Intel Labs   Making Sense of Museums

The Museum as 'Cultural Ecology'

June 2002, Genevieve Bell

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Introduction

For the last four years, I have worked as anthropologist at Intel. I am part of a small team of researchers, charged with the task of finding new users and new uses for technology. Peoples and Practices Research, as we are currently known, was first established in 1996, and we are a vital part of Intel's Corporate Technology Group. The team is comprised of a number of social scientists (trained in anthropology, psychology, communications), designers (interaction and industrial) and concept developers. Together, we attempt to translate insights about consumer behavior into product concepts, technology solutions, and business strategies. In all of our work, we attempt to privilege the experiences of real people. We have conducted research in the US, Western Europe, Asia and Latin America. Our research portfolio includes field studies with teenagers, boundary retirees, empty nesters and families with small children, as well as cross-demographic examinations of such issues of health, shopping, and broadband. We have also turned our attention to different kinds of spaces: the home, small business, school, the mall and the museum.

This paper draws on observations, interviews and experiences at a range of art, science, and cultural/historical museums during February and March of 1999, as well as less formal observations over the last 3 years.[1] The research project began as an attempt to explore the ways in which people interact with, and within museums. We hoped that these interactions might provide insights useful to the further development of in-museum technologies, as well as web-based services and content. Intel at that time was working with the Whitney in New York to create an online museum experience – artmuseum.net – as well as experimenting with new in-museum technologies.[2] In the years that have followed, Intel has also invested in and collaborated with a range of science and technology museums, including Australia's PowerHouse Museum, Britain's Science Museum, both the Exploratorium and the Tech Museum of Innovation and most recently, CIMI.

So what is an anthropologist doing at Intel? Indeed for that matter, what is an anthropologist doing at Intel, talking about museums? Anthropology, and by extension anthropologists, place high value on reflexivity – that act of self positioning that locates the researcher vis-à-vis both subject matter and audience. Here I want to pause just briefly to locate myself.

I am a child of the British Empire, raised in Australia in the 1970s and early 1980s – the daughter of working class intellectuals and a regular museum-goer since my childhood. My earliest memory of visiting a museum is indelible. I remember standing at the entrance of the National Gallery of Victoria mesmerized by the plate glass window façade where water ran in between the panes of glass in a constant,

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[1] A great many people have helped to shape my thinking on the subject of museums, and I gratefully acknowledge their time and patience. I am especially grateful to the following individuals: Peter Walsh, (Director of Information and Institutional Relations, David Museum and Cultural Center, Wellseley College); Guy Herman, (Director, Information Services, Mystic Seaport, Museum of America and the Sea); Tim Hart, (Powerhouse Museum, Sydney); Peter Samis (Program Manager, Interactive Educational Technologies, SFMOMA); Randall Packer (University of California, Berkeley), Graham Farmelo, (Director, British Science Museum); Susan Dunn, (Associate Director of the Stanford Humanities Center); Mary Salzman, (Art History Department, Stanford University); Tom Seligman, (Director, Iris and Gerald Cantor Center for Visual Arts, Stanford University); Jim Mason (Longnow Foundation); Jofish Kaye and Flavia Sparacino (Media Lab); Mike Kuniavsky (AdaptivePath); Nina Wakeford (University of Surrey/INCITE); Rick Robinson (Sapient); Mic Bowman (Corporate Technology Group, Intel); Jon Perkins (CIMI); John Von Sturmer, Irena Rogovsky (Content Group & New Business Group); and last, but by no means least, all my colleagues in PAPR.

[2] In 2002, Intel's ArtMuseum.net transitioned into an "artandculture.org network". In partnership with a non-profit group – The Arts Council – Intel hopes to establish a common publishing platform for the museum community, and a destination to find out about today's emerging artists (locally, nationally, and internationally).

contained, soundless waterfall. I pressed my hands up to the glass and marveled at the coldness, surprised not to touch water. I don't remember anything I saw that day, but I do remember the feel of cold slick glass under my palm and the sense that this wall separated two very different worlds.

The National Gallery of Victoria opened in 1968. Designed by modernist Australian architect Roy Grounds it signaled Australia's entry into the contemporary museum world. For my mother, this was a place that offered a glimpse into the world beyond the boundaries of the one we inhabited, and we visited it regularly. For me, it meant lunch with my great grandmother, an afternoon in the city, a chance to look at things differently, and the feel of glass underneath my palm.

Later I would move to central Australia, accompanying my mother on her fieldwork in a small aboriginal community north of Alice Springs. The aboriginal people my mother worked with remembered their first encounters with white Australians, and when they could, preferred to go bush, getting off the settlement to hunt and gather. In the years I lived there, I participated in a vibrant culture very different from my own. I learnt among other things how to find water in a desert, how to tell the difference between a snake and lizard hole, knowing with certain which to stick my hand down for food, and perhaps most importantly how to appreciate shifting between very different worlds and very different realities. It is no surprise to me, looking back on it now, that I became an anthropologist, nor I suppose that I might have an affinity for museum spaces.

