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This is a book about humanities explorations of digital mapping. That’s strange, you say. **What do the humanities have to do with map-making? And why write a book about something digital?** To address the first question: the book brings together the methods, content, and values of the humanities to create and re-create representations of places, what we are calling “thick mapping.” The methods are design-centered, critical interrogations and interpretations of the multiplicity, heterogeneity, and ambiguity of the cultural record of places. It is not a book about “maps” per se but about exploring, participating, and listening, something that transforms our conception of mapping into a practice of ethics. At the core of this book is an idea about the possibility of expanding participation and of the value of knowledge in the service of the public good.

But why write a book? A book allows for the choreography of an argument. While you can certainly start at any point in the book or skip around at will, if you read the pages sequentially, you will be brought through the argument as a choreographed experience, much like watching a dance ensemble perform a piece from start to finish. The authors imagine the book as a stage upon which a performance takes place, one in which many voices and movements come together in time. In this sense, the book is not a simple linear narrative; rather, it is a staging of various kinds of narratives and media in a spatial arrangement that is cumulative and recursive. In other words, the book represents a practice of mapping, an emplotment of many narratives and voices at once.

It starts with a series of essayistic pieces that define the key terms (HyperCities, thick mapping, digital humanities) before turning to a conceptual and technological genealogy of the HyperCities project. In places throughout the book, the narratives run parallel to a series of critical code studies.
We examine modules of code in order to expose the undergirding assumptions and structuring principles built into the HyperCities project at the level of the code itself. From there, the first project windows open up. These windows are written in the voices of the authors, designers, and cartographers themselves. After that, the book presents a media archaeology of Google Earth and turns to several cultural-historical investigations of map projections and the political epistemologies of mapping. This chapter terries with the profound contradictions and fraught dialectic at the heart of the HyperCities project and digital cultural mapping more generally. The final chapter focuses on two world-historical events—the 2011 “Arab Spring” in Egypt and Libya, and the Japanese earthquake and tsunami that same year—through the lens of social media mapping. The investigation moves from aggregations of data and high-altitude visualizations to the singularity of the human voice that personalizes and punctuates any abstracted totality. The narrative changes from theoretical and conceptual explorations of “events” to first-person accounts, photographic documents, and fragmentary, 140-character long Twitter streams. The geolocated tweets of a single eyewitness, Tranquil Dragon, are mapped onto the space of the page and can be “played” like a miniature flip-book.

Throughout the book, we can also make use of certain rhetorical devices, tropes, and figures such as synecdoche, ekphrasis, and aphorism. We consciously move between verbal and visual modes, while writing in several different registers, sometimes even on the same page, in order to denaturalize expectations of a single, objective voice. At the same time, the authors assume multiple relationships to and perspectives on the material, the events, and the objects of study. We take up these positions from within the act of writing and composing, as a kind of middle voice, in which neither active nor passive speech predominates. This is also driven by an awareness of our (sometimes) precarious ethical stance and embodied relationship vis-a-vis the material under consideration. Sometimes the view is “zoomed out” from a perspective of abstracted data, and sometimes the view is profoundly “zoomed in,” such as Kawano’s experience of going inside the radiation zone around the Fukushima nuclear power plant. This is a view that is no longer that of a safe spectator but of a body-at-risk.

More pointedly, the book is an experiment in remediation, in which certain expectations of genre and narrative are consciously flouted. “Scholarly” writing exists side-by-side with code, which exists side-by-side with community generated content and voices from the public—at-large through social media feeds. As the book progresses, the long-form narratives break down into smaller and smaller pieces such as data streams, tweets, and images to reveal different perspectives—distant and close—on the mapping of events. The last chapter literalizes Walter Benjamin’s famous injunction that “history breaks down into images, not into histories [or stories, or narratives].” Benjamin was playing with the German term for history (Geschichte), which can mean an event (in the sense of das Geschehen, something that happened) as well as “history” or “story” in the sense of a narrative account of events and occurrences. For Benjamin, there is no homology between that which happened and the narrative means to present the past; instead, there are only transitory, fragile, and dialectical images, which form montages of interplay and constellations of tension between that which was and the now-time of a given present.

Altogether, you are looking at a book that was collaboratively conceived, authored, and choreographed at every stage of its development and design. The primary authors
were Todd Presner (Minion Pro), David Shepard (OCR B), and Yoh Kawano (Nezuít S). Not unlike Mark Z. Daniewsksi’s experimental novel House of Leaves, the different fonts within the book indicate changes in narrative voices. The book also features contributions written and designed by project leaders that open up as “windows” onto the HyperCities idea and digital cultural mapping more generally.

