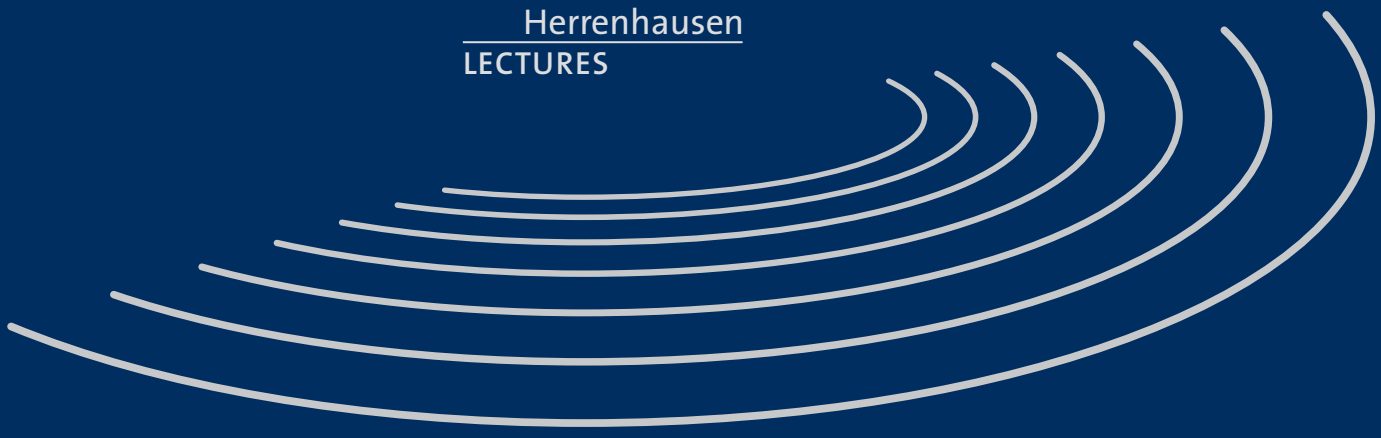
Jeffrey T. Schnapp

Knowledge Design

Herrenhausen
LECTURES



Herrenhausen
LECTURES

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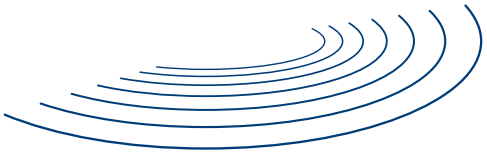

Stylized illustration of the auditorium in Herrenhausen Palace.

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Knowledge Design

Incubating new knowledge forms / genres / spaces in the laboratory of the digital humanities

Keynote delivered at the Herrenhausen Conference
"(Digital) Humanities Revisited – Challenges and Opportunities
in the Digital Age"

For more details on the Herrenhausen Conference
"(Digital) Humanities Revisited – Challenges and Opportunities
in the Digital Age", December 5 – 7, 2013
visit www.volkswagenstiftung.de/digitalhumanities

Knowledge Design

Incubating new knowledge forms / genres / spaces in the laboratory of the digital humanities

The phrase *Knowledge Design* describes the situation in the contemporary humanities that most closely engages my own work as both an analog and digital humanist: which is to say, a setting in which neither the methods that produce humanistic knowledge nor the *forms* and *genres* into which such knowledge is shaped are givens.[1]

The tools of humanistic inquiry have become as much objects of experimentation and research as have their modes of dissemination. Statistical methods press up against one edge of the qualitative human sciences; graphic and information design press up against another. Laboratories arise with a team-based ethos, embracing a triangulation of arts practice, critique, and outreach, merging research, pedagogy, publication, and practice. The once firm boundary line between libraries, museums, archives, and the classroom grows porous as scholarship, deprived of its once exclusive print-based home, shuttles back and forth between pixels and the page, the stacks and the streets, galleys and the gallery. Micro- and macro-scale modes of inquiry flourish side by side, giving rise to new challenges: how to construct arguments that zoom back and forth between the micro, the meso, and the macro, perhaps even overleaping those middle layers of analysis and narrative that once constituted the home turf of the arts and humanities disciplines? How to weave together

THE TOOLS OF HUMANISTIC INQUIRY HAVE BECOME OBJECTS OF EXPERIMENTATION

forms of visual and verbal (and – why not? – acoustical, tactile, and olfactory) evidence? How to chunk information in a world that demands short as well as long forms, and where iterative and multichannel publishing is increasingly the norm?

AN ECLIPSE OF HUMANISTIC LEARNING? AN OPPORTUNITY OF UNIQUE SCOPE AND POTENTIAL FOR RENEWAL!

Does this experimental turn, as some continue to argue, signal an abandonment of the humanities disciplines' core commitment to study exceptions rather than rules, to engage in forms of theorization or social critique, or to plumb the qualitative depths of human experience? Does it mark an eclipse of humanistic learning, a definitive crisis to be added to at least a half century of premonitory crises? On the contrary, I'm inclined to see it as an opportunity of unique scope and potential for renewal: to extend or remap fields of inquiry and knowledge; to increase their rigor, depth, and social impact; to reposition them with respect to contemporary society; to expand the audience for advanced cultural and knowledge forms and, therefore, further long-term processes of cultural democratization that remain one of the great legacies of the 19th and 20th centuries.[2]

This essay will be built less around answers to some of the questions just posed, than it is around models and hypotheses. And it will raise additional questions along the way. At core, it will provide a selective sketch of the overall setting just evoked and, in so doing, single out some nodes that seem to me of special interest with respect to the future of humanistic inquiry: "selective" because fellow experimenters would surely come up with their own, no less valid but different lists. For purposes of concision, I'm going to refer to these nodes as:

- storied collections (innovative things we can do with and across collections whether as data aggregates or as curated assemblages of individual records)
- the social lives of things (multimedia approaches to the description of three-dimensional objects and their representation as networks of relations, rather than as autonomous or atomized objects)
- new learning containers (rethinking learning spaces and models in the digital era), and
- ubiquitous curation (networks and natures, the world as open-air classroom and laboratory).

