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Inside: Museum Accessibility for the Blind

Plus: Strategies for Risk Taking in Exhibit Design, Subject Matter Experts in Library Programming, and MORE!

In this Issue:

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The Informal Learning Review is Evolving!

Withing the next few months this publication, currently based in Denver, will move to new ownership between Columbus, Ohio and Denver, Colorado. The next issue, #178, will be a joint effort of the collaboration comprised of Columbus Landmarks (Dr. Rebecca F. Kemper, lead organization), COSI (Dr. Frederic Bertley), OSU, and the longtime publisher, Informal Learning Experiences (Dr. Robert Mac West). The full transition to Ohio will be for issue #179. Rebecca Kemper and Mac West are leading the effort to develop the team that will take the Informal Learning Review into the future.

The subscription price of the digital Informal Learning Review (US $45 per 6 issues) will not change as the transition occurs. Invoices will be paid to ILE through the end of March. As of the beginning of April they will be issued by the Ohio collaborative and thus paid to them. All current subscriptions will be continued through the transition to provide the issues already paid for to date.

Questions about this transition may be directed to Robert Mac West at ileinc@informallearning.com and Rebecca Kemper at leadership@columbuslandmarks.org.

Museum Accessibility for the Blind and Low-Vision

By Bradley K. LaMere and Elaine Thatcher

As children, we are taught to look but not touch while in museums. We shove our hands in our pockets, hold them behind our backs, anything to asway the itch, the need, to touch. However, for some in our community, that is not an option. For the blind, a person cannot 'see' without touch, and one can make this argument even for those who are sighted. For this reason, one might wonder why a person who is blind might visit a museum. The answer: they seldom do. This article explores the space between the established museum exhibition and the blind and low-vision communities. We will investigate the invisible barriers, explore opportunities to increase accessibility, and discuss how these are crucial steps toward universal accessibility.

Throughout the article, the term 'museum' has been used to represent a multitude of institutions, including art museums, history museums, science and technology centers, children's museums, and libraries.

INVISIBLE BARRIERS:

According to disability statistics compiled by Cornell University, in 2019, nearly 2.3% of the population in the United States had a visual disability. Stated another way, about 7.5 million individuals in the United States rely on alternative means of sight (Erickson, W., Lee, C., von Schrader, S., 2022, *Disability Statistics from the American Community Survey* (ACS), Cornell University Yang-Tan Institute (YTI). Retrieved from Cornell University Disability Statistics website: www.disabilitystatistics.org). This is a significant portion of the population, and it is essential to acknowledge that visual impairment is a spectrum. To ensure accessibility to all visitors, regardless of visual ability, one must focus on creating a truly immersive, kinesthetic experience.

Traditional museums work against this concept. Vast, open exhibition halls, the cacophony of school groups and families rebounding from vaulted ceilings, artifacts held securely behind glass and stanchions. In the introduction to *Museum Exhibition Planning and Design*, Elizabeth Bogle states that "principles of good (exhibition) design…pertain to color, light, shape, form, space, line, balance, accent, rhythm, proportion, and scale." It is important to note that in Bogle's consideration, the ability to access items on exhibit is not a requirement of a 'good exhibition.' Indeed, the accessibility of an exhibition almost appears to be a footnote of exhibition planning. Only in the final step of exhibition creation does Bogle mention that "the planner/designer has the opportunity to research…and to ensure… the needs of the visually, physically, and mentally challenged are met" (Bogle, Elizabeth, 2013, *Museum Exhibition Planning and Design* AltaMira Press, 3-15). Indeed, accessibility is rarely considered under the purview of exhibition designers and curators, often confined instead to the education team. This demonstrates that access and equality are too often merely a consideration for exhibitions—additive instead of integral.

The exhibition experience mentioned above is a relatively modern invention for museums. During the early days at Oxford University's Ashmolean Museum, handling an artifact was considered essential to acquiring information and forming a connection with the artifact in question. A regular tour included object handling, such as lifting and shaking. Visitors would comment on the weight of objects, the way the materials felt, and what they smelled like (Levent, Nina, and D. Lynn McRainey, 2014, *The Multisensory Museum: Cross-disciplinary Perspectives on Touch, Sound, Smell, Memory, and Space*, 61-84). Today, this methodology is not practiced for artifact preservation and liability reasons. For many museums, the only items available for handling are located in children's only areas or the gift shop. To ensure an inclusive and accessible future for exhibitions and exhibition design, we must prioritize accessibility as an initial step.

OPPORTUNITIES:

While this is crucial for future exhibitions, many museums find themselves retrofitting established exhibitions. Multiple methods have been utilized in this attempt: extended audio guides, touch tours, and three-dimensional exhibition inserts. While these steps are valiant attempts forward, organizations need to consider how these gestures perpetuate repressive norms.

Giving closer examination to our examples, as mentioned earlier, comprehensive audio guides are available on an open schedule and offer additional descriptions of items on display. However, this maintains participant separation and removes connection with content, relegating those without sight to a tertiary connection with the work in question. With this deficit, how can a visitor gain a cognitive and cerebral connection with the pieces? Additionally, such audio guides rarely include every item on display, often focusing only on the most popular pieces and rarely

including temporary exhibitions. These exclusions severely limit access.

Touch tours are growing in popularity and are often viewed as a vital initiatory step toward access and inclusion. Taking visitors behind the scenes, those who are blind or low vision interact with collection items with a member of the education staff acting as guide and interpreter. While visitors experience a personal, intimate connection with the work, there are some strong deterrents to these programs. Tours can only be organized for specific times, often on a severely limited basis. Additionally, tours often exclude the more prized or popular pieces for conservation and insurance purposes. These steps segregate the blind and low vision from sighted visitors, offering them a fractional experience.

Another option growing in popularity is to offer three-dimensional reproductions available for interaction in traditional exhibition halls. Available equally, these pieces give blind and low vision visitors a traditional museum experience allowing them to develop an intimate relationship with each piece. However, these, too, display shortcomings. Many of these displays lack accessible interpretive materials resulting in the visitor having to guess the origin, background, or intended impact of the piece or to locate a sighted visitor or docent to disclose this information.

With current rejuvenation techniques falling short, what are museums to do? By making content available to those who are blind or low vision, you are making it more accessible for all visitors. Technology, such as tactile images, is one way to achieve this and allow institutions to provide a more equitable experience for those who are disabled. Using a variety of sensory stimulants, as well as enhanced kinesthetic approaches and methodologies, content can now be experienced and discussed in a manner that is far more equitable than it has been previously. It also allows those who are blind or low vision to participate in an experience from which they have been excluded and have longed to be a more significant part.

Figure 1: A blind visitor interacting with a tactile image at The Marines and Tet: The Battle that Changed the Vietnam War tactile exhibition at the Newseum in Washington, DC, 2018. Visual description for the blind and low vision: A blind woman with a cane in her left hand leans over and runs her hand across the surface of a tactile image featuring a US Marine. She is wearing glasses and a light grey jacket with dark buttons. Surrounding her are several other exhibition attendees, one of whom is taking a photograph with a camera.

UNIVERSAL ACCESSIBILITY:

American neuroscientist Paul Bach-y-Rita, MD, is credited with being one of the first to study the benefits of neuroplasticity. According to Bach-y-Rita, "The potential for biotechnology depends largely on the capacity of the human brain to adapt and modify function. The possibility exists to substitute for some lost functions by providing human-made substitutes". Initial studies surrounding neuroplasticity dealt with conditions that cause damage to the brain, such as stroke. It involves the 'awakening' of neural pathways that had previously been inactive and underutilized through various forms of rehabilitation, thereby allowing for recovery of function. This can also be achieved through sensory substitution (Bach-y-Rita, Paul, 1987, *Brain Plasticity as a Basis of Sensory Substitution*, 67-71). For example, tactile images provide those who are blind the opportunity to acquire visual information through the skin (touch), ears (hearing), and nose (smell). In short, what we refer to as 'seeing' occurs in the brain and not necessarily through one's eyes. Instead, 'seeing' occurs because of a confluence of sensory stimulants.

Technology, in combination with advancement in the study of neuroplasticity, provides institutions with a unique opportunity to integrate many sensory stimuli into their displays, exhibitions, and spaces. These stimuli, acquired through touch, hearing, and smell (among others), provide visitors with an enhanced kinesthetic learning experience. Studies have shown that kinesthetic learning is highly effective at strengthening learning experiences and improving information retrieval and amelioration. It also serves to increase confidence and morale and enhance independence. For many who are disabled, technology is a means to greater freedom and self-sufficiency. In the case of blind people, technology like tactile images allows them to experience an institution without overt reliance on a sighted companion to provide information.

The involvement of the blind and low vision communities is integral in developing assistive technology and new kinesthetic learning experiences and methodologies. For example, Tactile Images was formed and developed in association with the National Federation of the Blind. They

have proved to be a valuable partner in the development and advancement of technology, but also to advocate for greater accessibility and inclusion throughout a wide range of institutions. Mark Riccobono, President of the National Federation of the Blind, states, 'While sight is not a prerequisite for success, equal access to information is. The next great frontier in achieving this goal is access to images, not merely words to describe them."

Figure 2: A visitor's hand can be shown interacting with a tactile image of The Mona Lisa at the National Federation of the Blind National Convention in 2015. Visual description for the blind and low vision: A visitor's left hand is shown running fingers across the surface of a tactile image featuring The Mona Lisa by Leonardo da Vinci. The Mona Lisa is shown at an angle in three-dimensional relief.

It is not enough for institutions and staff to simply integrate this new technology. To become fully inclusive, they must also become advocates for those who are disabled throughout the entire industry. This involves developing and integrating training programs and instructional methodologies that assist the blind and low vision. There has been significant advancement over recent years to increase accessibility and inclusion. These technologies have been pivotal in helping to 'level the playing field', for these communities. Despite these developments, all of which are very important, one of the primary challenges is encouraging institutions to adopt and integrate these solutions within their institution(s). Many institutions prescribe solely to current government standards and do so solely to 'check off a box' to ensure that they follow required regulations. However, in most cases, compliance is not enough. To best serve all audiences, institutions should seek to fulfill these regulations and elect to integrate universal design solutions that provide a more equitable experience for all visitors.

It is also important to point out the disparity between experiences that are 'equal' and 'equitable'. Many use these terms interchangeably; however, each result is quite different. For example, let us say there are two visitors at a museum - one is in a wheelchair, and the other is not. To enter the main exhibition hall, the individual in the wheelchair has to proceed down a series of hallways to an elevator, which then takes them to the back of the exhibition hall. This individual then needs to proceed through the entire hall and back to the entrance to have any semblance of the same experience the other visitor had. This may provide equal access, but it is far from an equitable experience they are having together. The same can be said of those who are blind that visit museums. They have equal access as those who are sighted, but the experience is far from equitable. Technology, such as tactile images, allows those who are blind and those with sight to engage in an equitable and engaging experience.

For many, experiencing sensory stimulants to engage in content is a profoundly moving and emotional experience. Indeed, tactile representation, including audio and olfactory stimulation, is not a re-creation of a piece but a re-birth of the organic item. Several years ago, at an annual national convention for the National Federation of the Blind, the oldest and largest organization led by blind people in the United States, a Federation member had the opportunity to experience tactile imaging in person. For her, engaging with tactile images was a life-changing experience. When speaking with John Olson, founder of Tactile Images, she stated, "Do you know what this means? This represents freedom, independence, and equality. This will be our gift to the sighted" (Lynn Jackson in discussion with John Olson, co-founder of Tactile Images, 2015). These sentiments are echoed by many in the disabled community, especially those who are blind or low vision.

The barriers to full inclusion and accessibility are many, but we have the technology and knowledge to overcome them. Together with ongoing advocacy, this will allow for a more equitable experience for all museum visitors.

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Bradley K. LaMere is the Senior Creative Officer and Vice President of Marketing, 3DPhotoWorks, LLC and Tactile Images. You can find them at www.tactileimages.com and contact him at blamere@tactileimages.com.

Elaine Thatcher is the Manager of Strategic Partnerships – Western US at 3DPhotoWorks, LLC and Tactile Images. She can be reached at ethatcher@tactileimages.com.

