundation's 3-day Magnifi-Science Exhibitions in 2016 and 2017. As it developed a srong connection was made with the Center for Innovaton in Medical Education of Aga Khan University. There now is an MOU that confirms the mutual support for various aspects of medical education. And finally, the MSC is organizing science exhibitions and activities in other parts of Pakistn. These include the Lahore Science Mela and the Science Section in Children's Literature Festival and Summer Sci-ence Camp in Khyber Pakhunkwa in far northwest Pakistan.

The science center world is delighted that the MSC is open and doing well. Its potential impact on Pakistani lives and careers remains to be validated, but the current prospects are positive

And I, as an American, am very pleased to have been a part of the development of the MagnifiScience Center.

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Robert Mac West is the editor and publisher of The Informal Learning Review. He may be contacted at ileinc@informallearning.com.

An Agenda for American Museums in the 21st Century

By Harold Skramstad

This analysis of the state of the museum world was written by Harold Skramstad after he retired as president of the Henry Ford Museum and Greenfield Village in suburban Detroit and then devoted slightly over a decades to diverse consulting,. As one reads it, there are numerous observations of the current world and how it came to be as well as predictions of sorts about what things will be like in ten years. It was published as Number 1 Working Papers in Museum Studies by the University of Michigan.

Now, 12 years later, it is fascinating to read the careful commentary on the world that Skramstad occupied then. How have the predictions and recommendations done? We welcome readers to reflect upon the thoughts and circumstances of 2010 and prepare a reaction. Ten of those reactions of up to 400 words will be published in the next issue of the Informal Learning Review and will be very interesting dissections of the current future.

Manuscripts or other comments should be sent to both of us by January 27. Robert Mac West at ileinc@informallearning.com and Harold Skramstad at skrams2@q.com.

UNIVERSITY OF MICHIGAN WORKING PAPERS IN MUSEUM STUDIES NUMBER 1 (2010)

The University of Michigan Museum Studies Program's series of "Working Papers in Museum Studies" presents emerging research from a variety of disciplinary perspectives, all focused on the multiple concerns of the modern museum and heritage studies field. Contributions from scholars, members of the museum profession and graduate students are represented. Many of these papers have their origins in public presentations made under the auspices of the Museum Studies Program. We gratefully thank the authors published herein for their participation.

This paper was originally presented as the U-M Museum Studies Program Whitesell Memorial Lecture on March 13, 2008. Harold Skramstad is President Emeritus, Henry Ford Museum and Greenfield Village and is currently a consultant specializing in strategic and interpretive planning for museums and cultural organizations.skrams2@q.com.
1 UM Working Papers in Museum Studies, Number 1 (2010)

About 15 years ago I wrote in the journal, Museum News,

The word 'museum' has lost its power to adquately define a coherent body of institutions that have similar missions, goals, and strategies. To define a major research driven natural history museum, a regional science and technology center, an encyclopedic art museum, and a local volunteer-run historical society as a 'museum' is like describing General Motors, Kmart, a regional bank, and a local convenience store as a 'business'—it is accurate but not helpful.

As I look at that statement today I wonder why I thought that the word "museum" ever defined a body of coherent institutions.

From its beginnings, the great value of American museums has come from their diversity. It has always been a mix of collecting, inquiry and scholarship, entertainment, and education and I would like to take a few minutes to give you a flavor of some of these early museums. It is worth noting that Charles Willson Peale's museum in Philadelphia, begun late in the 18th century was a commercial as well as educational undertaking. Educationally, Peale understood that "It is only the arrangement and management of a Repository of subjects of Natural History...that can constitute a utility. For if it should be immensely rich in number and value of articles unless they are systematically arranged and the proper modes of seeing and using them attended to, the advantage of such a store will be of little account to the public." At its apogee Peale's museum had a collection of over 100,000 specimens including a mastodon named "mammoth" that was a popular Philadelphia attraction. As a businessman Peale was constantly juggling and balancing his serious collecting efforts and his entertainments in order to make his museum a financial success.

As Americans moved west to create what historian Daniel Boorstin has described as "Upstart" communities, museums, along with colleges and universities, opera houses, libraries, and theaters were often created before there were people to use them. They often provided the definition of

community before there was any community.

A museum that epitomizes the entrepreneurial spirit of these early "Upstart" museums was the Western Museum of Cincinnati, founded by Daniel Drake. In creating the museum, Drake was motivated by a blend of intellectual curiosity and civic boosterism. Drake's ambitious plan was to create a museum of "natural and artificial curiosities embracing nearly the whole of the great circle of knowledge: and appealing to the naturalist, the antiquark, and the mechanician." Drake established a partnership with the newly established Cincinnati College and started several archeological projects. To pay for it all he organized a stock company that permitted stockholders free admission to his museum. Others paid 25 cents. When Drake's attempts to make the museum a financial success failed, it was sold to a new group of stockholders who turned the collection over to Joseph Dorfeuille, a French immigrant who already had accumulated a large natural history collection of his own. While interested in science, Dorfeuille was a pragmatist who observed that for the general public "the truths of natural science were not as attractive...as the occasional errors of nature in her productions." Under his stewardship the museum created a colossal entertainment titled "The Infernal Regions." A blend of automated wax figures (interestingly created by the young sculptor Hiram Powers), the exhibit became one of the most popular attractions in the American West. The traveler Francis Trollope described it as "a pandaemonium...in which he has congregated all the images of horror that his fertile fancy could devise.