Do all neatly fall under the wing of the so-called digital humanities? Yes and no.

Yes, to the degree that "digital humanities" is an even more capacious umbrella than the labels – like computational humanities, humanities informatics, or humanities computing – that preceded it. It's less a "field" than an assemblage of sometimes concordant, sometimes discordant experimental practices.[3] The notion that this assemblage falls under a single unified umbrella is, I think, fated to fade away as the digital becomes part of "business as usual" within humanities fields.

LESS A FIELD THAN AN ASSEMBLAGE OF EXPERIMENTAL PRACTICES

However valuable to the advancement of the collective conversation regarding emerging areas of experimental practice, debates over the definition and boundaries of digital humanities have always struck me as being more symptomatic than substantive. The natural sciences may provide a useful point of comparison. To pit "digital biology" against "analog biology", for instance, would be seen as eccentric at best, because it's taken for granted that the *instrumentarium* of the natural sciences evolves with the times. New fields like Bioinformatics do, of course, arise as a collateral effect of the widespread use of digital methods and techniques; but they do so within an environment in which digital tools and methods join

non-digital tools and methods to advance the development of the long-standing disciplinary domain known as biology. The word *digital* in the phrase digital humanities is, thus, in my view, destined to be absorbed into the word *humanities* over the course of coming decades and to seem like the relic of a transitional era. And, while the former term designates a transformation, that transformation builds upon and continues the developmental history of the human science disciplines themselves.

Yes, also, to the degree that all the practices in question involve intensive work with the cultural record in the sort of historically and critically informed fashion that has been fundamental to the humanistic disciplines over the course of their modern history.

But *no*, to the degree that the words *digital* and *humanities* have spongy edges. All four of my nodes, that is, spill out into domains of contemporary culture and society that aren't under the exclusive ownership of any given constellation of disciplines or techniques.

And then, of course, there's the deeper sponginess of the digital itself. The digital is ultimately not *about* the digital. Rather it is about new ways of engaging and interacting with the world: it's about extending our cognitive faculties and social existences; new ways to analyze and experience the past in the present; new ways to work, think, share, and enjoy; new ways to make things, even tradition-bound things like scholarly books.

In short, the digital is about work and science and society, yes, but it is also about the stuff of culture, including pleasures, dreams, imaginings, and stories.

1. Storied Collections

Institutions of memory like museums, libraries, and archives are very good at accumulating, inventorying, sorting, and storing the sorts of materials that make up the cultural record. But they sometimes struggle

to make those materials accessible, bring them to life, and make them matter, whether to research communities or the general public. Most estimates on the portion of cultural collections *ever* exposed to the public run in the 5–15 % range; the rest is locked up in storage so deep as to be inaccessible to even in-house personnel in major institutions.[4] To a very significant degree, this is due to problems of *quantity* and *scale* that are conventionally addressed by means of extreme *selectivity*.

PROBLEMS OF QUANTITY AND SCALE ARE CONVENTIONALLY ADDRESSED BY EXTREME SELECTIVITY

The disproportion between inaccessible vs. accessible cultural assets was already a quandary in the 1800s; we've transformed it into an even greater one over the course of the past century as collecting practices have undergone democratization and diversification. We now collect and preserve more types, categories, and quantities of materials than ever in the history of humankind. And these materials tell a vastly expanded range of stories: about historical moments, people, places, and things. But only a finite number of such stories can be documented and told when the documenting and telling happens in a finite number of spaces with high-level production standards, restrictive rules of access, complex sets of security, climate control, and lighting requirements, all of which entail very substantial costs.

The problem isn't just personnel, space, and resources. And the solution isn't just digitizing everything because, without platforms that facilitate rich modes of interaction, digitization alone amounts to little more than a baby step in the direction of activating the potential knowledge found in that 85–95 % locked up in deep storage. The greater problem is one of growing quantities as well as redundancies.

Let's take the example of photographic archives. It would be hard to dispute the fact that photography has become one of the defining forms of cultural memory, whose significance has continued to expand over the

last century, as photography moved from craft to profession to omnipresent feature of everyday life.

The result is captured by factoids like the following: it has been estimated that *every two minutes* we now take as many photographs as were taken during the entire 19th century.[5] Even before the advent of digital photography or camera-equipped smart phones, collecting institutions were overwhelmed by the sheer volume of photographic documents: 13,640,325 analog photographs are currently housed at the United States Library of Congress – hundreds of times more than even the most extravagantly generous budgets will ever allow to be processed.[6] Yet Facebook houses a photographic repository 10,000 times larger, Flickr hosts another seven billion digital photographs, and during the reader's decoding of the present run-on sentence another 20,000 uploads will have taken place via Instagram.[7] This is the sea within which our digitized cultural collections must swim and it's a sea that is saturated with not just photographic, but also typographic, video, acoustical, and textual plankton – a plankton that is reproducing at exponential rates.

A SEA SATURATED WITH PHOTOGRAPHIC, TYPOGRAPHIC, VIDEO, ACOUSTICAL AND TEXTUAL PLANKTON

The question is not (and has never been) that of pursuing hazy ideals of total preservation: even at the end of the 18th century, total preservation was, at best, a convenient fiction. But how do we make the corpora that matter to a given community or within a given cultural domain accessible and usable in meaningful ways, particularly as collections migrate out of deep storage into massive inventories that are accessible online? The answer lies less on the storage and preservation side than on the user-activation side of the divide. Past, present, and future collections will live or die, come into being or cease to be, as a function of the communities that animate them by means of operations of processing,

analysis, interpretation, argumentation, and remixing. In short, thanks to active use and reuse.

The cognitive scale on which such operations have been traditionally carried out was that of scanning a small repository or collection, culling from the scanning process an even smaller subset of records or materials that then becomes the object of intensive analysis and interpretation, yielding a narrative, whether on the page or in space, that weaves together meanings in the lower middle (or meso-)zone between micro- and macro-perspectives, the individual artifact and the world of objects to which it belongs. Hundreds of years of tradition have gone into shaping the rules for such models of cultural argument and the analytical procedures that support them. Cultural history's domicile has long been somewhere in this small to middle zone.