The #FutureMuseum Project: Add Your Voice to the Future of Museums

A Collection of Opinions

An online project of museum-id

This compendium of observations and thoughts is a random selection of 14 out of a total of 67 that are in the online contribution from museum-id. This is the current edition which has been preceded by several others, all of which offer interesting and useful perspectives on the world of museums. The opening essay by Eli Kuslansky has been edited to be appropriate for the late winter of 2023. The others are the original versions that were posted in 2022.

A FRAMEWORK FOR CULTURE IN THE 21ST CENTURY

By Eli Kuslansky, Principal and Chief Strategist, Unified Field, New York City

During these challenging times, the pandemic has created significant breakdowns as well as breakthroughs in how museums operate, the audience they serve, and what they provide. As the universe is always seeking balance, big breakdowns lead to big breakthroughs. Here’s some data points:

Between 1347-1350, as the Bubonic Plague swept across Europe, the influence of the Catholic Church diminished, allowing secularism and individualism to rise unleashing the forces in Italian society that made the Renaissance possible. Now we are at a point where bold ideas and original thinking is what we need to make the most out of this moment for the future.

The museums getting the most value from breakthroughs are the ones willing to ride the currents of change and institute bold ideas to shift museums as we know them today. In our rapidly changing world, the biggest risk is not taking one. Mark Zuckerberg said it best: “The biggest risk is not taking any risk. In a world that’s changing really quickly, the only strategy that is guaranteed to fail is not taking risks.”

Museums that are taking risks are more visitor centric, have participatory experiences, use technology cleverly and sustainably, have a new generation of leaders, and their exhibits and programs are more relevant and inclusive. As museums ride these currents of change, they still need to retain their power of legitimacy as repositories of culture and trusted resources. Leveraging this trust, museums can develop sustainable models in the new normal well poised for the next era of museums. But it is a process that takes institutional courage.

From my experience of being a mentor for five years at the New Museum’s New Inc creative innovation incubator, and as the Chair of the Brooklyn Art Council’s advisory group, changing mindsets can reap huge benefits, tangible and intangible. Even shifting from conversations about scarcity to ones about abundance can have an ontological effect.

Museums that are forward-looking are shifting their mindsets (within reason and depending on circumstances) from the conversations of scarcity of a non-profit to one of abundance and possibilities, more typical of an entrepreneurial venture. Opening conversations beyond "we in the field" would also lead to fresh ideas. Museums are utilizing advanced technologies, and are looking at rapid advances in computing power, ultra-fast networks, digital media and fabrication, NFTs (non-fungible tokens) for membership services, AI generators, immersive environments, and multichannel experiences. In some instances, they're exploring their role in the smart city they exist in. In tandem, there is a return to authenticity — things with real meaning that are creating opportunities for museums to connect contemporary audiences to their troves of unique objects. These changes are significant.

Consider that in 2019/2020 there were 850,000,000 unique visits to cultural institutions in the USA alone, Mike Winkelmann NFT artwork sold for £ 51,115,545 ($69,000,000) at a Christies, the admissions income of the British Museum was 4.3 million British pounds ($5,801,130), while the Immersive Van Gogh experience generated £166,040,000 ($224,000,000) in revenues.

Against this backdrop, the future museum could be a networked, inclusive, co-curated and participatory community resource that is dynamically connected to and of the city in which it resides. These museums will make greater use of creative innovation like the New Museum's New Inc lab, or the Interaction Lab at Cooper Hewitt. The museum of the future will create inventive new revenue sources such as licensing collections to immersive art shows and other venues, using NFTs (non-fungible tokens) for selling "merchandise" to accompany exhibitions, for limited digital editions, tickets, and to replace physical membership cards.

A 21st century museum of the future will be flexible and responsive, connected via multi-platform networks to a broader range of audiences, have traditional and non-traditional partners and collaborators, and live and stored content feeds. They will have shared industry resources like living labs, content repositories, smart technology, and can rapidly develop new exhibits and programs. This is a museum designed to reinvent the future.

Resources

Museopreneur: How museums are leaping into new business models with entrepreneurial spirit. By Blaine Hafen, Hayes Hall Gazette. https://bit.ly/3HNd3Rr

The museum in the smart city: The role of cultural institutions in co-creating urban imaginaries. By Carlos Estrada-Grajales, Marcus Foth, Peta Mitchell, Glenda Amayo Caldwell. Book: The Routledge Companion to Smart Cities

City museums in the age of datafication: could museums be meaningful sites of data practice in smart cities? By Natalia Grincheva. https://www.tandfonline.com/doi/abs/10.1080/09647775.2021.2023904

The Newmusum: New Inc creative incubator https://www.newinc.org/our-story

Getty Images is suing the creators of AI art tool Stable Diffusion for scraping its content. The Verge. https://bit.ly/3jl9kRJ

The future is going to happen a lot faster than the past did. Moore's law just took steroids. By Matthew Boutte, Medium.com. https://bit.ly/3DwO4iS

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GETTING FUTURE READY TODAY

By Alvin Tan, Deputy Chief Executive (Policy & Community), National Heritage Board of Singapore

Museums in the past have traditionally been focused on studying, conserving, and showcasing their collections. While these roles continue to be fundamental, museums are now expected to take on expanded and evolving roles as community hubs and precinct rejuvenators as they transition towards becoming museums of the future.

The Indian Heritage Centre of Singapore is one of three heritage institutions established using a participatory approach which positions the centre as a shared community space right from the start. It is co-managed and co-funded by the government and the community, and the storyline for its permanent galleries was developed in consultation with 56 Indian organisations. Since its establishment, the centre has been presenting community co-curated exhibitions where communities contribute content, objects and programmes. In 2017, it launched Community Expressions where various Indian sub-communities would stage a "take-over" of the centre during a weekend and offer free programming such as workshops, talks, craft activities etc.

This approach has reduced the centre's operating costs, increased the size of its volunteer pool, and contributed to a more varied and inclusive programming calendar. It has also strengthened connections between the centre and the sub-communities (or source communities) and instilled a sense of pride and ownership for the centre.

"Besides functioning as community hubs and precinct rejuvenators, museums should leverage on technology

to create immersive experiences and increase access by bringing their collections and programmes beyond the museum walls"

To complement their roles as community hubs, museums of the present could further future-proof themselves by entrenching themselves as the cultural anchor of the precinct in which they are based, and partnering key stakeholders to co-present or co-fund programmes, enliven the precinct, and attract higher footfall. Located in Little India, the Indian Heritage Centre has always regarded the precinct as an extension of its programming space and precinct stakeholders as programming partners. It collaborates with these stakeholders to co-organize precinct-wide arts, culture and heritage festivals such as the annual CultureFest and other festive celebrations.

To bring its programming beyond museum walls and out onto the surrounding streets, the Centre also engages arts and cultural groups to stage regular outdoor performances known as Neighbourhood Sketches, and conducts guided tours to encourage visitors to explore the precinct.

Besides functioning as community hubs and precinct rejuvenators, museums of the present should leverage on technology to create immersive experiences and increase access by bringing their collections and programmes beyond museum walls and even beyond precinct boundaries. In this regard, the Centre has been adopting new technologies to cater to the audiences of today while preparing for the audiences of tomorrow. Within its galleries, the centre offers augmented reality applications and uses non-touch motion-based technology to create interactive visitor experiences. It has created virtual exhibitions, digital tours and online educational resources to reach out to existing and new audiences through its website and social media platforms, and it has even deployed a mobile telepresence robot to bring the museum experience to persons with disabilities or mobility issues.

As a result of its embrace of technology, the Indian Heritage Centre was able to stay relevant and remain connected with its stakeholders and the community during the COVID-19 pandemic. Through its digital and "phygital" offerings, the centre was also able to uplift spirits, and more importantly, to take bold and continuous steps towards becoming a pandemic resilient museum of the future.

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SYSTEMIC PROBLEMS RESTRAINING THE IMPACT OF MUSEUMS

By Laura Wilkinson, Programme Director, New Museum, Museum of London, UK

The Future Museum is a deconstructed form of its current self; it is more adaptable, creative and confident, enabling it to survive and thrive in times of change. Whilst museums as institutions have stayed static, the world around us has radically shifted. We are living in times of accelerated change. Growing social inequality, major environmental issues and the digital revolution are all affecting the role of museums as part of the cultural fabric of our society.

Systemic problems are restraining the impact of museums. The monoculture that pervades most senior management teams remains a significant issue. Decades of attempting and failing to tackle the lack of diversity means we need to change tack. The speed of technological change is transforming the way people access, enjoy and create culture and if we don't seek to fully grasp its potential there is a real risk that we become obsolete for those we seek to engage.

It's not to say there hasn't been any progress. We've seen pockets of innovation; new partnership models have been formed, there have been attempts at rebalancing power through methodologies such as co-production, and years of austerity have forced round after round of restructures – but fundamentally the museum as an institution remains the same.

How do we do change? By a wholesale review of the system. We need to look at more than the organisational chart when we talk about change; we need to challenge the formal structures and processes; and informal norms and behaviours that shape the way we work.

By working with people not like us. Partnership and collaboration will be core business – not just something for one or two departments to lead on. Teams will be formed with more than just 'museum' people. We will naturally draw in talent from across the creative industries and the social sector to create museum experiences that deliver the change we hope to see.

"We are living in times of accelerated change. Growing social inequality, major environmental issues and the digital revolution are all affecting the role of museums as part of the cultural fabric of our society"

By challenging our hierarchical models of decision making. A more participatory model will tackle the impenetrable old-fashioned silos – participation will extend within

and outside the museum and we will explore more human-centred models of design.

By loosening up our structures and flexing the 9-5. An increasingly intergenerational workforce presents huge opportunities for the sector. We will widen the pool of people we employ by enabling those who aren't able, or choose not to work a standard 5 day-week ensuring we can benefit from the lived experiences of the many, not the few.

By extending our horizons. **We will commit time to exploring** our collections and programme through futures thinking to ensure we are relevant for the audiences of tomorrow.

By letting go. The funding climate isn't going to get any easier. In order to adapt we need to look critically at what we do and stop that which has least impact.

We can't always predict the future but by rethinking the institution we can create the conditions for the Future Museum to thrive.

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MUSEUMS MUST TAKE THE ETHICAL PATH

By Bridget McKenzie, Director, Flow Associates, London, UK

When predicting the future of museums, it's vital to consider where we are referring to. As Tom Atlee has written "things are getting better and better and worse and worse, faster and faster, simultaneously". The better and the worse are not evenly distributed. Parts of the world are being destroyed by climate change, industrial ecocide and wars over resources, and are en route, faster and faster, to even worse. The role of museums for those places, such that they will exist, will be extreme conservation and salvage. That might mean locking up against looters, rather than opening up as places of sanctuary. It might mean moving collections into safer countries and using digital tools to maintain connections with communities of those places.

"If museums want to continue to exist, by being relevant, they will take the ethical path. They will proactively work with communities to shift towards more regenerative and circular economies. They will explore ethical and participatory forms of entrepreneurship. They will provide safe, inclusive spaces for envisaging possible futures"

The countries for whom things have been getting better, due to technology and benefiting from the industrial ecocide we choose not to see, will also become more unequal than many of them already are. Their communities, divided between haves and have-nots, will divide again between those who recognise their duties to regenerate the planet and repair injustices, and those who turn on each other and seek power.

If museums want to continue to exist, by being relevant, they will take the ethical path. They will proactively work with communities to shift towards more regenerative and circular economies. They will explore ethical and participatory forms of entrepreneurship in order to sustain themselves when or where public funding dries up. They will provide safe, inclusive spaces for envisaging possible futures, for learning from past and indigenous cultures and from the capacities of nature, and for helping communities take action for eco-social justice. They will look to the unliveable places and see people and non-human species exiled from, or still suffering, there as part of their community, our shared world.

Conserving heritage will be recognised as the core purpose of museums, but this will not contradict a greater emphasis on inclusive public education. Conservation and public service will be seen as one and the same thing. With this integral sense of purpose, their structures will become more sociocratic and less hierarchical.

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MUSEUMS AS AGENTS OF CHANGE

By Mike Murawski, Director of Education & Public Programs, Portland Art Museum, Oregon, USA

Museums everywhere have the potential to serve as agents of social change – bringing people together, contributing to local communities, and changing people's lives. Given our current moment of political polarization, highly-contested social debates, and widespread global efforts to confront oppression, now is the time to challenge the entrenched traditional notions of museums and proactively shape a new future. Now is the time to transform the roles that museums serve within our communities, envisioning them as living institutions and active spaces for connection and coming together, for dialogue and difficult conversations, and for listening and sharing. Museums have the potential to amplify marginalized voices and celebrate unheard stories. They can be spaces for acknowledging and reflecting on difference, and for bridging divides. They can be spaces for justice, growth, struggle, love, and hope.

