Center for the Future of Museums

TrendsWatch 2014

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Introduction

To new readers unfamiliar with TrendsWatch, welcome! This report is our annual overview of trends observed in the course of a year producing Dispatches from the Future of Museums, CFM's free e-newsletter. Each week in that communiqué, we compile a dozen or so stories from across the Web, drawing on a variety of mainstream news sources, blogs, research reports, pop culture and writers from the fringe. Outside the museum field, we look for news and commentary on culture, economics, policy, technology and the environment that signal where we may be headed in coming decades. Inside the field, we look for examples of museums and other cultural and scientific organizations testing innovations that may prove to be successful in our swiftly changing environment.

For returning readers: welcome back! The content of the report is much the same as our first two years: I summarize how each of six trends is playing out in the world, offer some observations on what this means for society and for museums, share a few examples of how museums are engaging with this trend, and suggest how any museum might like to respond. The major change this year is format. In addition to the free, downloadable PDF, we are offering print copies of TrendsWatch through the AAM Bookstore. There is discount pricing on bulk orders, which we hope facilitates use of the report for discussions with staff, committees or the board of trustees. (I recommend you use the print copies in conjunction with the PDF, to take advantage of the many embedded links in the digital version.) Also through the Bookstore, we are experimenting with an enhanced digital edition, formatted to read more cleanly on a tablet or other e-reading device, and with embedded videos to complement the text. I look forward to hearing whether you find this format makes the report more enjoyable to read and use.

Apropos of two of the trends covering in this year's report—big data and privacy—the free PDF is different in a subtle but important way. Embedded in the document is a tracking code (or, as it has come to be affectionately referred to by Alliance staff, "the magic chip") that counts when the report is opened or printed, and reports these stats back to CFM.

Why have we chipped the report? The PDF is free to users thanks to the generous sponsors listed on page 2. Their ROI is exposing readers to their brand and helping to share the content of the report. The more people who read TrendsWatch, the higher its value to sponsors, but we can't quantify that value without being able to track and report on how it is used. Hence the chip. In fact, the report isn't

really free—we are asking you to pay with data (about how often you access and share your copy) rather than with cash. This does raises privacy issues, which we are dealing with a) by disclosing what data we are collecting, and how, and b) offering other formats (print, enhanced digital) that you can pay for with cash instead.

No matter what the format, this report is intended as a jumping-off point for your own planning. The purpose of strategic foresight is to prime your imagination to envision different futures—some of the many ways that the world could evolve into more than an amped-up version of today. As you read about these six trends, think about how they will shape the world, what it would be like to live in the world they may create, and how you and your organization might respond. How do you feel about the prospect of ubiquitous surveillance, on and off line, and what steps would you take to protect your privacy? What underutilized resources do you have in your life (time, skills, space, possessions) that you might put to use in the sharing economy? Personally I think the most important and challenging question is raised in "For Profit for Good": How big an impact do museums want to have on the world, and how can we ensure that the good we do is good enough?

As always, your feedback is most welcome. Please contact me at **emerritt@aam-us.org** to share your observations about how these trends are playing out at your museum and in the world, suggest trends we should cover in subsequent reports, and please, please, tell us how you are using TrendsWatch to inform how you and your organization plan for the long term.

Yours from the future,

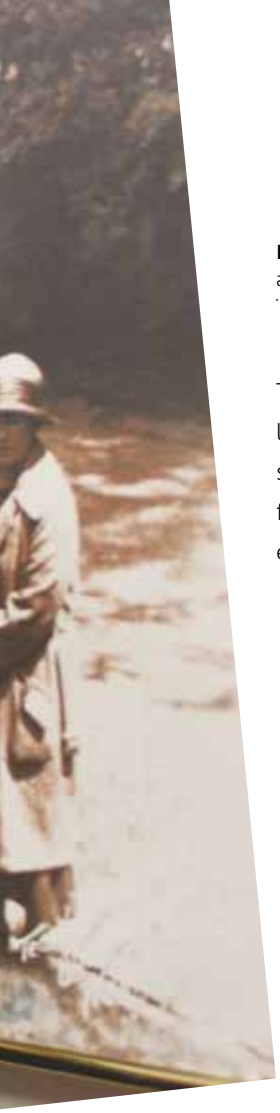
Elizabeth Merritt
Founding Director
Center for the Future of Museums
American Alliance of Museums

How to Use This Report

TrendsWatch 2014 highlights six trends that CFM's staff and advisors believe are highly significant to museums and their communities, based on our scanning and analysis over the past year. For each trend, we provide a brief summary, list examples of how the trend is playing out in the world, comment on the trend's significance to society and to museums specifically, and suggest ways that museums might respond.

TrendsWatch provides valuable background and context for your museum's planning and implementation. We encourage you to share copies with:

- the museum's executive and planning teams
- the entire staff (paid and volunteer)
- members of your governing authority
- local foundations and major donors
- policy makers and government representatives
- members of key community groups and museum partners
- the press



Left: CFM director Elizabeth Merritt peers into the future with Google Glass. Photograph in the background is of attendees at the AAM annual meeting in May, 1924, posing on the grounds of the White House.

To foster discussion, you might host brownbag lunches, make the report an agenda item on staff or board meetings, or organize your own forecasting workshop. Encourage people to explore the following questions:

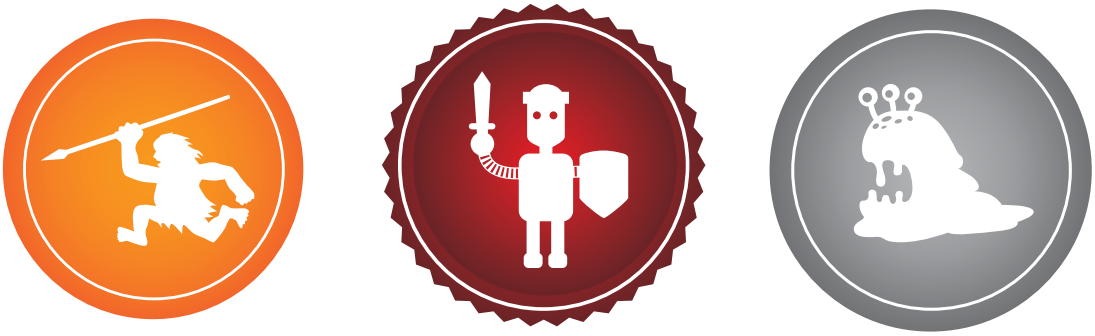
- How are these trends playing out in your community, state, region or country?
- Which trends are likely to have the greatest effect on your organization?
- How might your museum take advantage of the opportunities or avoid the risks these trends present?

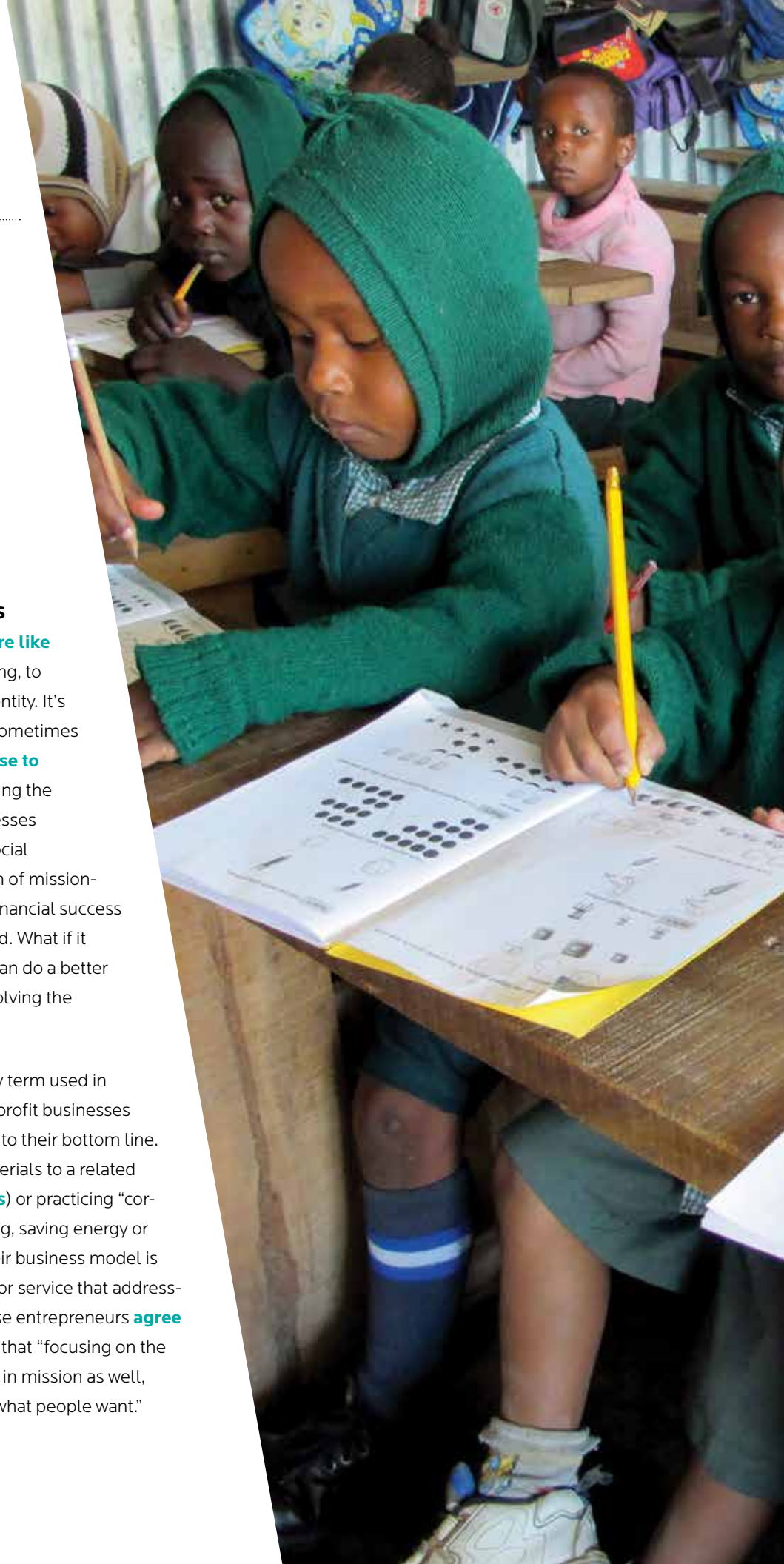
If you are not directly involved in museum planning, we encourage you to organize similar conversations in other settings, such as museum studies classes or professional conferences.

Another way to use TrendsWatch is to make it a guide for your own scanning—helping you focus your attention and filter news, essays and social media that land in your mailbox or cascade across your screen. In the coming year, keep an eye open for news and opinion pieces illustrating how these trends are playing out.

The PDF version of this report includes copious embedded links to news stories, blog posts, research reports, videos and other resources. (These links were all working at the time of publication, but we cannot guarantee they will remain stable over time.) If you are reading a print copy of the report, you can access the digital version with links at www.aam-us.org. You can access more information, including all CFM forecasting reports and scanning tools, at the CFM website www.futureofmuseums.org. Please share your scanning hits with CFM via e-mail at futureofmuseum@aam-us.org or twitter @futureofmuseums. And remember to let us know what you think about TrendsWatch and how you use it in your work. Together we can build a formidable forecasting network to help museums chart a successful course to the future.

Below: In 2013, learners enrolled in **CFM's experiment in microcredentialing** earned over one hundred digital badges. Read more about digital badges in **TrendsWatch 2013**.





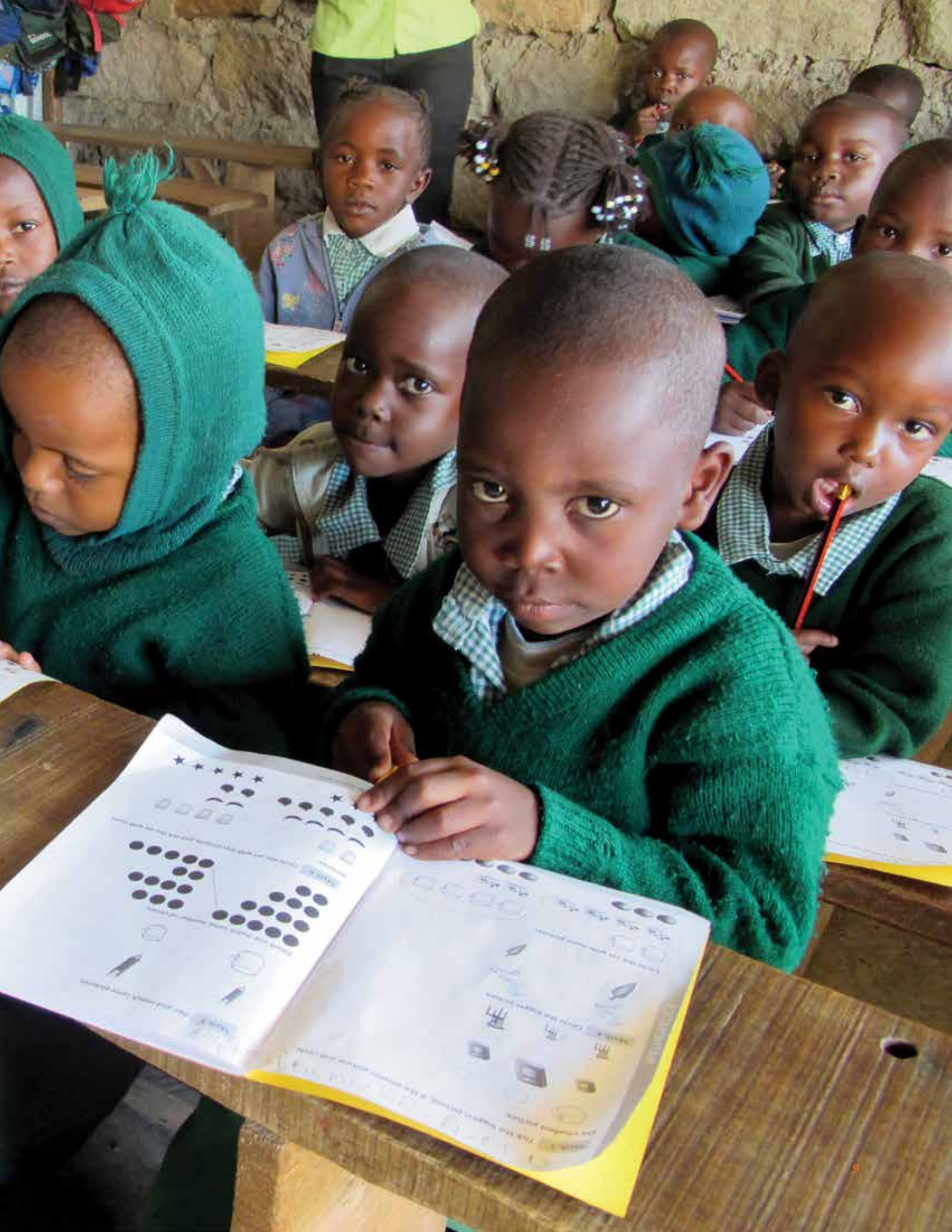
Right: The goal of Bridge International Academies' for-profit "school in a box" model is to provide **quality education for $5 a month**. Courtesy **Bridge International Academies**.