COLLECTIONS TELL BIG AND SIGNIFICANT STORIES

But what happens when we move from big to titanic collections, from tens or hundreds of cultural objects to tens or hundreds of thousands and beyond into the millions and billions? How do we navigate, describe, analyze, interpret, and tell stories with, about, and through such enormous aggregates? Collections tell big and significant stories that are fundamental to every field of cultural-historical inquiry. But, cognitively speaking, humans are far better at grappling with small rather than large sets of objects. Here, our traditions, not to mention our concepts of genre, methodology, evidence, and argument run the risk of failing us. And it is here that our imagination as knowledge designers is summoned into action.

The challenge posed is multifaceted. In my view, it doesn't involve relinquishing all those skills that humanists have honed over the course of the centuries: an interest in anomaly, ambiguity, the unresolvable and unprovable; close attention to detail, form, and nuance. But it does in-

volve new kinds of engagement with the data that accompany cultural objects and collections – inventory systems, catalogs, and databases – and their transformation into such representations as visualizations. But visualizations are a craft, not a science, and data themselves are not facts but rather artful constructs that express hierarchies of value, institutional norms, and contradictions.[8]

So what is an effective, significant or memorable data visualization? How to toggle between such aggregate forms of representation, the analysis and experience of large data aggregates, and the intimate experience of individual cultural objects in all of their particulars? And how do we make arguments, culturally meaningful and memorable arguments, that productively zoom back and forth between the one and the other? This is not a challenge unique to the humanities disciplines, but it is distinctive inasmuch as criticality and attention to the qualitative have long been core humanistic values.

DATA THEMSELVES ARE NOT FACTS BUT RATHER ARTFUL CONSTRUCTS THAT EXPRESS HIERARCHIES OF VALUE, INSTITUTIONAL NORMS, AND CONTRA-DICTIONS

Recent work carried out by Aude Oliva at MIT's Computer Science and Artificial Intelligence Lab and Hanspeter Pfister's research group at Harvard has suggested just how ineffective (at least from the standpoint of memorability) are traditional data display formats such as bar, pie, and scatter charts, noting the superior power of visualizations that incorporate faces and human-centric scenes, particularly when embedded within stories.[9] But though the study found tree diagrams, network diagrams, and grid matrices to be somewhat better, they remain imperfect, far from universally applicable tools. So what is the right tool for a given navigational, analytical or interpretive task? How do we weave outputs crafted with such tools into forms of argument and narration that signify culturally, that tell stories of consequence, that support or even replicate

the magic and enchantment of traditional forms of storytelling? How do we effectively embed human faces into trees, networks or matrices? And what sorts of distinctive new types of stories do collections want to tell that they have been unable to tell with prior toolkits?

THE NEED TO GIVE RISE TO A HUMANISTIC CULTURE OF CRITICAL ENGAGEMENT WITH DATA

Herein resides the challenge that I am referring to as *storied collections* and that I associate with the need to give rise to a humanistic culture of critical engagement with data and data architectures themselves as well as with the tools that analyze and translate them into argumentative or narrative forms. In this domain, I have long followed with interest an array of experiments, from emerging canons for the representation of human multitudes as the protagonists of modern life via mass panoramic photography[10] to Microsoft Research's *Photo Tourism* project to Nadav Hoffman, Lev Manovich, and Jay Chow's suggestive work on *Phototrails*.[11] Large-scale collaborative, data-driven information art practices have also been constant sources of inspiration: works like the Sensable City Labs's *New York Talk Exchange*, Aaron Koblin's *The Johnny Cash Project*, my colleague Robert Gerard Pietrusko's 2011 *Trans_actions. The Accelerated Art World 1989-09*, and Jonathan Harris's brilliant *The Whale Hunt*.[12]

In a related vein but with divergent aims, the small laboratory at Harvard of which I am the faculty director, known as metaLAB, is in the process of developing a platform known as *Curarium*: "Curarium" or Place of Curation, much in the same vein as *Vivarium* or Place of Life designated Cassiodorus's 6th century monastic compound and library.[13] Curarium's mission is to allow a diverse community of users – from scholars, curators, and museum professionals to teachers and students to members of the general public – to see and work not just with individual items

but with collections as aggregates – even massive aggregates – and *to do things* at and across the strata that run back and forth between individual objects and collections as wholes. The doing in question involves annotation, teaching and research, the making of collections out of collections, even the collective sourcing of unprocessed or difficult-to-process collections.

In the case of collections that have already been described and inventoried, Curarium is designed to allow for the easy ingestion of collections data within a flexible setting that allows for a range of navigation, analysis, processing, research, teaching, annotation, and publication activities. All media content is linked-to externally, so collections themselves are not hosted within Curarium: only cataloging data that is otherwise inaccessible to researchers or locked up in proprietary inventory systems like TMS.[14] The only requirement for record ingestion is that the data is presented as valid JSON[15] with a consistent hierarchy throughout the collection, since the configuration tool allows arbitrarily nested structures to be mapped to a flattened "key value" representation, with keys being fields like "title", "date", "subject", "author", each of which can have single or multiple values. Since no specific structure is prescribed, any and all source formats can be converted to JSON and then ingested. It is important to note that of the aforementioned fields, only the title and images are required, as Curarium allows the ingestor – let's call her the curator-in-chief – to establish collection-specific fields and to alter them over time within Curarium's database. On the basis of these fields, representations of everything from entire collections (and even collections of collections) to filtered subcollections can be generated on the fly via a library of visualization tools that includes tag charts, tree diagrams, scatter diagrams, thumbnail arrays,

REPRESENTATIONS OF EVERYTHING CAN BE GENERATED ON THE FLY VIA A LIBRARY OF VISUALIZATION TOOLS ...