To give the scheme some more effect, he makes it visible only through a grate of massive iron bars, among which are arranged wires connected to an electrical machine in a neighboring chamber; should any daring hand or foot obtrude itself within the bars, it receives a smart shock that often passes through many of the crowd, and he cause being unknown, the effect is extremely comic; terror, astonishment, curiosity, are all set in motion, and all contribute to make 'Dorfeuille's Hell' one of the most amusing exhibitions imaginable." Even with the success of such exhibitions, Dorfeuille's museum eventually closed in 1867 due to financial difficulties.

While Peale, Drake, and Dorfeuille represent important apprenticeships in the establishment of the American museum movement, it was P.T. Barnum who brought together a winning combination of education and entertainment in his American Museum, founded in 1841 in New York City.

On the surface, Barnum's museum housed a somewhat bizarre and exotic collection of curiosities and a group of performers. Yet Barnum recognized in his visitors a deep curiosity, a need to know and understand things for themselves. In the words of cultural historian Neil Harris, "despite Barnum's eclecticism there was a certain unity to its exotic trappings, and approach to reality and to pleasure. The objects inside the museum, and Barnum's activities outside, focused attention on their own structures and operations, were empirically testable, and enabled—or at least invited—audiences and participants to learn how they worked. They appealed because they exposed their processes of action."

For Barnum, the curiosity, the excitement, and knowledge embodied in his American Museum were to be shared with visitors in an active way. Even in his exhibitions that bordered on hoaxes, Barnum actively engaged the issue of authenticity; what is real and what is not. He realized that his audience took instinctive pleasure in uncovering process and that education, if doled out in acceptable doses, was a major American preoccupation that had some box office appeal. In fact Barnum wrote an English friend in 1845, "I trust that ere long, the richest men in America will be we museum chaps."

While Barnum was not very prescient in his prediction about the wages of museum directors, he was a genuine pioneer in understanding the needs of audiences to have an "experience" in a museum setting and that such experiences played upon the public's natural curiosity. Barnum insisted that the museum visitor be actively challenged, his hokum in many cases being specifically designed to invite skepticism, discussion, and debate.

I mention these early museums to make the point that many of the issues of commercialism, the use of new and exotic technologies in exhibitions to create a memorable experience, the blend of entertainment and education, and the balance between audience needs and museum purpose are not a new phenomenon. While the recipe for these early museums was somewhat different, the ingredients have generally remained remarkably similar to those in use today.

In addition to their diversity, the other continuing characteristic of the American museum movement has been its attempt to be responsive to changing social needs. At the same time the great 19th century American art and natural history museums were aggressively assembling their collections at a level of plunder that would not be accepted today, they continued a strong commitment to public education and uplift, as long as it stayed within clear boundaries of social control. If we look closer to the present we can see this characteristic still at work. The acknowledgement of a more diverse and pluralistic society in recent years has created a plethora of unmet contemporary social needs and museums have often been among the first respond-

ers. Major initiatives for encouraging and strengthening minority museums, for promoting a greater level of civic engagement by museums, and bringing museums closer to communities have been sponsored by the American Association of Museums and other groups. A simple measure of the continuing strength and diversity of the museum movement was provided by a study commissioned in 1979 by the newly formed Institute of Museum Services that showed that approximately half the museums in America had been brought into existence since 1960.

Looking at the state of the American museum movement from the perspective of today I think we can say that museums matter in a way that they have not in any earlier period. To an extent unimaginable even a generation ago, they are considered important and influential institutions that both shape and reflect the public agenda. The print and electronic media regularly review museum exhibitions, the comings and goings of museum directors are now considered newsworthy, and museum scandals are front-page stories. New museum building projects remain, like sports stadiums, benchmarks of civic pride and ambition.

I would like to now shift focus to the main topic of my remarks, which is to suggest some elements of an agenda for museums in the next century. Before doing so I would like to mention several things that set the stage for this agenda.

The first is a reality check on museum usage. Today's museums have done a very good job at believing their own press releases. We hear again and again how museum visitation exceeds that of professional sports; we are proud of ourselves at how we are reaching new and diverse audiences. Yet pretty much all the audience research confirms what we have always known instinctively: that a relatively small number of people of above average education and cultural confidence are avid museum goers and that their visits add up fast. I say this not to say it should always be, but that the missionary wing of the museum movement has a very hard time acknowledging that it is possible to live a full and rich life without ever visiting a museum.

The second is recognition that many of the careful distinctions that we make within the museum field regarding our unique and special professional roles in society are non-issues for those outside our movement. It is hard to argue that we are so special in a world in which Las Vegas casinos have major art collections and mount special exhibitions for the public; where the Hard Rock Cafe chain has an aggressive collecting program that has resulted in a world-class collection of historical materials relating to rock and roll that is curated and conserved by a well-trained professional staff; and where a full-blown but failed non- profit aquarium in Denver was purchased for pennies on the dollar by a foodservice chain to serve as an entertaining and educational backdrop to its signature restaurant. For the public the distinctions between non-profit and for-profit, education and entertainment have become largely irrelevant. The tax status and high purpose of their museum-like experience from is less important that the perceived value for their expenditure of time and money.

Yet that said, I think as we look to the future of museums, the possibilities for the future of the museum remain exciting. I think we are on the edge of an era in which museums and their natural partners, libraries, have the potential to greatly strengthen their ability to truly become the new "public utilities of a knowledge society."