There are four such windows in the book: a thickly layered “ghost map” of downtown Los Angeles by Philip Ethington; a cultural history of Historic Filipinotown (H-Fi) in Los Angeles by Mike Blockstein and Reanne Estrada, told through multiple mappings of this neighborhood using personal stories, art installations, and video testimonies; a four-dimensional geotemporal argument and virtual worlds exploration of the Roman Forum in the ancient world by Diane Favro and Chris Johanson; and, finally, a day-by-day and hour-by-hour mapping of the Tehran election protests of 2009 by Xárene Eskandar using social media.

In selecting these four windows, we wanted to showcase some of the variety and texture of mapping projects in the digital humanities. They are each told through the voices of the primary project cartographers and exemplify innovative approaches to creating and deepening public knowledge. In the case of the HiFi project, for example, many of the voices are those of immigrant youth living in Historic Filipinotown, collaborating with a class at UCLA, the Filipino Workers Center of Southern California, and a social enterprise called Public Matters to create a cultural record and to preserve community memories of this neighborhood. In the case of Tehran, the maps are attempts to curate the voices and images of protest in the face of powers determined to suppress and erase them.

All these voices and maps come together not in a hy-
Lexicon

HyperCities

Imagine a digital narrative crisscrossing place and time, starting with the date and location of your birth. The narrative grows, fragments, and connects many places and times together, as your life unfolds and as you tell your story. Any event in your life can be geo- and time-located, and each event connects with innumerable other events in your life and the lives of others. Everyone’s life story intersects with countless others at every moment, creating ever denser webs that document the complexity of the human experience. Every story matters, every voice can be heard, every event—no matter how big or how small—can be captured.

What if the World Wide Web was composed of lives, not pages? Imagine a search and discovery tool for this web in which you traveled through time and space, rather than inputting keywords in an empty white box. Imagine browsing this web by deciding where and when you wanted to go rather than what you needed to find. What if you could “drill down” at a given place over the last ten seconds, the last ten minutes, the last ten months, the last ten years, or the last ten centuries? Among other things you might find historical maps, architectural reconstructions, personal stories, pictures, documents, and other sources that bring alive the texture and vibrancy of past places. What if you could search any place in the world on a single day, and what if these ever-expanding, ever-thicker webs of events, documents, and lives were keyed to physical locations in built spaces? What if there was a way to let the ghosts return, the memories come to life, and the silenced voices be heard? Would it be a vision of digital democracy or a dystopia of total knowledge and control?

Alas, HyperCities doesn’t exist. It’s an idea, largely unrealized, perhaps impossible. This book is an exploration of attempts to imagine, build, and tarry with something called HyperCities. It documents a series of “laboratory” projects inspired by this idea. If you are looking for a finished software platform called HyperCities, let us be clear: it doesn’t exist. There is no fully functional, released piece of software, only a series of prototypes, experiments, code modules, and projects that more or less work. This book is a synthesis of the HyperCities idea, composed in historical, conceptual, and speculative modes. It tells the dialectical story of an idea—through many voices and with many authors—in the bur-
geoning field called “thick mapping in the digital humanities.”

Semantically, the term “HyperCities” accords with “hypertext” and “hypermedia,” coinages by the visionary media theorist Theodor Nelson. In a seminal essay of 1965, “A File Structure for the Complex, the Changing, and the Indeterminate,” Nelson sketched out an open-ended, non-linear system for organizing, interlinking, and accessing information. A hypertextual structure, in his articulation, cannot be reduced to a single medium (such as print) and could grow and change as new information was added to the system. The term “hypertext” thus refers to “a body of written or pictorial material interconnected in such a complex way that it could not conveniently be presented or represented on paper . . . Such a system could grow indefinitely, gradually including more and more of the world’s written knowledge” (144). Anticipating the World Wide Web by nearly twenty years, Nelson called his invention the “Evolutionary List File,” an interconnected, interlinked, hypermedia information system that could grow and proliferate as users added new material. As an open-ended authoring, curatorial, and annotation environment, HyperCities is founded on an analogous logic.

Within the disciplines of geography and urban planning, “hypercities” sometimes refer to densely populated cities with more than twenty million inhabitants, so-called “megacities.” While this definition is relevant for investigating urbanism and population dynamics, the HyperCities idea focuses on the past, present, and future of cities. In this respect, HyperCities are much larger than twenty million inhabitants, since they might embody the entire (largely erased or absent) history of a city—potentially every life, every structure, every street, every voice over time. Of course, it would be absurd to posit the resuscitation of the dead or pursue a naïve positivism (that the past can be fully recuperated or represented by the employment of technology); instead, HyperCities is about the possibility of telling stories, of narrating places, and of producing new configurations of knowledge in which every past, present, and future is a place. In this sense, mapping history is about curating places, conjuring and caring for ghosts.