timelines, and maps.[16] The library in question is expansible, designed to grow over time and can be used for purposes of navigation, sorting, and subcollection building in a user's trays. But, no less richly, it can also be employed to expose the so-called "data artifacts" or anomalies that tell stories about shifts and contradictions in the description and categorization of collections by host institutions.[17]

... AND VISUALIZATIONS CAN BE TRANSFORMED INTO CULTURAL OBJECTS IN THEIR OWN RIGHT

The real novelty here is less this library of visualization tools than the fact that visualizations generated within Curarium can be transformed into cultural objects in their own right. Saved as part of the research and curation process and added to a user's trays, able to track back to the moment in a search process that they capture, they can be woven into curatorial arguments that assume the form of so-called Spotlights. An eventual aim will be to build bridges for the export of trays and spotlights to other editing and production environments like Omeka.[18]

Our test collection in Curarium is an art historical puzzle: Bernard Berenson's *Homeless Paintings of the Italian Renaissance* photo archive – 17,000 vintage photographs of 11,000 art objects that once existed (because they were photographed) but whose present existence or location is unknown.[19] Within months of the initial publication of the archive on the Harvard servers, an American student was able to identify and establish the location of 120 such works, mostly paintings from the circle of Jacopo del Sellaio. The other 10,880 remain, for the moment, homeless (but perhaps not for long once Curarium is made available for public use in the summer of 2014). But what interests me most is not whether every puzzle regarding an artwork's current location or survival can be solved, but whether we can forge new models of scholarly storytelling where collections function as cultural artifacts in their own right, in dialogue with other collections as well as the families of objects of which they are composed.

2. The Social Lives of Things

Thus far, I have focused on big data and the challenges of working data into culturally meaningful forms, be they arguments, stories, portraits, or representations. Now I'd like to flip the question on its head, so to speak, and turn to questions of capture, classification, and description at the level of the individual object. These are questions that particularly haunt me as a cultural historian interested in fields like codicology, the history of art, industrial design, and material culture: namely, how can we interact more effectively with three-dimensional objects in screen-based settings? The cultural record consists not just in documents but in things: things whose meaning is reducible neither to text or photographs. The knowledge present in such artifacts is multisensory: tactile, olfactory, acoustical, spatial as well as visual. We experience these things not by adopting a single fixed perspective but by moving in and around them, by assembling and disassembling them, by using them as interfaces to explore the world.

THE CULTURAL RECORD CONSISTS NOT JUST IN DOCUMENTS BUT IN THINGS

Many of the items in that dormant 85–95% of cultural materials in deep storage are three-dimensional objects that translate poorly to the screen. The reduction of the materiality of a rare book to a resizable, two-dimensional record strips away key information regarding its cultural and social meaning. But in the case of a three dimensional object, the stripping away process is more draconian still. How could such objects be better captured and described in screen environments? How might techniques and practices be developed that deepen, expand, and enrich our experience of objects, rather than providing impoverished digital doubles? And what are the distinctive, medium-specific affordances of these doubles?

I believe that there are plausible answers to such questions: answers that involve both enhanced access as well as enhanced use value. But

they aren't going to be provided by engineers. The problem isn't generating geometrically exact three-dimensional scans of cultural objects. Technically speaking, that is a triviality. The problem is that such a scan is of limited significance if it reduces my object to a hollow shell stripped of most of its defining characteristics, or creates a data object too heavy to be worked on or shared in a browser. The solution lies in exploring how and where *value can be added* rather than subtracted in the process of translation of physical object to screen and then from screen back to physical object. In other words, it's a knowledge design question and it's one that requires: a) an enriched set of models of capture and description, b) experimentation with alternative modes of navigating data associated with objects and their interrelations (what I like to call "artifactual interfaces"); and c) an approach to objects themselves that understands them not just as singular entities but also as networks of relations.

EXPLORING HOW AND WHERE VALUE CAN BE ADDED

Such, at least, is the approach adopted in metaLAB's *Teaching with Things* project: a project still very much in the sketching stage, but that may be useful to describe for purposes of fleshing out some of the notions I just touched upon.[20]

So, let's start with capture and description. In *Teaching with Things* our point of departure was to enrich standard inventory or bibliographical records by adding two multimedia elements: an "anchor" representation in the form of a quick-and-dirty "working" three-dimensional model produced either via photogrammetry or the simplified scanning stations we came to call active Susans (an *active* Susan being the motor-actuated antithesis of the revolving *lazy* Susans integrated into kitchen shelving systems); and a library of video clips developed in the act of processing the object.[21] The latter would typically include documentation of the object's scale and weight, its sound properties, its component parts, and any details that are significant from the standpoint of its use or meaning. These

base elements are supplemented with forms of capture that expose otherwise *imperceptible* features: stuff you can't or couldn't see even if the object was sitting right there in front of you – high magnification views of surfaces or hidden contours, slices of the object's geometry (derived from sectioned high resolution scans), CT scans of the object's viscera.[22] In other words, here description and the building of the core record is an *interpretive* process that results in not a chunk of text accompanied by a photograph but in a *multimedia composite*. There's an anchor model, but it's little more than a working model. No one representation, whether text record or video clip or photograph or sound file, puts itself forward as the definitive portrait: rather each and every object is treated as a collection, a mosaic, an aggregate of characteristics.

THE BUILDING OF THE CORE RECORD IS AN INTERPRETIVE PROCESS THAT RESULTS IN A MULTIMEDIA COMPOSITE

Step two in *Teaching with Things* is to transform this composite into a node that supports and sustains an array of interpretive activities, from annotations and commentary to links across the collection and beyond (via open APIs).[23] Such annotations, whatever their medium, can be "pinned" to any location on the three-dimensional anchor model or to the model as a whole. They can be displayed in one of two forms. The first is as a set of windows radiating outward from the model which here serves as an "artifactual interface". Much as one explores an object in the physical world with one's hands, one is able to explore clusters of annotations without ever entering a keyword by simply rotating and zooming in and out of the anchor model. The second involves a split screen representation in which the core record made-up anchor model plus multimedia description appear on the far left, while on the right appears the accumulated stratigraphy of forms of analysis, argument, and commentary that, considered together, tell the full but still unfolding

story of a given object, its family relations, its meanings as construed by varying communities of interpreters. The aim is to model a world where instead of being treated as solitary entities, cultural objects appear instead in the midst of the networks of interrelations that confer meaning upon them. It's a social network of things and, yes, things have friends.