In order to accomplish this I think American museums must address three major challenges:

- The challenge of distinctiveness
- The challenge of connectedness
- The challenge of trustworthiness who they get

THE CHALLENGE OF DISTINCTIVENESS

If we look at the most influential museums in contemporary America, their success is less a result of the intrinsic quality of their collections than it is the distinctiveness of their mission, clearly articulated and executed strategies based on that mission, and an imaginative staff to execute museum strategies. This was driven home to me in a very practical way when I became President of what was then Henry Ford Museum & Greenfield Village in 1981. The verdict of my peers was already in when I arrived. As one very distinguished colleague told me when he called my first day in the office, "Harold, you have just committed professional suicide." To be sure the museum was not what anyone coming from a traditional museum background would find comforting. Its mission was to keep going although there was no shared sense of what direction to go. What saved us were the collaborative efforts of some wonderful people, and over time we were able to begin to find some common threads that led to a sense of mission that provided a platform for the creation of something educationally very powerful out of the strong yet somewhat strange legacy we inherited. As a result of that experience I have become a bit of a fanatic on the subject of mission but do not feel my fanaticism has been wrongly placed.

Since I left Henry Ford Museum & Greenfield Village in 1996, my wife Susan and I have worked with literally dozens of museums. For us the best indicator of success for these museums was their ability to create and execute a statement of mission that clearly articulated what the museum does, what was the outcome of doing it, and most importantly, what was the value added of the outcome to

the audiences it served. In business terms, it addresses the simple question of "what is the value proposition?"

It is essential that as American museums move forward, individual museums are able to clearly define for themselves, and for those they purport to serve, their reason for being. To say that the museum mission is to collect, preserve, and interpret a collection no longer will suffice since those activities are no longer seen by many as an intrinsic social good.

I should briefly insert here that I think the special missions of college and university museums need some attention. It has been my experience that too often the college and university museum is seen as a public relations tool to attract students, patch up town and gown tensions, and provide community service. All of these things are important and good. At the same time, being part of an already existing and privileged community devoted to critical inquiry and teaching offers opportunities for intellectual and aesthetic programming that few museums outside the academy can risk. The college and university museum has the potential and built in permission to become an intellectual and aesthetic provocateur that can raise issues, do exhibitions, and sponsor activities that could make it a focus and center of campus intellectual life. It seems to me to be a shame that in communities with such an incredible intellectual resource, college and university museums too often remain on the periphery of campus intellectual life.

THE CHALLENGE OF CONNECTEDNESS

Closely related to institutional distinctiveness is connectedness. Again the distinctiveness of the museum's mission helps it to know to whom it should be talking, to whom it should be listening, and what are the limits of the museum to respond. While there has been a great deal of talk about the need for museums to more directly engage communities, there has been little acknowledgement that this is easier said than done, given that contemporary communities are so fluid, transitory, and different from the more traditional community model that is held out as the ideal. We have moved from communities of need to communities of choice, where people define themselves by their personal choices rather than their needs. For museums these communities of choice signal a movement from a culture of "outreach" where museums create programs and activities and then reach out with them to potential audiences, to a culture of "inreach" where individual users reach in to those organizations that they see as giving personal value to them.

There is a great future for those museums that try to make themselves communities of choice. Certainly the museum cannot and should not try to provide all the things that people need and desire in their lives. However, with some imaginative thinking on the part of museums they could do a lot more to becoming the center of powerful "learning communities." The key to doing this is to create institutional strategies, consistent with mission, that connect museum programs to people's basic personal needs. I will suggest just a few such strategies.

Help Improve Knowledge: This is the most obvious strategy; an acknowledgement that people come to museums for increased knowledge. It is important that the museum both acknowledge its own expertise and authority and at the same time the competencies the user brings to the museum. It means answering the questions in the mind of the visitor, not the museum staff.

Find the Shared Stories: In connecting with audiences, one of the most powerful tools we have is storytelling. It remains the most elementary and effective form of memorable explanation and communication. An unhelpful legacy of the quasi-academic culture of museums has been a preference for analysis over narrative, theme over story. Museums need to return to storytelling as an important way of communicating and cultivating community; shared stories are the essence of any community.

Foster Dialogue: Dialogue is a focused conversation in a setting of trust. Dialogue is important because it allows people to experience the security of what they know and yet be willing to listen to an alternative version of it. It is a way of introducing ambiguity, uncertainty, and even threatening ideas in a setting of trust. Here there are real possibilities of acknowledging the content expertise of museum staff and the living expertise of the museum audience in a give and take process. It offers all an opportunity to acknowledge thenpossibility that things might have been different.

Provide Validation: A positive and affirming process, validation is the experience of finding an outside source of authority that gives value and meaning to one's life. This is especially important when one's personal or collective experience is left out as in the case of minority or other marginalized groups whose experiences are not part of "mainstream" museum interpretation.

Help People Mourn: This may seem a strange kind of cultural process and experience to build on in a museum setting, but it is an important one. Formally and informally, collectively and individually, saying goodbye to something that is irretrievably lost is an essential part of any community. I suggest that our museums need to help people mourn those things that are irretrievably lost by time and circumstance.

Be a Place and Time for Celebration: Conversely, it is through celebration rituals that most of us, collectively and individually, reinforce and strengthen what is most important in our lives. Visits to museums affirm that education is an important value and that history, art, and science are important enterprises that continue to change and evolve.

Many in the museum world see a "celebratory" role as uncritical, unscholarly, and unreflective. However the concept of "celebration" needs to be seen in a more broadly defined way: as a way of focusing on and paying attention to those things that are truly important in our lives.