"Now is the time to transform the roles that museums serve within our communities, envisioning them as living institutions and active spaces for connection and coming together, for dialogue and difficult conversations, and for

listening and sharing"

It is the vital task of museum professionals – as well as museum visitors, civic leaders, community organizers, and the broader public – to radically expand the work of museums as agents of change and more fiercely recognize the work that museums are doing to enact change around the relevant issues in our communities. These conversations and actions cannot take place solely behind museum walls or in the isolation of professional conferences. We need to publicly work together to realize this change. This work involves an enormous amount of listening, developing trust, and building relationships – both within our museums as well as with our audiences and communities. It involves shaping and productively debating a set of core values that reflect a commitment to accessibility, inclusion, justice, and human rights. It involves growing a community of change and advocacy from within, and envisioning the work of our museums as human-centered. The future of museums is being shaped by the work we are doing right now to take action toward positive social change and bring people together into a more just, equitable, compassionate, and connected society.

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PUBLIC RESEARCH AND ENQUIRY

By Ken Arnold, Creative Director, Medical Museion and Professor at Copenhagen University, Denmark

Should museums of the future prioritise collections or audiences? The problem with this well-worn debate is that it risks overshadowing a third essential aspect of their mission: namely research.

I have recently taken up the directorship of the small but vibrant Medical Museion in Copenhagen, where research is at the heart of much of what goes on. Not just focussed on its collections, the investigators it hosts also pursue interests in such diverse topics as the smell of hospitals, healthy aging and the connections between mind and gut. Collectively, they have fashioned a distinctive form of museum enquiry, one that is methodologically promiscuous, frequently multi-disciplinary and often focussed on topics that have a broad resonance: research that makes sense in public.

"The most important museums of the next half century will be those that frame their mission around a spirit of enquiry, and whose public programmes effectively turn both curators and visitors into investigators"

It is part of a university, and that no doubt helps explain its thriving inquisitive habits. But there is also something rather Danish about this too. For since at least 1958 their national Museum Act has stipulated that those supported by the government should undertake research as one of their five 'pillars'. It is simply taken for granted then that museums are, in part, institutions whose purpose is to find things out.

So here's my prediction, or maybe more accurately my prescriptive speculation: the most important museums of the next half century will be those that frame their mission around a spirit of enquiry, and whose public programmes effectively turn both curators and visitors into investigators of sorts. What's more, focusing on the role of museums in 'public research' offers those of us with professional interests in helping shape their future a chance to get beyond the bi-focal myopia of endlessly trying to decide whether collections or audiences should come first.

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TRANSPARENCY, AUTHENTICITY AND PARTICIPATION

By Lisa Leblanc Director, Creative Development, Canadian History Hall at Canadian Museum of History, Gatineau, Quebec

Museums have spent the better part of a generation in an identity crisis, querying their social role and value, and perhaps their underlying purpose. Were they research facilities, amusement parks, educational institutions, storage vaults? Technological change, though not inherently a game changer, raised additional questions about shared authority, democratization, and access.

But amidst change and uncertainty, there was constancy too, and not all of it about budget challenges or keeping abreast of everything digital. Museums continue to have one special and unique trait: the public trusts them, and more so than any other institution, public, private, or commercial. It is the perfect brand value proposition.

How might it be maintained in an increasingly crowded marketplace of ideas, where 'curating' has been stripped of professional context to sell home décor and breakfast foods, vacation travel and fashion trends? How perhaps might museums even expand it, moving beyond the status quo (however enviable) to positions of societal leadership?

"Leveraging – and sharing – authenticity, museums can transcend institutionalism or parochialism to demystify a shared humanity in a singular world"

It is not far-fetched. Already valued, reliable and demonstrably useful in societies made cacophonous by mind-bending quantities of data, museums consistently

provide the least biased, most critically neutral interpretations of the past. It is an extraordinary competitive advantage.

Working transparently, museums must now move beyond mere representations of evidence to demonstrate explicitly how knowledge is developed, shared, or revisited. Making evident the gaps or omissions in our knowledge, identifying marginal or absent voices, helps audiences to explore with confidence and promotes engagement through nuance, perspective, and diversity. Authoritativeness has not enhanced cultural institutions, but authenticity has. Leveraging – and sharing – authenticity, museums must speak from multiple points of view, encouraging stakeholder and audience participation, even while bolstering scholarship. In assisting audiences to better understand how the past informs the present, how patterns and similarities can be observed in the seeming diversity and idiosyncrasies of history, museums can transcend institutionalism or parochialism to demystify a shared humanity in a singular world.

Whether museums remain physical destinations or digital tools is of little importance. It is not the container that will define them. Public trust will. Continued vigourous inquiries, courageously shared; democratized access to knowledge and uncertainty; transparent professional practices and accountability: these are the cornerstones of the museums of the future.

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ART MUSEUMS, AN AMERICAN PERSPECTIVE

By Silvia Filippini-Fantoni – Director of Interpretation, Media and Evaluation at the Indianapolis Museum of Art, Indiana, USA

Recent reports from the National Endowment for the Arts (NEA) and the Association of Art Museum Directors (AAMD) indicate that attendance to museums, art museums in particular, continues to decline at least in the United States both in terms of audience share and size. This is in part due to the lingering effects of the economic downturn but also and especially to the changing demographics. While older Americans continue to visit, the drop is coming mostly from the younger well-educated but less committed Millennial generation and potentially their offspring. This drying-up of the pipeline imperils the very future of art organizations, and if not reversed, there might be very few art museums to go to in the not so distant future.

"Museums need to experiment with new ways of engaging their audiences, particularly the millennial generation, which is more interested in social interaction, participation and self-discovery than more traditional learning"

Given these premises, the current business model on which many American art museums are based, which relies heavily on traditional and more passive forms of engagement, large endowment draws and donation from an aging donor base is not sustainable in the long term. So the biggest priority for most art institutions in the United States in the next few years is to implement a digital age shift in their business model. What does that entail? While there is no clear answer as every institution is different and needs to figure out what works for its community, geographical location, and collection, it is paramount that art museums embark in a journey of rediscovery and reorganization. Art organizations need to evaluate and rethink their admission policies, price structure, membership benefits, marketing strategies and fundraising approaches. They need to experiment with new ways of engaging their audiences, particularly the millennial generation, which is more interested in social interaction, participation and self-discovery than more traditional learning. In order to support such changes it is important for cultural leaders to gain a deeper understanding of the business and management side of things and support infrastructural changes within their institutions that foster experimentation and innovation.

As with many issues, a good place to start is to admit that there is a problem. I am fortunate enough to work for an institution that has made financial sustainability a priority for the next five to ten years. This has already brought a number of structural changes and forced us to experiment with different ways of engaging and communicating with our audience. While some of these experiments might fail, admitting that we cannot afford to operate in the same way we have done in the past hundred and fifty years is a very important step in the long-term process of finding a new and sustainable model that works within the context of our changing society.

So going back to the original question: what will museums, particularly art museums, be like in the future? The answer is: I am not sure yet but what I know is that if we want them to still be open and relevant thirty years from now, a paradigm shift needs to happen very soon.

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MUSEUMS ARE FOREVER, REMOVE THE SHORT-TERM PRESSURE

By Merel van der Vaart, PhD Candidate, University of Amsterdam / Allard Pierson Museum, Amsterdam, Netherlands

It is often said that museums are conservative by nature. They preserve our heritage for future generations and when working within the timeframe of forever an organ-

isation is unlikely to change, or so we tell ourselves. But what if the opposite is true? What if many museums find it so hard to change, because they are trapped in the short-term cycles of project funding, temporary exhibitions and ever-changing (local) government demands? This way of working, from one deadline to the next, puts tremendous pressure on museums and leaves little room for reflection, defining your identity, and developing a vision for the future. This is especially challenging for small museums, with few paid staff and limited resources.

For museums to thrive and be relevant, now and in the future, we need to find ways to alleviate this short-term pressure. Technology is not the solution, but it can help. It allows museums to easily update gallery and online content, it lets them re-use and repurpose, and it can create space to be playful.

"The museum of the future will not be conservative. It will be ambitious about being an accessible, relevant, and flexible organisation. It will be confident about being unlike any other museum"

For many small museums the introduction of on-gallery technology has been challenging. Hardware is costly and almost all tech development, support, and maintenance have to be outsourced. This both has financial implications and prohibits staff from gaining new, digital, skills. In the future, technology should not only benefit museum visitors, it should enhance the organisation as a whole. For example, by allowing for quick content-updates and the re-use of hardware, without the need of external support.

Technology can allow museums to be more sustainable and let the new evolve from the existing. Today, museums often only make an exhibition on a certain subject once. In the future, it should be common practice to revisit a theme, because society changed, the organisation changed, and with the help of technology something new can be developed that builds on the resources and research that were created before.

In addition, museum staff should be encouraged to experiment and play. By being playful we can bring new relevance to existing content, shine a new light on our historic collections and use our existing, digital, tools in exciting new ways.

The museum of the future will not be conservative. It will be ambitious about being an accessible, relevant, and flexible organisation. It will be confident about being unlike any other museum.

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REBOOTING THE MUSEUM BUSINESS MODEL

By Ben Hamley, Manager of Audience Research, Strategy and Advocacy, Queensland Museum, South Brisbane, Australia

There is a gap in the market for a museum with no exhibitions.

Working in audience research, when I ask people what value they get from a museum experience, I always hear the same kind of thing. A story about an object, or an idea about the way the world works. This tells me something; that people come to museums for stories and ideas – not for exhibitions. Yet exhibitions are 'what we do', they are our primary product.

I believe that fundamentally, museums are content distribution businesses, and content businesses everywhere are undergoing massive transformations towards on-demand/access-over-ownership models (Netflix / Spotify). Museums are already halfway there with an established 'access premium' advantage for one-of-a-kind objects of significance.

If we follow the thread of the digital age forwards into the maturity of Internet-of-things / automation technology, I believe we will see the emergence of an entirely new class of museum. The on-demand museum.

This future museum will have far fewer (zero) exhibition teams and a great deal more interdisciplinary creatives, storytellers, interpreters, translators, concierges, chefs…. and robots. They will become hybrids of five-star hotels and swiss-bank vault viewing rooms.

– Robots (For Collection Management): Amazon own a company called Kiva Systems, whose robots operate the warehouse inventory and order fulfillment systems of Amazon in a way that treats a system of modular shelves like most majestic game of never-ending-chess you could ever imagine. Museums are already feeling the pinch with regards to space. A future museum will solve this problem by doing away with many and varied compacti, allowing collection transfers to be handled by kin of Kiva. Architecturally challenged institutions may even reclaim gallery space because exhibitions are redundant. Storage facilities will be redeveloped, even museums who choose to stick with exhibitions will benefit from the rapid random-access to their collections.

– Collection As Database – On-Demand, Snackable Content: A digitised and automated collection automatically updates the availability of items and tracks important factors such as light exposure, or rest-time required before

next viewing. These variables will become part of the a new museum visitors literacy. It is highly likely that most visitors will pre-arrange their visits – often many months in advance. If a collection item has associated content or articles, they will be displayed on the in-room monitors for the visitor to engage if they desire. A cousin of Netflix's content algorithm will match users with items they may enjoy, and schedule conservation works based on collection usage.

– Five Star Experience: A museum of the future will not have lines or crowds. There will be no tacky, wasteful single-use paraphernalia. Guests will have booked in advance – much like hotels today – and be greeted by a concierge who is expecting them, knows their preferences, and can anticipate their needs. The museum building itself will be barely recognisable. Great halls now replaced with private rooms, appointed to an unrecognisable level of luxury – a perk of consolidating the exhibition design budget into refurbishment. From individual item viewing or research term rooms all the way to mixed use function space and dining – there will be a room for any purpose, at any time of day. Rates will vary accordingly, however standard inclusions may offer a drink on arrival and 15-20mins with an expert generalist collection interpreter who assists visitors with their first selections or tells the story an item pre-arranged for viewing. Additional services include an interpretation officer or storyteller on hand at all times, or a seven course degustation – with matched objects.