**Thick Mapping**

Mapping is not a one-time thing, and maps are not stable objects that reference, reflect, or correspond to an external reality. Mapping is a verb and bespeaks an on-going process of picturing, narrating, symbolizing, contesting, re-picturing, re-narrating, re-symbolizing, erasing, and re-inscribing a set of relations. On its most fundamental level, a map is a graphical representation of a set of relations. Maps are visual arguments and stories; they make claims and harbor ideals, hopes, desires, biases, prejudices, and violences. They are always relational, in dialogue or in contact with someone or something. They may or may not attempt to reference, reflect, or represent an “external reality” (however one defines that), but they are fundamentally propositions, suffused with world-views, structuring epistemologies, and ways of seeing. Maps are representations of a world, which reference other such representations. When we georeference historical maps, we are not “correcting” them or making them “accurate”; instead, we are keying one representation to another representation (not to reality).

The history of cartography indicates a clear recognition of the material substance or media of the map. The very terms “map” and “chart” derive from their materiality: the Latin word *carta* denotes a formal document on paper or
parchment, while the term *mappa* indicates cloth. Prior to the printing of maps in the late fifteenth century, maps were often drawn on parchment or cloth or etched in wood, metal, or stone. In Renaissance Europe, the circumnavigation of the world and the production of accurate projections for empirical exploration went hand-in-hand with the engraving of world maps and the production of celestial and terrestrial globes. With the development of the printing press and the scientific revolution in the Age of the Enlightenment, mapping began to assume a central role in developing accurate statistical methods (such as the census) and the proliferation of mappable data, both of which played a critical role in the expansion of the European nation-state and the colonial conquest of the “unknown” world. Not until the late nineteenth and early twentieth centuries did non-print technologies (particularly, aerial photography and film) play a role in producing maps of the world. This would be taken to a new level with the deployment of remote sensing Global Positioning Satellites (GPS), allowing accurate determinations and targeting of any point on earth according to latitude, longitude, altitude, and time. With the development of the first computational tools for producing digital maps and analyzing troves of geo-data in the 1970s, the material history of mapping entered a new chapter: mapping was transmogrified into computational processes and Geographic Information Systems (GIS). Today, web-based mapping applications such as Google Earth, OpenStreetMap, and WorldMap have brought the analytic tools of GIS to the general public and are changing the way people create, visualize, interpret, and access geographic information.

Digital mapping offers a significant break in the history of cartography precisely because it fundamentally changes the materiality and media of mapping. Unlike artifactual maps on paper, cloth, or parchment, digital maps are extensible, mobile, and networked. As such, new data about location (ranging from traffic reports, crime statistics, voting patterns, and housing prices to user-generated routes, historical photographs, and personal stories) can be instantly added from a range of web-enabled devices. But until recently, these tools have primarily served utilitarian purposes (like driving directions), as well as, more ominously, micro-level surveillance and population monitoring. Following the 2012 presidential race, massive amounts of GIS data, strategically keyed to and targeted at the granularity of a given household, were touted as critical determinants for Obama’s reelection. And following the revelations of the scope of the NSA’s dataveillance programs, we now know that we live in a world in which everything and everyone can be watched, monitored, tracked, and mapped. “Thick mapping” has an underbelly of unmitigated paranoia and unchecked control.

On its most basic level, “thick mapping” refers to the processes of collecting, aggregating, and visualizing ever more layers of geographic or place-specific data. Thick maps are sometimes called “deep maps” because they embody temporal and historical dynamics through a multiplicity of layered narratives, sources, and even representational practices.1 But “thickness,” as we are using the term here, is not quite tantamount to “depth.” Depth models, of course, abound in the history of modernism: Freud imagines psychoanalysis as an archaeological enterprise, likened to unearthing ancient Rome, in which the latent desires of the subject can be probed ever more deeply; hermeneutical models in the sciences and certain historical disciplines imagine their methods as excavations of hidden processes and meanings; the aesthetic forms of modernism—the black square on a black canvas, the glass box, but also the montage form—stemmed
from a world in which deep, total, and utopian “solutions” were still imaginable and possible. Postmodernism, on the other hand, is supposedly all about surface, the infinite play of signifiers, the total loss of historicity, and the schizophrenic subject called to cognitively map the world in order to somehowbrook resistance to the leveling effects of capitalism. It privileges categories of spatiality precisely because the mutation in the global spaces of multinational capital requires the development of new perceptual habits to find orientation, develop agency, and map this space.

HyperCities draws from both modernism and postmodernism: it is inspired by a depth model rooted in the idea of archaeological coring and can be seen as a response to the crisis of historicity. And yet it is infinitely extensible and rhizomatic in practice, simultaneously moving vertically and horizontally, down and across. Intertextual play exists side-by-side with historical layers of meaning-making; practices of cognitive mapping are both global and local but never simply mimetic, as if a stable external reality can be reliably and definitively mapped.