MEANINGS CONSTRUED BY VARYING COMMUNITIES OF INTERPRETERS

Such a "thick" approach to description implies an elevated degree of engagement with a limited set of objects and, in the case of *Teaching with Things*, our initial focus has been on collections-based teaching and on exhibitions as sites of scholarly practice. In the first case, this has implied the development of syllabi of things: semester-long collaborative exercises in the intensive description, curation, and annotation of small families of objects; in the second, as yet unrealized, the goal of integrating intensive / thick forms of digital curation into gallery installations.

If the overall aim of *Teaching with Things* is to explore the networks of relations that animate a given cultural object in a digital environment, then the final destination is to place those networks in dialogue with physical originals. Let's take as an example the category of objects that ancient Athenians called an ὄστρακον *(ostrakhon)*.[24] The ancient Greeks never threw anything away, so when a pot broke, it became the equivalent of a post-it note. Such shards were inscribed with messages of all kinds. Among these were the votes that were cast by citizens in favor or against the expulsion of a citizen for a crime against the polis: the institution known as *ostracism*. So now imagine that such difficult-to-decode fragments, of which there are many thousands, are exhibited in ways that permit visitors to experience the many stories they tell, perhaps even while physically handling uninscribed fragments of equivalent age. The stories in question regard the pots from which each came, the votes of banishment that they conveyed, the places and times where and when

such voting processes occurred, the history of their dispersal and re-collection – in short, they feature the buzz of conversation between domain experts flickering around the physical fragments like an animating halo.

3. New Learning Containers

We have reflected upon the stories that collections can tell and talked about the minute, even microscopic world of things and its multifarious genealogies. Now let's turn to the question of what it means to inhabit a world that has been transfigured into a wifi hot spot. Only a decade ago, places of connectivity had to be sought out like island paradises; today the greater challenge is carving out *cold spots* in a hyperconnected world. I say this with only a modicum of irony inasmuch as the question of how we design spaces for learning, spaces for data and media-rich knowledge production and reproduction, whether offline or online, is very much up for grabs. And I see no reason why such a question should lie outside the purview of the humanities. Certainly, it's a knowledge design question that cannot be addressed without the insights of multiple expert domains.

TODAY THE GREATER CHALLENGE IS CARVING OUT COLD SPOTS IN A HYPERCONNECTED WORLD

I began with the concept of the Cold Spot inasmuch as it was first formulated by a student in the Library Test Kitchen design studio that my colleagues and I have been running at the Harvard Graduate School of Design since the fall of 2011.[25] The Cold Spot represents one contemporary way to pose a question that reaches back to the very foundations of the humanities: namely, the notion that knowledge is produced and reproduced in spaces of solitary retreat and contemplation, spaces where one leaves behind the world of everyday distractions to enter a deeper world of conversation with the spirits of living and dead authors.[26] For

much of human history, such spaces of communion have been called *libraries* and everything in them, from the architectural container to shelving systems, carrels, and copy stations to the collections that they contain, has been designed to support *certain* forms of attention, engagement, interaction, and creation. Surely much of this core mission of retreat remains as pertinent today as it was in the past – witness the stable or rising library usage statistics worldwide – but the conditions have changed in fundamental ways.[27]

BOOKS NOW LIVE MULTI-CHANNEL LIVES

What happens to the library qua architectural container (or to its close cousins, the study and the classroom) when I can carry or access a library one thousand times bigger than the entire library of Alexandria on the mobile device in my pocket, or when modes of solitary inquiry find themselves increasingly flanked by noisy collaborative models or when thinking is no longer segregated from physical making? And what about the library's contents? On the one hand, knowledge forms are migrating to digital platforms, where models of publication are, by their very nature, iterative; on the other hand, we are now printing more books than ever before and these books now live multichannel lives, raising a tangle of questions about the boundary between the world of information and the world of objects (not to mention the physical and social spaces in which they circulate). And, what exactly ought books to become in the digital age? Mere moments in an iterative process or final products? Analog supports for digital originals? Autonomous artifacts that revel in their very bookishness? Remixable objects produced on the fly on Espresso Book Machines?[28] And what of scholarly books: maybe it's time for an overhaul of their look, their modes of argument, the balance between image and text? The remediation of print and a redesign of the scholarly book: there are two worthy tasks for the digital humanities.

THE REMEDIATION OF PRINT AND A REDESIGN OF THE SCHOLARLY BOOK: THERE ARE TWO WORTHY TASKS FOR THE DIGITAL HUMANITIES

All of which brings me back to the design of our Cold Spot: namely, just how *cold* do we want our Cold Spot to be? If "reading" and "study" signify engagements both with digital as well as print media, do we want to filter out all microwave communications? Only email and tweets? What about access to online databases? Do we really want to limit note-taking to analog note-taking? Such questions have a way of focusing our attention on what is, in a sense, one of the deepest design questions of our era. We live in an information-saturated world, a world in which there is a great deal of talk about smart cities and smart spaces. And, since the beginning of human history, libraries (studies and classrooms) have been the smartest spaces of all. Yet just how "smart" are today's environments where the digital and the analog, the online and the offline comingle? Not all that smart. Some are, as they say, "dumb as a doorknob".[29]

Take as an example the design of workstation clusters in academic and library settings. Most are architectural after-thoughts, re-adaptations of existing spaces, as ill-suited to individual work that alternates between analog and digital reading as they are to collaborative work involving groups of individuals, mixed on-site and off-site linked learning, or work that conjoins thinking to making.[30] Likewise, despite the drumbeat of hype, most MOOCs (Massive Open Online Courses) have delivered little more than an online version of the traditional talking-head classroom which, stripped of its conventional academic context, has led to course completion rates mostly below 10 %. So what if a social and spatial dimension were restored to such new learning models and, if so, what might smart spaces specifically designed for participation in MOOCs look like or, better still, hybrid learning spaces that combine elements of the MOOC with the traditional face-to-face classroom?