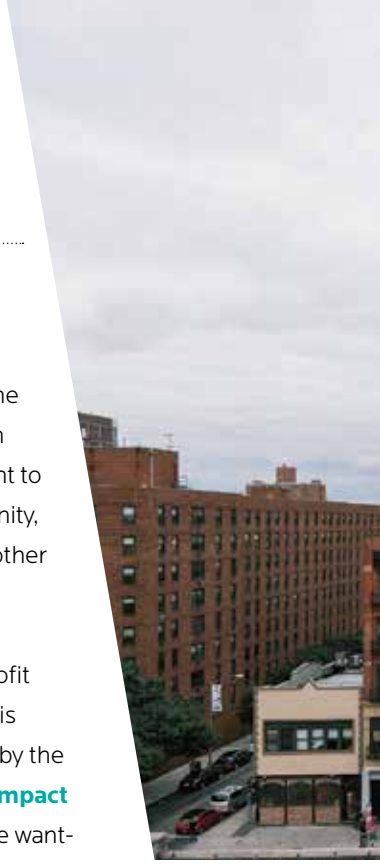
For Profit for Good:

The rise of the social entrepreneurs

For years, well-meaning critics have been telling nonprofits to **act more like businesses:** to do a better job marketing, to innovate, to develop a strong brand identity. It's even been suggested that nonprofits sometimes use their tax-exempt status as **an excuse to operate inefficiently**. Now we are seeing the flip side of the coin, as for-profit businesses tackle traditionally nonprofit goals. "Social entrepreneurship" is the growing realm of mission-driven business enterprises that view financial success as a way to create more and better good. What if it turns out that for-profit organizations can do a better job than the "independent sector" at solving the world's problems?

Social entrepreneurship is a big, messy term used in many ways, but let's focus here on for-profit businesses that explicitly factor mission delivery into their bottom line. They aren't just donating profits or materials to a related issue (e.g.,**TOMS shoes**, **Ben & Jerry's**) or practicing "corporate social responsibility" by recycling, saving energy or giving money to charitable causes. Their business model is structured around providing a product or service that addresses social or environmental needs. These entrepreneurs **agree with the founder of Zipcar**, who feels that "focusing on the business is what makes you successful in mission as well, because it makes you pay attention to what people want."





RIght: The New Museum of Contemporary Art, New York (shown here with sculptures by Chris Burden on façade) is developing space next door as a business incubator. Courtesy New Museum/Photo: Dean Kaufman.

Mission-driven companies have a lot of choices for how to structure their operations. As we discussed in TrendsWatch 2012, emerging hybrid legal entities (**benefit corporations**, **L3Cs**) provide the option of combining some of the advantages of the for-profit and nonprofit worlds. But some entrepreneurs are deciding that the benefits of the for-profit model (e.g., access to capital) and the disadvantages of nonprofit structure (e.g., cumbersome governance) make straight for-profit the best way to do a lot of good.

Take, for example, the case of Saul Garlick, founder of the nonprofit ThinkImpact, a company that fosters microenterprise in third world countries to meet local needs. Garlick, struggling to meet payroll and expand services, assessed his options (nonprofit, hybrid, for-profit) and decided to **convert ThinkImpact into a for-profit** to free the company from the "treadmill of donor dependency" and increase his ability to amass capital and scale up. Or consider the way the D'Eri family tackled the challenge of employment for adults with autism: 80–90 percent, including their son, are unemployed. To address this social need, the D'Eris could have founded a nonprofit that provided jobs or training. Instead they started **Rising Tide Car Wash**, a business designed to capitalize on the **abilities of autistic adults** rather than alleviating their disabilities. Not content to help just their own family and community, they are expanding the business into other geographic areas as well.

> **"I think people make the mistake of distinguishing for-good versus for-money. The notion that nonprofits are the right—or even better—vehicle for doing good in the world is no longer true. That may have been the case at one time, but today, ethical, well-run businesses with products that make life better are remarkable at improving lives at scale."**
>
> *—Saul Garlick, founder and CEO of ThinkImpact*

The rise of for-profit social enterprise is being reinforced by the **parallel rise of impact investing**: people wanting to do good with their money not through charity, but through investing in companies that give a return both in cash and in mission-driven results. Funders, especially younger, high-wealth donors, fund according to measurable impact, rather than a fuzzy desire to "support the arts" or help their community. If they can have more impact for their dollars by investing in a hybrid nonprofit or a for-profit business (and get a modest financial return on their dollar as well), well, that seems like a no-brainer, right?

The ranks of social entrepreneurs are increasingly populated by Millennials, driven by the economic realities of their generation, their aspirations and their values. Only **60 percent of Millennials have jobs**, half of which are part time. Perhaps in part because of the lousy job

Above: Courtesy SO-IL.

market, 54 percent either **want to start a business or have already started one**. It isn't just about the money, either—Millennials see small businesses as a social form, a **way to express their artistic or moral aspirations**. **Polls** show that 85 percent of Millennials want their work to make a difference in the world, and 71 percent want to work for a company that encourages global or community social responsibility.

While the popularity of for-profit social enterprise is soaring, the reputation of the nonprofit sector is taking a dive. Even reputable nonprofits are being criticized for not having a big enough impact on the problems they are trying to solve—**for being good, but not good enough**. Fundraiser and activist **Dan Pallotta** argues that American social attitudes and regulatory structures doom the nonprofit sector to be small and ineffective. In his **March 2013 TED talk** (over 2.6 million views and counting), Pallotta preached his message that expecting nonprofits to pay low (non-competitive) salaries and skimp on their marketing budget—all without access to investment capital—cripples their ability to solve problems.

What This Means for Society

The growing importance of social enterprises may signal a fundamental shift in the traditional division of responsibilities between the "three sectors"—government, for-profit and nonprofit. If for-profit companies with social missions rack up big wins in solving problems in areas of need such as health care, education, civil justice, **foreign aid** and the environment, will that change public perceptions about the best way to tackle social needs and social good? How might that, in turn, affect attitudes towards nonprofits, charitable contributions and tax-exempt status?

There is already a **growing split** between the way policy makers and donors regard nonprofits that perform social service functions such as feeding the hungry, housing the homeless and helping the poor, and their attitude towards cultural nonprofits. In current debates about budget and funding, the former are often treated as not only good, but as a group on which to offload the social safety net responsibilities heretofore assumed by the government. The latter are increasingly being seen as hobbies

of the rich and undeserving of public support. If social enterprise tackles the role traditionally filled by the "social service" nonprofits, with notable success, will it deepen this divide? Might that, in turn, fragment the nonprofit sector and erode its willingness or ability to advocate as a group for policies favorable to the sector?

If social enterprise catches on, mainstream for-profit companies may start examining how they can use their core business to achieve social good. An early signal of this potential: in June 2013, Bre Pettis, founder of the 3D printing manufacturer MakerBot, sold the company to Stratasys for $600 million. In November, Pettis, who stayed on as MakerBot's CEO, announced **the launch of MakerBot Academy**, with a mission of integrating 3D printing into education. Instead of a chicken in every pot, Pettis envisions a MakerBot® Desktop 3D Printer in every school in the U.S. He is reputed to have sunk a "**Gates-sized contribution**" into making it work, partnering with nonprofits like DonorsChoose.org, but not making the academy itself a separate nonprofit.

What This Means for Museums

What if for-profit businesses become effective competitors in delivery of traditional museum missions? Not just for-profit museums, but other entities that achieve the same ends. Some have noted the irony of the big fuss made when Jeffrey Deitch, an art dealer hired to run the Museum of Contemporary Art Los Angeles (MoCA), reputedly forced out highly respected (academic, museum-trained) chief curator Paul Schimmel…who promptly became a partner in a commercial gallery. Schimmel says he will organize the exhibitions to be "more thoroughly researched and elucidated, and…dressed with many other museum-style fixings, including educational programming, scholarly publications and auxiliary programming." As **this article comments**, "combining sustainable

Left: Artsy staff partner with over 200 museums around the world. Photo: Molly Gottschalk.

business practices with museum quality exhibitions, it's a trend that could catch on, right?"

Having a competitor in the marketplace of doing good may challenge nonprofits, including museums, to up their game. Museums traditionally boast about their "unique" products and services, as if providing a great experience for only a small set of the total population was something to be proud of. Social enterprise generally assumes that any good thing can and should be scaled up; this may lead funders and donors to expect the same from nonprofits. Might "unique" become a pejorative term when applied to museum operations?

Social enterprise isn't only about food, housing, medicine. It can also be about culture. For example, **Artsy** is a for-profit company dedicated to arts education via an online platform that both sells art and displays digitized art, some of it from museum collections. Artsy's chief curator, Christine Kuan, **explains** that "[b]eing for-profit, in the sense of taking a sales commission from artworks that sell through our website, is a sustainability plan that makes sense in the online realm and it enables us to be free to the public."

Museums are working hard to document how they help meet essential social goals—to establish that they are "necessary rather than nice." If social entrepreneurs show they can be better than nonprofits at making real inroads on truly "necessary" social goals, will that leave museums undisputed only in the areas that are "nice?" Will it change the way museums measure success and the argument we make for support?

The majority of museums are distinguished from the rest of the nonprofit sector by the collections they hold in trust for the public. Yet most people don't know that the works they see on exhibit are the tip of the iceberg, and they haven't been taught to value, and pay for, the collections behind the scenes. Despite proposals that the Detroit Institute of Arts raise money by **renting out works currently not on display**, museums generally don't generate enough income from the collections in storage to pay for their preservation and conservation. Museums already compete in the marketplace for income from ancillary activities (shop, space rentals, special events). If for-profit enterprises out-compete museums at producing the mission-driven products and services (exhibits, education) that help support our collections, what does that leave us?

Museums Might Want to…

Revisit their ambitions for scale and impact, and consider how much good they want to do in order to feel successful. For example, museums are proud of their work as educational institutions. As Michael Edson, director of Web and new media strategy at the Smithsonian Institution, **points out**, "dreams come in different sizes," but "a billion learners

MUSEUM EXAMPLES

The **NEW MUSEUM** in lower Manhattan is building **a business incubator** slated to open in 2014. The museum will invite up to 70 emerging designers, architects, tech developers, artists and others to occupy the space. The goal is to generate ideas that make money for their creators, who pay fees to the museum to work in the incubator, and help the city by addressing the environment, transportation, poverty, food and other urban challenges.

The **SPARK!LAB National Network** is an entrepreneurial endeavor of the Smithsonian's Lemelson Center for the Study of Invention and Innovation. Spark!Lab uses hands-on activities to engage children and families in the history and process of invention, from having a great idea to bringing it to market. By licensing the design and educational content of Spark!Lab out to other museums, the Lemelson Center creates an income stream for its own operation as well as creating a network of permanent satellite locations that form a mutually reinforcing community of practice about education and about the business model for this enterprise.

The **CHILDREN'S MUSEUM OF RICHMOND** (CMOR) has **opened two satellite locations**, both to expand the population it serves and increase its financial sustainability. The museum had to raise nearly $1 million over three years to invest in this expansion, but staff had good data supporting the market for this leap—many parents reported that the transit time to the original location was a significant barrier to attendance. When they embarked on this course, CMOR staff were surprised they seemed to be the first children's museum to adopt a "branching strategy," and found themselves besieged by calls from colleagues interested in following suit.

GORE PLACE, a historic house and estate in Waltham, Massachusetts, **operates a small farm** complete with sheep, goats and poultry. In 2013 they completed the first year of a three-year plan to see if the farm can turn a profit without support from the museum. While they earn a modest amount from a **farm stand** (two large technology parks recently invited them to set up weekly farm stands on their grounds as well), the museum actually earns more from selling tickets to farm-related activities than from the crops themselves (a strategy pursued by many small family farms in this "**experience economy**"). Gore Place also gave away over 6,000 pounds of vegetables to community kitchens last year, an ancillary "good" of which the museum is particularly proud.

Above: Gore Place Farm Stand. Courtesy of Gore Place.

is the scale of dream [museums] need to have if we are going to seriously discuss improving education in America."

Consider entrepreneurial methods of delivering and scaling up successful programs and services. Use philanthropy as a source of capital to build sustainable income streams, rather than as fleeting support for projects that will disappear once funding dries up. And before using underwriting to **deliver free services**, consider whether they are undermining their own ability to charge a price that would provide these services in a sustainable manner.

Look for for-profit, hybrid and governmental partners who might help museums create joint projects-for-good that generate sustainable income streams. Joining forces with entrepreneurs who can draw on museum resources while sharing the resources of their own business platform may enable museums to reap the benefits of social enterprise without completely reinventing their own organizational structures.

Further Reading

David Bornstein, ***How to Change the World: Social Entrepreneurs and the Power of New Ideas*** (Oxford University Press, updated edition 2007). Bornstein, founder of the Ashoka foundation, shares stories of finding, mentoring and scaling up the work of social entrepreneurs around the world.

John Elkington, Pamela Hartigan, Klaus Schwab, ***The Power of Unreasonable People: How Social Entrepreneurs Create Markets That Change the World*** (Harvard Business Review Press, 2008). This book explores market-based solutions to "society's most intractable problems." Draws on the expertise of staff of foundations funding social entrepreneurs, including the ***Schwab Foundation for Social Entrepreneurship***, the ***Skoll Foundation for Social Entrepreneurship*** and the ***World Economic Forum***.

Jane C. Wei-Skillern, James E. Austin, Herman B. Leo, ***Entrepreneurship in the Social Sector*** (SAGE Publications, 2007). Written to support undergraduate and graduate courses in entrepreneurship and social enterprise, this textbook contains numerous Harvard Business School case studies addressing business models, funding, growth and collaborations.

Synesthesia:

Multisensory experiences for a multisensory world

Remember when you looked at a painting, listened to music, tasted your food, smelled perfume and touched a (real, physical) object? The rich messiness of the five human senses has always been hard to record in tangible media, but now, thanks to emerging technologies, sensory impressions can be captured, mixed and presented in new ways to enrich and refresh traditional cultural experiences. Emerging technologies hold out the promise of recording and remembering scent as easily as we snap a picture, and the ability to (virtually) touch anything rendered as digital data. And as the technology for capturing and (re)combining sensory experiences becomes more common and more effective, people may become less interested in traditional experiences that appeal primarily to one sense at a time.