Instead of positing another depth model or yet another celebration of postmodern hyperspace, the HyperCities project strives for “thickness.” Thickness means extensibility and polyvocality: diachronic and synchronic, temporally layered, and polyvalent ways of authoring, knowing, and making meaning. Not unlike the notion of “thick description” made famous by anthropologist Clifford Geertz, thickness connotes a kind of cultural analysis trained on the political, economic, linguistic, social, and other stratificatory and contextual realities in which human beings act and create. By eschewing any kind of universalism, it is a kind of analysis that is intrinsically incomplete, always under contestation, and never reaching any kind of final, underlying truth. Thick mappings, like

thick descriptions, emphasize context and meaning-making through a combination of micro and macro analyses that foster a multiplicity of interpretations rather than simply reporting facts or considering maps as somehow given, objective, or complete.

Thick maps are conjoined with stories, and stories are conjoined with maps, such that ever more complex contexts for meaning are created. As such, thick maps are never finished and meanings are never definitive. They are infinitely extensible and participatory, open to the unknown and to futures that have not yet come. And perhaps most importantly, thick maps betray their conditions of possibility, their authorship and contingency, without naturalizing or imposing a singular world-view. In essence, thick maps give rise to forms of counter-mapping, alternative maps, multiple voices, and on-going contestations. Thick maps are not simply “more data” on maps, but interrogations of the very possibility of data, mapping, and cartographic representational practices. In this sense, “thickness” arises from the never-ending friction between maps and counter-maps, constructions and deconstructions, mappings and counter-mappings.

Digital Humanities

The conjunction of “digital” and “humanities” raises fundamental questions for documenting and analyzing the cultural record of humankind. “Digital” is a shorthand term that connotes the domain of the computational governed by binary numeric form and the electronic technologies that operate according to this logic. The Internet and the World Wide Web are, of course, digital technologies but the digital refers, more broadly, to any computational or algorithmic
procedure to encode, present, distribute, and analyze data. This logic is, ostensibly, antithetical to the “humanities” which are, at least traditionally, the domain of the arts, philosophy, literature, and culture more generally. The humanities are characterized by creative energies and critical practices that relish ambiguity, subjectivity, and interpretation. They cannot be reduced to ones and zeros.

But over the past decade, the methods, media, and materiality of humanities research have undergone dramatic change, with massive new possibilities emerging for authorship, creative design, meaning-making, data curation, interaction, and dissemination of scholarship. The world of print culture has not vanished, but it has become transformed in fundamental ways and supplemented by new technologies that allow researchers to ask entirely new questions about the cultural record, at a scale that requires computation. As such, the humanities have developed new research methods through their encounter with the computational sciences, not only creating large and complex cultural datasets for analysis but also fostering humanistic approaches to algorithmic thought, which interrogate the governing assumptions built into technologies, data, and computational practices themselves. “Digital Humanities” is an emerging field that explores the deeply productive tension and precarious linkage between computational practices and humanities scholarship. The HyperCities project is a product of this linkage.

This is why HyperCities is not primarily a “technological” or “computational” problem but foremost a “humanities” problem, namely one of memory, narrative, archival practices, knowledge design, and, finally, ethics. The Digital Humanities for which I am arguing is not simply about computational processing of data but about the design of something new, an “insertion”—as Hannah Arendt might say—of a new potentiality, of a future that remains open to possibilities, even new worlds. We thus begin by inserting ourselves into the world.
The figure of the flâneur—the so-called “man of the crowd”—was made popular in the mid-nineteenth century by the likes of Edgar Allan Poe and Charles Baudelaire in short stories and poetry that portrayed the modernity of great cities like London and Paris. The flâneur (almost always a man of leisure, a dandy) strolled along the bustling streets, under the gas lamps, observing the metropolis as an urban spectator and occupying a liminal zone of privilege and transgression. But for Walter Benjamin, the German-Jewish cultural critic and philosopher writing his magnum opus, *The Arcades Project*, a book on nineteenth-century Paris, the flâneur was not simply someone who walked the streets of the modern metropolis and disappeared into the swarm of crowds; rather, it was someone who was a time-traveler. As the flâneur walked along the streets, he was conducted downward in time. What a striking idea: that the physical topography of the street could lead you back to a time that had vanished, to a time that was not even your own. How could this be? Is it really the street, or might it be a kind of sensibility or openness to apprehending, listening to, and, ultimately, caring about and caring for the past? In other words, maybe the past is always there—quiet, muted, faded, hidden—and it is the task of the flâneur to enable it to speak, to make it come alive and come to light, and, thereby, resonate with the present. In this sense, the past must be conjured, awakened, and cared for.