Such was the overall terrain on which the *Library Test Kitchen* was built: as a propositional but historically and critically informed design studio – a humanities studio – for building the library of the future "one component at a time." The family of components ranges from the big to the small, the practical to the purely speculative: it has encompassed new rule sets for reading spaces, designs for carrels as collaboration spaces, reading booths that function as concentration zones, scanning stations that expose the social history of the books being scanned, books that ping readers on the basis of their prior search histories, reference desks that serve as knowledge exhibition and performance spaces, real-time live and emerging event bulletin boards, and a library innovation strike force van.[31] The aim is at once practical and experimental: to renew the relevance of the critical and narrative tools of the arts and sciences for a world in which technology serves as a means of inquiry.

4. Ubiquitous Curation

By way of a conclusion, I would now like to take the notion of the world as hot spot a bit more literally in order to return to a question that lies at the heart of the present essay: namely, how do we make data, big or small, *matter* – and matter not for purposes of targeted advertising or surveillance or predictive forecasting, but instead in substantive societal and cultural ways?

HOW DO WE MAKE DATA MATTER IN SUBSTANTIVE SOCIETAL AND CULTURAL WAYS?

Paradoxically, data today is often so abundant as to render it of little impact or use; and it is almost a truism to observe that, in and of itself, even the very best knowledge base doesn't necessarily alter behaviors or perceptions, not to mention effect social or cultural change. So how do we model and develop the tools, translational arts and techniques, the criti-

cal and curatorial practices, the modes of communication and participation that bring information to bear meaningfully on and in the world? This seems to me an eminently humanistic question and it's one that takes on a dramatic coloration when it comes to matters such as climate change. It also applies more broadly to human interactions with the environment.

Until recently, the natural world mostly fell outside the compass of data networks. Now much of it no longer does. But how to leverage the powers of a networked nature in ways that promote and sustain a culture of engagement and shared guardianship of the landscape and the environment? That's the question.

Let's take the example of the urban parklands frequented by significant portions of the population throughout the world. A majority of that visitor population, smart-phone in pocket or tablet in handbag, experiences these environments not as artificial constructs meticulously crafted and maintained like the galleries of a museum, but rather as "natural" landscapes. And understandably so. With the exception of themed formal gardens, signage is usually limited to metallic tags bearing the Latin names of trees, of significance mostly to professional gardeners and botanists. There's little to suggest that there's a learning opportunity here, not to mention that your place of recreation is also an open-air classroom in the making. Everything says instead "this is a place of relaxation and recreation". Curiously enough, the relative scarcity of on-site didactic supports is inversely mirrored by the abundance of open science resources on the World Wide Web regarding plant life, the landscape, and the environment.

YOUR PLACE OF RECREATION IS ALSO AN OPEN-AIR CLASSROOM IN THE MAKING

But it's not just a matter of building a bridge between these information resources and the array of locations that make up an urban parkland. The deeper question is what kind of bridge? Following a standard

top-down didactic model, it would be easy enough to envisage placement of QR codes on every tree and plant so as to supplement the experience of standing before a specimen with layer upon layer of information provided by experts. One might well augment the experience with plant details (leaves, buds, flowers, trunk sections, roots) or maps showing the migration and distribution patterns of given species, or information regarding interactions with insect and bird populations.

HOW EFFECTIVE IS IT TO LOAD VISITORS UP WITH INFORMATION INSTEAD OF LETTING THEM DRIVE THE PROCESS OF INQUIRY AND DISCOVERY?

But just how productively do people make use of QR codes? Not so productively. Moreover, however well designed and intended, how effective is it to load visitors up with information instead of letting them drive the process of inquiry and discovery? And why intensify their focus on the portable device as information source instead of, say, developing their observational skills as naturalists with the device serving as a mere support? Like most early experimenters in such domains, I have sometimes noted with dismay the ways in which the attention budget of visitors becomes unbalanced with augmented reality and smart phone supports for both indoor and outdoor exhibition programming, as compared with less invasive conventional vectors (like recordings on headphones). Moreover, in both the conventional and unconventional cases, the delivery model is still predominantly top-down. Little is *produced* at the user-level. (Even a photograph snapped in a gallery in the Louvre is already an initial gesture of engagement: a promissory note with respect to the viewer's future intent to exercise his or her perceptual muscles.)

Such questions might seem secondary when quality information is the primary focus, but urban parklands don't tell just one kind of story or provide just one point of engagement for visitor populations. Rather, they are cultural, social, and economic spaces that spill out into the city,

and the city spills back into them. And this is true not only of the flow of visitors, day and night, on-path or off-path, human and not, but also of the flora that makes them up. The intended landscape is constantly intruded upon by so-called invasive species; and "invited" species introduced in parks frequently migrate outwards to invade the urban landscape in unintended ways. And each and every plant or tree is more than a botanical record: it comes from a place; it was extracted from that place at a given moment in time; it figures in works of the imagination (the park is an anthology); it has physical properties and various histories of uses (from the decorative to the medicinal). Last but not least, each and every plant is a living specimen: its story is not yet complete; it's perpetually on the move; its story overlaps with other stories of movements and migrations.