– Set free through insight: And finally – museums will have succeeded in overcoming two of their greatest existential risks; collection use and relevance, and audience insight. Their multi-million item collections will be mobile, accessible and monitored to ensure utilisation. But perhaps more importantly; museums will have available at their fingertips, precise customer information, collection preference information and a variety of other data-points on their operations that have never before been considered – let alone measured.

I don't expect every museum of the future to be like the one described here, but for those willing to invest in designing a better business model for museums – the rewards are waiting

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A NATURALLY COMPELLING FUTURE

By Sharon Ament, Director Public Engagement, The Natural History Museum, London, UK

In a world which necessitates the navigation of scientific issues for people to live their daily lives and one which has rapidly changing natural resources the future for natural history museums is compelling. As the repository of the world's natural heritage the collective contribution that the international network of natural history museums can make to some of the most pressing scientific issues of the day is profound.

We in London alone have more than 70 million specimens and in European museums it numbers more than 500 million. Each collection has its strengths, built up over hundreds of years, drawn from particular geographies and with particular specialisms. Internationally this represents a rich picture of the world's natural diversity over time and place; a resource which is drawn on by thousands of scientists each year. The future challenge is to consider it collectively as a shared global resource. To meet this challenge we will need to have stronger collaborations within the museum sector and beyond with universities, government agencies, libraries, digital enterprises and business.

Natural history museums are at the centre of public discourse. With the environment high on the agenda I can think of no other part of the museum sector that has the potential to engage at the highest political level and with such potency at the personal level. Looking to the future we will need to tread a careful path, as trusted institutions we must continue to guard public confidence in our objectivity, whilst putting forward strong views on evolution, climate change and biodiversity loss.

Moreover, simply by inhabiting the spaces we do in cities and towns, natural history museums will become even more significant, in the urban lives of the majority of the world's population where perhaps we are the only connection with the natural environment for people who will never venture into or feel comfortable in the countryside. Due to our roots to the past our contribution to the future is likely to have a greater impact than many of us can currently imagine.

EVOLVING FOR THE 21ST CENTURY

By Roy Clare, Director, Auckland Museum – Tamaki Paenga Hira, New Zealand

Museums face two major challenges: how to collect sustainably; and how to remain relevant. These challenges reflect the abiding principles of museums: collections-centred, audience-focused.

No museum can afford to acquire everything that is available. Discernment is crucial, coupled with a rigorous analysis of the collections, focusing both on acquiring and disposing.

Expectations of museums are changing. Leisure time is

at a premium. Consumers make choices based on perceived value and potential for excitement. Some museums neglect their collections and become 'attractions', losing authority as places of scholarship and learning. Others fail to keep up with changing patterns of use, with risks for viability. Digital media are core to people's lives, so museums need fluency in that environment too, from promotion and access to engagement.

Museum Boards and executives need to:

- Drive policies for managing collections. A whole life-cycle strategy should systematically encompass: goal-setting; acquiring new items; caring for collections; making as much as possible available to the public (physically, in galleries; virtually, on-line; and intellectually, through research programmes and published resources); assessing duplication and merit; and enabling disposal.
- Really understand their market. Including those people that are neither visitors nor users. Based on that evidence, decision-makers can reach conclusions about the style, pace and nature of programmes. Partnerships can support delivery in more than one location, reaching more diverse audiences, being innovative and generating revenues.

The profile of a museum starts with leadership and risk appetite; creative ambition and entrepreneurialism should follow, so that evolution matches public demand

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THE MUSEUM OF TOMORROW

By Jean-Yves Gallardo, Director of Communications, The National Museum of Art, Architecture & Design, Oslo, Norway

'Forum artist' is the name the architect Klaus Schuwerk has given his winning proposal for a new building to house Norway's National Museum, due to open in 2017. As a name for a museum it is well suited to our century.

In planning the museum, we try to imagine how art and audiences might come together five years from now, in an institution that not only houses and cares for a collection, but is also a meeting place of major social significance. In brief: a forum for the arts.

The museum of tomorrow should be able to satisfy the diverse approaches to time and space that its visitors are likely to apply; some will have just fifteen minutes to spare, some a couple of hours, while others will want to spend a whole day there. Should the museum be a white cube for contemplation, a black box for meditation, or a forum for production?

Gaining space and functionality is not enough. Added value lies in creating an environment where it is good to be, an arena for interaction between artwork, visitor, museum and society.

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GLOBAL MUSEUM COMMUNITY

By Lucy Hockley, Adult Education Officer, Weald & Downland Open Air Museum, West Sussex, UK

A favourite quote of mine is 'not to know what happened before you were born is to remain forever a child' (Cicero). Museums have fantastic learning potential and can broaden their visitors' horizons. This should be shared as widely as possible and explored more fully in the future.

On the other hand, a term often used in the press, 'community', is not generally one of my favourite words. Yet, I feel the term 'museum community' is used accurately and a just cause for pride at my current organisation, and I'm sure this is the case in many other museums. Issues around well-being and social involvement with heritage organisations are due further future consideration.

In the future I'd like to see museums working in innovative, imaginative ways whilst retaining their core principles. In-depth research and specialist knowledge is vital to underpin other museum activities. Volunteering roles will need to reflect changing models of work to engage wide sections of society and enable people to continue to contribute at different life stages in a way that suits individuals.

As funding cuts continue to be felt and organisations adapt, they will need to search for new sources of income but should resist being overly swayed by funder's objectives or short-term agendas. Of course museums must show their relevance to society, but they can't try to be everything to everyone.

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COLLECTIONS AND COMMUNITIES

By Tracy Puklowski, Senior Operations Manager, Collections and Research, Museum of New Zealand, Te Papa Tongarewa, Wellington

Museums build their reputations around their collections, and the knowledge and experiences that those collections generate. However, without recognising the real and ongoing connections between collections and communities, museums are only telling half the story. For this reason, I

believe that one of the futures of museums (for there are many) revolves around the notion of shared authority. Rather than giving up curatorial authority, shared authority enhances curatorial knowledge by recognising the significant impact communities (and particularly source communities) can have on our understanding of the collections that we keep in trust on their behalf. In turn, communities benefit from the knowledge that museums build around collections. Objects need multiple and varied voices to tell their stories fully. Source communities, particularly, have social, spiritual, and innate connections to objects – and they accordingly have a right to define that knowledge, and how it is used. This requires the creation of fully reciprocal partnerships between museums and communities, as well as processes that are transparent, accessible, and flexible.

Shared authority requires museums to rethink their role as guardians of collections. Rather than being about guarding or owning collections, guardianship is about using and holding collections responsibly, and this includes the obligation to find new ways of sharing collections – intellectually, physically, and virtually.

Without learning how to explore, understand, and enhance the connections between collections and communities, museums will tell limited stories and consequently limit their futures.

You can find the full report here:
https://museum-id.com/the-futuremuseum-project-what-will-museums-be-like-in-the-future

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Taking Chances: 6 Strategies to Encourage Risk-Taking in Exhibit Design

By David Whitemyer

Attractive and engaging exhibition projects are born from more than just good designers and interesting subjects. Successful projects are also the result of teams and leaders who take risks. Risks may include bucking industry trends, spending a bit more—or even less!—than the project budget, ignoring the advice of "experts," or scrapping work and starting over. Risks lead to discovery and new ideas, which is precisely what museum exhibitions need to stay fresh and to spark the interest of current and future museumgoers.

The clichés are endless: think outside the box, push the envelope, take it to the next level, raise the bar, etc. The list goes on. We often believe that the exhibits we're creating are groundbreaking and truly push the boundaries. But the reality is that those in the museum profession, as a collective, tend to be a bit safe. A Matters, commissioned by four UK-based cultural associations, surveyed around 2,000 people in the English museum workforce and found that, on average, individuals employed in museums are more risk averse than the wider UK population.

When developing a new museum exhibit, doing the same old thing and expecting the same results is the easiest thing you can do. And in truth, it would probably be fine.

But wouldn't it be so much more fun—and probably more successful—to take a leap and do something different and against the grain of what you, your team, or your institution expect? As exhibit developers and designers, shouldn't we go beyond the mediums and delivery methods that visitors expect and have seen in countless other museums? Here are six strategies for pushing your exhibit development team to take risks:

1. **Avoid the Status Quo**: The most watched TED Talk of all time, with over 51 million views, is Ken Robinson's presentation, Do Schools Kill Creativity? In it, he suggests that we have an educational system that rewards conformity and discourages risk-taking. Meaning, for museum and design professionals, this don't-rock-the-boat culture starts early in our schooling.

   When developing new exhibitions, start the process by encouraging the team—whether internal or as a designer-client relationship—to ignore (to a point) what's been done before and what they know will be acceptable and comfortable.

2. **Eschew Consensus**: Design-by-committee may lead to decisions agreed upon by the group, but they're

not necessarily the best decisions. Consensus is a risk-taking killer. In an article from the Stanford Social Innovation Review, it suggests, "Consensus-based decision-making can lead to funding only the clearest, safest, or lowest-common-denominator ideas."

Team leaders need to feel comfortable making design decisions that the project group may disagree with. Sometimes one person's idea is the right idea, even if it seems strange and risky, and not bought into by the entire exhibit development and design team.

3. **Say Yes**: "Go out on a limb," said Jimmy Carter. "That's where the fruit is." Saying "No" to new and untested exhibit concepts is safe and easy, but it rarely leads to groundbreaking ideas and experiences. When Luci Creative was designing the Numbers in Nature permanent exhibition for the Chicago Museum of Science and Industry, someone suggested that nearly 25% of the gallery's square footage be devoted to a Mirror Maze: a fun-house of sorts, with a subtle lesson in geometry. Saying "Yes" to this bold idea led to the project's success, with the Mirror Maze being a major draw at the museum; and being one of the main reasons people visit the traveling version currently touring the U.S.

4. **Embrace Failure**: Good leaders—in all businesses—know that failure is just one step along the path to innovation. But failure isn't safe. And fear of failing is what holds us back from taking risks. Making mistakes or a wrong decision on an exhibition project can lead to increased cost or an extended schedule, or simply to the creation of a mediocre exhibit that doesn't pull in the expected attendance.

   There's a trendy concept in business called "Fail Forward Fast," which promotes the idea that failure is a normal part of any creative process, but that teams need to quickly learn from those failures, pull themselves up, and push forward.

5. **Be Willing to Experiment**: Institutions that spend part of their exhibition development budget—and schedule!—on prototyping and evaluations know that the final results are more successful. This doesn't need to be an overly formal process. Just trying out new, untested ideas, and learning through the process, is a risk-taking venture.

   The 10-person virtual reality Raid experience in the new Duty First gallery at the First Division Museum, in Wheaton, Illinois, was a major experiment—and a risk! The museum team understood that nothing quite like it had been done before and that the process was going to require a fair amount of trial and error. Luci Creative, along with their AV and fabrication partners, had the support of a risk-tolerant client leader who was comfortable with this being a learning process.

6. **Look Outside of the Museum Community**: The early part of an exhibit design process often involves benchmarking: looking at other museum examples in the field, to acknowledge trends, successes, and shortcomings. Observing other museum exhibitions is a safe way to learn about and drum up ideas for new exhibitions.

   Instead, take a leap by visiting and studying examples that aren't museums, but that offer unique visitor experiences and design solutions. Examples include restaurants, retail spaces, event pop-ups, and Hollywood-based themed attractions. Even well-designed parking garages can inspire a daring new exhibit design concept.

One of the responsibilities of an exhibit project leader is to challenge the museum's and design team's thinking; to push for something new, and something better than the original expectation. We want to create museum experiences that visitors can't do or see anywhere else. Risk-taking in design encourages reframing the traditional thought-process, and if allowed to prosper, the process can be truly thrilling, and result in successful exhibitions and visitor experiences that push the entire museum community forward.

Getting our traditionally cautious professional community to embrace risk will require encouragement from those within cultural institutions, and from those of us who serve museums, and to know that with risk comes the possibility of failure…as well as the possibility of something wonderful. Luci Creative's hometown hero, Chicago Bears quarterback Jim McMahon, said it best, "Yes, risk-taking is inherently failure-prone. Otherwise, it would be called 'sure-thing taking.'"