**Legibility / Recognizability**

(78) Driving around Los Angeles, I use Google Maps almost every day. The streets are yellow, the buildings are white, the parks are green, and the waterways are blue. Street names are written in black Arial font with a white glow. The maps are clean and move effortlessly with my finger. They seem infinitely draggable and zoomable. The browser window on my laptop or phone is hardly a limitation; these maps
are slippy beyond all enframing. And they grow thicker, as multiple data layers are toggled on or off: traffic, satellite imagery, photos, webcams, and more. I get driving directions and check for traffic using Google's real-time data. Don't take the 405 at this time of day. Clicking on the little orange person, I am taken out of my world of stereoscopic vision to one constituted by nine camera eyes and stitched together to form a panoramic digital bubble that lets me see streets, interiors, and even oceans 360 degrees horizontally and 290 degrees vertically. I start to see differently, as if I'm flying above the world, zooming in and zooming out at will, in a multi-perspectival digital bubble. What does it mean that this seamless panning and zooming has become (almost) naturalized, that it has become how I see and experience the world, or how I want to see and experience my world?

I turn off Google Maps and start to drive. I wonder: what would it mean to drive downward, into the buried pasts that persist somewhere—in the imagination, in the archive, in the memories of others, in the traces of places long gone and lost? Who used to live here? What used to be there? What's buried under this freeway, under this skyscraper, beneath these overpasses? What has vanished imperceptibly from the surface of the earth? What voices and ghosts haunt, however imperceptibly, these concrete landscapes? Why do I care? It's a past which is, ostensibly, not my own. I don't recognize it. It's not mine. Time is out of joint.

Berlin, November 1995. Six years earlier, I had watched the Berlin Wall tumble on an eighteen-inch television screen mounted above the blackboard on the wall of my high school history classroom. Now, I was living in Berlin, near Mitte, a region in the east that had once been the center of Berlin's eastern-European Jewish population. The outer walls of buildings still had bullet holes from street fighting during the last months of the Second World War. Cranes dotted the city skyline, and brightly colored pipes, pink and green, ran along and over almost every street. Water was constantly being pumped out of the ground. Because the entire city is built on sand, the water table is only a few meters deep. Friedrich Schinkel, arguably Berlin's greatest architect, knew this when he decided to build the Altes Museum, a monumental Greek-Roman building, on a massive pile of logs to prevent it from sinking. Hitler's architect, Albert Speer, was also aware of the problem and engineered a massive pylon structure to hold up Hitler's Triumphal Arch, intended to mark the new southerly entrance into the city and celebrate the thousand-year empire. The pylon is a solid cement cylinder that measures 14 meters
high, 21 meters in diameter, and extends 18 meters underground; it weighs 12,650 tons and exerts a pressure of 72 tons per square foot. It’s still there today (you can see it in Google Earth), and it can’t be destroyed because it is too close to residential apartments. (Fig. 1) And so it remains in a middle-class neighborhood in southern Berlin, as a strangely protected monument to a megalomaniacal dream. The triumphal arch, of course, was never built.

The Wall divided the city for twenty-eight years, or, more precisely, encircled West Berlin and turned it into a little island in the middle of East Germany. Subway stops located in the east turned into “ghost stations,” as underground trains originating in the west could no longer stop in East Berlin. Above ground, long-distance railway lines that once connected Berlin to all of Europe sat idle, cut off by the Wall. Over decades, trees grew between the railway tracks; stations languished in ruin, bombed out by the aerial war and left to the forces of nature as the Cold War raged on. I became obsessed with ruins, perhaps because I wasn’t used to living among them. For Berliners, they were as unremarkable as any other feature of the natural or built environment. Berlin is a very flat city, but there are two mountains in the neighborhood of Friedrichshain, both covered with grass and even hiking trails. They are man-made mountains of debris, the remains of two million cubic meters of destroyed buildings that were firebombed in the last years of the War.

Other ruins, like those of Berlin’s proudest railway station, the Anhalter Bahnhof, and the railway tracks leading away from it, were simply fenced off, stranded in another time and left to the future to figure out what to do with them. They were finally disposed of in 2008, more than half a century after the last train departed the railway station. Only a small fragment of the entrance portal to this once-great railway sta-

tion remains, sitting idly beside a busy street and soccer park, which exists on the empty ground where the station once stood. (Fig. 2) The past was recognizable, but only just barely.