So let's return to the question of how to build a proper bridge. An alternative approach might involve understanding the mobile device as the equivalent of a field-notebook or sketchbook: that is, as a gathering and collecting device that, rather than simply delivering information, supports operations of study and observation on the part of visitors. In the spirit of its 19th century precursors, such operations would include sample collection (in the form of images taken on various scales), field notes (vocal or written), the capture of sounds, the taking of measurements and temperatures, and, why not?, other procedures that use the capabilities of smart devices equipped with sensors. Carried out on-site as a function of visitor interests (rather than on the basis of a prescribed botanical, ornithological, entomological, art historical, or other script), these materials could then be processed, edited, cross-bred with online resources, and published post-visit in the form of curated itineraries that become part of a shared pre-visit library that unfolds the multiplicity of ways in which visitor communities, whether of experts or non-experts, teachers or members of the general audience, are actively engaged in interpreting a parkland. Among these, the prospect of participation in

ongoing resource management and citizen science projects, or other analogous forms of research that foster a collective sense of ownership, guardianship, and responsibility, represents a horizon that no longer seems unattainable. And it's a horizon that brings us closer to honoring the etymological meaning of the word curation as caretaking, especially caretaking for that which is endangered or unable to care for itself.[32]

In these remarks, I have sought to survey some of the ways in which such caretaking of our cultural present and past is evolving in scale and scope, shuttling back and forth between familiar and unfamiliar realms, creating new audiences and possibilities as well as forming new challenges and problems, eroding some disciplinary boundaries and forging new ones. Amidst such shifts, there's a deeper question: in a world that is ever increasingly being transformed into an open air classroom, laboratory, library, archive, and museum, what is the location of institutions of higher learning. From the standpoint of what I've been referring to here as knowledge design, the most compelling answer to the question can be summed up in a single word: *everywhere*.

THE PROSPECT OF PARTICIPATION IN ONGOING RESOURCE MANAGEMENT AND CITIZEN SCIENCE PROJECTS REPRESENTS A HORIZON THAT NO LONGER SEEMS UNATTAINABLE

Notes

1 This essay is based on a series of talks first incubated for the "Emerging Disciplines" conference at Rice University, held in February 2011. Additional inputs along the way have come from the coauthors of *Digital_Humanities* (Cambridge, MA: MIT Press, 2012), Anne Burdick, Johanna Drucker, Peter Lunenfeld, and Todd Presner, and, most especially, my colleagues at metaLAB: Matthew Battles, Yanni Loukissas, Kyle Parry, Pablo Barria, and Jessica Yurkofsky.

2 Such is the argument made throughout *Digital_Humanities*, but see in particular pp. vii-x and 75–98.

3 To get a sense of the range of positions, Matt Gold's *Debates in the Digital Humanities* (Minneapolis: University of Minnesota Press, 2012) is the ideal point of departure.

4 Many studies have been carried out over the years on this topic. Among them, I've found Suzanne Keane's "Collections for People. Museums' Stored Collections as a Public Resource," University College of London, published by the UCL Institute of Archeology in 2008, particulary rich in ideas. The document is available at www.ucl.ac.uk/storedcollections. Also indicative is a study conducted by the Office of Policy and Analysis of the Smithsonian Institution in April 2005, *Concern at the Core – Managing Smithsonian Collections*, available at http://www.si.edu/content/opanda/docs/Rpts2005/05.04.ConcernAtTheCore.Contents.pdf.

5 There are many such estimates circulating in contemporary discussions regarding the ubiquity of photography. On this subject, I've found Jonathan Good's blog entry "How Many Photos Have Ever Been Taken?" (Sept. 15, 2011) to be useful: http://blog.1000memories.com/94-number-of-photos-ever-taken-digital-and-analog-in-shoebox (accessed Dec. 1, 2013).

6 My figures are based on http://www.loc.gov/about/generalinfo.html (accessed Nov. 30, 2013).

7 See the May 2012 report "Instagram by the Numbers" at http://blog.kissmetrics.com/wp-content/uploads/2012/05/instagram-by-the-numbers.pdf (accessed November 28, 2013).

8 On the history of both critical and acritical usages of visualization techniques see Johanna Drucker's *Graphesis: Visual Forms of Knowledge Production*, metaLABprojects, (Cambridge, MA: Harvard University Press, 2014).

9 This work was recently written up on the web page of the Harvard School of Engineering and Applied Sciences at http://www.seas.harvard.edu/news/2013/10/what-makes-data-visualization-memorable, consulted Oct. 30, 2013. It has been published as Oliva, A., Isola, P., Khosla, A., & Bainbridge, W.A., "What makes a picture memorable?" SPIE Newsroom article, 7 May 2013, http://spie.org/x93734.xml and as Borkin, M.A, Vo, A.A., Bylinskii, Z., Isola, P., Sunkavalli, S., Oliva, A., & Pfister, H. (2013). What makes a visualization memorable? IEEE Transactions on Visualization and Computer Graphics (forthcoming).

10 See, for example, "The Mass Panorama," *Modernism/modernity* 9.2 (April 2002): pp. 1–39.

11 Documentation on the *Photo Tourism* project is located at http://phototour.cs.washington.edu/). On *Phototrails*, see http://phototrails.net/.

12 The following urls provide documentation of these projects: http://senseable.mit.edu/nyte/, http://www.thejohnnycashproject.com/, http://stewd.io/w/transactions, and http://thewhalehunt.org/.

13 metaLAB (http://metalab.harvard.edu/) is part of Harvard's Berkman Center for Internet and Society, though it is physically housed at the Graduate School of Design. The development site for Curarium is located at http://www.curarium.com/.

14 TMS is an open-architecture collections management system, widely employed in museums and other collecting institutions, that divides up collection information into ten interlinked record types: objects, constituents, media, exhibitions, loans, shipping, bibliography, sites, events and insurance. For further information see http://www.gallerysystems.com/tms.

15 JavaScript Object Notation or JSON is a data-interchange format that employs conventions shared by the C-family of programming languages that are simple for machines to parse and readily intelligible to human operators.

16 There are some challenges inherent to the approach I have described, particularly as collections increase in scale, causing slow loading times and delays in the generation of on-the-fly visualizations. As currently constructed, Curarium is able to work productively with collections in the range of 0-70,000 items; we are currently grappling with the problem of how to handle larger collections.