Over the last 30 years, I have visited a lot of museums, both large and small, canonically and desperately obscure and I have continued to find them places of wonderful possibility. But, historically there has been a popular perception that museums cater only to the wealthy and predominantly white urban elite, and to children on mandatory excursions. In the last 3 decades, museum workers have done a great deal to counter this perception, and transform museums into friendly and inviting spaces for everyone. From simple audio tours to multi-media kiosks, technology has played an important role in this transformation. And the acceleration of technology in the last decade has markedly expanded the ways museums can diversify their spaces, creating meaningful interactions for their visitors. But what will museums look in the twenty-first century? And, arguably more important, what will visitors experience when they visit these museums?

In this paper, I want to reflect on the nature of museums and the role that technology can play in them and for them. And I want to do so from three interlocking vantage points: as an anthropologist who has studied museum spaces, as a researcher working in the technology industry and as a regular museum goer.

Museums under the microscope

> "But beyond leisure and entertainment, our perception of a museum, and its moral value, still has to do with our desire for sacred space, even if we are reluctant to put it that way. Museums exist to offer us something that we can't find anywhere else: an encounter, whether with an object or idea (or even with something on the Internet if we consider virtual museums) – an encounter we deem true and authentic in a place respectful of this private transaction. Otherwise, museums are just fancy storage facilities and gift stores." (Kimmelman 2001)

One cannot start to talk about museums and role of technology therein, without acknowledging the ongoing public debate about museums. It seems like every couple of months, a major American newspaper carries a story suggesting that museums are at a point of crisis. When I started this project three years ago, the Wall Street Journal asked "Why are Museums so Clueless?" Three months ago, the New York Times declared "Museums are in a Quandary: where are the ideals?" So what is the nature of this cluelessness? This quandary? (And is it a distinctly American crisis?)

In part, this sense of crisis reflects a growing ambivalence about the role of museums as social institutions: are they the arbiters of cultural value or just another sort of theme-park; do they represent the tradition of public intellectuals, asking hard questions and providing critical perspectives or do they cater to the lowest common denominator; should they be educational or entertaining? In some ways, this ambivalence maps onto other shifts in American culture – anti-intellectualism cut with a longing for self-improvement, a sense that there is less and less time and we should get more and more value from it, and changing leisure patterns. And in other ways, it reflects shifting funding realities for American museums.

It is interesting to reflect, against the backdrop of all this museum anxiety, on the ways in which the category 'museum' has been expanded to include an ever increasing diversity of sites – museums are appearing everywhere from airports to casinos. Museums also seen to include a wider range of experiences, from the burgeoning Neon Museum in Las Vegas with its 8 pieces of art, no walls and limited signage to the Burning Man Museum in Gerlach, Nevada, and many points in between.

Of course, this is the not the first time that museums have been the object of scrutiny, nor is it the first time that their definition has shifted. Beginning in the 1980s, there has been considerable critical interest within academic circles about the role of museums in society (Karp and Lavine 1991, Greenberg et al 1996, Kirshenblatt-Gimblett 1998). The work of French sociologist Pierre Bourdieu was instrumental in establishing the museum as a meaningful object (institution) of academic inquiry (Bourdieu 1984). It is Bourdieu's work that helps to identity the ways in museums function as sites for the creation and renewal of cultural capital – that social intangible we accrue through participation in and consumption of certain interactions and institutions. It hardly surprising then, that his work frames much of the current analysis of the ideological 'work' of museums.

There is a not insignificant body of research focusing on museums and current academic research tends to fall into one of 4 categories:
   (1) Commentaries on particular exhibits (Karp and Lavine 1991, Greenberg et al 1996).
   (2) Analysis of museums as powerful social institutions [(Karp and Lavine 1991, Greenberg et al 1996, Bourdieu 1984, Halle 1993, Hooper-Greenhill 1994, Marcus and Myers 1995).
   (3) Handbook & Instructional guides for running museums (McLean 1997, Boylan 1992, Keene 1998, Miles and Zavala 1994, Edson and Dean 1994)
   (4) Analysis of museum visitors (McLean 1997, Boylan 1992, Edson and Dean 1994, Hooper-Greenhill 1994).

The bulk of this work has one significant flaw. It tends to view the museum visitor as a passive recipient of the museum's 'messages'. Here, museums function as sites for the production of hegemonic thinking –

ideology about appropriate class, race, gender and sexuality behavior is propagated by the museum. Visitors are apparently powerless to refuse or reject this ideology. This constant contextualization of the museum visitor as agentless means that little attention has been paid to the ways in which visitors use museum spaces.