Above: Janet Cardiff, *The Forty Part Motet* (2001), Fuentidueña Chapel at The Cloisters Museum and Gardens. Image: The Metropolitan Museum of Art/Wilson Santiago.

The demand for multisensory experiences is accelerated by discoveries documenting the utility as well as the artistic challenge and the sheer fun of engaging all the senses. Recent research suggests the best way to remember facts may be to **set them to music**, while the ancients long ago discovered how to use our **innate spatial sense** as a memory tool. One reason so much time and effort is being spent on developing scent technology is a growing understanding of the power of smell to **stimulate memory, engage emotions**, and affect mood and **health**. Some multisensory experiences are already being used to meet the needs of special audiences, as with the **Memories in the Museum** project for people with Alzheimer's, which inspired the Cincinnati Art Museum to take a "holistic approach, incorporating sound and other sensations rather than exclusively visual" to better serve its audiences.

But much of the demand for multisensory experiences is driven by pure pleasure. We can wear multisensory fashion, such as designer Iris Van Herpen's costumes that generate their own "**embossed sound**." We can stroll the city enjoying multisensory public art, such as Di Mainstone's project that **wired the Brooklyn Bridge** as a giant harp. **Multisensory dining**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experiences are a hot thing: **Ultraviolet**, in Shanghai, combines food with moving images projected on the walls of the dining room, music and aromas (other than that of the food—the scent of the ocean for a lobster course, for example). In Barcelona, Ferran Adria's 41 Degrees "plunges guests into an art installation...exploring how combined sensory stimuli create powerful, emotional and memorable ties between consumers and restaurants." Hotels are expanding their sensory experiences, from the Nordic Light, with rooms featuring individually programmable lights chosen to create calm, relaxation, romance or whatever mood guests desire, to the 21c Museum Hotels inviting guests to "**bed down with art**," including video, sound, light, digital and text installations.

The digital revolution was, at first, aural and then largely visual. But we are rapidly developing digital technologies that channel the other senses as well. **Digital scent technologies** are especially promising. The **Smelling Screen** makes specific objects on an LCD screen release particular odors at pre-set intervals. The **Ophone**, currently in development, takes smells mobile, enabling users to "text" any of 320 different scents, creating personalized aromas that are produced by a cylinder synched to a smartphone via Bluetooth. Inventors are even tackling the fleeting nature of scent: an analog camera dubbed the **Madeleine** captures smells, which can then be sent off for analysis, supporting the creation of "bespoke memory capsules." Smell isn't the only sense making a new leap into the digital realm, either: researchers at the National University of Singapore are working on a "**digital lollipop**" that can simulate taste.

Haptic technology explores the realm of digital touch. **AIREAL** uses puffs of air to create tactile sensations in midair, corresponding to a user's body gestures in front of a screen (playing goalie, if you go to "block" that digital soccer ball, you actually feel it hitting your hand!) Another gizmo uses electro-vibrations to **simulate the feel of textured surfaces** as rendered on a touchscreen via digital data—letting you feel what you are looking at on your screen. MIT Media Lab's **inFORM** allows users to "reach through" a computer screen to manipulate a real object in a remote location. Researchers at UC San Diego are even working on devices that would **digitally record touch** in much the same way we record sound. Their work was initiated in response to a request from the UCSD School of Medicine's neonatology group, which wanted to record the sensations of a mother holding her baby in order to "play it back" to premature infants confined to incubators.

We don't need haptics or "scent texts" to create multisensory experiences—sometimes it's enough to create immersive experiences that co-opt the sensory landscape where they take place. This is the case with "immersive film" such as **The Alter Bahnhof Video Walk** (2012) designed for an old train station in Kassel, Germany, which creates an immersive "physical cinema" environment. Participants check out an iPod and headphones, and cue up an alternate reality app that overlays events playing out on

Left: Epic reenactment of Rembrandt's "Night Watch" staged in a shopping center to celebrate the reopening of the Rijksmuseum in 2013. Courtesy ING.

the small screen onto the location where the scenes were shot. Or even more low-tech, in the **Invisible Cities** opera performed at Los Angeles' Union Station, performers move throughout the courtyards, waiting rooms and ticket halls of the station. This presentation combines sight, sound, movement and audience participation for a heightened emotional impact; it appealed to younger audiences that do not typically attend operas in concert halls.

What This Means for Society

The psychology of scent has implications for architecture and urban planning: "**medicinal urbanism**" could expand the design palette to include scents to improve mood and promote good civic behavior. (One study from the Netherlands shows that people exposed to citrus-scented cleaning fluids were unconsciously prompted to **keep their environment cleaner**.)

Multisensory experiences can be more accessible to people with one or more sensory limitations. Haptics can enhance the experience of people with compromised vision. (Using haptic devices can even **rewire the visual centers of the brain** to process touch input.) Sound can complement or replace visual cues.

Commercial marketing firms, always poised to exploit technologies that create compelling and addictive experiences, are finding that if a picture is worth a million words, all five senses can be worth a million bucks. Brands are commissioning **well-rounded sensory identities** for their products—not only obvious candidates like food, drink and beauty products, but even travel and insurance. As marketing becomes more multidimensional, it may shape consumers in either of two ways: we may learn to "tune out" this sensory assault, just as we learn to ignore sidebar ads in our browsers, or our attention may become "retuned" to expect multisensory cues.

What This Means for Museums

Heritage is increasingly being defined as multisensory as well. The Fontoteca National (National Sound Archive) of Mexico, for example, declared the sounds of Mexico City to be **part of the nation's cultural patrimony**. Many countries are identifying and controlling the names associated with traditional foods, such as France's appellation d'origine contrôlée, or Italy's denominazione di origine controllata. People are starting to recognize "**smellscapes**" as important and distinctive characteristics of cities that deserve to be mapped and preserved. As keepers of cultural heritage, museums may need to expand the boundaries of what they choose to preserve as well.

Growing demand for multisensory experiences may pressure museums to routinely use more modalities in their exhibits and programs. MoMA even invited Prairie Home Companion's Garrison Keillor to lead art lovers in a **serenade**

Above: Graphic design for a **fictional museum** conceptualized by Pratt Institute graduate student **Shijia Gu**. Courtesy of Shijia Gu.

to works in current exhibitions, and indeed, New York Times culture critic Robin Pogrebin recently proclaimed music to be the "**next big thing in museums**...What you see in...exhibitions is a real coalescing of art forms—music, painting, sometimes a live element, video. It's all a big mix now."

While museums have long used relatively low-tech ways of incorporating scent into exhibits ("lift and sniff" panels; pumping scents into the air of walk-through dioramas), touch (via demonstration carts), sometimes taste and, as noted above, sound, the technologies reviewed in this essay provide more creative, seamless, personalized ways of creating multisensory museums. The availability of these techniques, along with consumer preferences for multi-sensory experiences, might reset the baseline expectation for museums, from providers of primarily visual experiences, occasionally embellished with scent, sound or taste, to experts in synesthesia.

Museums Might Want to...

Routinely use multisensory design to provide accessible experiences for people with disabilities, such as the Met's "**multisensory stations**" that invite all visitors to experience the exhibits though scent, touch, music and verbal imaging. Or like the Brooklyn Museum's **sensory tours**, which include 3D printed

replicas to create touchable experiences for visually impaired visitors—a low-cost method of making hands-on models of any object that can be digitally scanned.

Use the museum's building as a setting for immersive experiences that are inherently multisensory. See, for example, the Sheldon Museum of Art's "**Naked Museum exhibit**," which celebrated the 50th anniversary of its Philip Johnson-designed building by removing all the art from the galleries and Great Hall and filling them with poetry, music, drama, history, dance and performance art.

Partner with other organizations that specialize in other sensory modalities. The Science Museum in London took this approach to create the "**Universe of Sound**," working with the Philharmonia Orchestra to create a high-definition, interactive, immersive experience. Giant screens distributed throughout the museum presented the 10 sections of the "virtual" orchestra performing Gustav Holst's The Planets; visitors can step inside the heart of a symphony orchestra, taking on the role of a musician, conductor or composer. Philharmonia musicians staffed the exhibit each day, playing along live with the recording and answering questions.

Consider their role in preserving a sensory patrimony that exceeds traditional collections boundaries. Historians and scientists are taking the idea of **smells as historical artifacts** seriously, questioning whether we can really understand a past time if we can't immerse ourselves in its scent. Is it incumbent on museums to take on the role of preserving the smells of a given time and place, or the sounds? How would this change the scope of our collecting, our concept of "complete" documentation or the technologies needed for preservation?

Combine their intellectual resources and digital expertise with the new sensory reproduction technologies to provide well-rounded remote access to collections. Using the full palate of sensory tools, museums could go beyond augmented reality, and beyond just sharing artifacts via 3D digital scans. Can museums provide digital libraries of historic smells? Can an immersive virtual museum enable visitors to see, handle, smell, taste and hear a reconstructed world? How can museums encourage artists (and others) to conduct their own synesthetic experiments as part of the Maker/remix culture, using museum resources?

Further Reading

Diane Ackerman, *A Natural History of the Senses* (Vintage, 2011). A "lusciously written grand tour of the realm of the senses."

Rachel Herz, *The Scent of Desire: Discovering Our Enigmatic Sense of Smell* (Harper Perennial, 2008). A psychological study of the importance of smell in our lives.

Liz Neely, Miriam Langer, *Please Feel the Museum: The Emergence of 3D Printing and Scanning* (paper from the 2013 Museums and the Web conference, digital download). This paper documents and explores how 3D printing and scanning can be used to help audiences feel the museum, starting with an introduction to 3D scanning and printing, and discussing how printed models can become "social objects" that provide access to collections for a wider and more diverse audience.

Mark M. Smith, *Sensing the Past: Seeing, Hearing, Smelling, Tasting, and Touching in History* (University of California Press, 2008). Smith has consulted with several museums that were interested in recreating sensory experiences from the past.

MUSEUM EXAMPLES

Museums and other cultural organizations are exploring adding taste to their sensory repertoire. The **MUSEUM OF MODERN ART** (MoMA) recently hosted a culinary class that reinterprets **René Magritte's art** as a five-course tasting menu. The Hartford Symphony's "**Playing with Food**" series challenges chefs at local restaurants to create dishes paired with specific pieces of music, while the orchestra's conductor chooses one piece of music inspired by a regular item on a restaurant's menu. (Selected drinks and desserts from the series have been offered for sale to concert-goers.)

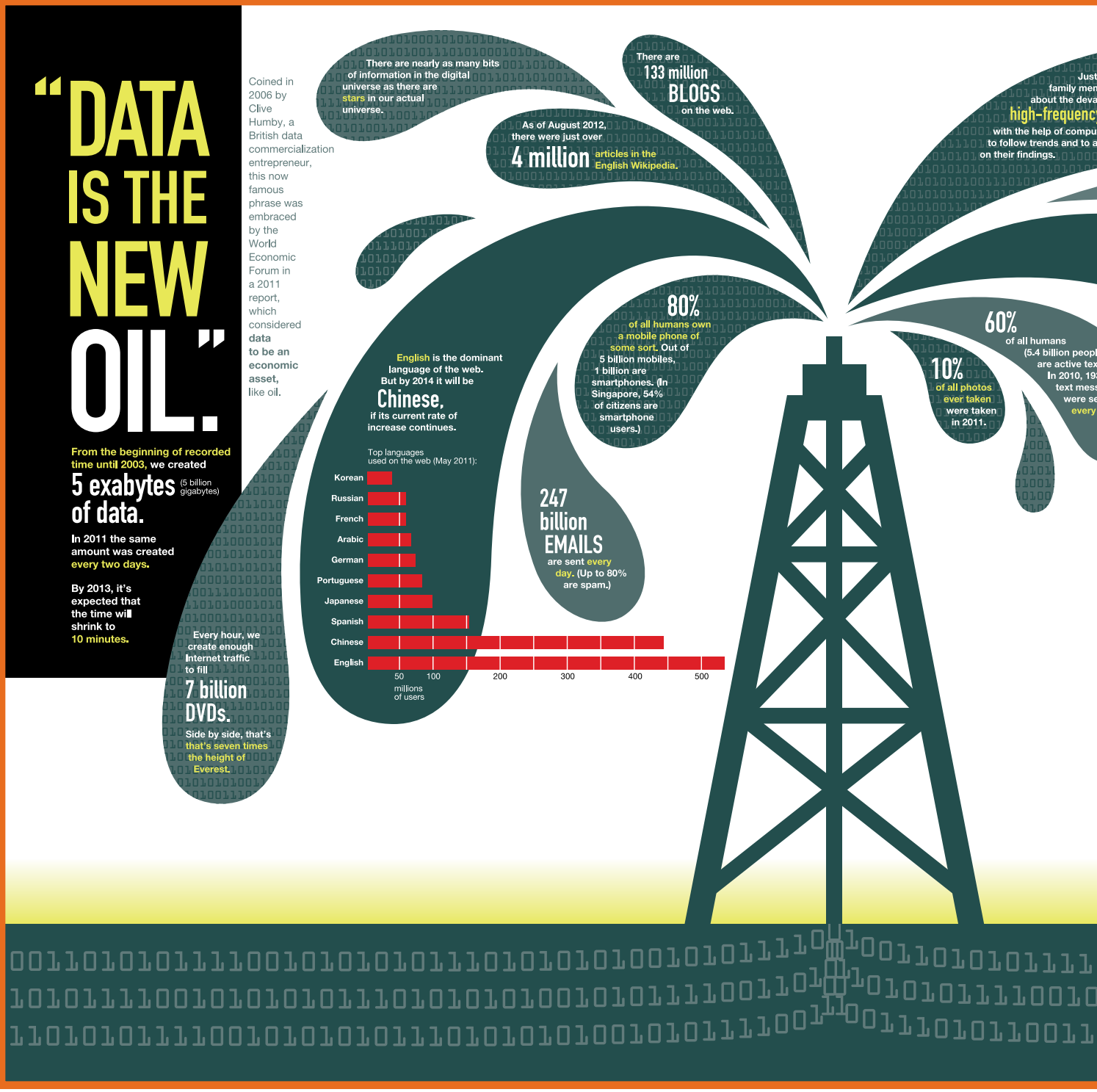
Also at MoMA, rAndom International's "**Rain Room**" caused quite a splash this summer, with visitors queuing early in the morning and waiting in line over five hours to spend up to 10 minutes, 10 people at a time, walking through the immersive installation in which water rains down everywhere except where sensors detect people, giving visitors the illusion of walking between the drops.

The new **SHIJIA COURTYARD MUSEUM** in China, which is dedicated to preserving the traditional architecture of the hutongs (alleyways) and siheyuan (courtyard homes) of Beijing, is determined to preserve the traditional sounds of this disappearing culture as well. Volunteers are creating a database of different sounds that might be heard in the old alleyways to stream at the museum: street vendors calling out their wares, pigeons cooing, local doctors announcing their arrival.