David Whitemyer is the Director of Business Development at Luci Creative, an exhibit design firm, and an instructor in Johns Hopkins University's Museum Studies program. He can be reached at david@lucicreative.com

Curious Devices and Mighty Machines: Exploring Science Museums by Samuel J.M.M. Alberti

Book Review by Robert Mac West

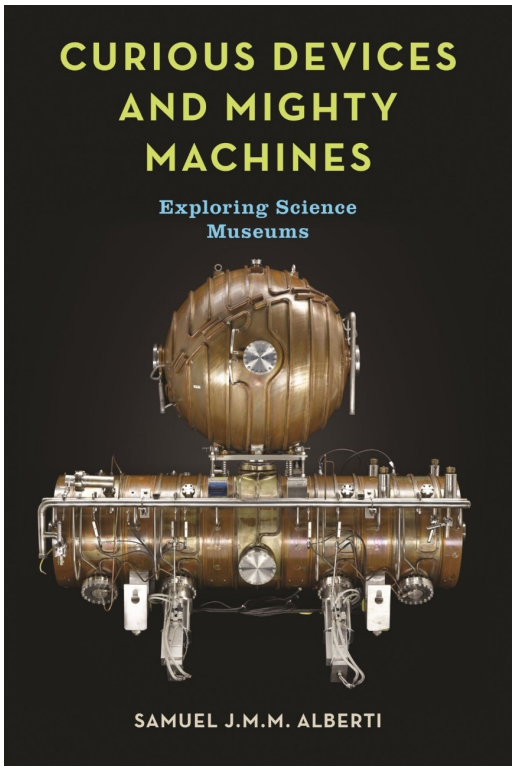
This is an interesting broad view of the science museum world from the perspective of the Director of Collections at the National Museums Scotland. Alberti takes the reader through the history of science museums (carefully pointing out that science does not include natural history) and the array of materials that have been and are in their possession. The discussions often are based on the current collections of science museums, many of them in Europe, which show the diversity of materials, both historic and contemporary.

Alberti's book is in a relatively unique position as we look at the history of museums. If not the only, it is one of the few recent publications about museum history that does not use the museum family tree generated by Alan Friedman in 1996 (Informal Learning Review #17) and reproduced frequently by other authors. It shows science and technology museums and then centers as second or third generation institutions which were recognized around the end of the 19th century although their collections and instructional materials had been available to the public considerably before then.

As is the case with most museums, the vast majority of science museum collections are not on public view. He regrets this but then is pleased when a collection investigation turns up remarkable objects or mechanical devises that then can be used to reveal a fact or principal.

The sources of collections, going back to the Cabinets of Curiosity in Renaissance times to materials used to demonstrate various processes at modern science center such as the Science Museum in London or the Canada Science and Technology Museum. The rationales for materials to make their way into collections are multiple and fascinating. They include materials used in science festivals, corporate materials, personal collections, and solicited material needed for new exhibitions and programs. And to some extent the collection materials can be construed as promotional for particular science/technology businesses.

As I read, I was taken back to my own days as a curator (geology, not "science"). I identify with many of the examples that Alberti presents and am compelled to remind of my personal definition of a curator – "a person who needs more stuff".



In short, this is a very interesting book from a very specific perspective and does address the science museum collections, their acquisition and development, their diversity, and their utility in ways not often discussed.

An interesting accompaniment to Alberti's book is Idea Colliders: The Future of Science Museums, by Michael John Gorman, 2020, Massachusetts Institute of Technology, 162pp. He stresses the need for science centers to move beyond their focus on machines and "facts" to become community organizations engaged also in conversations of scientists with artists, policymakers and the public.

Friedman, Alan J. 1996. The Evolution of Science and Technology Museums. *Informal Science Review* 17, 1, 14-17.

Alberta, Samuel J.M.M., 2022, Curious Devices and Mighty Machines: Exploring Science Museums, Reaktion Books, Ltd, London, UK, 269pp.

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

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

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

RECAP

This is the second part of a two-part series exploring the participation of undergraduate and postgraduate students as Near Peer Subject Matter Experts (SMEs) in Public Library STEM programming. Part I, published in the last issue of ILR, described the NASA@ My Library project and the importance of libraries for out-of-school STEM education. Part I also highlighted specific examples of library programs facilitated by SMEs. Part II will examine the successes and challenges of this model based on the initial implementation and subsequent evaluation of the pilot program, and present the authors' recommendations for others seeking to engage university students as SMEs.

WHY STUDENTS?

Phase 2 of the NASA@ My Library program sought to remedy a common concern of library staff across the country—finding knowledgeable and engaging facilitators for STEM-related programs. While libraries have had great success collaborating on programming with volunteer organizations, such as NASA's Solar System Ambassadors or the Night Sky Network, the participants in these programs number only in the hundreds, even though there are over 17,000 individual public library venues in the United State. And while university and community college professors are often requested to present programs, many libraries have reported these presentations are often too technical or not engaging for their audience. University students presented a unique opportunity for younger library patrons to interact with knowledgeable individuals who were closer to them in age.

Providing near-peer STEM role models is a well-supported strategy to increase youth engagement in STEM, and creates opportunities for hands-on learning (Zaniewski & Reinholz, 2016). NASA@ My Library chose to connect university students to libraries to lead STEM activities, with hopes of benefiting all parties by:

- Providing libraries with a subject matter expert who is comfortable talking to patrons about scientific concepts.
- Giving university students outreach experience.
- Offering library patrons hands-on, interactive opportunities to engage with STEAM and exposure to a role model in STEAM who might broaden their definition of who does science and can speak of their educational pathway and career possibilities.

> A librarian spoke about how public libraries should provide students opportunities to present and facilitate for the benefit of the student and for the library patrons in the audience:
>
> *"Working with students and other volunteers is part of our mission as a public library. Giving a student the opportunity to teach in a public setting is beneficial to the student and provides a different perspective to our audiences."*

EXPERIENCES WORKING WITH UNIVERSITY STUDENT SUBJECT MATTER EXPERTS

Recruitment and Training

Recruitment of students for participation in NASA@ My Library began during the COVID-19 pandemic, and, due to delays project funding, happened just as universities were wrapping up their spring semester. Many groups we asked to share our Request for Proposals (such as Space Grant, MUREP, and other equity-based programs) indicated a high-level interest in supporting universities to pursue these grants but cautioned that we would get very few responses due to timing. In the future, they recommended recruiting students in the early fall for spring and summer programs.

Each participating university was required to appoint an advisor to facilitate student efforts and invoicing, benefiting the project in several ways. The advisors were familiar with the students who could be a good fit for the project, and they helped recruit, monitor, and manage the university students. Administratively, it allowed the project to have one contract per university rather than one contract per student.

One advisor spoke of the value of students having a mentor at their institution, "Students, especially undergraduate students, need help and direction. They need a guide to help them navigate and may flounder without that guidance since outreach was new to a lot of them." The involvement of advisors directly contributed to the success

of the project, helping with effective planning and support to the students and the libraries they were working with. The advisors appreciated the opportunities the program provided to their students as well as themselves. As one advisor noted, "This has been a fantastic opportunity for the out of the classroom audience to engage with STEM. And the students got to experience engaging with audiences that don't know what they do." Many advisors were unaware of public library programming as an avenue for outreach before their participation in the project.

Working with the advisors was not without challenges. Advisors often had differing perceptions of their responsibilities, from providing direct instruction to students and asking for quarterly meetings with project staff, to only working on initial recruitment and the submission of invoices. Students of more hands-off advisors were often not given sufficient guidance, lacked avenues for asking relevant questions, or didn't receive communication about opportunities for trainings.

A total of 35 students from five universities were recruited to participate. Most of the students worked with between one and four libraries. Some students who were trained did not end up selecting libraries due to not finding a match for their interests and availability).

Pros of Having University Advisors Overseeing Students:

- *Easier management of contracts and invoicing.*
- *Helpful for student recruitment.*
- *Another layer of support for the students.*

Once recruited, the project team aimed to connect students to each other with an online community group to share ideas, brainstorm programs, ask questions, and work together on outreach across universities.

The online community was useful at the start of the project for student and project team communication. Students were able to access recordings of trainings, image releases, template PowerPoints, and discussion threads. However, engagement within the group quickly dropped off as students started to plan their programs. When asked, several students stated it was "just another platform to use."

The project team also coordinated multiple trainings for the students to help them feel more comfortable with programming and outreach in a library setting. These trainings consisted of three required sessions. The first was a general project overview, where opportunities were provided for students to discuss their areas of interest (both within STEM, but also as it pertained to facilitation style), and to discuss ideas with students from other universities. The second training was an interactive demonstration of a virtual storytime, utilizing books about the Mars Rovers. After participating in the demonstration, students provided critique and feedback on the presentation style, and discussed what they might do differently while facilitating a similar program. The final training was an opportunity to participate in an activity for teens and tweens, and like the storytime program, discuss ways to modify and adapt the program to the students' individual interests, and their facilitation abilities. By offering multiple opportunities for the same training, and then recording them for review later, students could all access the trainings, regardless of their school schedules. Many of the students were not just attending classes but had labs, student groups, work-study jobs, and other engagements that kept them busy. More trainings also meant they were able to be smaller, with ten to twenty students at each session, allowing for deeper discussions, more detailed answers to questions, and better relationship development between the project team and students.

Challenges Having University Advisors Overseeing Students:

- *Added another level to communications, with the project messages not getting through to students.*
- *Advisors did not provide adequate support to students.*
- *Advisors could be too engaged and controlling student ideas.*

Reflecting on their experiences, almost all students indicated they felt prepared for their role as a SME for a library program or event (out of 19 respondents, 797% indicated they were "moderately" or "very prepared." Students credited the trainings offered by NASA@ My Library, previous experience doing outreach, and their own personal preparation for their program(s). Another student described how they prepared, "I had every aspect planned out: what book to read, the slide show, and program. I made sure all of the stuff worked before showing it to the kids and I also made sure the programs were cohesive." Beyond the project team and their advisor, the libraries they were working with gave students input and guidance on the programs and what might work well at their library.

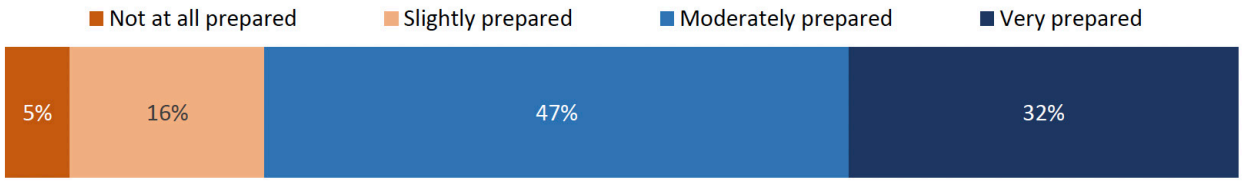


*Figure 1: **Students felt prepared for their role as a subject matter expert for a library program or event**. (n = 19). Students responded regardless of whether they worked with a library.*

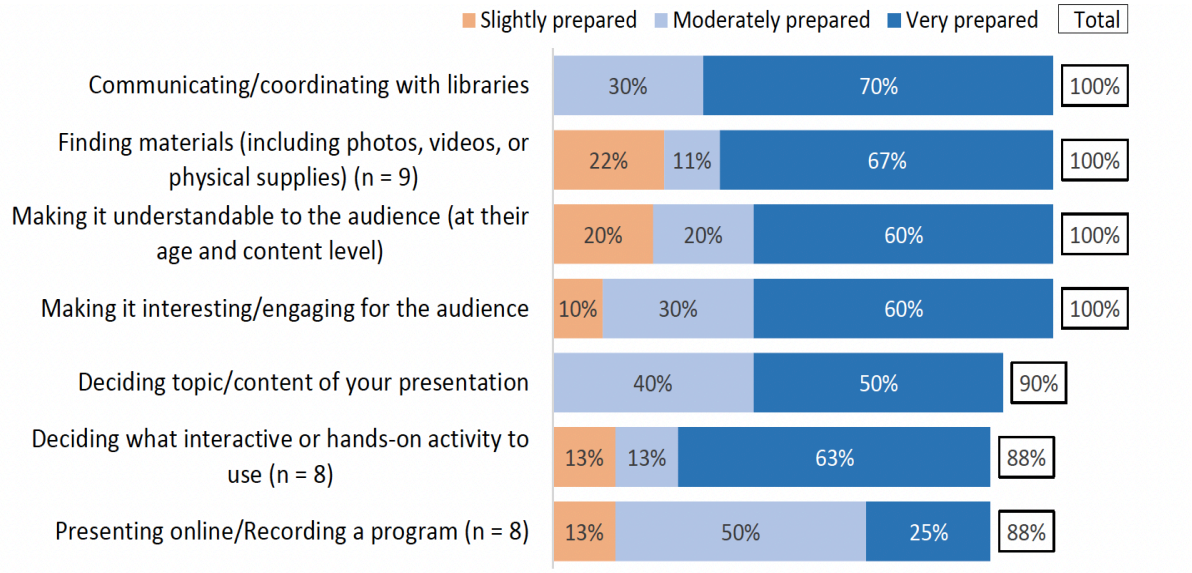


Figure 2: Student SMEs felt fairly well prepare for various aspects of their role, especially communicating and coordinating with libraries. They were least likely to indicate they felt "very prepared" for presenting online, though 88% felt at least "slightly prepared." (n = 10 unless otherwise specified)

Students felt specifically well prepared for the roles of communicating with libraries, finding materials, making the content understandable to the audience and engaging with that audience.