There are exceptions. Carol Duncan, for example, suggests that one must view the museum visit as a kind of ritual (Duncan 1995). Duncan sees museums as "a stage setting that prompts visitors to enact a performance of some kind, whether or not actual visitors would describe it as such (and whether or not they are prepared to do so). From this perspective, art museums appear as environments structured around specific ritual scenarios." (1995: 1-2). Duncan's perspective, on the museum visit as a kind of ritual, with its attendant sense of liminality (a passage of time marked off from daily life) and of content driven by the physical space, is a helpful one when thinking about how to explore museums ethnographically. This notion of the liminal museum experience goes part of the way to explaining the current popularity of art museums. Unlike some of their entertainment space counterparts – the sports stadium, the amusement or theme park – museums offer their visitors the space for quiet reflection, bracketed off from the pressing concerns of every day life.

Likewise relevant to this project is the small but growing sub-field of 'cultural ecology.' This field had its beginnings with the ecological determinists of the 1960s who argued that environmental change drove cultural change (White 1947, 1973, Stewart 1955, Harris 1979). Some went as far as to argue that there was a process of co-evolution, where the environment and culture operate in a dynamic feedback loop (Durham 1991). In its later iterations, anthropologists, in particular, argued that in order to understand cultural forms it was important to understand the environments in which they were embedded (Rapport 1968, McNetting 1981). This strand of cultural ecology also argues that the nature of the physical, geographical or cultural ecology constrains the types of activities that make sense within its boundaries.

Here, the definition of 'cultural ecology' is pushed one step further. Removed from the immediacy of a natural/biological environment, 'ecology' is used to invoke the museum space or more generally, the whole of the museum experience. The remainder of this paper focuses on the research we conducted in museums, positing that those spaces are indeed ecologies with the attendant constraints, expectations and rituals. In this paper, I am interested in the ways that museums function as public spaces. I theorize that peoples' interactions both with each other and with the space itself would create powerful local ecologies.

The research on which I am drawing relied on standard ethnographic methods – observation, participation, and interviews (Bernard 1998). Along with a colleague, I spent time in a dozen museums across the US, mingling with other visitors, talking to some, listening to conversations, observing body language and behavior, taking photographs of different museum spaces and formally interviewing several visitors, as well as a number of different museums workers and directors. We also reviewed museum guides, handouts, and other informational material. This kind of 'cultural contexts' research helped us develop a sense of different museum ecologies (Trotter and Schensul, 1998).

Our Typology
In 1999, we visited the following museums: San Jose Museum of Art, Tech Museum of Innovation (San Jose), Iris and B. Gerald Cantor Center for Visual Arts (Stanford University), Yerba Buena Center for the

Arts (San Francisco), San Francisco Museum of Modern Art, The Exploratorium (San Francisco), Portland Art Museum, Portland Historical Museum, Fort Clatsop National Park Interpretive Center (Oregon), American Museum of Natural History (New York), Smithsonian Museum of the American Indian (New York). This selection was driven as much by proximity to Intel facilities, as it was by achieving a range of different museum experiences.

Historically, there have been three major types of museums in the United States: art museums, science museums and cultural or historical museums. In principle, each of these museums contains different objects, serves a different audience and creates a very different visitor experience.

Art Museums. Traditionally, these spaces are dedicated to the display of works of art. In the United States, art museums are organized in a number of ways. The bulk of art museums display a wide variety of different pieces. There are also museums that focus on a particular kind of art (i.e.: a specific period, genre or medium), and others focus on a set of artists (women, ethnic minorities, indigenous peoples). There is also a small subset of museums that are donor memorials – they display the works acquired by a single collector (i.e.: the J. Paul Getty Museum, the Frick Collection, etc.)

Science and Technology Museums. These museums focus on aspects of science, offering visitors the opportunity to experience their exhibits by physically engaging with them or actively participating in some other way.[3]

Cultural, and Historical Museums. Exemplified by the Smithsonian, cultural and historical museums exist throughout the United States. Some are dedicated to a particular historical period, or a particular event, some are dedicated to the history of particular organization, some focus on a region of the United States, or a particular ethnic group, and others focus on the history of an object, or set of objects.

There is always an issue of scale in these museums. There are the archetype museums: the Metropolitan Museum of Art in New York, the Exploratorium in San Francisco and the Smithsonian in Washington D.C. These museums create a distinctive set of experiences for the visitors. There are also a range of regional, city and local museums, interpretive centers, libraries, universities and historical societies that have repositories of various kinds. These museums borrow heavily on their respective museum templates or styles.

Museum Ecologies: an overview

Before discussing the specifics of the ecologies we explored in our research, it is important to examine commonalties across the various museum spaces, and the rituals such spaces engender. There are three significant components that define the museum ecology: liminality, sociality, and engagement.

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[3] Natural history museums straddle the divide between science and technology museums and cultural and historical museums. They have collections of artifacts and objects and also use interactive exhibits. Many of these museums are transitioning into a more interactive model. The American Natural History Museum is a good example of this.