In Venice, the **PALAZZO MOCENIGO** is adding perfume to its traditional focus on clothing and textiles. Noting that the modern perfume industry began in Venice in the 10th century, the new galleries allow visitors to smell traditional ingredients, as well as featuring a collection of perfume flasks dating to 2000 B.C and a 1555 Venetian publication thought to be the first manual in the West that scientifically catalogued cosmetic formulas. **The Art of Scent** exhibit at the **MUSEUM OF ART AND DESIGN** in New York consisted of nearly empty galleries filled with this "invisible art form."

The **CLOISTERS** museum in Manhattan chose as its first-ever presentation of contemporary art an installation of Janet Cardiff's "**The Forty Part Motet**," an 11-minute performance by the Salisbury Cathedral Choir rendered through 40 high-fidelity speakers arrayed in the museum's Fuentidueña Chapel. One visitor described the experience as "transcendent," and some emerged "wobbling, blissed out, a few in tears."

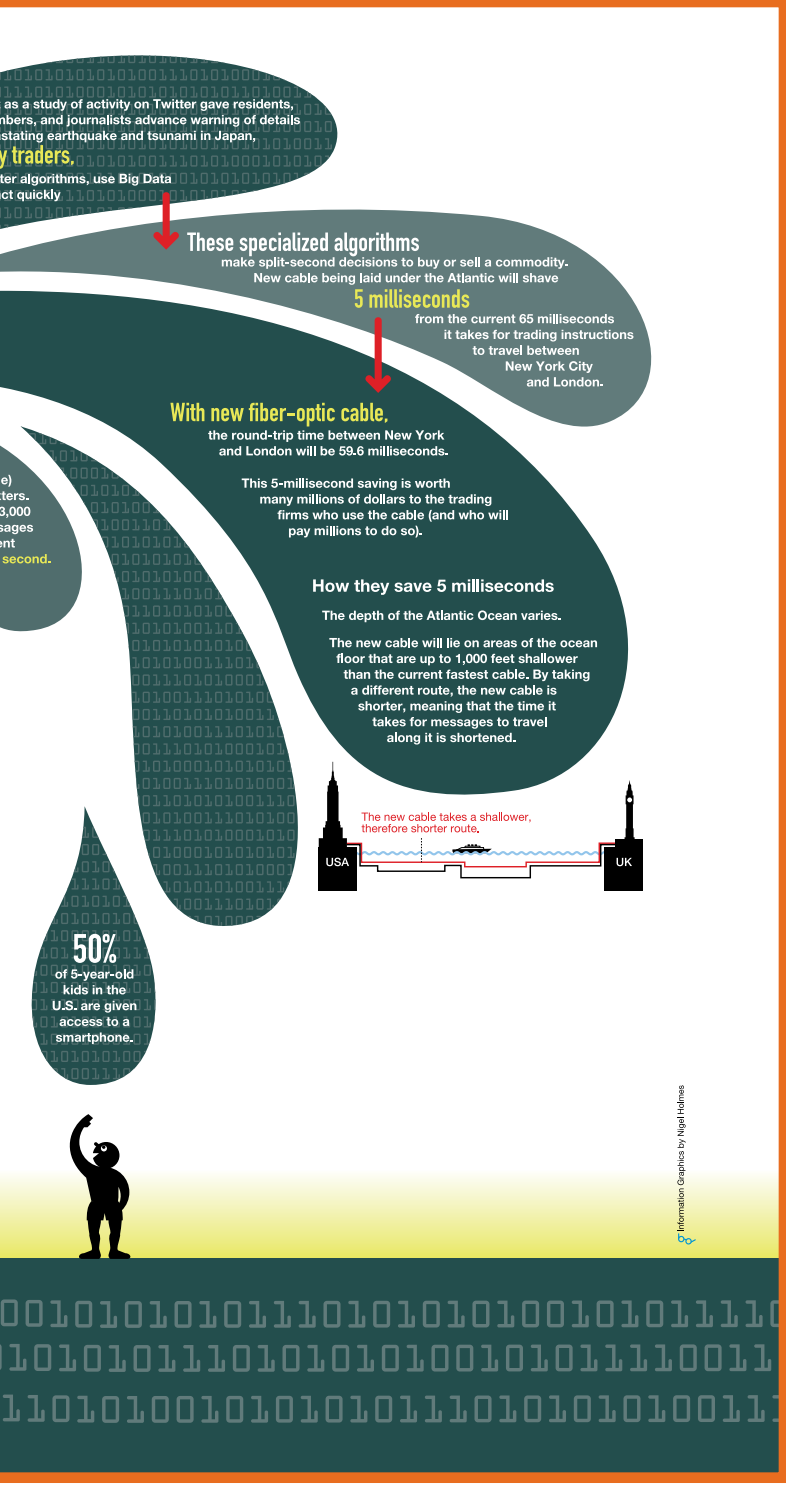
The desire for immersive experiences gives museums yet another avenue for "Takin' it to the Streets" (as we explored in TrendsWatch 2012). The **MINT MUSEUM UPTOWN** in Charlotte, North Carolina, incorporated **live music into their marketing** for their Romare Bearden "Southern Recollection" exhibit, creating living billboards that featured reproductions of Bearden's work activated by live performances. Periodically, musicians dressed as characters in the paintings would show up and play unannounced gigs in front of the billboard. The **RIJKSMUSEUM** staged **a recreation of The Night Watch** in Amsterdam, with costumed reenactors invading a public shopping mall on horseback and swinging from the balconies.



Above: © Nigel Holmes 2012, from The Human Face of Big Data.

A Geyser of Information:

Tapping the big data oil boom



While the human race is rapidly depleting or degrading natural resources—oil, water, minerals, biodiversity—one resource is growing at an exponential pace. Every two days people create as much information as we did **from the dawn of civilization up until 2003**. Put another way, 90 percent of all the data in the world has been **generated in the last two years**. This includes digitized versions of traditional print media, as well as all the output of our interactions via social media: tweets, uploaded pictures and video, e-mail, instant messages, etc. Data becomes "big" when its scale is so large it can't be grasped, managed and manipulated by traditional statistical software, and the scale of the information we are generating now is mind-blowing: by 2012, people were creating 2.8 zettabytes of data a year, and this is **projected to double by 2015** ("zetta" is 2 to the 70th power). But what's really impressive are the tools we are developing to make sense of all these bytes.

Sci-fi author Sir Arthur C. Clarke coined three laws of prediction, the third of which is "Any sufficiently advanced technology is indistinguishable from magic." Big data analytics definitely launches us into that magical realm. While some of the current applications merely **increase efficiencies of traditional business** (reducing fuel use, for example), they can open up whole new vistas. Predictive marketing enables stores to process the vast amount of personal data they collect on customers to identify what they might buy, and when, with pinpoint accuracy. (Target famously **outraged one father** by sending coupons for baby products to his teenage daughter, only to have the abashed dad find out "there's been some activities in my house I haven't been completely aware of.") Analysts are becoming ever more savvy at reading the digital footprints we leave via social media, **parsing our Facebook posts** or **mining our tweets** to predict our **basic personality traits, values and needs**.

Below: Comments Wall in The **Tate Modern's "Art in Action" exhibit**. In addition to being shared with visitors, tweets were used for "sentiment analysis." © Tate Photography

Big data analytics aren't confined to marketing, either. **Predictive policing** modeled on earthquake prediction algorithms is being use to spot "fault lines" of crime, forecasting where and when criminal acts such as burglary and gun violence will occur, and who will become a repeat offender. **Esri**, which characterizes itself as a "**Facebook for Maps**," integrates geographically tagged data with maps, social networks and statistical analysis to help with functions as diverse as finding lost hikers and mobilizing relief aid after natural disasters. Big data is being enlisted by the nonprofit humanitarian sector to do more and better good as well. "**Big Data for Development**" brings real-time monitoring and prediction to global aid programs: the United Nations **Global Pulse** project can analyze Twitter messages to predict spikes in unemployment, disease and food supply prices—what they call "digital smoke signals of distress." At some point, this predictive software begins to look like precognition: a 27-year-old computer prodigy recently **created an algorithm** that mines news archives to predict possible disasters, geopolitical events and disease outbreaks with 70–90 percent accuracy.

While for-profit companies are at the forefront of exploiting the potential of big data, nonprofit organizations are already creating data sets that draw on museum data, particularly from the arts. Examples include Fractured Atlas' **Archipelago** data visualization software, Americans for the Arts' **Arts & Economic Prosperity Calculator** and the University of Pennsylvania's **Social Impact of the Arts**

Project (SIAP). These may only count as "medium large" rather than truly big data, but they point to how such tools may evolve as cultural organizations realize the power of pooled data resources.

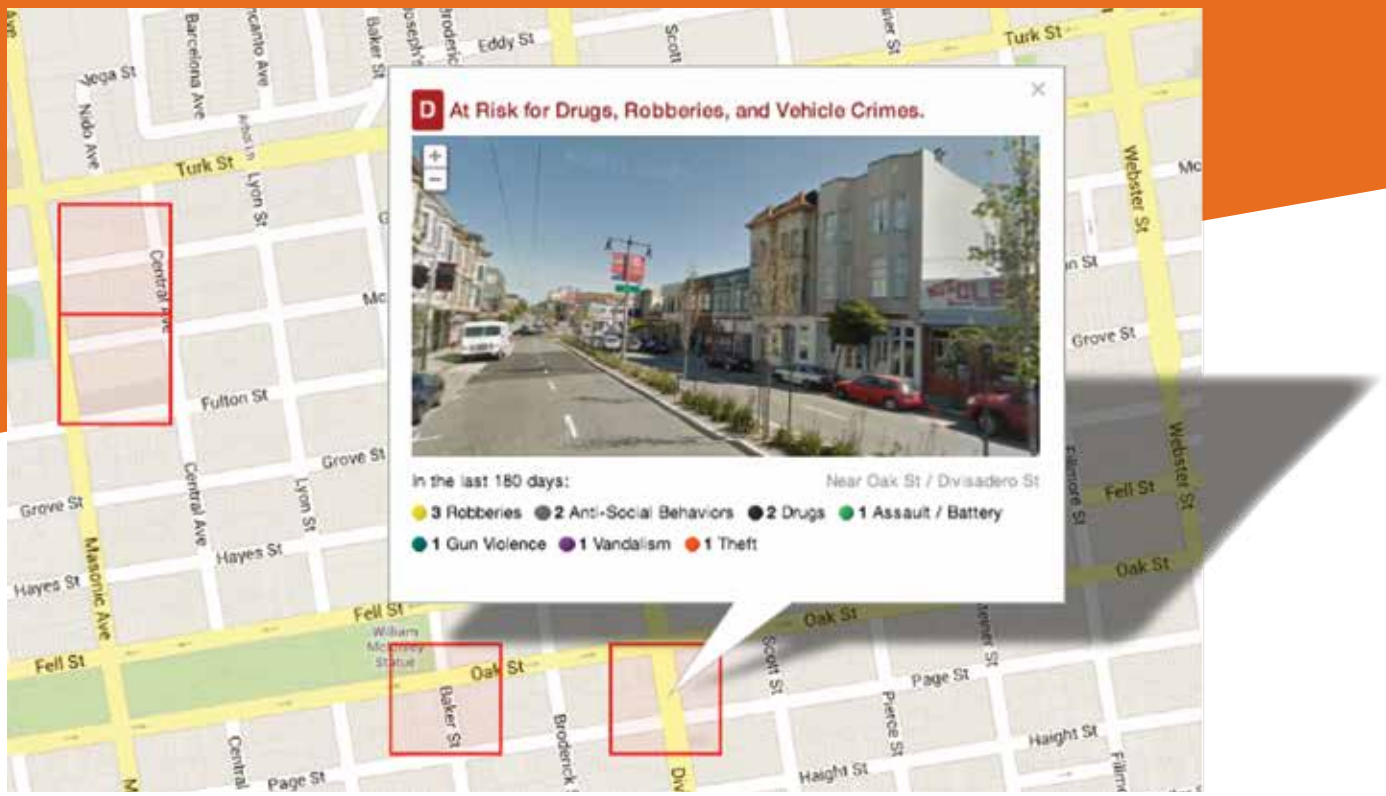
While some commentators are already saying Big Data is **overhyped**, there is no sign of it slowing down. Its growth is fueled in part by the power of combining the information collected via the "Internet of Things" (ubiquitous Internet-connected sensing and monitoring devices) with more "traditional" forms of data collection (the U.S. Census, mobile, landline, in-person intercept surveys, etc.). And it is driven by linking all these sources to rapid advances in computing intelligence that can recognize patterns and learn from its own mistakes. This in turn is supporting a **growing workforce** of programmers, analysts and data-literate managers.

What This Means for Society

For decades, science fiction has speculated on whether human workers may be displaced by robots, whether humanoid or transformer-like. Now it seems that the disruption will be more subtle but just as profound. In 2011 **IBM Watson** caught our attention by beating human champions Ken Jennings and Brad Rutter at **Jeopardy**. That was just prologue to the real work of this artificial intelligence system. Watson's ability to understand questions posed in natural language, mine huge data sets and learn from interacting with that data is now being harnessed to create a **health-care Watson** to improve diagnosis and treatment decisions, and a Wall Street Watson to give advice on investment choices, trading patterns and risk management. The question is not so much whether big data channeled through programs such as Watson will displace jobs, but how it will change the human role in decision making. Researchers point out that the biggest challenge facing doctors, investment analysts, engineers, policy makers and managers is **learning to trust analytic algorithms** rather than their own judgment.

As our country faces an epidemic of obesity and attendant diseases, and as Boomers enter their retirement years projected to live longer and be sicker than any previous generation, we face a crisis in personal health management. Big data has something to contribute in this arena as well: the **Quantified Self movement**, consisting of people who believe that collecting obsessively detailed data about their own bodies can improve health and behavior. This movement is driven by increasingly affordable **wearable biomonitors** in the form of wristbands or sensors embedded in your shoes or sewn into your clothing that track how many steps you take, how much and how well you sleep, your heart rate and how many calories you consume. In the near future, these may be joined by **biomonitoring implants** tracking your body from the inside. These tools have been shown to affect physical health, and paired with interactive software and a diagnostic, cognitive system like Watson, such monitors **could largely supplant traditional psychotherapy** as well.

Just as we begin to discover how much we can do with massive data mining, society is already struggling to decide how data should be used. As with all technology, analytic tools



Above: PredPol uses big data analytics to assign probabilities to where and when future crimes may occur. Courtesy PredPol.

themselves are neutral, and the devil is in the application. When does predictive policing become cyber-profiling, the digital version of stop-and-frisk? Will "data profiling" result in a **segregated Web**, where what you see on the Web depends on your age, race, gender or income? When do an individual's rights to control personal data trump the public interest in the good that can be achieved by pooling this data?