**Time (the simultaneity of the non-simultaneous) / Space (the contiguity of the non-contiguous)**

Great cities like Berlin are almost inconceivably complex and multilayered. Over its nearly eight centuries, Berlin emerged from a backwater mercantile town built on sand to become the capital of a unified Germany under Bismarck and the site of Hitler’s dream for a world-dominant Germania. It was devastated by the Thirty Years War, occupied by Napoleon in 1805, rebuilt numerous times throughout the eighteenth and nineteenth centuries,
destroyed by the aerial bombardment campaigns of World War II, divided by the Berlin Wall for twenty-eight years, and hastily put back together again in 1990. Foisted on the border between Western and Eastern Europe, this cosmopolitan city has variously welcomed and persecuted its minorities: Huguenots, Jews, Poles, Russians, Turks, and others. It doubled in size in less than a quarter of a century between 1890 and 1925, reaching a size of four million people, and making it one of the largest cities in the world at the time. Another quarter of a century later, it lost almost half of its population and nearly all of its Jewish population in World War II and the Holocaust. Berlin, like other great cities, is comprised of densely layered architectural, social, political, and cultural palimpsests. I began to wonder: how can one make sense of this complexity, the many pasts, hopes, fears, and desires built and buried in these urban landscapes? How could one detect, mark, or hear the voices that had once traveled in these places, many of which are now just ruins? What did it mean to walk, as a flâneur, along these streets of amnesia? I began making mental maps of vanished times.

In the mid-1990s, I was hardly the only one to engage in such a critical, cartographic practice of memory and media. It was at this time that I encountered the Berlin interventions of the ART+COM group, particularly their multimedia project “The Invisible Shape of Things Past” (1995–2007). This interactive mapping and visualization project, focused on Berlin’s Leipzigerplatz, placed historic film sequences as three-dimensional spatial objects on top of time maps. The result was a series of complex time-space perspectives and navigational interfaces to probe the layered histories of Berlin, some of which were still visible but most of which had slipped into oblivion. Like “The Invisible Shape of Things Past,” the maps I began to create as a prototype for the

HyperCities project were strangely dense—like stacks of images overlaid one on top of the other—that did not quite line up and offered little in the way of clarity. That’s because all of these pasts co-exist, in various degrees, depending on what remains legible and what we care to recognize in the spaces of the present. A church from the thirteenth century sits next to an imposing television tower, encircled by the sedimented remains of the medieval city wall and a moat, on which a railway line runs and crisscrosses the city that was once divided into two halves. The solid cement cylinder commissioned by Speer in 1937 was the foundation of a future that—thankfully—will never come to be; but given its ponderous size and solidity, the cylinder, ironically, may easily remain for a thousand years. These pasts are not simply part of some long-gone, chronological history but exist—simultaneously—in the spaces of the present. What’s muted are the hopes and desires, anxieties and fears that were embodied in the ways these vanished pasts imagined the future. With few exceptions, all but the most strident voices are lost, all but the most indelible memories are erased—and even these are transient.

The space of the modern metropolis is indissociable from and profoundly shaped by the various media in which it is represented, whether through novels, photography, film, television, computer simulations, or geo-browsers like Google Earth. City films, such as those by Walter Ruttmann, Dziga Vertov, and Sergei Eisenstein, gave rise to a new phenomenology of the city, as space was fragmented into its constitutive parts and reassembled according to the perceptual contingencies of the film maker. As Benjamin explained with regard to film, the embodied experience of space and time changed with the advent of this new medium: “Our taverns and our metropolitan streets, our offices and furnished
rooms, our railroad stations and our factories appeared to have us locked up hopelessly. Then came the film and burst this prison-world asunder by the dynamite of the tenth of a second, so that now, in the midst of its far-flung ruins and debris, we calmly and adventurously go traveling. With the close-up, space expands; with slow motion, movement is extended.” The embodied experiences of the nineteenth century flâneur were now displaced by the non-contiguous, disembodied representations of the city that can be seen or heard from a distance, at varying tempos, and even in a new sequence. Not only is space transformed by new media, allowing it to be apprehended and experienced in ways that were previously not possible, but the figure of the flâneur is also transformed, as spectatorship migrates to the screen and eventually the computer interface. Today, we are all digital dandies, and thus it is no coincidence that the figure of the flâneur has frequently informed discussions of the co-constitutive relationship between urban modernity and new media, whether photography, film, computer simulations, or other digital technologies.