Liminality. One important component of the museum ecology is its liminality – the sense that it embodies experiences that are set apart from the rest of life. Indeed, the ideal museum visit should be transformative, spiritual, moving. This aspect of the visit-ritual should allow the visitor the opportunity to pause and reflect in space that encourages such behaviors.

For example, there is a room at the Stanford Art Museum dedicated to one installation only. It is the hope of museum workers that this space, bracketed as it is even from the rest of the bustle of the museum, will allow visitors the opportunity to engage deeply with one piece of art, and their own reactions to it.

Sociality. Interestingly, another equally important component of the museum ecology is a social one. People go to museums in groups: couples, families, classes, friends, dates. Museum spaces, while seemingly imposing and alienating, have been appropriated by visitors as large public spaces in which to engage in social activities. The visit-ritual element here is about socializing with other museum visitors.

Museums have capitalized on this social aspect of the visit by operating restaurants and cafes, and by finding ways of tailoring the visit experience to families. Several art museums, including the Stanford Art Museum and the Denver Fine Arts Museum, offer special guides/games for children that encourage interactions between parents, children and the art.

In same ways, it is also about a less intimate sense of togetherness, of the opportunity to gather with other like-minded people, in a safe space. And one can only speculate about how all of this has been changed by the events of September 11th and their aftermaths.

Engagement. A third component of the museum ecology is that of engagement. People go to museums to be educated about something, to learn about a particular period of history, or of art, or to engage with a set of ideas or objects. However, this engagement must be packaged in an entertaining way, because increasingly museums are being viewed by the public as a kind of tourist destination, with the accompanying expectations (Kirshenblatt-Gimblett 1998). The museum in this perception becomes just another sort of amusement park. Thus museums, as learning spaces, are being reshaped by a dyad of competing expectations: the desire for education, and the desire to be entertained. Here, the visit-ritual involves an interaction with the museum artifacts.

A number of art museums are currently experimenting with different forms of multi-media kiosks within their gallery spaces, combining different sorts of information and presentation styles, from the now traditional computer interfaces to a project called "The Secret Gallery: Hidden Stories of the Collection" at the Davis Museum and Cultural Center at Wellesley College that incorporated recorded messages in ringing phones at podiums scattered through the gallery. These multi-media points enhance the sense of personal and immediate interaction with the museum artifacts by reinstalling a sense of context.

By contrast, the rapid growth of the visiting blockbuster exhibits – Monet, Degas, Van Gough – enhance the value of the museum visit by allowing the visitor interaction with well-known, and highly valued, museum artifacts. People often go to museums for the cultural capital – that is for the bragging rights or subtle social points that accrue through visiting 'high kultur.' These visiting artifacts operate like celebrities guests, (to extend the entertainment metaphor), attracting new visitors to the museum space.

Of course one cannot ignore the fact that blockbuster exhibits significantly impact the financial bottom line for most museums. Not only to they attract existing museum members back to the museum, but they also entice non-museum visitors to the museum space. "Van Gogh's Van Gogh" brought 460,000 visitors to the National Gallery in 1998, and the Calder exhibit set attendance records at SFMOMA with the number of first time visitors increasing 65%, and exhibit attendance equaling more than half the museum's total attendance for 1998.

Museum ecologies also operate within a set of constraints and barriers. Some of these barriers/constraints are financial. Many museums charge an entrance fee. [4] Such visit-costs prevent certain segments of the population from visiting museums. Yet most museums must generate revenue to cover operating costs.[5] Some have to do with logistics. Not all population centers have museums; not all museums are easily accessible. And some constraints and barriers are perceptual or cultural. Many potential visitors feel intimidated by the aura of 'elite' knowledge they perceive museums to embody. They feel that they don't know enough to go to a museum.

Our research identified at least two major museum ecologies in the United States: that which existed in and around art museums, and that which existed in and around science and technology museums. These two ecologies have distinct hallmarks and facilitate different kinds of visiting rituals.

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[4] Museums are not cheap, averaging $7-12 per visit (slightly more than the average movie ticket). Parking is expensive around many museums ($1.50/20minutes or a flat fee of $15 around the bay area), and only some are easily accessible by public transport. Museum cafes are also expensive (lunch menus ranged from $7-15 for a sandwich and a drink).
[5] One of the ways in which museum generate income is through memberships. Individual museum membership ranges from $35-80 dollars, averaging about $50 per year. Family memberships range from $60-160, averaging about $75 per year. There are also higher contribution levels reserved for corporate sponsorship and lifetime membership. Membership always entitles individuals to free museum access. For an individual member that means an average of 5 museum visits a year recoups your costs. For families, whose membership usually includes free admission for two adults and any children under 18, it could mean as little as 2 or 3 visits. (The Tech Museum of Innovation has a new category of family membership for grandparents). Membership may also include a discount (10-15%) in the museum store; special members-only events; early admittance to exhibits; free subscriptions to museum publications; special tours, easier ticketing; special hours; admission to other cultural events in the area, admission to other similar museums nationwide; and priority admittance to classes and programs offered at the museum.