What This Means for Museums

Data analytics give museums tools that enable them to hone their business practices and become more efficient in operations like food service, sales, pricing, marketing campaigns, retail, development and exhibit design. Museums can index attendance data to literacy rates, household incomes, average number of children and other community services to yield an intimately detailed picture of whom they are serving. Data mining can help museums understand how weather patterns affect attendance, or create personalized promotions, experiences and discounts based on demographics and past behavior. It has the ability to transcend "traditional" market research information (age, household income, etc.) to create and target demographic and psychographic profiles, delve deeper into understanding human behaviors and reach desired audiences.

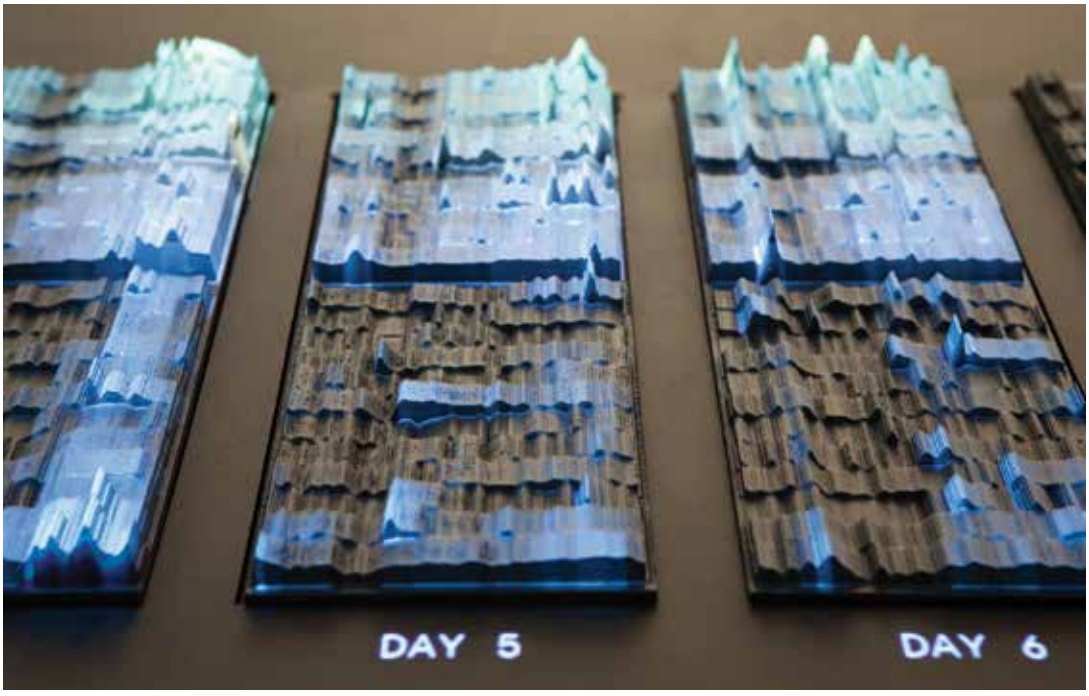
Even though many powerful data sets (U.S. Census data, for example) are freely available in the public domain, harnessing the power of big data can still be relatively expensive. Will the competitive advantage conferred by data analytics widen the gap between museums that afford such services and those that cannot? Jacob Harold, CEO of the nonprofit financial watchdog GuideStar, is encouraging nonprofits to **master "medium data"** about who they are and what they are trying to do as a manageable first step before tackling the

"big stuff." And less expensive ways to learn from data are **emerging all the time**. Still, to minimize the potential for such inequity, the field needs to compile and share **resources that can make analytics affordable** even for small museums.

The potential to cross-index museum attendance and engagement data with records about health, educational attainment, employment, satisfaction and life condition means that museums may finally be able to document their real, long-term impact. Prior to this, tracking the life-long effects of cultural engagement with museums has required the kind of massive longitudinal study that is **rare in medicine** and unknown in the humanities. As MuseumGeek Suse Cairns **blogged last year**, "What happens when we start judging success as being about lifetime engagement rather than just numbers in the door? The scale and possible granularity of that measurement is staggering." Philanthropic foundations are already turning data analytics inward to examine the effects of their own giving—see, for example, the **Hewlett Foundation's free, Creative Commons licensed tool for analyzing grants data**. This will only increase the pressure on organizations they fund to provide data on outcomes to feed back into that analysis.

Sadly there are countless entities collecting "bad data" informed by poorly designed surveys. Improperly applied, or applied to bad data, analytics may only yield bigger, badder decisions. To wade into the world of data analytics, nonprofit organizations will have to become informed data consumers, even if they don't have a statistician on staff.

Below: **Emoto data sculptures** captured the emotional ups and downs of London 2012 Olympics as expressed via 12.5 million Twitter messages. Created by Moritz Stefaner, Drew Hemment, Studio NAND. A FutureEverything project with MIT SENSEable City Lab for the Cultural Olympiad programme and London 2012 Festival.



MUSEUM EXAMPLES

The **SEATTLE ART MUSEUM**'s installation **Mirror**, by Doug Aitken, uses responsive editing software that tracks weather, traffic and atmospheric conditions and renders them as images projected onto 12 stories of the museum's façade, pulling from hundreds of hours of footage Aiken filmed around the museum, city and state. The pixels in the logo on the **webpage of the NEVADA MUSEUM OF ART** change color throughout the day and the seasons, taking on hues determined by the previous hour's temperature information in Reno. This dynamic image, driven by environmental monitoring, gives form to data that pertains to the museum's Art + Environment-oriented identity.

Some museums are already using data analytics to hone their operations. **HISTORY COLORADO** and the **POINT DEFIANCE ZOO & AQUARIUM** are both working with IBM partner organization **Bright Star Partners** to capture visitor-related data from point-of-sale systems (admissions, store, food service) and analyze it in real time. This data enables the organizations to make efficient decisions about staffing and use of space, and tailor their membership programs, pricing and communications to the demographics and behavior of their audience. In the near future, the zoo intends to **enlist the Near Field Communication capabilities of smartphones** to encourage visitors to "check in" as they move through the grounds, which will help managers assess the popularity and dwell time of particular exhibits. The **DALLAS MUSEUM OF ART** uses **Chartio** for real-time analytics of patterns of membership sign-up and visitor use of the museum.

As data becomes more valuable, it becomes, in effect, **a kind of currency**. Even museums have cottoned on to this: early last year **the DALLAS MUSEUM OF ART** introduced a membership model that invites visitors to trade personal data for a "free" basic membership. The DMA's membership structure is designed to capture as many people and as much data as possible. The information they collect includes Zip-plus-four, which they can cross-reference

Museums Might Want to...

Assess the analytic potential of the data sets we are making freely accessible over the Web. What can museums do with digital data that we can't do with the objects the data represents? What value can be created using large-scale analytics, and how do we encourage researchers to ask interesting and appropriate questions that can be answered with our data sets? We are just beginning to explore the value of **big data in the humanities**. If museums don't start data mining to extract the value of their own resources, **other more tech-savvy organizations will**.

Join the growing number of organizations that are cooperatively pooling large data sets, allowing cross mining—a form of sharing sometimes called "**data philanthropy**." Esri, for example, has launched **ArcGIS**, a "social networking hub

with Census data for a demographic snapshot, and real-time data from cards that encourage members to "check in" to galleries during their visit. This enables the museum to engage with members in a more interactive and personalized way, and to compile a detailed and compelling story to tell funders about whom the DMA is serving, how they engage with the museum and what they learn.

Big data has an aesthetic side as well. **THE ALBUQUERQUE MUSEUM OF ART AND HISTORY** features **Agnes Chavez & Alessandro Saccoia's (x)trees**—a "socially interactive virtual forest" generated from search words found in tweets and text messages, making it an experiment in data visualization, video mapping and participatory art.

for geographic information" that enables any user to share maps in a cloud environment. Many are calling for a "**data commons**" where even commercial companies would contribute data stripped of personal information. Museums would do well to identify who holds the data they would most like to access for their own analytics, and play nice about sharing their own data, too.

Audit their approach to collecting and using data, and focus on doing data-centric work, becoming what are sometimes called "**learning organizations**" Museums can seek capacity-building grants from funders to improve their ability to gather and manage data in a way that improves their ability to track impact and improve their bottom line.

Further Reading

Rick Smolan and Jennifer Erwitt, *The Human Face of Big Data* (Against All Odds Productions, 2012, 224 pp.). This impressive coffee-table sized book presents images, essays and articles based on the conclusions of the Human Face of Big Data Project, which used a free mobile app to create a week-long "snapshot of humanity" from information contributed by over 300,000 participants worldwide. (Merging print with digital media, the book uses the Aurasma mobile app to trigger video and other content by using a smartphone or tablet camera to read icons on selected pages.)

Anthony Lilley and Paul Moore, *Counting What Counts: What big data can do for the cultural sector* (Nesta, 2013, free downloadable PDF, 3.77 MB).

Tony Hey, Stewart Tansley and Kristen Tolle (editors), ***The Fourth Paradigm: Data Intensive Scientific Discovery*** (Microsoft Research, 2009). Available as a ***free download*** from Microsoft Research, this collection of essays explores how data analytics will shape 21st-century research.

Paving the Path to a Big Data Commons (World Economic Forum and Vital Wave Consulting, 2013, free downloadable PDF, 7 pp.). This briefing explores personal data and how issues of privacy and data ownership can be balanced against the good that can be realized from the open use of such data.

Phil Simon, *Too Big to Ignore: The Business Case for Big Data* (Wiley and SAS Business Series, 2013). Presents an overview of how businesses and municipalities are using data analytics to make "astute and otherwise impossible observations, actions and predictions."

Above and Right: Wristbands let parents track their children via Wi-Fi triangulation. Courtesy Filip Technologies.

Privacy in a Watchful World:

What have you got to hide?

In a world where companies and governments can, and increasingly do, track vast amounts of personal information about our habits, preferences, behavior, communications and even our thoughts, where will we draw the line? People evidently enjoy the benefits of social media and big data—Amazon suggesting "you might like"; your phone **flagging the proximity of a potential date** pre-vetted by your friends; monitoring systems that send alerts when an elderly parent isn't taking medication—but sometime in the last year we seem to have crossed the "**creepy line**" that Google's CEO famously warned against. Now governments are struggling to regulate the use of personal information, companies are weathering backlash for customer surveillance in-store and online, and individuals are exploring a suite of options for covering their digital tracks.

As pointed out in the previous essay in this report, digital data is the one of the few resources increasing, rather than being depleted, by human activity, and plenty of companies are setting out to exploit this resource. Some of this data is generated by online activities: e-mail, use of social media, shopping and Web browsing are all fair game. **Tweetmining** is the practice of some companies harvesting, analyzing and selling old tweets to others that want to gauge reactions to their products and services.

The new Graph Search engine on Facebook makes it easier than ever for marketers, or hackers, to **assemble detailed profiles of users**. We're even developing technologies that can reach through the screen to gather data on the physical you, using the monitor's camera to **track what you are looking at** on the screen and how you react to advertisements.

Just carrying a cell phone makes you a target. Retailers can use smartphone signals to capture serial numbers and track users' locations. A firm hired to install **bomb-proof trash bins** in London prior to the Olympic Games embedded tracking technology that used phone signals to follow people through the streets.

Being off-line, even sans phone, is no protection. Our world is saturated with sensors that watch you in the real world. How many video cameras do you pass in the course of a day? Video is data, and enormous amounts of information can be gleaned from a feed. Stores use facial recognition software tied to video feeds to **analyze the demographic profile** of shoppers—age, gender and even race—to tweak everything from what merchandise they display to what kind of music they play to appeal to their typical client at a given time of day. Some high-end stores are using facial recognition software to **spot VIPs**s so staff can be alerted via iPad or smartphone and provided with data on the celeb's preferences or buying history.

The abilities of these systems border on telepathy, analyzing facial expressions to infer feelings and moods. One retail system specializes in deducing shoppers' "**emotional engagement**" with products from video streams in-store or onscreen. The Department of Homeland Security is testing **Future Attribute Screening Technology**, a "pre-crime" detection program based on sensors that secretly collect video, audio, cardiovascular signals, pheromones, electrodermal activity and respiration, and applies algorithms to identify suspicious individuals (hopefully distinguishing between the elevated heart rate of a mere nervous traveler and cues denoting a true "unknown terrorist").

Museums are adapting surveillance technology to their own purposes. They are using the feed from security cameras to **create safety perimeters** around objects on display. Some are monitoring (and responding to) real-time tweets and location data. (See, for example, how the **Tate Modern used Twitter**

Left: Adam Harvey's "Anti-Drone" scarf is made of a metallized fabric that protects against thermal imaging. **Above:** Stealth wear in the "**Privacy Gift Shop**" at the New Museum. The OFF Pocket phone case blocks all incoming and outgoing phone signals. Photos courtesy Adam Harvey.

for "sentiment analysis" of its exhibit "The Tanks: Art in Action.") Indoor GPS systems give museums the ability to tell—to within 3 to 10 feet, depending on the system being used—where a visitor is in the building, and **museums are using this ability** in conjunction with apps to push location-appropriate content to visitors, tailored to the exhibit they are in. Researchers have even played with **measuring the physiological reactions of visitors** as they move through an exhibit.

There is a **long history of concerns about privacy**; these are being accelerated by ever more sophisticated surveillance technologies. Tidying up your legacy is no longer as simple as **burning a pile of letters**. People are becoming more conscious and careful about what data they share, and with whom. **One recent Pew study** reports that over half of app users have uninstalled or not installed an app due to concerns about personal information, and 19 percent turn off the location-tracking feature on their cell phone. **Another Pew study** showed 68 percent of the public feels current laws are inadequate to protect people's privacy online, and half of Internet users are concerned about the amount of personal information about them that is online.

In particular, people are protesting the collection of data they have not voluntarily provided. Many major retailers now use **Indoor Location Tracking Software** that ties together data from surveillance cameras, sensors and WiFi. Shoppers aren't always aware this is happening or happy when they find out. When Nordstrom's, in an effort to be transparent in its operations, disclosed how it was monitoring customers, it provoked a **"firestorm" of criticism** and had to stop. Google decided **not to install facial recognition software** on its wearable heads-up display, Google Glass, due to concerns expressed by the public and a congressional committee that this feature could be used to call up personal data on anyone a Glass user encounters. With or without facial recognition, 5 Point Café in Seattle made a point

of **banning Google Glass** before it was even commercially available, while a related establishment actually **booted out** an early adopter of Glass later in the year.