Finally, **Inspire:** This is, in my opinion, the highest level of aspiration for a museum. Any museum that can inspire people can claim a grand achievement. The real things that are a museum's stock in trade: the people, stories, and objects of art, history and science—are the great raw materials of inspiration.

To create a community of choice in an individual museum is no small challenge. And to create the kinds of exhibitions and programs that try to connect and sustain a shared sense of community is not easy—and requires some skills that are in short supply in most museums.
It also requires a sense of urgency and timeliness that is lacking in most museums. I remain baffled when I look at the exhibition agenda of many museums that claim a public agenda and see very few topics that could be characterized as timely. Journalistic exhibitions that could be competently mounted in a matter of weeks or months need find a larger place in a museum's program vocabulary. There are few topics in contemporary life that could not benefit through engagement by museum exhibitions.

Finally, museums attempting to create communities of choice need to understand just how important the sense of place is in building a shared community. Communities are grounded in both physical space—and increasingly in virtual space. The great observer of cultural landscapes, J.B. Jackson, writes in his essay, "A Sense of Place, a Sense of Time," that successful places .

. . . are embedded in the everyday world around us and easily accessible, but at the same time are distinct from that world. A visit...is a small but significant event. We are refreshed and elated each time we are there. I cannot really define such localities any more precisely. The experience varies in intensity; it can be private and solitary, or convivial and social. The place can be a natural setting or a crowded street or even a public occasion. What moves us is our change of mood, the brief but vivid event. And what automatically ensues... is a sense of fellowship with those who share the experience, and the instinctive desire to return, to establish a custom of repeated ritual. (p. 158)

I think the same characteristics also apply to virtual spaces. I remain amazed that at this late date more museums have not adopted the simplest forms of chat rooms and other types of virtual communities that could act to strengthen a sense of shared interests and relationships among those affiliated with individual museums.

THE CHALLENGE OF TRUSTWORTHINESS

In the world of tomorrow the relative trustworthiness of institutions will increasingly mark the difference between those that are successful and those that are not. The issue of trustworthiness is, for museums, closely tied up with he issue of authority. Traditionally museums have sought heir authority through the authenticity of their collections and the expertise of their staff. In an era when museum audiences, staff, and patrons shared the same transcendent values and saw them as an intrinsic good, they could be transmitted through their collections and exhibitions without fear of controversy or contradiction. Museums provided a strategy for organizing and colonizing the natural and human world. Their exhibitions provided a way for museum goers to discover, explore, and "consume" other people's heritage in a culturally comfortable setting

In recent years the rules of the game have changed. As American museums became more visible and their audiences more diverse, the shared understanding that arlier underlay museum assumptions about the scope and focus of their collections and the subject matter and approach of their exhibitions and programs, began to erode. As a result, museums are no longer seen as places of unquestioned authority and trustworthiness.

A landmark example of this was the controversy during the 1980s over traditional museum stewardship and display of objects considered sacred by various Native American groups. While the intellectual and ethical debate turned on two very different cultural views of the value of tangible Native American objects, the controversy also uncovered the fact that the museums that had held these objects for many years had in many cases done a poor job of caring for them.

Museum exhibitions have also become battlegrounds for larger historical, scientific, and aesthetic debates. Exhibitions mounted by such varied institutions as the Museum of the City of New York, Library of Congress, the Brooklyn Museum, Cincinnati Contemporary Arts Center, Metropolitan Museum of Art, and the Museum of New Mexico

have become platforms for strident advocacy representing a variety of points of view. This was new stuff for most museums. They are having a hard time learning to listen to groups and individuals who do not accept their authority yet understand the importance of challenging an influential shaper of values and opinion. The most visible example of this remains the National Air and Space Museum's planned exhibition on strategic bombing during WWII in the 1990s. The result of the controversy pitted the museum's curators and director against a variety of outraged veterans and other interested groups, several of which were politically savvy and quite ruthless. The result was the exhibition was cancelled before it opened.

More recently, however, there have been numerous examples where controversial topics have been successfully addressed by museums. We are learning.

Science museums have also been the scenes of demonstrations and disruptive activities by various groups opposed to evolution. For the most part these museums have taken the offensive in defending both their scientific perspective on evolution and the scientific method as an overwhelmingly recognized form of inquiry.

A new debate regarding the authority and trustworthiness of museums is just now emerging with the creation of major new museums that privilege the perspectives of groups that have been excluded from more traditional museum narratives. The most important of these has been the National Museum of the American Indian which opened in 2004. Its location and architecture clearly symbolize the change from the museum as a colonizing force to the museum as a legitimizing force. The large and dramatic architecture of the building and its location on the National Mall is a clear sign to all that American Indians and their heritage are indeed important and will not be denied. The exhibitions have proved more controversial. Most were conceived and organized by Native American historians and anthropologists in close collaboration with various tribal informants. To some the exhibitions are a successful attempt to de-privilege traditional academic constructs of Indian life and culture; for others they represent multicultural platitudes. The American Indian Museum is by no means the first autobiographical museum but it is by far the largest and most influential to date. Its ability to develop a reputation of legitimacy and trust among an audience beyond Indians is yet to be seen but will set a precedent for other major national museums such as the National Museum of African American History and Culture planned for the Mall, and a planned national museum of Hispanic culture.

The growing number of presidential museums, especially those dealing with living presidents, poses many of the same issues. The subject of the museum picks the planners of museum content and the exhibition designer, pretty much answering the question in advance as to whether the museum will provide a serious assessment of the particular presidency or attempt to secure a positive historical legacy.