To improve their preparation, students suggested including more demonstrations of what programs at libraries might look like and providing more information on strategies and technology for presenting virtually. One SME suggested that the project could provide different options for presentations that the students could use or adapt for library programs.

<u>Matching SMEs and Libraries</u>

Once the SMEs were trained, the next step was to connect them to NASA@ My Library library partners. The project team provided the libraries with a Google Form on what type of SME led program they were looking for (e.g., hands-on, in-person STEAM programs, hands-on Virtual STEAM programs, adult lecture, interactive storytime), the content areas they were interested in (e.g., James Webb Space Telescope (JWST), Summer Reading Theme: Oceans of Possibilities, Basic Astronomy, Engineering Challenge), and their preferred timing for a program. Each library filled out the request form, allowing the project team to match them with a student, preferably within their region, or that matched their content area of interest. The form itself was straightforward and made it easy to understand what each library was looking for, allowing the students to select libraries based on their location and in line with the type of program they were interested in facilitating.

One of the biggest hurdles of the project was the communication between students and libraries, especially when just getting established. After SMEs had been paired with one or more libraries, it was the students' responsibility to make initial contact with the respective library project directors. Students were asked to copy members of the NASA@ My Library project team on the initial emails to make sure those interactions began, but several factors complicated this. First, several of the libraries, having filled out the form, never responded to their assigned SME despite being contacted. In some cases, those libraries had found other local SMEs to host the program they wanted.

Some of the students were discouraged when libraries they reached out to did not reply or said they no longer needed them. Secondly, some of the students, after the initial communications were sent, failed to continue to correspond with the relevant library. Finally, the largest challenge faced in this project was the high turnover of library staff. Within the first twelve months of NASA@ My Library, over 20% of project directors changed. This turnover often resulted in communications from SMEs getting lost or changes to library program interests or capabilities. In summary, while there were several difficulties in matching students with libraries, two strategies were especially successful: first, the use of the Google Form, and second, a live meeting where students selected libraries to partner with based of their Google Form submissions.

Successes of Matching Student SMEs and Libraries:

- *Collecting information from libraries on their program requests on topic, format, and schedule via Google Forms*
- *Project team hosting meetings with the group of SMEs to assign a SME to each library.*
- *Letting students select their library instead of assigning.*

Challenges of matching Student SMEs with Libraries:

- *Lack of response from the students*
- *Lack of response from the libraries*
- *Library staff turnover (changes in contacts and program interests)*
- *Regional Model complicating student assignments*

In summary, while there were several difficulties in matching students with libraries, two strategies were especially successful: first, the use of the Google Form, and second, a live meeting where students selected libraries to partner with based of their Google Form submissions.

Student SME Programs at Libraries

After being trained and matched, the students were prompted to coordinate with libraries on their programs, develop materials, and begin engaging audiences. The project team wondered how much support did the students need to feel comfortable and be successful. To make sure the students felt supported, project team members made themselves available for one-on-one calls with students. While not every student utilized this resource, several students did meet with the project members over the course of their programming. Some met multiple times, while others met only once. Call topics ranged from programming questions, advice, review of their program plans, and general feedback or follow up questions. The availability of the project team to meet with the students for individualized, just-in-time support was the strongest factor toward successful student programs. Through these meetings, students felt supported, got timely feedback so they could adjust plans if needed, and were able to create meaningful programs that the libraries found impactful.

Successes with Student SME Programming:

- *Freedom to create creative programs.*
- *Availability of Project Team for one-on-one calls*
- *Opportunities to be in-person and/or virtual.*
- *Advisor support*

Students were creative with their programing ideas for the libraries. Some created recorded videos explaining aspects of JWST, or how space impacts the human body. Others hosted coding challenges virtually with multiple libraries at once. Still others were able to do in-person programs like storytimes or various hands-on activities. SMEs even teamed up so that one person was not doing everything on a given program. In one case, the advisor went with the student SME to their in-person program, providing another level of support and encouragement. Although there were some challenges associated with the virtual realm (such as technical issues and timing across multiple time zones), the majority of the students were able to navigate any issues and provided engaging STEM focused activities that attracted library audiences.

The largest challenge associated with the programs was in obtaining relevant data for the multiple teams involved. The evaluation team wanted to track the number and type of programs offered and be able to directly observe programs and potentially reach patrons who attended. The project team required information on who was tasked with what, while the advisors wanted to make sure the students were fulfilling obligations. To coordinate, a shared Excel spreadsheet was created to store information (e.g., the library contact information, the student assigned, dates of communication, type of program, etc.). Advisors relied on students to update the spreadsheet, but they

Challenges with Student SME Programming:

- *Technical issues with virtual programs*
- *Connecting with the audience during virtual programs*
- *Managing program schedules across multiple time zones*
- *Keeping the project team, advisors, and evaluation team aware of programs as they were scheduled.*
- *Low attendance*

sometimes had difficulty accessing the file or remembering where the link was located. While the project team would send multiple reminders, the SMEs did not always follow through with updating program details in the spreadsheet, or they would add pertinent information after programs had already occurred.

EXPERIENCES OF LIBRARY STAFF, SMES, AND PATRONS WITH PROGRAMMING BY STUDENTS

Experience of Library Staff

Thirty-six out of the 46 libraries involved with NASA@ My Library worked with a SME during their year of project activities, and 20 of those used a university student SME trained by the project. All library staff completing a survey reported they were satisfied with their university student SME's work and almost all agreed that their SME was a good fit for their patrons.

Past projects have indicated library staff often struggle to find professional scientists to lead educational programs, especially in-person. Barriers include lack of STEM professionals in close proximity, the time and cost of travel (with expense reimbursement and/or a stipend being more important for STEM professionals), scheduling difficulties, and issues with vetting or preparing STEM professionals to effectively conduct public outreach. (Johnson, et al. 2019).

Scheduling between libraries and university students proved to be difficult. Some student SMEs who were trained did not end up partnering with a library due to scheduling mismatches (reported as an issue for four out of nine of the student SME respondents to an end-of-project reflection survey). Due to scheduling issues as well as COVID restrictions, only a few in-person programs were offered by student SMEs despite interest from library staff and from the student SMEs themselves. As one library staff member wrote, "I wish that it were easier to meet with the SMEs. I would have loved to be able to do something in person, but it just wouldn't have been feasible based on location, and also this year especially with the continued effects of the pandemic."

Overall, librarians were appreciative of the connection to a university student as a SME to facilitate STEM learning opportunities at their library, whether in-person or online. They noted the value of having someone with content-area knowledge as a presenter, "It was nice to have the perspective of an expert. It was also great to have people who knew what they were doing explain things to participants."

One librarian offered specific praise for a SME's presentation skills and making complex ideas understandable to a public audience, "Our SME was incredibly knowledgeable and able to break down some complicated ideas so everyone felt they understood what he was saying. Not only was he knowledgeable, he was also funny, kind, and patient; an ideal presenter to a diverse audience."

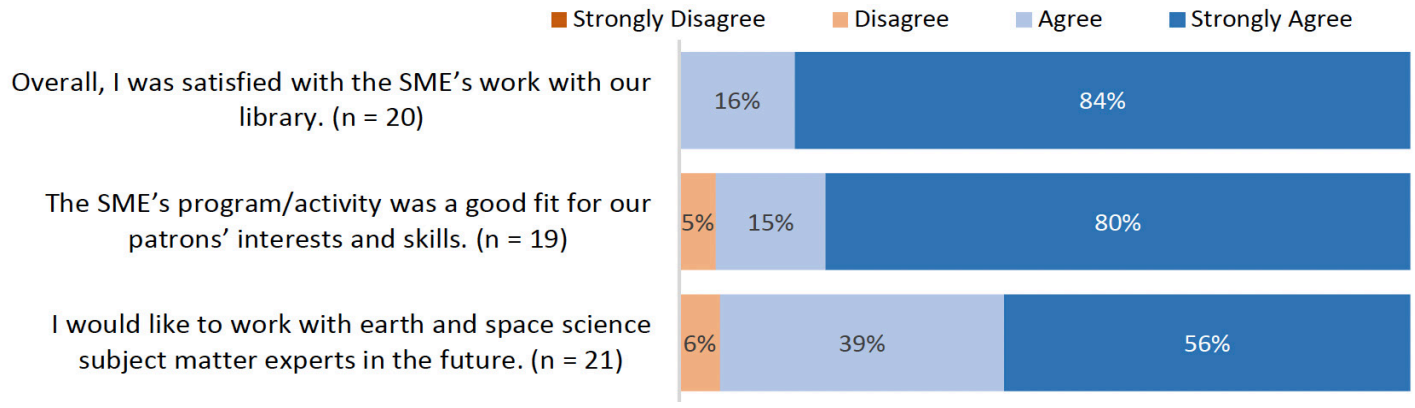


Figure 3: Library staff who had worked with a NASA@ My Library provided university student SME were satisfied with the SME's work with their library (84% strongly agreed). They were also likely to strongly agree that their patrons learned about educational pathways or career opportunities in science (67% strongly agreed). Respondents who worked with a NASA@ My Library provided university student SME

Praise from librarians on the student SME presentations at their library:

"[The two SMEs presenting at our library] were both fantastic and did so well with the public, especially the kids that asked A LOT of basic questions. I was impressed with their overall positive energy and I believe they were great role models that really loved physics and space science."

"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."

"This has been an excellent experience and was very organized. I have learned a lot and have experienced the importance in furthering STEM learning and research."

- University student serving as a Subject Matter Expert for NASA@ My Library

Experience of Student SMEs

The student SMEs identified multiple reasons why they decided to participate in NASA@ My Library as a student scientist. They most commonly selected that they hoped to increase public interest and knowledge in earth and space sciences and hoped to develop their skills communicating scientific knowledge to the public.

Some students ended up presenting on topics they did not feel fully comfortable with, requiring additional prior research and preparation to be able to speak to the public in an engaging and knowledgeable way. To ameliorate this burden on students in the future, it may be helpful to allow students to present on a broader range of topics with which they felt comfortable.

The project team found that students needed a high level of encouragement and support to reach out to libraries and begin a conversation about how they might facilitate a program. Several students offered suggestions for future student SMEs related to communicating with libraries, including reaching out early, having a conversation with the library staff to figure out what type of program would be mutually agreeable, and asking for help (from project staff or their advisor), if needed.