In 2013 these privacy concerns came to a head. The leaks by former NSA contractor Edward Snowden of classified security documents showed the massive extent of U.S. government surveillance, and his claim that **Google, Facebook, Apple and Microsoft were complicit** shook users' faith in those companies. While the Boston Marathon bombings showed the power of surveillance plus social media to identify perpetrators, it also demonstrated the power of those forces to **stigmatize the innocent**. Surveillance drones have become such a reflexively scary meme that when trusted vendor Amazon announced it might start **delivering packages via drone**, it unleashed a **torrent of concern**.

"Museums have always been sites of intense surveillance—security guards, metal detectors, bag searches and lots of cameras. Now that surveillance is being extended to visitors' smartphones, social media posts and even their facial expressions, not to protect the collections, but to better understand visitor behaviors."

—Eric Hintz, Historian, Lemelson Center for the Study of Invention and Innovation, National Museum of American History, Smithsonian Institution

Not content to wait for legal protection, some people are inventing creative ways to protect themselves from overbearing surveillance. Artist Adam Harvey has introduced "**Stealth Wear**" clothing that can outfox drones by countering thermal imaging, an "anti-paparazzi clutch" and a stylish privacy case that blocks the signal of mobile phones. Harvey has also come up with **makeup patterns and hairstyles** that can defeat facial recognition software. Other artists are raising awareness about and provoking debate on privacy issues by creating "**surveillance art**" that appropriates public data and images from the Web or uses covert tactics to collect data from unsuspecting subjects.

What This Means for Society

Society is struggling to find appropriate boundaries and regulations to rein in digital surveillance. The city of London, for example, made the Renew ad firm yank those WiFi tracking trash bins from the streets, even though it wasn't clear they were violating any specific

regulations. On a broader scale, the European Commission is struggling with how to **protect the data of EU citizens**, including trying to extend their control to foreign companies that process personal data of EU citizens. In the U.S. the Obama administration has proposed a **Consumer Privacy Bill of Rights** to give users more control over how their information is handled. Yet even if the government or corporations promise not to collect personal identifying information or to strip it from the data they do collect, data analytics are capable of ***inferring* personal data**—creating data that isn't protected by current measures.

There is a growing awareness that the issue at stake isn't just privacy, it is also control of personal data—the right to know what data is being collected about you, to set boundaries on how others can use it and to **access this data for your own use.** At the corporate level, a few businesses are beginning to voluntarily **give users access to data** they generate through the company's services. Arguing that data is a form of personal property, some are calling for a **Digital Consumer Bill of Rights** that recognizes and protects the value of that property, establishing, for example, that people deserve compensation if a company loses or misuses personal data it has "borrowed."

Children traditionally have fewer privacy rights when it comes to masking their activities from parents, teachers, and other guardians and protectors. The past couple of decades have shortened the leash even further, due to increased concerns about safety and the rise of the helicopter parent. Now parents are deploying surveillance tech as well, **using watches and other miniature sensing devices** to keep track of their kids. Some have wondered if this may culminate in **microchipping children** as the ultimate safeguard. Would this be the first step towards an Orwellian society in which everyone is chipped and monitored (for their own good, of course)?

Just as the rise of the Internet gave rise to calls for digital literacy, concerns over surveillance and data mining have highlighted the need for **privacy literacy**. This may range from promulgating **simple rules** that eventually will seem like common sense (but currently are far from obvious to many people) to creating **privacy education programs** for children.

What This Means for Museums

Emerging surveillance technologies hold enormous promise for evaluating and fine-tuning what museums do, and for meeting the rising demand for personalized experiences. Some museums are already installing **pervasive free WiFi systems** that support the use of indoor GPS and content delivery for visitors. These systems can also be harnessed to track visitors, just as retail stores are doing. In the near future, museums may also have the capability of monitoring how much of a label visitors are reading, how long they look at a painting or their emotional reaction to an object. This would provide the ultimate in visitor feedback and offer the opportunity to feed visitors content personalized to their actual behavior. Taking a lesson from Nordstrom's, however, museums must balance the benefits of using these technologies with the potential backlash.

Museums enjoy **high levels of trust**, but that may mean people also expect them to maintain higher standards than commercial companies or the government. Museums need to determine how to apply the standards of transparency and accountability which govern their institutional operations to the collection and use of personal data, while striving to communicate **more clearly** than the average social media privacy policy.

As artists mine digital data and social media for content, or deploy their own surveillance devices, museums need to consider the privacy concerns of people whose posts, images and information may have been co-opted without their permission. The legal issues surrounding use of online data and images appropriated from social media are **still being worked out**, but even where the legal issues are murky, such concerns may have ethical standing—presenting a whole new area of sensitivity for museums to navigate.

Museums Might Want to…

Review internal policies and procedures about data collection to ensure that any personal data they hold is secure and that appropriate disclosures have been made **about what is being collected and how it will be used**. Consider creating data protection statements for **subscriptions to e-newsletters**, **online interactions** and **apps**.

Consider sharing with users the data that the museum collects about them, in a way that is useful to them. Recognize that the data people provide the museum is valuable, and give them something of value in return.

Consider the privacy concerns of employees and staff. HR staff are increasingly using Internet searches to vet prospective employees. In making policies about what is, and is not, fair game, museums should consider whether such New Age background checks disadvantage candidates who are not savvy about **tidying their digital footprints**, which might further narrow the diversity of museums' already homogenous applicant pool. Insider theft is a significant source of risk to museums, and reasonable monitoring of staff is prudent—but what constitutes reasonable? Museum policies about background checks, hiring and monitoring of staff's physical and online activities need to adapt to these new realities, while keeping pace with employees' expectations and concerns.

Devote time, in their organizational planning, to envisioning the future of surveillance technology and privacy concerns five or 10 years from now, and factor this into their decision making. This will help create a technological, physical and policy infrastructure that can adapt to the rapid changes in these fields.

Further Reading

In November 2013, the National Museum of American History presented a day-long symposium on **"Inventing the Surveillance Society."** Content is available via the archived webcast, blog posts, podcast (with designer Adam Harvey) and Storify.

Dave Eggers, *The Circle* (Knopf, 2013). In this work of dystopian futurist fiction, Eggers explores the total control exerted by a giant tech company over its employees and society as a whole. In an economy based on strip mining personal data, the Circle's motto is "Privacy is theft, Secrets are lies."

Seeta Peña Gagnadharan, *Joining the Surveillance Society? New Internet Users in an Age of Tracking.* (New America Foundation, 2013, PDF, 18 pp.). An in-depth look at surveillance and privacy problems faced by individuals who turn to digital literacy organizations for training and Internet access.

Wolfgang Sofsky, *Privacy: A Manifesto* (Princeton University Press, 2008.) An exploration of the history of the status of privacy in society, and deconstruction of the social, political and technological forces eroding privacy today. First chapter available free online as HTML or PDF download.

Daniel J. Solove, numerous publications on surveillance and privacy from a legal perspective. Solov is a professor of law at George Washington University Law School in Washington, DC.

MUSEUM EXAMPLES

In August 2013 the **NEW MUSEUM** debuted the **Privacy Gift Shop**, a pop-up store featuring "stealth wear" by artist Adam Harvey and fashion designer Johanna Bloomfield. The project was designed to promote conversation about domestic and international surveillance and threats to individual privacy.

The **JEWISH MUSEUM** decided to **remove photographs** from the exhibit "Composed: Identity, Politics, Sex" after receiving complaints from men who appeared in the photos. The artist, Marc Adelman, had appropriated the images from a gay Internet dating site. The museum positioned their decision as a response to "complex issues of privacy, privacy expectations regarding photos made available on social media, personal safety, and the consequences of image appropriation in the digital age," but Adelman took issue with the decision, saying he felt that the work itself was an appropriate way to explore those very concerns.

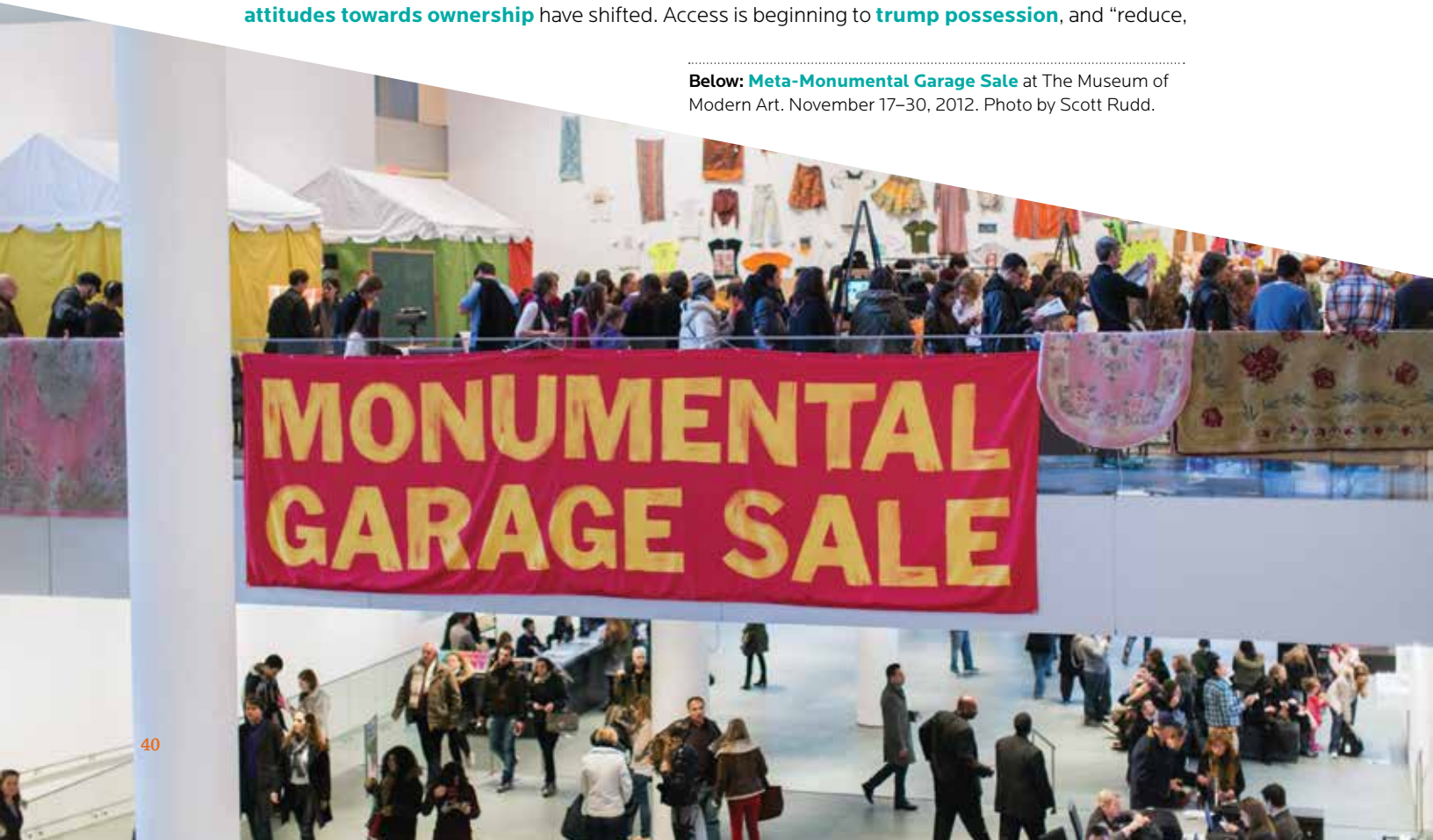
A number of recent museum exhibits have explored the history of surveillance and its appropriation by artists. The **NORTHERN ILLINOIS UNIVERSITY ART MUSEUM** presented "**On Watching and Being Seen**" in fall 2013. The exhibit and accompanying **film series** explored the impact of social media and surveillance technology on voyeurism and exhibitionism. Works included dot paintings by Houston artist William Betts derived from public surveillance camera footage, and embroidered drawings by Chicago-based Kathy Halper of intimate Facebook posts by young adults. In 2010 the **TATE MODERN** originated "**Exposed: Voyeurism, Surveillance & the Camera**", exploring the history of covert photography as well as current issues related to individual rights versus security in an age of terrorism. The exhibit subsequently went on tour to the San Francisco Museum of Modern Art and the Walker Art Center in Minneapolis.

What's Mine Is Yours:

The economy of collaborative consumption

Nature abhors a vacuum, and both environmentalists and capitalists hate waste. That empty room in your house—why not rent it out? You only drive your car on weekends—why leave it sitting at the curb the rest of the week? You have a couple of hours free—why not take on an odd job? Welcome to the era of collaborative consumption, also referred to as Peer to Peer (P2P) or the Sharing Economy. This movement isn't just about altruism, though—it's also about creating profit from underused resources. "Sharing" **generates** an estimated $3.5 billion annually and is projected to grow to $110 billion in just a few years. It has the potential to significantly transform how we create, consume and monetize resources.

At one time, success in America meant owning a home and a car or two, financed by the bank; hopping in a taxi for a nice dinner at a restaurant; and flying to a vacation spot where you drove to your hotel in a rental car. But the mortgage loan crisis overturned the assumption that the path to middle-class stability was grounded in home ownership, and the recession, high unemployment rates and income depression put increasing pressure on consumers to make the most of what they have. Our **attitudes towards ownership** have shifted. Access is beginning to **trump possession**, and "reduce,



Below: Meta-Monumental Garage Sale at The Museum of Modern Art. November 17–30, 2012. Photo by Scott Rudd.

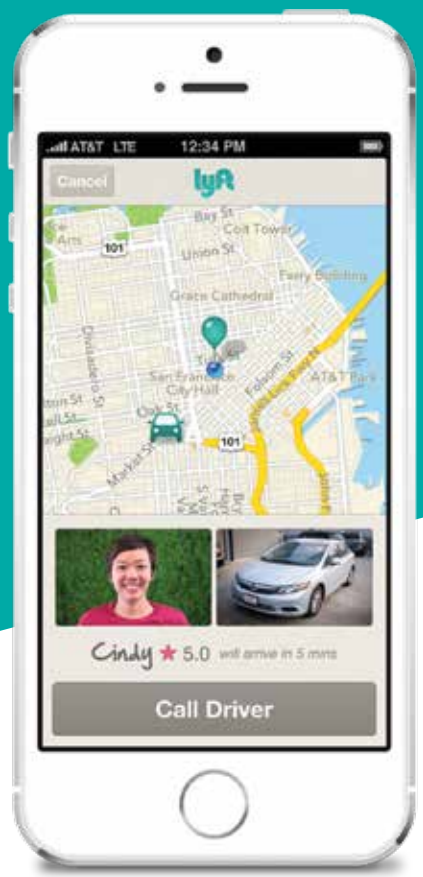
Above: Sharing the "wisdom of elders." Courtesy The Amazings.

reuse, recycle" isn't just a mantra for environmentalists anymore; it is a set of principles for anyone trying to get by.