Art Museum Ecologies

Art museums have a long and complicated history in the United States, and elsewhere. The notion of the public art museum, which has its roots in 18th and 19th century European traditions, is a contested one. Art museum practices are currently undergoing a major transformation, as they struggle to meet the expectations of their rapidly expanding public, while maintaining a viable ecology (Keates 1999, Archimuse 1999). Here, we make some observations about the important components of the existing art museum ecology.

Space. Traditionally, art museums have operated within a well-defined set of aesthetic parameters – a semantic code. The gallery spaces were neutral – neutral colors on the walls, bland floors, minimal signage and text. The focus was always on the art, and on the creation of a contemplative space for appreciation of that art.

Of course, like many other sorts of received wisdom, it is easy to argue that art museums were hardly 'neutral' spaces. They were built to recall 'monumental ceremonial structures of the past' (Duncan, 1995:9), or other equally imposing and impressive structures. And because of that, art museums were in fact institutions ripe with meaning, affect and power (Karp and Lavine 1991, Marcus and Myers 1995). Many visitors complain about feeling alienated, or constrained by these architectural structures.

There has been a shift in space practices lately. Some museums are trying to provide explicit 'context' for their objects. The walls on which work hang are painted in colors appropriate to the period of the work, and other objects from that time period are also placed in the area and signage has become more narrative-driven.[6] Other museums are taking advantage of their physical spaces in interesting and provocative ways, (for example the recent exhibit of motorcycles as art at the Guggenheim in New York) and the hanging art in the stairways at SFMOMA. At the Stanford Art Museum, the chairs in the galleries are portable and visitors can move them wherever they like, disrupting the notion of benches and seats fixed in positions determined by curators, architects and other museum workers. Despite these shifting curatorial practices, art museum ecologies remain surprisingly still and quiet. Although visitors talk with one another, it is frequently in hushed tones.

Some museums, like SFMOMA, are also engaged in the production of teaching and learning materials that allow for museum visits without actually coming to the museum space. "Voices and Images of California", a CD-ROM of film, audio, and video clips, artworks, snapshots, correspondence, and other memorabilia about the life and work of several California artists recreates a sense of the museum space and of its collections, without recreating its semantics.

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[6] Currently, one of the ongoing debates in art museums concerns the amount and type of information that should be included for an exhibit. Some believe that the art should speak for itself, while others believe a lot of information should be included. At a minimum, all works on display have a "tombstone" sign that describes the work, the artist, the time period, and the accession number (the museum's catalog number). Some art museums also use 'didactic' signage that can provide an introduction to a collection, spell out a set of themes, or make explicit connections between the works or to historical/cultural trends. There is a lot of politics involved in such contextual signage, and also a lot of debate – witness some of the recent disputes at the Smithsonian regarding the Enola Gay exhibit and the Library of Congress regarding the retrospective on Freud.

Visitors. At all of the art museums we visited during the week, (during the day, lunch-hour, and into the early evening), the visitors were noticeably older (55-75), predominantly female (2-3:1), and predominantly white. These visitors were also well dressed – women were wearing brooches, hats and stockings, and suits and dresses, men had on blazers and the occasional tie. There were three social arrangements in evidence at the art museums: couples (probably husbands and wives), groups of women, and solidarity men. There were very few solitary men, and only two couples with small children (toddlers and under). At the Stanford Art Museum there were members of an art class, as well as some solitary sketchers. These demographic observations are supported by much larger studies of museum visitors (Hooper-Greenhill 1994).

Had we visited these same museums during the weekends, we would have seen a different cross-section of the population. The 'leisure class' of the week would have been replaced with a younger, slightly more ethnically diverse and gender-balanced group. However, the family as an audience has been historically under-served by art museums. In order to attract families (which represent a big market for museums), art museums now need to think about creating areas or exhibits where parents can interact with their kids, and where there is some obvious educational value and learning.

> For example, the kids can try on clothes from a historical era (i.e.: Fort Clatsop National Park Cultural center) or wear reproductions of the art/jewelry from the exhibit (Denver), or interact with artifacts and science exhibits (i.e.: the Exploratorium in San Francisco, or the Chicago Field Museum). At Denver's museum, there are "I spy" games and puzzles for children that rely on seeing different work in the museum. At the Stanford Art Museum, there are guides to finding animals, people and places in the art. Once a month at SF MoMA, they dedicate a Sunday to families, offering events and activities geared to families with children. It should hardly be surprising then that even United's inflight magazine has a section on baby-friendly museums.