Presidential museums and advocacy museums clearly fit under the tent of American museums. However, if they become seen as instruments of propaganda rather than a trustworthy source of information and insight they will cast a shadow on the trustworthiness of other museums.

Another equally interesting example of the conceptual change of the museum from a colonizing force to a legitimizing force is the recent creation of corporate museums that use the positive culture capital of the word "museum" to strengthen their brand identity. German automakers Mercedes, BMW, and Volkswagen have all built expensive museums, each housed in distinctive and cutting edge works of architecture designed to give experiential reinforcement of the values of quality and precision. Japan Airlines has just created an internal museum to teach safety to its employees as well as strengthen a culture of safety awareness. Hong Kong has recently opened a museum devoted to helping people tell the difference between fake and authentic goods produced in China. There is an interesting irony here in that while many groups, especially those in the U.S., seeking to create museums, debate endlessly whether or not the term conveys an image of stuffiness, more market savvy branders and educators openly embrace the word "museum" as a sign of authenticity, authority, and trustworthiness.

We will see more of this in the future. The authors James Gilmore and Joseph Pine, whose book The Experience Economy, was a thoughtful acknowledgment of the importance of providing engaging, personal, and memorable experiences as a key to business success have just published a new book titled Authenticity. Its purpose is to help businesses position their goods and services as authentic, arguing, "If your customers don't view your offerings as authentic, you'll be branded inauthentic— fake! —and risk losing sales." Gilmore and Pine suggest three major characteristics of authenticity: sense of place, strong point of view, and a sense of larger purpose. They then go on to outline ways that a brand identity stressingvauthenticity can be created for any business.

The Experience Economy laid out a blueprint as to how a business could create engaging, exciting, value-giving, and memorable experiences that should be our museums' stock in trade. Business got it yet most museums did not.

In Authenticity the authors provide a strong argument for the branding value of authenticity as another key to business success. Again, if there is any brand identity that museums should own it is authenticity. For me it is more than a little strange that we should need to relearn from the brand managers of businesses the most basic things about our own enterprise.

In the future the authority that a museum claims will not be a function of the quality and authenticity of its collections or its specialized content expertise. It will be secured by having a clear and distinctive mission that is well executed and relentless connectedness with its audiences in an atmosphere of mutual trust. Museums can no longer continue to take refuge in their claims of higher purpose and nonprofit status. Like any organization, they must demonstrate their value and renew the bonds of trust with their users and supporters every day. In the final analysis it is quite simple. People listen to, affiliate with, and support people and organizations they trust.

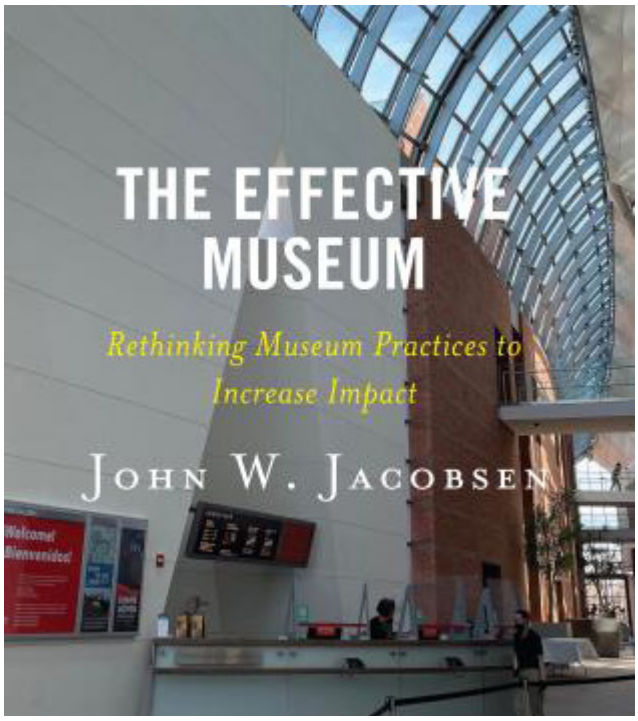
The poet Edna St. Vincent Millay wrote in one of her best-known poems,

Upon this age, that never speaks its mind,
This furtive age, this age endowed with power
To wake the moon with footsteps, fit an oar
Into the rowlocks of the wind, and find
What swims before his prow, what swirls behind—
Upon this gifted age, in its dark hour,
Rains from the sky a meteoric shower
Of facts...they lie unquestioned, uncombined.
Wisdom enough to leech us of our ill
Is daily spun; but there exists no loom
To weave it into fabric . . .

Museums, I think, can be looms that can help us all weave the wonders of the world into a continuing array of distinctive, authentic, and trustworthy fabrics that can teach us, bring us together, inspire us, and give us pleasure and delight through their warmth.

Review of The Effective Museum by John W. Jacobsen

By Robert Mac West



Jacobsen has produced a very readable book that takes full advantage of his 40+ years of working as a consultant to museums that were forming, figuring out who they are, evolving to meet the demands of the external world, and looking for ways to collaborate or assist one another in many ways. It is an interesting read, with some very difficult issues or circumstances presented in friendly and accessible language.

The book is organized as seven parts which, although treated separately, really do connect and often rely upon one another.