There has always been sharing, of course, via yard sales, classified ads, notices posted on the coffee shop bulletin board. The difference now is scale: the Internet provides an incredibly efficient and effective way to match sellers and buyers of unused things and time. And our increasingly dense urban environment makes it easier to make a good match. This opens up new competitive niches for entrepreneurs, and it offers consumers the prospect of lower costs as well as faster, more personalized services.

As with so many current trends, collaborative consumption is being driven in part by the Millennials: their economic status (**low employment**, the long-term **burden of student loans**) and **attitudes towards ownership**. When you don't have much space or much money, it may be preferable to rent rather than buy a **a fancy dress for a big occasion**. Or seek out **libraries that loan out tools and kitchenware** in addition to books. This is a generation that would rather **spend money on experiences** than on durable goods. They stream music from Pandora or Spotify rather than downloading it (much less buying CDs). But collaborative consumption is also **welcomed by companies** that recognize the economies of sharing resources and integrate this practice into their workplaces.

In a world increasingly dominated by large, faceless corporations, P2P also brings business back to a human and personal scale. Collaborative consumption, after all, is **based on the value of trust**: How do you decide whom to let into your house or your car? How do you know if that guy will return your chainsaw, or take you where you want to go? P2P companies typically screen the people who provide services through their platform—this, together with matching clients and consumers and facilitating payments, is one of the core services they provide. But P2P also **builds trust**



Left and Above: Lyft pairs passengers needing a ride with drivers who have a car. Courtesy Lyft.

and community because it is comprised of interactions at least seem more personal than those provided by faceless corporate entities. Some advocates of collaborative consumption point to these personal connections as one of the benefits of P2P transactions—countering the increasing isolation and anonymization of society. **Neighborgoods**, for example, makes "building community" an explicit part of its sales pitch.

How does sharing work? Take housing: **Airbnb** enables anyone with a house, an apartment, a room, even a spare couch, to compete with mainstream hotels by renting space to travelers. With the soaring cost of real estate, this is a god-send to people with mortgages or rent to pay. Zipcar owns a fleet of vehicles that people can rent by the hour, picking them up from widely distributed locations embedded in neighborhoods (no more hiking out to the airport to find Avis). But P2P can cut out the middleman entirely—**RelayRides** helps people rent out their own cars when they aren't using them.

The Sharing Economy isn't just about big things like housing and transportation. **Neighborgoods** facilitates borrowing, renting and selling stuff "between friends" by creating neighborhood inventories of available resources. Several services let urban wanna-be farmers **rent chickens** (which, once you work the numbers, is clearly about the experience, not the eggs). **Trendly** helps you pass that fancy dress on to someone else after you wear it to the wedding.

And it is not just about goods, it's about labor. **TaskRabbit** helps people shop out small pieces of work (picking up laundry, vacation planning, proofreading, assembling IKEA furniture) to "Rabbits" willing to take on odd jobs. **Uber, Lyft and Sidecar** match people needing a ride with drivers willing to take them where

they want to go. **Feastly** promises to "democratize dining" by enabling home chefs to invite eaters into their house. Dog-loving social entrepreneurs can register with **DogVacay**, getting their canine love fix by **caring for dogs rather than owning them** (and making some money, to boot).

Sharing is also about knowledge, as an increasing number of platforms help people market what's in their head and hands: **Skillshare** for teachers, **The Amazings** for "crafty elders," **Vayable** for knowledgeable locals willing to serve as tour guides for their city. It's even about money itself: **Lending Club** lets consumers lend money directly to each other, bypassing the bank.

And sharing is, sometimes, truly altruistic. Portland, for one, is chock-a-block with nonprofit or informal "sharing" services such as **Yardshare—**a forum to open unused land to gardeners. This forum plays out on a national scale as well: the **Neighborhood Fruit** app encourages people to find and share fruit, "both backyard bounty and abundance on public lands"; it has mapped 10,000 trees and counting. **Piqniq** helps colleagues organize food-sharing groups in their workplace. These examples of noncommercial, organized "sharing" are ways for people to value "**community over selfishness, and sustainability over novelty**."

In the future, the Sharing Economy may accelerate as it begins to **interface with the Internet of Things**. Internet-connected sensing devices could post their availability for use without a human intermediary, resulting in even more efficient allocation of resources. (This concept has been explored by **Brad the Toaster**, an appliance who, when he finds himself to be underused and underappreciated, ships himself to a more suitable "host.")

> "Social media is about sharing online. We've extended that behavior into the offline world… The last century was predicated around ownership as status. There's an opportunity for this century to be defined by access as status."
>
> *—Joe Gebbia, co-founder Airbnb*

What This Means for Society

Some people fear the effect of collaborative consumption on the economy could be **catastrophic**, as it disrupts traditional businesses such as taxi services and hotels, lowers home prices, and deprives governments of taxes and fees. It's not a simple equation, however. Services like Airbnb stimulate travel in two ways: they provide affordable housing for travelers, and they provide income to offset the cost of travel for a home owner who wants to hit the road. This may help nurture a rebound in tourism after years of recession-driven "staycations." When Sony teamed with the U.K.'s Forum for the Future to look at life in 2025, one of the **scenarios** they envisioned was a future in which the global economy is based on shared ownership and P2P transactions.

In a dismal job market, collaborative consumption offers a way for individuals to make a living outside traditional employment, and for entrepreneurs to build new businesses. By bypassing big middlemen that traditionally control access to resources, it may help distribute wealth more evenly. But the implications for labor are not all cheery. P2P startups, outside the bounds of or flying beneath the radar of existing regulations, have been accused of being one more way of **exploiting labor** and evading worker protections. Workers in the sharing economy are, in effect, **independent contractors** with no benefits, no steady paycheck and always on the prowl for their next gig.

Society is just beginning to address how to balance the interests of the public, new entrepreneurs and established businesses. This has led to **a number of lawsuits** as we seek to clarify the grey zone between regulated public commerce and less-regulated private ownership. Legislators and voters are debating fair ways to license, regulate and tax activity in the sharing economy. City commissioners in Grand Rapids, Michigan, **considered, but then rejected**, a ban on "short-term home rentals secured via the Internet." Airbnb has fought several battles along these lines, including **a tussle with** New York's attorney general. A nonprofit organization, **Peers**, recently formed to support the emerging Sharing Economy via community organizing and advocacy. It remains to be seen how the "sharing" business model will hold up when it must conform to constraints comparable to those faced by their traditional peers.

What This Means for Museums

The fact that Millennials prefer to spend money on experiences rather than on acquiring stuff opens the opportunity for museums to position

Above: Courtesy The Amazings.

themselves as a good buy. As pre-eminent players in the experience economy, museums can tout their status as the leading source of high-quality content you can use just as much of as you want, just when you want it. But the curation that creates that quality also restricts what is offered. Will people trained by services such as Spotify, Pandora and Netflix prefer experiences that are more agnostic about quality and content, but provide more choice?

Museums would seem to be in a great position to provide people with the pleasures of vicarious ownership—the opportunity to access all the stuff they don't want to buy. On the other hand, the Sharing Economy may be teaching folks to expect to be able to use, borrow or rent almost anything—and museums are not set up to share their collections on these terms.

If we are entering an era in which people don't want burdens of ownership, even more people may look to museums as repositories for the stuff they value but don't want to take care of.

If Millennials treasure, but don't want to schlep and store, stuff collected by their parents and grandparents, will they put it on the market or donate it to a museum? That would present challenges (since museums probably won't want the majority of what would be offered) and opportunities, not just for collecting, but for museums to play a role in ensuring the inheritance of a whole generation makes its way to an appropriate new home, rather than a landfill.

We are also experiencing the rise of the "**gig economy**" comprised of short-term projects, consulting, contract and part-time work all stitched together to make a living. Museums go through cycles of insourcing and outsourcing, but it seems over time like more and more work such as exhibit design, fabrication, evaluation and even registration, are being farmed out to external firms or accomplished with temporary employees. Will the Sharing Economy—with its hardnosed efficiency at meeting only the need that must be filled and using every scrap of resource to the fullest—propel museums into a world of more "gigs?" That might mean using labor-sharing services to find people to do small bits of work that might otherwise be bundled into a full- or part-time job. Or it might mean making a few bucks from museum staff, hiring out bits of their time for writing, editing, research or design.

Museums Might Want to…

Analyze what assets they can monetize in the Sharing Economy. Does the museum own underutilized resources (tools, equipment, vehicles, office space, workshops) that could be rented to the general public, businesses or other museums in their "down time?" Museums could invest in and then rent out sporadically used equipment such as **portable fumigation bubbles**, or rent use of specialized storage space such as ultracold freezers for tissue specimens, or cold vaults for film. Big cities usually have rental services that can provide large forklifts, gantries and other rigging, but in smaller communities where equipment like this is not readily available, it could benefit the local museum community to jointly purchase and share such gear.

Create services that cater to the desire for access rather than ownership, experience rather than material goods. What about creating a collection of art specifically designated for rentals, paired with ongoing training in art history and connoisseurship? Or a drivable collection of historic cars or carriages, consisting of vehicles the museum would not have accepted for the permanent collection? Ensuring that there is broad access not only to view but to temporarily own and use goods typically restricted to the well-off might help combat perceptions that museums **cater only to the interests of the 1 percent**.

Consider what goods and services museums could access via sharing, rather than owning. For a small museum, TaskRabbit might be an effective way to supplement the time and abilities of staff and volunteers for tasks like editing, graphics, Web design, carpentry or groundskeeping. Museums of all sizes struggle to find resources to send staff to conferences and professional training. The use of P2P transportation and lodging might make tight travel budgets stretch further.

Play a role as a hub or facilitator of sharing activities. Collaborative consumption by its nature reduces the waste stream and promotes green practices—a goal very much in alignment with the mission of many museums. And as noted above, the P2P economy is based on shared trust. What better venue for building and celebrating community cohesion than the local museum?

Above: Portland Museum of Art's Rental Sales Gallery. Courtesy Portland Museum of Art.

Further Reading

NPR's **All Tech Considered** devoted the week of November 11, 2013, to a **special series** on the Sharing Economy.

Beth Buczynski, ***Sharing is Good: How to Save Money, Time and Resources Through Collaborative Consumption*** (New Society Publishers, 2013). This book includes an overview of the history of sharing and a resource guide to current sharing networks.

Rachel Botsman, ***What's Mine Is Yours: The Rise of Collaborative Consumption*** (Collins, 2011).

MUSEUM EXAMPLES

The Student Loan Art Program at the **MIT LIST VISUAL ARTS CENTER** makes over 500 framed original works of art, primarily prints and photographs by leading artists, available to students and student groups for loan each September. Students can view the available pieces during a two-week exhibit and register their top three picks for the subsequent lottery. Artwork borrowed from the program can be displayed in dorm rooms or communal spaces. In a more business-like model, the **PORTLAND ART MUSEUM** in Oregon has a "**Rental Sales Gallery**" consisting of over 2,000 original works of art by regional artists available to museum members for rental or rent-to-purchase.

Artist Martha Rosler held the latest iteration of her "**Meta-Monumental Garage Sale**" at the **MUSEUM OF MODERN ART** (MoMA) in November 2012. The installation filled MoMA's atrium with objects donated by the artist, MoMA staff and the general public. The public was invited to come in and shop, and the process of haggling with Rosler over the price of an object became part of the performance. *The New York Times* **characterized it** as "an exhibition using conceptual instruments of value to interrogate Marx's theory of commodity fetishism." On a more modest scale, and in a less artistic though still high-minded vein, the **MUSEUM OF VANCOUVER** hosted **Swap-o-Rama-Rama**, a massive clothing swap that encouraged the community to "explore reuse and creativity" through recycling used clothing.

Robots!

Are Rosie, Voltron, Bender and their kin finally coming into their own?

For decades (if not centuries), futurists, writers and inventors have promised that robotic help—mechanized beings ready to serve as soldiers, maids, chauffeurs—is just on the horizon. In 1988 **pundits predicted** "convenience robots" would be part of our everyday life by the year 2000. But that horizon keeps receding. So far, more time has been spent angsting over whether robots will take over the world than actually making use of them. But advances in the last five years may signal that the age of the robot has at last arrived, and we may be on the brink of a "**Cambrian explosion**" in robotic evolution. Really. This time we mean it.

We've had effective industrial robots for some time—strong, fast, accurate, tethered to one spot, and walled off from the co-workers they could potentially maim. This century is seeing the rapid development of smaller, mobile robots with a far wider range of capabilities. Now robots are gentle enough to **help nursing home patients into or out of bed**, and can come equipped with **electronic "skin"** responsive to the lightest touch. At the more muscular end of the scale, the Department of

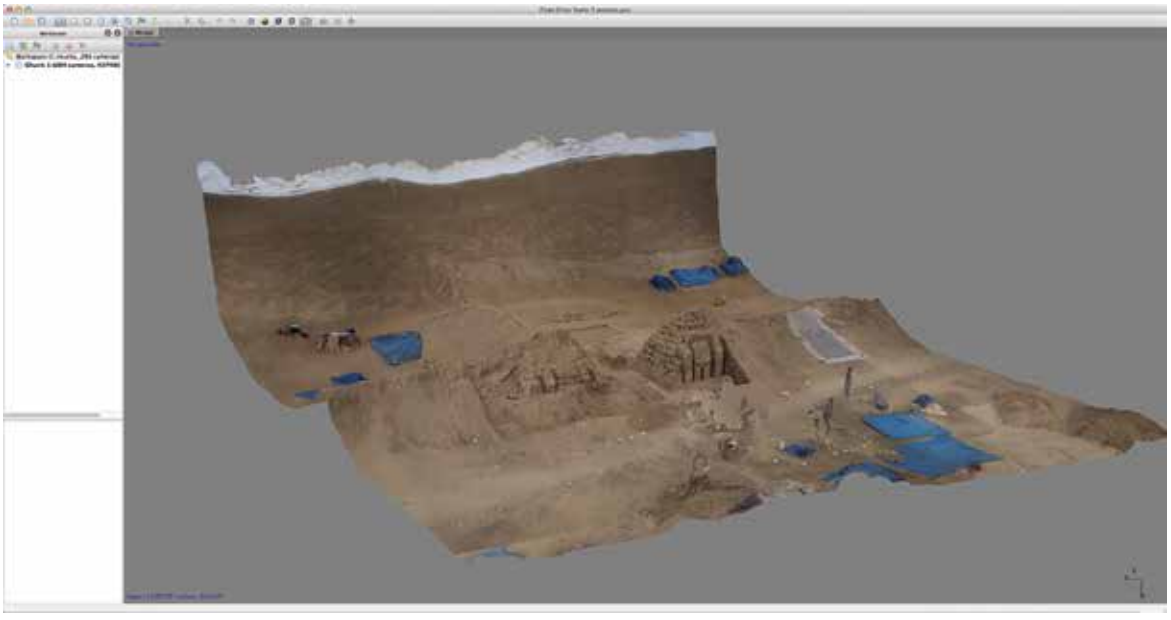
Left: Multicopter drone being used to record archaeological sites, Cerro Chepen, Peru. **Below:** 3D model of the excavation area at Chan Chan produced with photos taken by the multicopter. Photos courtesy of Luis Jaime Castillo Butters, PhD, Pontificia Universidad Católica del Perú.