In film, the realism of urban space is reconfigured and reordered through the principle of "the contiguity of the non-contiguous." In Ruttman’s Berlin: Symphony of a Great City (1928), objects, buildings, streetcars, train stations, factories, theaters, and entire neighborhoods of Berlin are re-mapped through cinema and placed side-by-side as if contiguous. The result is that the new media flâneur can experience the city in a way that was simply not possible for Poe’s man of the crowd or Baudelaire’s dandy, both of whom physically walked around the built space of the city. Now, a viewer of Ruttmann’s film can travel through and experience Berlin synchronically: filmed over a year, a single, twenty-four day is presented in an hour of film, and scores of physically non-contig-

HyperCities: A Very Brief History

2000: Web 1.0, the Readerly Web

The original idea for the digital mapping project that would eventually become “HyperCities” was a research initiative called “Berlin: Temporal Topographies” that was begun around 2000 at the Stanford Humanities Laboratory. Temporal topographies were just that: investigations of the historical and time-based dimensions of places. The concept refers to the inscription of time in space, the simultaneous
presence of different "time-layers" in a given location. The initiative yielded an early website that sought to present a multiplicity of pathways through the city. The pathways were HTML web pages about aspects of Berlin's cultural history, illustrated with photographs and other digitized artifacts. The idea was to eventually have many authors who created pathways, some of which would intersect with one another, and others of which would veer off in new directions. While the project never matured beyond the initial website, it yielded an array of conceptual approaches that would become foundational for the burgeoning field of digital cultural mapping and the HyperCities project itself.

In retrospect, I would call this project Berlin 1.0, the readerly web, in which knowledge is presented to viewers who are asked to consume it but not alter its conditions, meaning-making strategies, and modes of production. The readerly web is ultimately just that: a web of pages to be read, a web governed by a singularity of meaning achieved through a common set of naturalized practices of interaction and consumption.

2004: Flash—Animating and Reanimating the Readerly Web

In 2004, I designed a flash-based, digital textbook called "Hypermedia Berlin" with the support of UCLA's Center for Digital Humanities. Tracing its historical genealogy back to "database" projects such as Rutmann's city film and Benjamin's cultural history of nineteenth century Paris, the goal of Hypermedia Berlin was to construct a web-based platform for representing and studying the cultural, urban, and architectural history of a layered city space. While Benjamin attempted to create a montage text to investigate Paris, we were using the technologies of new media to imagine a new study of city spaces and culture, something that Benjamin was ultimately unable to realize in the hand-written folios he made for The Arcades Project. (Fig. 3)

Deploying the organizing principle of "temporal topographies," my team created a digital textbook for exploring Berlin using a series of digitized historical maps that I manually georeferenced as the basis for experiencing the city's history from 1237, when the city was founded, up through the present day. But rather than taking chronology as the sole organizing principle, I wanted to foreground the uneven time-layers comprising Berlin's nearly 800-year history, the urban palimpsests, as it were, that form the present. "Hypermedia Berlin" was completed in 2004 and allowed students to navigate by both time and space through twenty-five interlinked maps of Berlin keyed to relevant "people" and "place"
HyperCities: Thick Mapping in the Digital Humanities

links. Students explored Berlin by zooming in and out of the maps, scrolling—in any order—through some 800 years of space and time, and clicking on various regions, neighborhoods, blocks, buildings, and streets.

Technically, the project was constructed in Flash, using HTML popup windows, and a modified version of “Zoomify,” a software program that allows viewers to zoom in and out of particular locations of an image. A visitor might jump to the Berlin of 1811 or 1850 and then proceed, by place, through the Brandenburg Gate in 1962, 1936, and 1871. In each “time-layer,” photographs, film clips, and popup “windows” detail aspects of the cultural and architectural history of the city at that moment, including extensive information about key people in Berlin’s history. I taught the pilot version of “Hypermmedia Berlin” at UCLA in the Spring of 2004 to a class of 65 undergraduate students. Applying the theory of the “simultaneity of the non-simultaneous” as an organizing principle, every lecture began at a place in present-day Berlin (such as Potsdamer Platz or the Olympic Stadium) and then proceeded to “drill down” into the historical layers impacted in these places. At any moment, students could stop and “travel” synchronically or move backward or forward in time to other city layers. The class seemed to elicit great curiosity, intellectual excitement, and not a small bit of confusion.

2005: Geo-temporal Search and the Writerly Web

When Google released its Map API in the summer of 2005, a small revolution occurred: anyone with basic programming skills could now integrate Google’s world map and the accompanying satellite imagery into individual websites, create and mark up maps using this imagery, and even develop new software using the Google Maps application. An Application Programming Interface (API) allows programmers to build on, customize, and incorporate existing software code into their own applications. Quite suddenly, the world of Geographic Information Systems (GIS), a terrain that had been dominated for decades by significantly more abstruse, desktop applications such as ESRI’s ArcMap and ArcGIS, had been opened up to the masses. Map mash-ups flourished almost overnight, as nearly everyone with any sort of geo-data began making maps—of their favorite restaurants, bike paths, and whale-watching spots. Geo and time mark-up became indispensable metadata fields for a vast array of web content, prompting Michael Jones, Google’s Chief Technologist, to amend his company’s mission “to geographically organize the world’s information and make it universally accessible and useful.”