SMEs spoke of the benefits to themselves of their participation in the project, including adding their experience to their résumés and new connections to the community. One student wrote, "Being able to relate to and inspire underrepresented communities through my work with

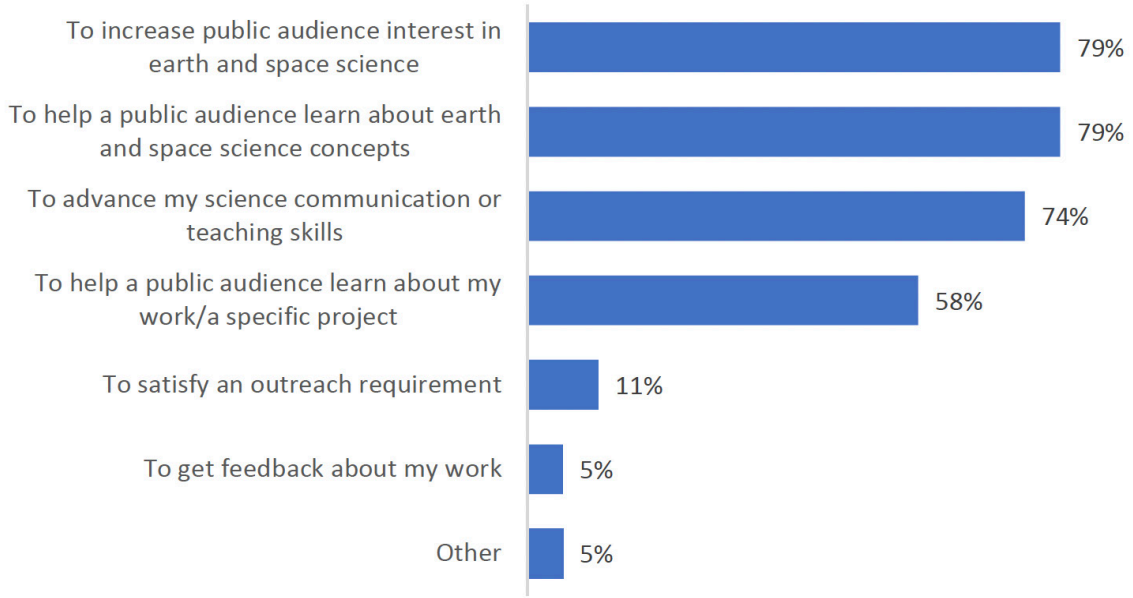


Figure 4: Students decided to participate in order to increase public interest and knowledge in earth and space science, and to advance their science communication and teaching skills. (n = 19)

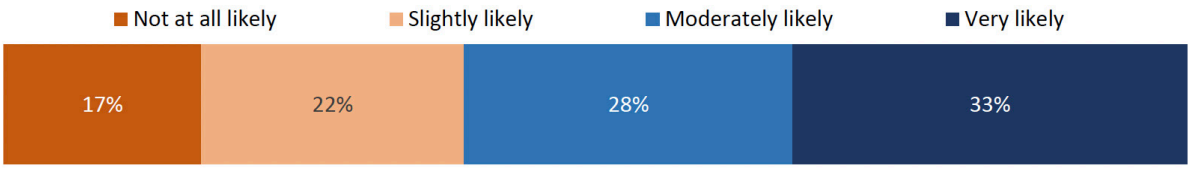


Figure 5: SMEs were very likely to look for opportunities to deliver STEM programming in a library in the future. (n = 18)

NASA@ My library gave me a sense of purpose and community that I would not have found otherwise."

Experience of Library Patrons Attending SME Programs

Programs facilitated by young science students can expose the public to a broader view of what a scientist is. University students can also serve as role models for children, as one librarian said, "Such programs expose the community, particularly the children, to different people, topics, and careers. Also, having library programs run by college students exposes children to the possibility of becoming a college student themselves someday."

The student SMEs shared personal and general information about educational pathways and opportunities in science careers. For example:

"I did a Q&A and I began by introducing myself as a Ph.D. student, what work I currently was doing, and what work I previously was doing. I also discussed just being interested in astronomy from a young age. One participant asked how to prepare to be a space scientist and I just informed them to be curious, be passionate, and learn as much as you can about the science going on now (especially with JWST)."

- "We [the presenters] talked about how astronomers use filters to take images through telescopes and got asked lots of questions about astronauts."

Patrons who attended student SME programs who completed a post-survey all agreed they learned something new about Earth science or space science and about what earth or space scientists do. They were very likely to agree that they learned about what you need to study to become an Earth scientist or space scientist, the skills used and about the diversity of people that study in these areas.

One attendee wrote, "Thanks to the wonderful young man who did a great job of helping us understand this fabulous accomplishment!" and another wrote, "[I] learned more than one thing: space terminology, how the JWST functions, what keeps it cool, the incredible vastness of space, the realization on how far ahead of the curve Albert Einstein was... and the amazing effort of putting this project together!"

These programs also reached a group that was not regularly attending programs about space (50% of 14 post-survey respondents from five different programs had not previously attended a program about Earth or space science). Based on their experience with the program, patrons all agreed that they were interested in learning more about Earth or space science and very likely to agree that they were interested in looking for more information about NASA (see Figure 7).

RECOMMENDATIONS

The following recommendations for an effective program using university students as SMEs for library presentations emerged based on the experience of the project team, informal feedback, and evaluation findings (next page):

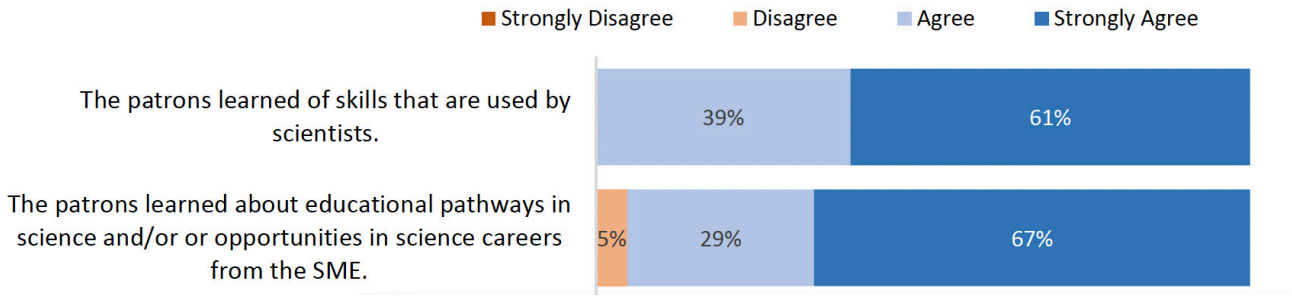


Figure 6: Library staff were very likely to agree that patrons of SME programs learned skills used by scientists as well as about STEM educational pathways or careers. (n = 18) Respondents who worked with a NASA@ My Library provided university student SME

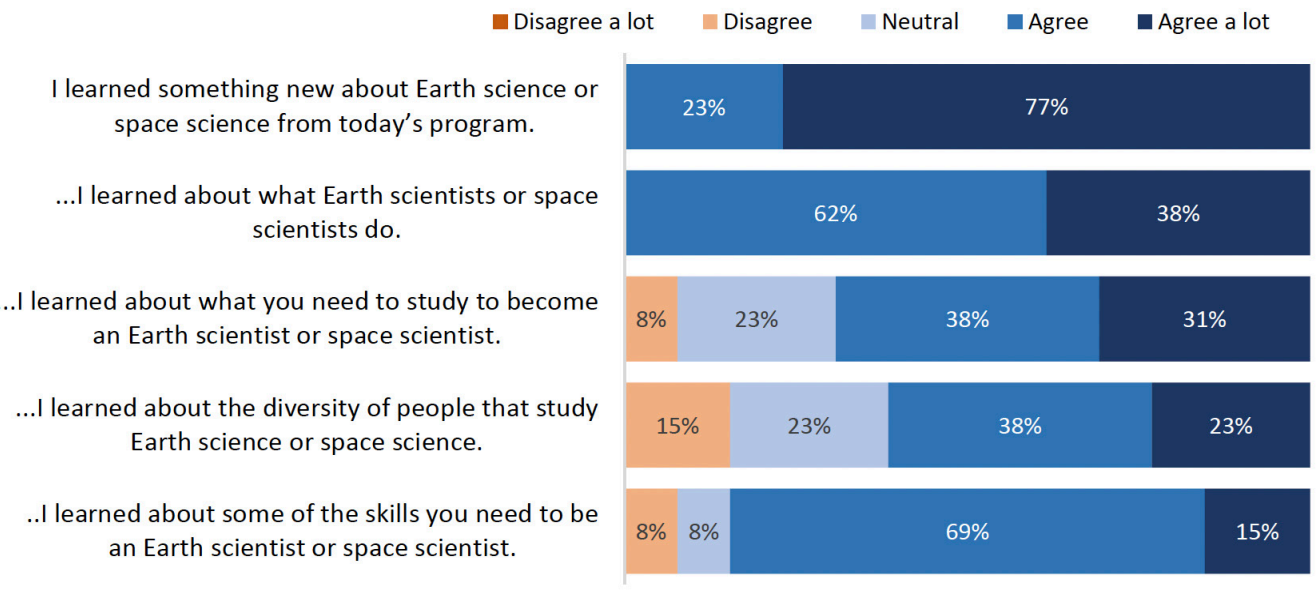


Figure 7: Patrons agreed they learned about earth or space science and about what scientists do. (n = 13) Respondents who attended a NASA@ My Library program facilitated by a university student SME.

- Clearly define the role of advisors and provide advisors with training and resources.
- Share a video recording of an exemplary library program led by a SME as part of the students' training.
- Give students more training on virtual presentation strategies and technology.
- Start earlier in the fall so there is time to train students and schedule programs with libraries with sufficient advanced notice (as libraries plan programs three to six months in advance)
- Provide more guidance to students regarding communicating science to a public audience
- Consider matching students with libraries prior to the training, so they know what aspects of the training to pay closer to attention to as they plan their program (e.g. whether they are doing an in in-person or virtual program, the topic, and details about the audience)
- Help students reach out/arrange programs with librarians, potentially having the project team write the initial email connecting library staff to student SMEs, or by providing students with email text to use and/or a deadline
- Brainstorm strategies to allow for more in-person presentations, such as finding libraries and universities that are in close proximity to each other and/or providing a travel budget.
- Create opportunities for students to work together, share resources, and learn from one another.
- Provide students with program ideas to use or adapt
- Help librarians recruit a larger audience for the student programs by providing marketing materials or using SMEs to help disseminate information about the program
- Ensure that SMEs are comfortable with the content of the presentations, capitalizing on their areas of interest and expertise

SUMMARY

Despite the challenges experienced by the project team, SMEs, and library staff in implementing this new program model, we feel hopeful of the value of using university students to engage the public in STEM learning opportunities through library programs. Using lessons learned to build on effective practices as well as adapting new strategies to address challenges will result in the increased effectiveness of these programs. By providing library staff with needed assistance, students with outreach experience, and patrons with exposure to fun STEM learning opportunities and role models, we can potentially inspire a new generation of scientists and engineers.

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Smithsonian National Museum of Natural History 2021-2025 Strategic Plan

Smithsonian
National Museum of Natural History

The Smithsonian National Museum of Natural History recently released it's current strategic plan which will take it to 2025. With the permission of museum director Kirk R. Johnson we are here providing a verbatim summary of the primary elements of this plan which can be a useful model or stimulant to many museums, natural history and well beyond. The full plan is available at https://naturalhistory.si.edu/sites/default/files/media/file/nmnh-2021-2025-strategic-plan.pdf

Following are selected sections of the full plan. Segments that are included here are further developed and explained in the full document.

The photographs are not part of the strategic plan but rather inserted by ILE as modest amplifications of the Smithsonian's process and activities.

OUR MISSION

Understanding the natural world and our place in it.

OUR VISION

A future-facing Smithsonian museum that confronts the big questions in nature, science,
and society

A GLOBAL LEADER IN SCIENCE AND OUTREACH

The Smithsonian National Museum of Natural History connects people everywhere to the unfolding story of our solar system, the planet we call home, and the life upon it.

We curate an irreplaceable archive of physical, cultural, and biological diversity.Our researchers, scientific collections, free exhibitions, and educational programs address fundamental questions, spark curiosity, and illuminate the beauty, wonder, and fragility of our planet.

Now more than ever, we are called upon to fulfill our promise to science and to our audiences. We will uncover new knowledge about our 4.6 billion-year-old planet—how it works, how it supports life on land and sea, and how people and cultures both shaped and have been shaped by it. Our research is critical because it tells us what has been, what is now, and what could be. Equally important is our ability tobreak down barriers and invite diverse audiences into the world of science and to catalyze within them a passion for the natural world and their place in it.

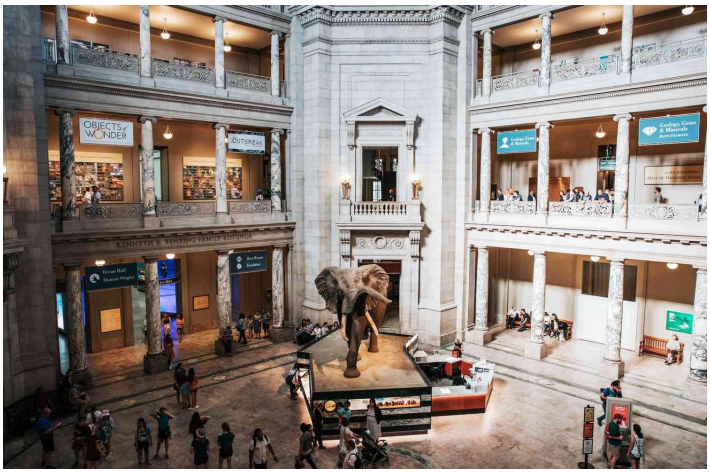

Figure 1: Main entry area of the National Museum of Natural History.