Defense's **DARPA Robotics Challenge** is spurring the development of robot strength, dexterity, mobility, and "supervised autonomy" in decision making, resulting, for example, in **headless robotic pack mules** (more formally known as the "Legged Squad Support System") that can carry 400 pounds over rugged terrain. They have also demoed the **the first gun-toting robots**, either controlled by a remote operator or programmed to fire on their own.

Undersea, **amphibious snake robots** can explore the depths of the ocean, while **autonomous robot jellyfish** conduct military surveillance. Researchers are creating **cyborg roaches** and **miniature flying robots** to explore collapsed buildings looking for survivors. Medical technologists are enlisting robots as surgical assistants and to enable doctors to **practice poking around in virtual brains** before they tackle real ones. The first robots to become truly ubiquitous may be **self-driving cars**—**legal** in three states and the District of Columbia, and projected to transform the automotive industry, urban design and our transportation grid.

Robots are **becoming more human**: walking (even on unstable surfaces **like sand**), **dancing** (including **Gangnam style**, of course), sitting, walking and using facial expressions. It is, after all, functional for robots to be humanoid in a world created for humans to navigate. And people may not be comfortable interacting with robots until they are a bit more like us. Zoe, a digital visage, has the ability to **express human emotions** on demand—which could help create computers (and robots) that people can actually converse with.

Perhaps surprisingly, one emerging role for robots is serving as companions—providing a supplement to or substitute for human interaction. **Projo** is programmed to be the "ideal peer



learner" for students, helping them self-correct their work. Robots can be particularly good at **working with autistic children**, who "understand the physical world much better than the social world." The year 2013 saw the launch of the first robot into space. **Kiribo** was sent to provide companionship for astronauts on the International Space Station, but his creators at the University of Tokyo are interested in droids' potential to provide company for anyone living alone, **especially the elderly**.

One important cybernetic subspecies is the **telepresence robot**: a physical stand-in that an individual can control remotely, using the 'bot's mobility as well as its (two-way) video and audio feeds. Telemedicine robots enable doctors to "**beam in**" to remote clinics or to hospitals lacking staff with expertise in a particular area. **Teleteachers** may improve education by letting "the right people be in more places at once." These robots also provide a way to mainstream people formerly relegated to the sidelines. Children with compromised immune systems **can attend school** via proxy robots. **Quadriplegics** can control telepresence robots (or fly drones!) via eye movements.

Finally we are seeing the development of true cyborgs, as humans incorporate ever more sophisticated robotic components onto and into their own bodies. A new generation of **prosthetic limbs** can be controlled by nerve signals sent by the brain. Technology has already been developed and tested that lets paralyzed patients **control robots via their**

Below: The Legged Squad Support System (LS3) robot can carry 400 pounds of equipment over rough terrain and obey voice commands. **Right:** Geeking out at the 2013 Robotics Challenge. Photos courtesy DARPA.

MUSEUM EXAMPLES

The **PITTSBURGH ZOO & PPG AQUARIUM** has a **resident telepresence robot named VGo**. This mobile video- and audio-enabled communications robot enables school groups to visit the zoo remotely, using VGo to navigate the exhibits, watch demonstrations and lectures, and interact with museum instructors. The museum's staff notes VGo "not only saves time and money, but also supports the Pittsburgh Zoo & PPG Aquarium's conservation message by reducing the emission of carbon dioxide into the atmosphere with less travel."

The Commonwealth Scientific and Industrial Research Organization's **(CSIRO) Museum Robot** helped the **NATIONAL MUSEUM OF AUSTRALIA** "reassemble" the body of Australia's most famous racehorse, Phar Lap, who won three successive Melbourne Cups. Tragically Phar Lap was poisoned at the height of his career, and pieces of his body reside in three museums. In honor of Melbourne Cup Day 2013, students from three schools were handed the digital reins of the CSIRO museum robot, controlling its 360-degree camera to explore exhibits and speak with experts at the three museums.

The **REINA SOFIA MUSEUM** in Madrid enlisted the help of a robot in its conservation department. **Pablito**, as this robot is known, uses infrared and ultraviolet photography to meticulously examine paintings, taking hundreds of microscopic pictures to document condition in fine detail. Pablito has worked on about a dozen paintings, including works by Picasso and Joan Miro. The robot can work unsupervised 24/7, and can be controlled by computer from a remote location. It can travel to work onsite for art that cannot be moved (it worked on Picasso's Guernica this way), though paintings are usually brought to its lab.

The **MIRAIKAN SCIENCE MUSEUM** auditioned Honda Motor Company's bubble-headed Asimo robot as a docent in July 2013. The trial was a bit rocky, with Asimo struggling to distinguish between hands raised to ask a question, and those merely snapping a photo with a smartphone. Asimo's fairly low-tech interface enabled it to respond to about a hundred questions selected from a touch panel.

brainwaves. Robotic exoskeletons can provide an **assist to weak muscles** or enable people who are paralyzed to **walk on their own**.

What This Means for Society

In 1942 Isaac Asimov introduced the **Three Laws of Robotics**, tackling the issue of how we would include ethics in robotic programming. The ethical implications of robots have become more urgent in the past couple of years, as the military deploys pilotless drones that can both make decisions and act on them. Asimov's laws are not questions for the future anymore, they are questions for now. Robots also raise the reciprocal question of **our ethical responsibilities** to these increasingly life-like beings. Can robots be abused? Should they have rights?

Whatever the programming we provide to guide robots' behavior, we also have to grapple with our own. How will we choose to deploy robots, even if we retain control over their actions? The **Stop the Killer Robots** campaign seeks appropriate boundaries on what we authorize robots to do on our behalf, and **roboticists are confabbing with ethicists** on the constructive and destructive potential of their work. The UN's Convention on Conventional Weapons has **added "killer robots" to its agenda for 2016**, at which point they may be banned. And if not, could the 21st century see our first largely robotic war?

At times we have looked forward to our new robotic helpmeets, but quite often "techno-dystopians" angst over whether **robots will take over** not only manufacturing, but also white collar jobs like **teaching**. People **tally the professions**—pharmacist, paralegal, taxidriver—that may be lost, if not to robot overlords then to robot scabs. (Though it has been **noted** that robots may help finally create gender equity in jobs and wages, as they are less likely to take over jobs based on social skills, which women tend to dominate.) Certainly between the sophisticated artificial intelligence of IBM's Watson (an intelligence not housed in a robot, at least not yet), and the increasing physical and perceptual abilities of robots, there will at least be a shift from some jobs that required manual dexterity or data analysis to jobs requiring the skills to invent, build, program and maintain these machines. But we may well find that, as with the big data analytics explored in an earlier essay in this report, the real question is not whether robots will replace people, but how they will supplement their work.

The merging of human and machine amplifies questions already raised by doping scandals and quarrels over the **extent of any given athlete's ability or disability**. Double amputee **Oscar Pistorius** qualified for the (mainstream) London Olympics in 2012, **fueling arguments** about whether his high tech but purely mechanical prosthetics give him an unfair advantage. In a future where cybernetic enhancements can make anyone faster, stronger or even smarter, what constitutes a level playing field? Will we draw ever finer distinctions among levels of ability—natural, corrected or enhanced—or throw up our hands and find another way to determine what is "fair" competition?

What This Means for Museums

Robots are already deeply embedded as

subjects in human **history**, **music**, **literature** and **film**. Now they are becoming agents as well. **e-David**, a robot artist created by a team at the University of Konstanz, Germany, doesn't just "paint by numbers," it takes a picture of what it is going to depict, watches itself paint and uses algorithms to decide where to add the next stroke. David continually assesses its own progress and generates new commands to correct errors from previous steps. A Spanish robotics lab has created a "**robot imagination system**" that enables robots to envision and create new things based on what they have seen in the past. Can a robot produce works of artistic merit? Might robots become useful collaborators for artists, providing new techniques? In the future, "from the workshop of" might indicate that a painting attributed to a 21st-century artist was worked on by a robotic, as opposed to a human, assistant. Could robot instructors demonstrate the techniques of Old Masters?

While it seems unlikely that curators, exhibit designers or educators will **lose their job to a robot** anytime soon, it is possible that museums, having instituted significant lay-offs in the recession, may invest some of the money they recover, as the economy slowly rebounds, in technology instead of staff. When an autonomous **night watchman with wheels**—complete with video camera, thermal

Above: Telepresence robot VGo interacts with a visitor. Photo courtesy of Pittsburgh Zoo & PPG Aquarium

imaging sensors, a laser range finder, radar, air quality sensors and a microphone—can patrol the grounds and galleries for $6.25 an hour, museum security at larger institutions may consist of a trained technician supervising a "herd of security robots."

Museums Might Want to…

Think about what **roles robots can play in museums**: field trip avatars for remote school groups; tour guides to take people (virtually) behind the scenes; conservation assistants; security guards; patrols in storage rooms looking for pests. What else can you imagine? Think about the skills that robots might bring to museum tasks: dexterity, sensory acuity, tolerance for repetitive tasks. Think about things that museum staff do that might be better done better, faster or safer with the assistance of a robotic partner.

Consider the implications for accessibility. If telepresence robots become a major way for people with disabilities to regain their mobility, how will museums accommodate these physical avatars? They might make their own in-house robot available to school groups or disabled individuals, or institute an SYOD (Send Your Own Drone) policy. The idea of a wheeled robot, much less a flying drone, trundling or **soaring through the galleries** is enough to give any conservator the willies. But these agents might make museums accessible to a population that cannot visit in person, in a way arguably more "real" than using digital assets on the Web. It behooves museums to explore this issue—yet another area in which institutions struggle to strike an appropriate balance between safety (of the collections) and access (for the public).

Further Reading

Neil Fine, ed., *"Time Rise of the Robots"* (Time Magazine, January 2013). This special edition is devoted to all robots, all the time.

The **Paleofuture** blog has a **plethora of wonderful posts** documenting robot visions of times past.

2013 was also a good year for robot movies. Appreciate the apocalyptic potential of 'bots with Guillermo del Toro's **Pacific Rim** or, more realistically (at least more humorously), explore how the idea of a "robot companion for the elderly" could backfire, in Jake Schreier's **Robot and Frank**.

Where to Find the Future

Most of CFM's content is available free over the Web.

CFM's page on the Alliance website (**www.futureofmuseums.org**) includes links to all of our projects and reports.

The CFM Blog (**http://futureofmuseums.blogspot.com/**) features a mix of essays by CFM's director, guest posts, recommended reading and viewing, and commentary on current news. The trends featured in this report will be explored in more depth on the blog throughout 2014.

CFM's weekly e-newsletter, *Dispatches from the Future of Museums*, contains summaries of and links to a dozen or so news items about trends, projections, museum innovations and tools for the future. You can find the newsletter archive and subscription link at **http://www.multibriefs.com/briefs/aam/**.

You can follow CFM on Twitter (**@futureofmuseums**), where our tweets feature links to news, research, opportunities and current events.

On Pinterest (**http://www.pinterest.com/futureofmuseums/**), CFM's boards are devoted to images illustrating the trends we follow, recommended reading and viewing, and glimpses of potential futures.

CFM's YouTube channel (**http://www.youtube.com/futureofmuseums**) hosts interviews with museum professionals around the world as well as recordings and screencasts of talks by CFM staff, while our "Favorites" list is a compilation of futures-related videos from a wide variety of sources.

In addition, CFM's director, Elizabeth Merritt, is available for a limited number of paid speaking engagements each year. Send inquiries regarding availability and fee structure to emerritt@aam-us.org.

Author credit

Elizabeth E. Merritt is founding director of the American Alliance of Museums' Center for the Future of Museums. A biologist by training, she earned an M.A. in cell and molecular biology at Duke University, after being sidetracked from her original goal of becoming the next Jane Goodall, studying animal behavior in remote and wild places. After discovering she was not cut out to spend her days in a lab dissecting embryonic chicken eyeballs, Merritt reconsidered her career path, and concluded that the best job in the world would be working in a museum. This led her to a series of positions at a children's museum, a natural history museum and finally, Cincinnati Museum Center, where she was director of collections and research.

Leaping to the association world, Merritt joined AAM in 1999, eventually leading the Excellence programs at the Alliance, including Accreditation, the Museum Assessment Program, peer review and the Information Center. In 2006 the Alliance Board approved the creation of a futurist initiative as one of the AAM Centennial projects, and Merritt hied herself off to Texas to complete the University of Houston's certificate course in Strategic Foresight. Her areas of expertise include museum standards and best practices, ethics, collections management and planning, and assessment of nonprofit performance. Her books include National Standards and Best Practices for U.S. Museums and the AAM Guide to Collections Planning.

TrendsWatch 2014 was designed by **Selena Robleto** and **Susan v. Levine**.

The Alliance's **Center for the Future of Museums** (CFM) helps museums explore the cultural, political and economic challenges facing society and devise strategies to shape a better tomorrow. CFM is a think tank and R & D lab for fostering creativity and helping museums transcend traditional boundaries to serve society in new ways. For more information, visit www.futureofmuseums.org.

The **American Alliance of Museums** has been bringing museums together since 1906, helping to develop standards and best practices, gathering and sharing knowledge, and providing advocacy on issues of concern to the entire museum community. With more than 21,000 individual, institutional and corporate members, the Alliance is dedicated to ensuring that museums remain a vital part of the American landscape, connecting people with the greatest achievements of the human experience, past, present and future. For more information, visit **www.aam-us.org.**

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Cover: **SeaOrbiter**. Copyright: Creations Jacques Rougerie / SeaOrbiter

"SeaOrbiter" is the vision of architect Jacques Rougerie, who describes the vessel as the "Starship USS Enterprise of the Sea." One hundred ninety feet from top to bottom and 500 tons, the ship is a mobile underwater habitat designed to house 18 crew on 12 levels, as well as a diving drone capable of descending to 6,000 meters to map the sea floor. It is intended for long-term habitation and exploration of the ocean at all levels, the first of a planned fleet of self-powered, sustainable vessels—one in each of the world's oceans.

American Alliance of Museums

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Join or donate online at http://www.aam-us.org/ or by calling 866-226-2150.

Corporate and foundation support are also welcome. To learn more, contact Brent Mundt, vice president of development, at **bmundt@aam-us.org** or 202-289-9101.