Interactions & Rituals. One of the biggest barriers to meaningful interaction within the museum ecology is the pervasive sense that museums are the arbiters of culture and that in order to understand the exhibit you need to have special knowledge (Keates 1999). This helps, in part, to explain the popularity of docent tours and audio guides that allow museum visitors access to the museum's knowledge. These tours and guides empower visitors and help to overcome the sense of alienation and isolation.

Museums also have a variety of mechanisms for soliciting feedback from their visitors. This feedback can come in the form of comment cards, suggestion boxes, docent experiences and other anecdotal forms.[7] However, this form of feedback (re)creates the interaction with the museum as a one-sided relationship. Talking back to the museum interrupts this relationship.

> In the San Jose Museum of Art there is an exhibit of street photography from the 1920s and 1930s. At one end of the exhibit space, there is a large library table with a binder folder full of sheets of

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[7] At the Stanford Fine Arts Museum, the director and curatorial staff spend time at the various help desks and information booths interacting with the public. This helps them develop a sense of what works and what doesn't work at the museum. It also helps the staff cultivate a more accurate sense of their visitor-base.

paper. Each sheet of paper invites a museum visitor to write about how the exhibit struck them, moved them, and touched them in some way. There is a range of responses on those sheets: some moving, others pedantic, still others gratified and drawn on. This binder of sheets allows museum visitors to feel incorporated into the exhibit. It gives them a way to have some authority, some experience, which the museum clearly valued.

The art museum visit with the stop in the café for lunch or coffee, the visit to the museum store, and the perusal of art objects has a certain ritual feel. The prioritization of the activities varies from visitor to visitor, as does the amount of time spent in the galleries, shop and café. However, most visitors would agree that their visit was an outing, an event.

Design Implications. Art museum ecologies are ripe for the introduction of a range of different technologies. As art museums move toward more explicit semantics of space, a greater level of dialectic engagement with their visitors and a greater recognition of a range of visitor rituals and expectations, it is possible to imagine a plethora of new in-museum technologies.

Audio-tours are a popular feature in art museums currently.*8* Yet it would appear that they interrupt part of the visitor-ritual by impeding its social aspect. What is needed is a tour that takes advantage of the visitor's desire to be educated and entertained, but that also encourages social interactions and contemplation. The availability of increasing small and lightweight portable computing devices, along with GPS and RF technologies, should make it possible to re-imagine the guided tour. It appears that the disconnect between the current demographic of art museum visitors and the demographic of web users and computer owners is closing. This raises some interesting questions for in-museum technologies, as well as for web-based museum experiences. And suggests the need for more research into the behaviors and expectations of on-line museum visitors, as well as museum visitors who use in-museum technologies.

Science and Technology Museum Ecologies

Science and technology museums have their antecedents in the various worlds' fairs and expositions of the late nineteenth, and early twentieth, centuries. In their current iterations, they still maintain that sense of wonder and spectacle, and of possibilities. These ecologies seem more robust than their art museum counterparts.

Space. With a few notable exceptions, most of these museums were built in the last half-century. And although, some of the architecture also borrows on the more traditional museum forms, many of the structures depart from the classic traditions. Indeed some science and technology museums are housed in structures built for entirely different purposes, or constructed within the last decade. Most of these structures are deliberately provocative or playful, commenting ironically on the museum format, or creating new sorts of display spaces. The Tech Museum of Innovation in San Jose is probably the most extravagant of these new buildings.

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[8] Audio tours are considerably more popular with blockbuster shows than with permanent installations. This seems, in part, due to the sense of urgency and time constraints that accompany blockbuster shows.

The display culture within these museum spaces also departs radically from the art museum format. In these ecological niches, displays and installations are predominantly interactive, demanding/commanding the visitors' attention. Sometimes the installation requires the visitor's physical body to animate it, or engages the visitor through a series of different sorts of multi-media presentations. The bulk of these installations are meant to be instructive and as such signs have an explicitly educational function. The providence of objects is important, likewise original purpose and use. Historical contexts, details, explanations are all provided for the visitor.

> For instance, at the Exploratorium each sign has four components. A title, brief description of what the exhibit does, instruction for how to use the exhibit, labeled "to do and notice", and a scientific explanation for how the exhibit works and how it fits into a broader body of scientific knowledge entitled "what's going on."

Visitors. The very nature of the space within the science and technology museums ecologies seems to encourage a different kind of visitor and a different kind of visitor-ritual. At both the Tech Museum and the Exploratorium, visitors were younger and more diverse than in the art museums. There were a lot more children, as well as a range of ethnic minorities (especially Chicano/Chicana). We visited the Tech Museum during a day when it was a destination for several different school excursions. As a result the museum was teeming with middle school and high school students. There were also adults (without children) visiting the museum – they were younger than the art museum visitors were. We visited the Exploratorium during afternoon and it was considerably less full than the Tech Museum. There were several couples with younger children whom they supervised. There were a couple of groups of mixed teenagers and a couple of groups of young men (in their late teens and early twenties). There were also a number of solitary men. (The Exploratorium has a policy of using teenage staff in the afternoon and this seems to attract other teenagers.) These museum ecologies seem to teem with activity and noise. People were talking and moving loudly.