17 On this subject see Matthew Battles and Yanni Loukissas, "Data Artifacts: Tracking Knowledge-Ordering Conflicts Through Visualization," paper presented at the 2013 *UDC Seminar in Classification and Visualization*, published in A. Slavic, A. Akdag Salah, and S. Davies eds., *Classification and visualization: interfaces to knowledge* (Würzburg: Ergon Verlag, 2013).

18 Omeka is an open source web-publishing platform for the display of library, museum, archives, and scholarly collections and exhibitions developed at the Roy Rosenzweig Center for History and New Media; for further information, consult http://omeka.org/.

19 A posthumous volume of essays documenting Berenson's lifelong gathering of documentation of lost or destroyed works was published as *Homeless Paintings of the Renaissance*, Hanna Kiel ed. (London: Thames & Hudson, 1969), but the photographic archive far exceeds the contours of this gathering of published essays.

20 The sketching phase of this project was funded by a modest grant from the Hauser Initiative for Learning and Teaching at Harvard, received during the 2012 – 2013 academic year.

21 Some documentation of the early sketching work is available at http://metalab.herokuapp.com/exp_twt.php

22 Computed tomography (CT) scans use x-rays to yield detailed pictures of structures inside of a body or object in the form of "virtual slices" that can then be assembled into full three-dimensional models.

23 API stands for *application program interface*. It is made up of protocols and

tools that can serve as the building blocks for the development of applications that allow software components to interact simply and efficiently. For a comprehensive listing of major APIs see http://www.programmableweb.com/apis/directory/1?sort=mashups.

24 On *ostraka* and the institution of ostracism, see Sara Forsdyke, *Exile, Ostracism, and Democracy: The Politics of Expulsion in Ancient Greece* (Princeton: Princeton Univeristy Press, 2005).

25 The concept of the cold spot and an actual cold spot environment were first developed by the former metaLAB collaborator Ben Brady. For documentation see http://benbrady.wordpress.com/2012/09/10/wifi-cold-spot-updated-pics/, with additional coverage in the press (see, for instance, Ariel Schwartz, "The Wi-Fi Cold Spot Shields You From The Pressures Of Modern Technology," *Fast Company* (Sept. 17, 2012), http://www.fastcoexist.com/1680506/the-wi-fi-cold-spot-shields-you-from-the-pressures-of-modern-technology, accessed January 2, 2014).

26 From Horace, Tibullus, and Cicero to Petrarch, *otium* has been understood as fundamental to the humanistic enterprise, on which subject see Jean-Marie André, *L'Otium dans la vie morale et intellectuelle romaine des origines à l'époque augustéenne* (Paris: Presses Universitaires de France, 1966).

27 Such matters are the concern of Jeffrey T. Schnapp and Matthew Battles, *The Library Beyond the Book*, metaLABprojects (Cambridge, MA: Harvard University Press, 2014).

28 Espresso Book Machines are sometimes described as print-on-demand "bookstores in a box". They enable readers to produce their own custom books as well as to commission instant reprints of out-of-print volumes by means of a machine that turns out books with full-color covers, trimmed to an exact size, that are largely indistinguishable from ordinary books. See http://ondemandbooks.com/ for further information.

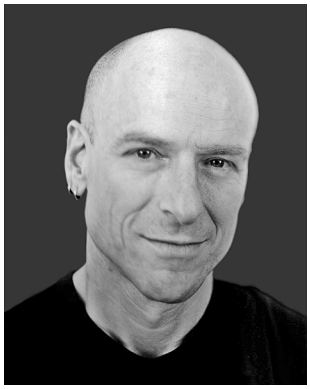
29 Indeed, the well-designed doorknob is the starting point for Donald A. Norman's *The Design of Everyday Things* (3rd edition; New York: Basic Books, 2002), pp. 9–10.

30 There are an increasing number of counterexamples today — libraries such as those at the University of Calgary and North Carolina State University — where collaboration spaces and hybrid work environments have become integral to the library's architecture.

31 Documentation of the ongoing work of Library Test Kitchen, led by Jeff Goldenson from the Harvard Library Innovation Lab, may be found at http://www.librarytestkitchen.org/.

32 Such an approach has been sketched out in metaLAB's *Digital Ecologies* project described at http://metalab.harvard.edu/digital-ecologies/ with some additional documentation available also at http://arbonauts.nafster.com/site/.

The Author



Jeffrey T. Schnapp

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Before moving to Harvard University in 2011, Jeffrey T. Schnapp occupied the Pierotti Chair of Italian Studies at Stanford, where he founded the Stanford Humanities Lab in 1999.

A cultural historian with research interests extending from antiquity to the present, his most recent books are *The Electric Information Age Book* (with Adam Michaels); *Modernitalia*, a collection of essays on 20th century Italian literature, design, and architecture; and *Digital_Humanities*, co-written with Anne Burdick, Johanna Drucker, Peter Lunenfeld, and Todd Presner. Forthcoming with Harvard University Press is *The Library Beyond the Book*, an experimental book that explores future scenarios for libraries in the digital age.

His work in the domains of design, digital arts and humanities, and curatorial practice includes collaborations with the Triennale di Milano, the Cantor Center for the Visual Arts, the Wolfsonian-FIU, and the Canadian Center for Architecture. His *Trento Tunnels* project – a 6,000 square meter pair of highway tunnels repurposed as a history museum – was featured in the Italian pavilion of the 2010 Venice Biennale and at the MAXXI in Rome (fall-winter 2011). *Panorama of the Cold War*, a collaboration with Studio Terragni Architetti and XY communications, was exhibited in the Albanian Pavilion of the 2012 Venice Biennale and at the MAXXI (Dec. 2013–April 2014). He is the chief curator of *BZ 18-45*, a documentation center built under Marcello Piacentini's Monument to Victory in Bolzano, scheduled to open in May 2014.

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Communication: Jens Rehländer
Editing and Coordination: Beate Reinhold
Typesetting and Layout: Das Herstellungsbüro, Hamburg
Printing: Rasch Druckerei und Verlag, Bramsche

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