The parts are
1. Revise Your Conceptual Framework
2. Revitalize Your Audiences and Supporters
3. Reorganize Your Museum
4. Reinvest in Your Resources
5. Reposition Your Programming
6. Restore Management Basics
7. Reimagine Museum Models

These seven Rs organize the diversity of museums in very interesting ways. The strategies and manipulations that are discussed in each demonstrate very well that the museum world is very diverse. Jacobsen has dealt with a great variety of organizations so is able to both condense ideas and strategies to make them uniformly applicable while at the same time acknowledging that personal solutions need to take into account museums' size, topic, location, economics, ownership, etc. An interesting and useful element here is, given the differences in the worlds of various museums, often those same descriptive terms will have different meanings. That suggests some careful assessment of self-descriptions, mission statements, etc.

Another basic theme is examining cultural and community changes that impact individual institutions. He and many others of his generation certainly have seen lots of things happen and simultaneously lots of responses, some of which were successful. At the end of the book Jacobsen does an interesting chronology of what museums have had to deal with. Starting over fifty years ago here is the museum world: New Technologies in a Time of Turmoil (1867-1980); Reagan's Go-Go Years (1981-1987); The Nervous 903 (1987-2001); Under Attach (2001-2005); The Great Recession (2008-2009); Trouble Brewing (2010-2019); and The Covid 19 Pandemic (2020-2022). These are interesting clusters and provoke the reader to go back to earlier sections of the book for details and new perspectives.

Throughout the book he directs the reader to think about the different times of the year, month, day, etc. As museums are seeking to be economically stable, there are efforts of great variety to diversify the audiences (paid and unpaid), uses of museum spaces, and ways in which museums can extend themselves out of their site into their community. Certainly, the recent Covid crisis has stimulated some very creative approaches to make fuller use of the museum's resources.

I have taken John's analysis of differences over the course of the year, into some very detailed examinations of the 465 days. Let's look at what we are and what is out there at 10:00am on a Tuesday in February. Then what about 6:00pm on Sunday in April? Then check out noon on Saturday in July. And take this year round and it is very interesting to see how variable the world is and therefore both opportunities and challenges for the museums. But as John tells us, the effective museum is the one that is operating right now. And will be operating differently on another day in another month.

Another contemporary circumstance that is looked at very carefully is the value of collaboration and cooperation among museums. He points out the areas of museums that are common – back of house, food services, security, and even outside contractors, etc. By behaving and organizing jointly museums in a community or a neighborhood can operate much more efficiently as a cooperative. There are some good examples of this in place which are not mentioned in the book but do stick out right away.

It is very clear from the discussions of museum circumstances that Jacobsen is taking advantage of his deep plunge into hundreds of museums where he say interesting circumstances and responses. Every now and then, as I was reading, I asked myself what place(s) he was referring to. There are a few named examples, but most of the circumstances are treated more anonymously – which is just fine. And then I do note (as a former curator of geology) that this assessment of museum operations and effectiveness doesn't devote similar attention to the fact that many museums are the legal and ethical holders of vast accumulations of materials that are unique repositories of human history and culture, technology, the biological and physical world, and the organic history of the planet. It would be very interesting to bring the same tools to work in the world of natural history and science.

CONCLUSION

This is an excellently written and researched book. It is a new arrival (2022 publication date) that does an excellent job of dissecting the modern museums and looking at the resources and challenges that are confronting them today.

Jacobsen, John W., 2022. The Effective Museum: Rethinking Museum Practices to Increase Impact. Rowman and Littlefield, 177pages. He may be reached at jwj.jacobsen@comcast.net

The Current Reality Demands The Right Questions: How You Can Lead In This Crisis

Musings by David E. Chesebrough

How are you and your team approaching this crisis?

When I was hired in 2005 to lead the effort to save COSI the situation was sobering. From a heady opening in a brand-new building in 1999 there had been a rapid decline in finances as deficits grew. By the time I joined, cash reserves were gone and COSI had cut roughly 40% of its budget and staff. Over one third of the 325,000 sf facility was closed off. Yet, COSI was still bleeding cash and only operating through millions of dollars of emergency support.

As many times as I have stepped in to lead financially challenged organizations, COSI was by far in the most dire straits. Clearly, more of the same was not going to work. The huge installed costs of the facility were oppressive, highlighted by $1 million annual utility bills alone.

Are you or fellow CEOs currently or potentially dealing with severe stresses of this scale?

My guess is possibly, as Covid-19 is creating financial and operational challenges unlike any other time.

It is also an unique equalizer, in that all museums are faced with significant disruptions and financial shortfalls. With most institutions experiencing similar threats there is the ability to share ideas and efforts in remaking our museums in a positive way.

So far, I'm amazed at the wide variety of situations I am finding. Some museums are currently stable with little or no staff layoffs yet -- others almost immediately cut 80% or more of their staff to preserve precious cash in the face of significant revenue shortfalls.

The entire field is dealing with great unknowns and unpredictability with an indeterminate, and probably long, timeline until society and the economy return to what we might call "normal". Experts I have talked to suggest this is going to be a challenge for years – not just months.

Consequently, I am researching and working on several pieces exploring the possibilities for museums and science centers in the future. I am trying to envision institutions that are sustainable and impactful in the Covid-19 era.

While those articles are in development, I want to share some of my reference points and questions generated so far – often informed by colleague communications.