Interacting & Rituals. The bulk of installations within the science and technology museum ecology are predicated on the notion of visitor interactions. As a result, these ecological niches seem to have been a lot quicker to adopt in-museum technology (i.e.: multi-media installations, computer stations, hands-on experiments). These ecologies have also taken great pains to recognize the fact that people learn and absorb information in variety of different ways.

> For instance, in the Tech Museum of Innovation, there is an entire section dedicated to different forms of communication. This area features a display on the history and operation of cell-phones, a virtual world with visitor-driven avatars, a multi-media presentation experiment and two tin cans connected by a piece of string. Each one of these installations encourages the visitor to reflect on the nature of communication, yet each installation appeals to very different learning styles and educational/experiential levels.

The presence of a wider range of visitors in this set of museum ecologies allows for the expression of a wider range of visitor rituals. Children play in these spaces, adults speak in regular tones, people laugh, people clown around, and visitors are engaged, engrossed and sometimes bored.

Design Implications. Unlike the art museum ecologies, there are far fewer barriers to technology adoption in the technology and science museum ecologies. The challenges to find new sorts of in-museum technologies, as well as web-based museum experiences are very different here.

Technologies need to support existing interactions and create the possibilities for others conditioned by the visitor expectation that this interaction will be engaging and dynamic. Technologies might also support the capacity of taking the best of the museum home with you.

Museums and New Technologies

The world-wide-web has found a place in many museums. Currently there are at least four critical constituencies operating within this space: museums with in-house web-enhanced museum experiences; museums establishing a web presence to attract visitors to their museum; museums establishing a web-presence to augment and extend their educational and other out reach programs; and virtual museums without a physical presence. Each of these constituencies, while not mutually exclusive, has a different set of concerns and a different set of constraints, making use of the available technologies in a myriad of interesting and nuanced ways.

The majority of the museums we visited had their own web-sites, offering a wide range of services and information. All sites provided information to aid in visiting the physical museum spaces, and most provided some e-commerce opportunities. Several also provided teaching and curricular material.

For instance, the Exploratorium web-site offers visitors a range of different experiences, from teaching modules to narrow-casting on the web. The web-site has its own 'safe' search engine – Sherlock – providing schools with a mechanism to search a pre-screened selection of third-party web-sites. The Exploratorium site got 3.5 million hits alone in one week in February (1999), far outdrawing its off-line spaces. The URL for this website is not advertised anywhere, nor does it appear on any of the Exploratorium products. Ironically, the Exploratorium did not include the web on the visitor surveys as a mechanism for hearing about their museum until February of 1999 despite the fact they have had an operational and highly acclaimed web-site for 5 years.

In 1998/9, when we began thinking about museums at Intel, the web was still a relatively new phenomenon. Now its newness has been eclipsed by a range of technologies including the rapid rise of all manner of mobile devices and wireless protocols. These technologies suggest new possibilities and raise new problems. Here I want to reflect on just a couple of intersections of technology and museums.

Enhancing the Museum Experience. One of the most obvious places for new technologies to come into the museum space is through the enhancement of existing museum experiences, especially when it comes to providing visitors with more information.

At MIT's Media Lab, Flavio Sparacino has been experimenting with wearable museum technology. Her most recent piece, The Museum Wearable, exists at the intersection of wearable computing, augmented reality and interactive story-telling. She describes the device as "a real time storytelling device: it is a museum guide which in real time evaluates the visitor's preferences by observing his/her path and length of stops along the museum's exhibit space, and selects content from a large database of available movie clips, audio, and animations" (Sparacino 2001). The

Museum wearable, which exists in prototype, draws on the traditions of immersive cinema and virtual reality. Sparacino has identified three visitor types: busy, greedy, and selective. Using a range of infrared sensors and some real-time analysis of a visitor's behavior in the space, Sparacino's Museum wearable identifies the visitor type and delivers the appropriate and pre-selected audiovisual narration to the visitor interactively in time and space.

At the Exploratorium, a collaboration between HP Labs and the science museum is experimenting with wirelessly connected handheld devices. The project, called the Electronic Guidebook aims to explore the ways in which technology can be used to bridge the physical and virtual worlds. According to researchers, "The museum exhibits are augmented with information and services in the form of web pages, and the users can access those pages conveniently when in the proximity of the exhibits as well as from their desktops outside the museum" (Spasojevic and Kindberg 2001).