A VIEW FOR THE FUTURE

What does it mean to be one of the world's great public museums and a trusted science powerhouse as we enter the third decade of the 21st Century?

This plan attempts to balance our necessary ambition with our present reality. It considers lessons learned from the COVID-19 pandemic, it is unafraid to address our shortcomings, and it aspires to fulfill our promise to be inclsive, diverse, and accessible.

Over the next five years, we will learn and grow together as we make scientific discoveries and share what we learn with millions of people. We will also make the museum a better place than we found it. We will:

- Uncover and share the story of the Earth, its ocean, people, and nature, and clearly articulate the urgency of the present moment.
- Collaborate with the Smithsonian to enhance our role as a trusted source for all Americans, not just those who come to Washington, D.C.
- Take meaningful steps to build a more diverse and inclusive environment.
- Build a healthy and resilient community that promotes work-life balance.
- Collaborate with strategic partners to achieve our mission and extend our reach.
- Invest in the facilities, technologies, and tools needed to advance science, improve access to research collections, engage audiences, and improve our operations
- Work to create an adaptable and sustainable financial model to support our ambitions.

A central element of this plan is a set of four Signature Initiatives which are intended to be high-impact, cross-disciplinary projects that provide an opportunity for us to accelerate our evolution as an institution and serve to focus our communications
and fundraising.

The Inclusive Science Initiative will focus on youth from underserved communities and underrepresented groups and provide them with training to be the next generation of scientists and science-savvy citizens.

Our Unique Planet will combine our Earth science assets and a NASA mission to understand the origin of Earth's oceans, continents, and the geologic conditions that allowed for the evolution of life.

The Ocean Science Center will consolidate our vast marine portfolio and the Ocean DNA big idea to create a suite of new tools, techniques and collections that will allow for rapid measurement of marine biodiversity.

The People in Nature Experience will immerse museum visitors in a dazzling display of global imagery and nimble story-telling that will drive home the reality and urgency of the climate and biodiversity crises while focusing on success stories that inspire visitors to understand the possibility of positive outcomes.

In addition to the four Signature Initiatives, we will also create a 'Big Ideas Incubator' to foster the development of future initiatives, with the overall aim of harnessing new technologies, expanding our role as a national museum, and deepening our partnerships with Smithsonian colleagues, federal agencies, corporations and non-profit organizations. Initially, we will focus on four areas for incubation:

Genomics and Informatics will enable us to increase access to our research collections and create a coordinated national infrastructure for genomics and digital collections.

Community Science will empower individuals across the nation and around the world to directly engage in the scientific process.

Digital Education and Outreach will connect us to homes and classrooms across the nation to make our Smithsonian digital content freely available.

The Science of People in Nature will broaden our understanding of how the relationship between people and nature has changed over time and across cultures and inform the development of new exhibition halls.

Figure 2: The butterfly collection within the entemology collection.

How will the National Museum of Natural History be different at the end of this plan?

- We will use our unique strengths to tackle the big questions in nature, science, and society.
- We will have expanded our role as the national museum in education, collections, and research.
- We will operate a museum that is a national model for sustainability.
- We will have established a creative and collaborative 'One Smithsonian' culture.
- We will be a diverse and inclusive community that actively works to break down barriers.
- We will have fully embraced new digital, genomic, and analytical technologies.

- We will have a resilient financial base and effective systems to support our mission.

What impact on the World will we have achieved by the end of this plan?

- Our audiences will have a deeper appreciation for the natural world, a better understanding of current threats, and a sense of what they can do to be part of a positive future for people and nature.
- Our audiences will be much more aware of what it takes to decrease carbon in the atmosphere, to regenerate ecosystems, and to prevent pandemics.
- Children, parents, and teachers will have access to rich digital education tools to inspire their learning about nature, science, and sustainability and be empowered to take part in community-led science projects that explore the big questions relevant to them.
- A new generation of science leaders from diverse backgrounds will be ready to explore the world and find solutions to tomorrow's challenges.
- The global research and education communities will have open access to the natural history collections and research through a digital knowledge platform linked to other major sources of information.
- Conservation leaders and environmental managers will have access to cutting-edge molecular tools to identify key areas for conservation, test which methods work best, and make informed decisions

SIGNATURE INITIATIVES

STEM Education and Careers: The Inclusive Science Initiative

Objective: Expand Access to Science Careers and put a diverse face on Smithsonian science

The Inclusive Science Initiative has three goals:

- Increase access to natural history and museum science careers to students from all backgrounds through programs of paid internships, assistantships, and fellowships.
- Share our expertise and enthusiasm with underserved communities through schools, learning communities, and local partnerships, piloting in DC schools before expanding to a pan-Smithsonian national education network.
- Create and distribute a portfolio of digital learning and teacher support resources through the Smithsonian's Learning Lab platform and other relevant channels.

Earth and Planetary Sciences: Our Unique Planet

Objective: Address fundamental questions about the origin of Earth and its Ocean, continents, and life and share that knowledge with the public through exhibits and public programs.

On a longer timeframe, the project will provide the foundational scientific knowledge and inspiration for a brand-new exhibition about the origins of our solar system, Earth, and life itself that we expect to part of the next strategic plan.

- What was the source of the Earth's oceans?
- How did silica-rich continental crust first form?
- What was the role of minerals in the origin of life?

Marine Science and Conservation: The Ocean Science Center

Objective: Develop new suites of tools to map ocean life and monitor ocean health, and consolidate the museum's marine research expertise and vast collections into a collaborative center to advance stewardship and thesustainable use of the ocean

The Ocean DNA project will catalyze change and action through sharing and advancing our knowledge of ocean science and will focus on three goals:

- Construct and curate a comprehensive voucher-based DNA reference library that leads to an unprecedented map of marine life.
- Provide a toolkit to assess ocean health and determine how marine diversity responds to change.
- Launch an ambitious national community science project that monitors change in marine life around America's coastlines

Climate Change and Sustainability: People in Nature

Objective: Empower local and national audiences to become informed participants in discussions about climate change and sustainability

People in Nature integrates three core elements to provide comprehensive coverage of the major issues facing the planet. We will:

- Convene and curate programs and conversations about the environmental challenges we face, and the decisions that we need to make to ensure the continuation of life on a sustainable planet. We will seek to engage local and national audiences in this discussion through a variety of channels and technologies, depending on the needs of the audience.
- Deliver a series of provocative special exhibitions and related digital resources that will challenge audiences to reconsider their relationship with nature and the impact of humans on the future of our planet.
- Construct a major new experience at the heart of the museum. This exhibition will use cutting-edge technol-

ogies that combine an immersive visitor experience with a compelling examination of the consequences of climate change and population growth for society and nature.

STRATEGIC PRIORITIES AND GOALS

PRIORITY 1: MISSION SUPPORT

Establish an inclusive culture that actively promotes creativity and diversity, and strengthen our mission-enabling operations, facilities, and relationships

Goal 1.1: Museum Culture

Foster a culture of collaboration, communication, and transparency to increase morale, teamwork and use of resources.

Goal 1.2: People and Careers

Develop a holistic approach to managing our workforce that balances development and retention of existing staff with recruitment of new talent; supports our contractor, academic, volunteer, and partner communities; enables enhanced diversity; and incentivizes succession planning

Figure 3: Teachers at work in the Coralyn W. Whitney Science Education Center

Goal 1.3: Diversity and Inclusion

Improve diversity, equity, inclusion, and access across all aspects of our activity, so we better represent society, address societal inequity, and deepen our community relationships

Goal 1.4: Key Facilities and Sustainability

Invest in our key facilities to maintain the long-term health of the infrastructure and put sustainability at the heart of the museum's activities.

Goal 1.5: Fundraising Capacity

Increase our financial resilience and ability to pursue ambitious projects by diversifying our sources of revenue and strengthening our fundraising capacity.

PRIORITY 2: SCIENCE

Continue to expand the frontiers of our understanding of the natural world and take the lead in tackling the big questions of our time

Goal 2.1: THE NMNH SCIENCE ENGINE

Promote excellence by leveraging our combined expertise and resources; fostering collaboration across teams; facilitating effective use of resources and partnerships; and collaboratively pursuing external funding.

Goal 2.2: Collection-Based Research

Strengthen our core capacity and science leadership in collection-based research and develop innovative, high-impact, cross-disciplinary research projects

Goal 2.3: The National Collection

Increase the relevance and use of the national collection with coordinated collection management and development programs, investments in future-facing collections, and improved digital access

Figure 4: Here are divers materials in the botany collection

Goal 2.4: Information and Genomics

Strengthen and further develop our informatics and genomics capacity so that the museum can better undertake the big-picture questions of our time while also making our data available to the global research community

Goal 2.5: A Diverse and Inclusive Science Team

Support the future of our core disciplines and increase participation by under-represented groups through internships and fellowships focused on career development for the next generation of museum scientific professionals

PRIORITY 3: PUBLIC AUDIENCES

Inspire people to appreciate their place in nature and

empower them to engage on the pressing decisions that confront the global community and our planet.

Goal 3.1: Audience Research and Visitor Experience
Create a safe 'New Normal' environment for our visitors and deepen our engagement with our audiences, maximize our impact, and improve the experience of our visitors by using audience data and research to inform our public programs

Goal 3.2: Digital Outreach and Education
Engage a global virtual community by making strategic use of digital technologies

Goal 3.3: Schools, Families and Communities
Capitalize on the museum's unique resources to enrich the experience of pre-K-12 students through their families, teachers, and local communities

Goal 3.4: A National Museum
Deliver on our role as the nation's natural history museum and expand our reach by empowering communities across the nation to engage with the natural world

Goal 3.5: Exhibitions and Experiences
Make full use of our public spaces to inspire our visitors to think about their roles in addressing the big ideas in science, nature, and society through innovative exhibitions and experiences.

STRATEGIC PLAN MILESTONES

Mission Support

- Centralize the museum's administrative and financial structure and systems by the end of 2022.
- Develop a close relationship with central Human Resources and resolve the hiring and promotions backlog by the end of 2022.
- Put IDEA principles at the heart of the museum's culture and increase representation from BIPOC groups among interns, fellows, research associates, and new federal and trust hires year over year.
- Take a leadership position in Museum sustainability practice and revise NMNH and MSC Facilities Capital Master plans to provide roadmap for improvement in collections, research and public spaces by the end of 2023.
- Raise $100 million through fundraising over the period of the plan and build an ongoing capacity to annually generate: $20 million through fundraising, $5 million through commercial activities, and $10 million through scientific and education grants.

Science

- Strengthen relationships with external partners and Smithsonian colleagues as evidenced by collaborative projects in research infrastructure, joint investigations, and funding proposals.
- Lead collection-based research scholarship both nationally and internationally by publishing 400 scientific papers/year, with at least 20% in high impact journals.
- Digitize 500,000 specimens/year focusing on collections that inform environmental change, planetary composition, marine biodiversity and cultural diversity.
- Develop new tools to deliver access to, and analysis of, our natural history data by makinginvestments in genomics, informatics, expertise and partnerships.
- Expand and diversify our mentoring programs through partnerships with educational institutions and support at least 20 fully-funded college-level internships each year.

Figure 5: National History Museum anthropologist searches for hominid footprints in Kenya

Public Audiences

- Maximize the impact of all our public programs by conducting two major learning research projects to help understand how people learn science.
- Offer digital and onsite K-12 learning experiences five days a week during the school year to expand student understanding of science and the scientific process.
- Design five new K-12 STEM education programs and make at least 20 fully-funded internships available each year to high school students from underrepresented populations.
- Increase awareness of the global impact of human activities on nature by staging at least 2 special exhibitions/year (with associated digital and/or DIY content).
- Collaborate with technology and media partners to create and present The People in Nature Experience by 2025

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On the cover:

TEXT Needed

Full story on page 4.