COMPELLING REFERENCES

Here are few relevant quotes that stand out to me:

- From evolutionary biologist Dr. David Resnick, **"When faced with rapid change environment and threats some species will adapt rapidly, or die out."**
- Jim Collins, in his book Good to Great, describes the Stockdale Paradox as **"Retain faith that you will prevail in the end, regardless of the difficulties. - AND at the same time - Confront the most brutal facts of your current reality, whatever they might be."** (Jim Stockdale was a POW admiral held in the Hanoi Hilton for eight years during the Vietnam War in horrible conditions with his follow captured aviators.)

I think both concepts need to be taken to heart.

Pondering them helped generate my first series of questions below.

COMMUNITY NEEDS

How do you keep your institution relevant to critical needs in your community?

I can't overemphasize how important it is to identify and engage with your region's current priorities. Health, social services, education (writ large) and restarting the economy are all going to be rated higher than museums for attention and support.

Every science center and museum right now should be positioning themselves, within their mission area where possible, as contributing to solutions to priority problems. It will not serve you well to be perceived as a self-focused organization competing for "survival" funds.

If you are not delivering services in priority areas of need, you will not find funds available for your endeavors.

Some, however, of your experimental initiatives to reach and serve audiences are probably not paying for themselves right now. If you are getting positive feedback, try to sustain those offerings in some form. If they are truly providing important services, they will help establish your credibility as an important asset in this area. You can work through monetizing and adjusting them later with the data and responses you collect from your efforts.

With my points in mind, check your work with your management team against these questions:

- Have you asked key leaders in your community how you might support their efforts?
- Have you asked your primary audiences (teachers, families, members, social service/government partners) what they need at this point in time? (One client who supports local governments had staff help survey all of their major stakeholders, resulting in them pivoting from planning support to providing succinct and vetted Covid-19 information to guide the government leaders' decision-making.)
- Do you have advisories or partners that can inform or validate your thinking in identifying opportunities for your institution to contribute focused services that are needed and necessary right now, not just nice to have?
- Have you taken a look at short term, priority unmet/undermet needs of your community that your organization by itself or in partnership with others, could provide, even if that is a shift from your normal services? (e.g. Colleagues with central locations and accessible parking have offered to be used as testing or distribution centers.)
- Are there innovative sources of funds that could be secured to provide an important service? (e.g. Several colleagues reported that donors wrote support checks because they saw the value of new programs that the museum was providing as resources for teachers and parents at home.)
- Looking long-term, what are emerging community needs and priorities that you can anticipate that your institution has special capacity to meet consistent with your core Mission and Brand? Can you shift toward some of them?

FINANCES

My strong opinion is that few, if any, museums will return to past revenue levels for a long time. Particularly if your revenue sources relied heavily on big crowds and blockbuster exhibits. I would encourage all leaders to decide now that you will need to be more focused as an institution with as lean a staff as possible, while still maximizing the assets for which you have fixed expenses.

In light of that statement, I suggest that these questions be considered:

- What funds are flowing that might be available to your museum for providing urgently needed services? (One science center is receiving government funding to provide day care services for frontline responders. This is also letting them refine safety protocol to be used for camps and classes when they are able to resume them.)
- I assume you have done a careful analysis of your current cash situation. How fast are you burning cash? How long can you sustain that? What then?
- What are additional ways for you to preserve cash?
- Have you figured out the minimum staff you need right now and what a reduced staff would look like when you can start to reopen?
- Do you have financial setpoints that would trigger actions by management and the board? Have you agreed with your board on what those actions would be?

THINKING THE UNTHINKABLE

Management and board leadership are not fulfilling their full responsibilities if they are not planning for the worst possibilities. If there ever was a disruptive time to force you to consider that, this has to be it.

By having a plan for the worst, you won't have to scramble and look unprepared if you have to implement the plan (or lesser versions of it). Questions that need answered in your plan might include:

- If you see an impending, massive layoff, do you have a list of your top employees to retain so that you can rebuild the organization later around them? (I learned long ago to focus on top talent over matching job descriptions.)
- Have you built a scenario around sustaining the organization if the Covid-19 disruptions extend for two years or more in at least some form?
- Do you have a scenario for how you might "mothball" the organization until more normal operations can be resumed? (I immediately think of two science centers that I know well which had to do this in the past. One reemerged later as an entirely different organization but with the same building and mission. The other reopened after almost 2 years of dormancy with new funders, new board, new name and energy but the same leadership.)
- Have you considered shared services with other organizations to reduce your core costs?
- If your situation is precarious is there the potential of a

merger to a compatible organization to create a stronger, more sustainable joint entity?

INNOVATION

For this last set of questions, I look to Jim Collins and Jerry Porras in their best-selling book *Built to Last.* Two chapter titles stood out to me as relevant for right now and looking forward.

Preserve The Core, Stimulate Progress

Try A Lot Of Stuff And Keep What Works

The following questions match with those ideas:

- What are your unique assets (expertise, building, location, talent, access, brand, etc.) of priority value to others? How might you already be utilizing those in new ways or planning to do so in the future?
- Have you fostered creative exercises with your full team to generate a large number of possiblenew services to explore further? Can you generate some empirical data through small pilots to help your museum quickly focus on the best possibilities to explore further?
- What partnerships or affiliations might be worth exploring to better serve your region with your collective special assets and together be more attractive to donors and supporters?