There are at least a dozen other museums, universities and corporations experimenting in this space, ranging from SFMOMA to the University of Lancaster in the UK. The same thing hampers all of these experiments – thus far, wireless devices remain awkward and intrusive. In science and technology museums, you are already using your hands to engage with exhibits, so where do you put this device? How do you interact with it? How does it interact with you? There is also an argument to be made that many of these 'solutions' crosscut the desire for social interaction and togetherness. The challenge remains to think about how to take the best of the new, wireless technologies and work them seamless into museum ecologies. Sometimes, just because you can do it, doesn't mean you should.

Taking the Museum Home. One of the interesting consequences of the web for museums has been that the formal boundaries of the museum dissolve. Suddenly the museum is everywhere, or at least potentially everywhere, visited when it isn't open, by people who aren't there. Taking advantage of these new porous borders creates opportunities to let the museum linger, or to take it home with you.

The Science Museum in London opened its new Wellcome Wing last year. A remarkable space, with suspended floors and a layering of interactions, museum workers there have been experimenting with ways to take the museum home. Through finger-print recognition technology, it is possible for museum visitors to take their 'experiments from installation to installation and then ultimately, through web-based technology, access those experiments from their home computers. The Electronic Guidebook at the Exploratorium seeks to do something very similar, allowing visitors to customize their own exploratorium.com pages.

Talking Back to the Museum. Traditionally museums have invited a certain level of participation from their visitors, whether it is simply filling in a visitor's book or adding one's own personal narrative to an active exhibit. New technologies have the potential to create new ways for museum goers to talk back to their museums.

The Longnow Foundation is a San Francisco non-profit dedicated to the proposition that technology should be designed and built with an eye to the distant future. Concerned by the rapid decline in the number of spoken languages in the world, the Longnow Foundation has embarked

on an ambitious project to create an archive of one thousand languages. Upon completion, the archive will be made available to the public in three different medias: a micro-etched nickel disk with 2,000 year life expectancy; a single volume monumental reference book; and through an online archive. What makes this Rosetta Project so interesting, and provocative, is that it relies on the web as a tool to gather information from people all over the world. By creating an open contribution, open review process, Longnow is effectively mimicking the open source movement to take advantage of geographically disparate linguists and contributors. In its first 6 months of live operation, Longnow has attracted 404 volunteers from the around world, has received information about more than 1000 languages and has seen the completion of 11,567 individual text pages.

I am not suggesting that museums embark upon such projects, but the Rosetta project, and its successor – the All Species project – suggest new collection, curation and storage methods and materials, as well as a new paradigm for interaction with museums and their exhibits.

Making New Experiences with new technology. Rather than using technology to re-inhabit and reanimate existing museum experiences, museums can choose to create an entirely new experience. The challenge is not just to instrument old experiences, but also to create new ones.

On the grounds of the Museum of Sydney there is an installation called "from the edge of the trees" (Dyshart, 1995). The title alludes to the vantage point from which Australia's indigenous people might first have seen the colonial intruders – standing at the tree line looking toward the harbor. . The work was first conceived in 1992. It came to final fruition in 1995, under the sponsorship and direction of the Historical Houses Trust of Australia. The installation compromises 29 poles made from sandstone, metal, wood and glass, some carved with names, others marked with bone, ochre, feathers and hair. These poles talk in the voices of local indigenous peoples – as you pass by they call out. The technology here is relatively simple, motion-sensitive embedded recording, but the experience is haunting. Whilst this exhibit is not without its problems, it does suggest something interesting about alternative technology futures within the museum space.

Implications & Conclusions

In the opening days of the twenty-first century, museums are changing, and it is an uncomfortable transition. It is no longer enough to be the repository of objects and artifacts stored for presentation and posterity, presented to the public for their edification. Now museums have to engage with the public, competing with the rest of the entertainment industry for tourist dollars and leisure time. All the while maintaining their learning function. And right now museums seem to be doing a good job. In 1997, museums eclipsed theme parks as a desirable leisure destination (Keates 1999), and have continued to do so in every year since.

However, with all these visitors come a new set of expectations and desires and a new set of demands on the museum ecology. In particular, the increasing visitor desire for, and expectation of technology in the museum ecologies creates a new set of problems for many American museums. This technology is

expensive, and unlike many other western countries, funding for museums is not a high priority in federal and state budgeting.

The emergence of the web and a range of mobile technologies and wireless infrastructures provide an interesting opportunity to reflect on the ways in which museum ecologies have traditionally functioned. Our research has thus far focused on two dominant museum ecologies in the US, and a range of visitor rituals and experiences. We speculate that there are different expectations and rituals in different ethnic, class and regional groups within the United States, as well as significant differences between the United States and other nations. Further research, with a larger sample pool of museums might yield some interesting results and perhaps a key to making the museum ecology more compelling to groups historically under-serviced by such public spaces.

Our research suggests that museums are information rich ecologies with a wide-ranging audience with many different tastes, interests, and expectations. The challenge here is to design information technologies that help to make new connections for museum visitors.

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