REOPENING SUSTAINABLY

Reopening is one thing, making it a sustainable enterprise again is quite the challenge as I talk to leaders in the field. Just a few of the questions that come to my mind, are:

- What elements of your current museum experience could be continued or expanded in a Covid-19 safe way as you start to reopen? (At COSI, one of the first things we did when I started was to invest in portable activity carts spread around the building and staffed by trained youth volunteers that could be used for family sized demonstrations. We also built a stage in our empty, main atrium area to hold regular Science shows for the public.)
- What is the shift in your offerings to lower or no touch experiences that are still compelling?
- What is your new projected throughput with adjusted operations and offerings? Have you figured a breakeven point in costs for this adjusted model?
- Have you decided to return to your original entrance fees or are you reducing them?
- Do you have plans for a soft opening with invited members or partner groups to test operations before opening to the broad public?
- Do historic attendance data suggest the best restricted schedule to test your new operations and the appeal and comfort for your returning or new audiences?
- How do you plan to gather regular data as guests return to your building to assess safe and effective operations as well as their comfort, feelings about the experience you offer and its value?
- How can you continue and expand your services in ways that aren't building centric?
- Do you envision an adjusted model with more diverse offerings and modalities (on site, off-site, virtual) to serve your community?
- How might each set of offerings have an identifiable revenue stream, either directly (tickets, contracts for services, grants) or indirectly (packaged with members, school/social service partnership contracts, GOS funding rationale)?
- Are there possible partnerships that can better leverage the combined efforts and resources to meet community needs that might be attractive to donors?

LOOKING FORWARD

Do any of my questions or comments resonate with you? How many of these have you already tackled?

It astonishes me that you have so much to think about right now – and I am just starting to think through all the issues and opportunities. My hat is off to all of you, your management team and your boards for managing through this for the benefit of your communities in organizations.

As you see, it is much easier for me to pose questions than potential solutions. I don't pretend to think that I have any more insights and answers than you and our colleagues. I do believe successful transformations will require collective thinking, sharing and experimentation among museums and science centers.

Like I wrote in my last piece, there are a number of the leaders that I coach and advise who, as awful and stressful a time as this is, see these challenges providing welcome impetus to remake their organizations to better deliver great and sustainable impact in helping meet their community's needs.

As you proceed, remember the Stockdale Paradox – he and his fellow aviators survived incredible hardship, torture and challenges and yet were successful survivors at the outcome.

(I am always anxious to hear ideas, comments and innovations as they relate to the topic of my writing. I can be reached at David@ChesebroughSolutions.com)

REOPENING SUSTAINABLY – Some thoughts and questions from a sustainability nut

By David E. Chesebrough

Reopening a museum, or any guest facing business, during the Covid-19 era is one thing -- making it a **sustainable enterprise** again is quite the challenge as I talk to leaders in the field and business owners.

A few questions regarding operations and messaging that come to mind, are:

- What priority needs of the community and members have you identified that you are able to meet better in reopening your institution? How do you articulate your alignment with those needs in your messaging to your constituents and the community?
- What elements of your current museum experience could be continued or expanded in a Covid-19 safe way as you start to reopen? (At COSI, when I started, we invested in portable activity carts spread around the building and staffed by trained youth volunteers that could be used for family sized demonstrations. We also built a stage in our empty, main atrium area to hold-regular Science shows for the public.)
- What is the shift in your offerings to create lower or no touch experience options that are still compelling? How are you promoting these offerings and changes to your guests and members?
- How are you messaging the safety considerations and measures you plan to assure the public it is safe to come and to assure that guests in the museum are comfortable? How is that message reinforced with consistent actions and messaging throughout your facility?
- How are you engaging your team, particularly those going to be on the front line, in researching and deciding on the best protocols and configurations for both safe museum operations and safety for your team members? Has your team walked through the 3 key variables of risk –Intensity of exposure; Frequency of contact; and Duration of contact for all aspects of a guest visit to your museum to guide operational adjustments?
- Are you sure you have buy-in from your team members? Have you thought of flexibility for members with personal or family concerns and needs about safety?
- Here is a tough one - how do you plan to encourage/ mandate safe behavior on your guests' part?

A few questions regarding **finances** that come to mind, are:

- What is your new projected throughput with adjusted operations and offerings? Have you figured a breakeven point in revenue to cover the costs for this adjusted model?
- Have you decided to return to your original entrance fees or are you reducing them? What, if any, are your messages around any changes?
- Do you have plans for a soft opening with invited members or partner groups to test operations before opening to the broader public and charging them?
- Do historic attendance data suggest the best restricted schedule to test your new operations and the appeal and comfort for your returning or new audiences and your value proposition to them?
- How do you plan to gather regular data as guests return to your building to assess safe and effective operations as well as their comfort, feelings about the experience you offer and its value? What about a protocol and staffing to collect data on traffic patterns, dwell time, pinch points, etc when you test your new operations?
- How can you continue to expand your services in ways that aren't building-centric? Which ones were promising that you experimented with during your shutdown?
- Do you envision an adjusted model with more diverse offerings and modalities (on site, off-site, virtual) to serve your community now and in the future?
- How might each set of offerings have an identifiable revenue stream, either directly (tickets, contracts for services, grants) or indirectly (packaged with membership, school/ social service partnership contracts, GOS funding rationale)?
- Are there possible partnerships that can better leverage the combined efforts and resources to meet community needs that might be attractive to donors?
- If there is another spike in Covid-19 in your community and you have to shut down or adjust operations again, do you have a plan in hand to implement? Can you immediately fallback to virtual and outreach approaches to sustain the organization and its impact?

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On the cover:

The MagnifiScience Centre opened in Karachi, Pakistan in the fall of 2021. Now the country has a fully programmed science and technology centre that is doing very well. The Dawood Foundation has played the major role in developing and now operating the MSC.

Full story on page 18.