Built on the idea that every past is a place, HyperCities came to life as a digital research and educational platform for exploring, learning about, and interacting with the layered histories of city and global spaces. Developed though collaboration between UCLA, USC, CUNY, and numerous community-based organizations, the fundamental idea behind HyperCities is that all histories “take place” somewhere and sometime, and that they become more meaningful when they interact and intersect with other histories. Through the Google Maps and Earth APIs, HyperCities essentially allows users to go back in time to create, narrate, and explore the historical layers of city spaces and tell stories in an interactive, hypermedia environment. Partner teams have developed content connected to Los Angeles, New York, Berlin, Rome, Ollantaytambo, Tehran, Mexico City, Wellington, and many more places, big and small, urban and rural.

The project asks two seemingly simple—but deeply fraught and often contested—questions that are fundamental to identity: Where are you from? What used to be here?

The answers, of course, are far from simple or straight-
forward. As a globally-oriented platform that reaches deeply into archival collections and links together a wide range of media content (including photograph archives, 3D reconstructions, historical and user-created maps, oral histories and videos, GIS data, and community stories), HyperCities seeks to transform how humanities scholarship is produced, accessed, and shared, thereby jutting it to a public mission to document and delve into places in time.

When a user first visits Hypercities, what is shown is Google's satellite imagery of the world zoomed out to show the "historical cities" featured in HyperCities. There is no "starting" or "ending" point—just a digital globe and the chance to explore and contribute. Each time the user moves the map (zooms in, pans, jumps to a new city) or adjusts the time-bar, the application interacts with one or more external servers to retrieve relevant data based on the spatial and temporal bounding coordinates. I likened this process to archaeological coring, in which a sample might be taken from a single block or street over, say, 500 years, or perhaps a single city over a day. Such a search and query process was intended to simulate how visitors navigate a city with which they are not familiar: you proceed down a given street, you look around, and eventually you may even get lost. The flâneur in the age of new media becomes a kind of digital dandy, navigating a world that is open, under construction, and, to a certain extent, unknown.

Beyond browsing, HyperCities became a tool for leaving your own traces. With an emphasis on participatory learning, users can add media objects, curate and share their own collections, as well as view and link to other people's public collections. Users are able to add "micro-annotations" by geotagging locations in time, such as Unter den Linden in the year 1793, or the northwest corner of Leipzigerstrasse and Wilhelmstrasse from 1920 to 1945. The rationale is that these annotations contribute to the creation of a "people's history" of the city, leveraging the democratizing possibilities of the web to create, display, and distribute information. These annotations function collectively as "folksonomies," which complement academically generated taxonomies or "expert" content.

The birth of Web 2.0—the writerly web—has been well articulated by technology gurus such as Tim O’Reilly as well as leaders in the field of Digital Humanities such as Cathy Davidson and David Theo Goldberg, both of whom have advocated for a more open and participatory humanities, what might be called "Humanities 2.0." Such a term refers to the generative humanities, a humanistic practice anchored in creation, curation, collaboration, experimentation, and the multi-purposing or multi-channeling of humanistic knowledge. It places a primacy on participatory scholarship, open-source models for sharing content and applications, iterative development, and interdisciplinary collaboration. In so doing, new communities—academic and the general public—are involved in the production of scholarship. This collaboration and interaction is at the heart of the HyperCities idea.

2009: AJAX and Web services

The HyperCities system architecture also follows one of the central trends often identified as Web 2.0: the front-end is almost entirely separated from its back-end. Although a web-based platform, HyperCities behaves more like a desktop application because the front-end follows an event-driven programming model rather than a standard webpage submission model. The platform is a collaboration of web services, compiling digital content from disparate
sources through the use of XML, KML, JSON, and Javascript. The Google Maps/Earth APIs define a set of JavaScript objects and methods, which HyperCities uses to put maps on its interface, allowing instant integration of satellite imagery with other layers such as markers, pathways, images, historical maps, 3D objects, and other kinds of geo-data. The technical goal of HyperCities is to be a generalizable, easily scalable data model for linking together and publishing geotemporal content using a unified front-end delivery system and a distributed back-end architecture. HyperCities consists

of a geotemporal markup server and a front-end visualization platform built on the Google Maps/Earth APIs that enables users to explore, manipulate, and contribute to any geographically aware environment. At its core are databases of openly accessible, geotemporal content represented by KML, a mark-up language chosen because its development is funded by private enterprise (Google) but governed by the Open Geospatial Consortium, which ensures a robust user-base and an open-source development model for specification and implementation. HyperCities generates real-time, KML-based network

power yet odd responsibility. With AJAX, web pages grew into web applications. And now much anxiety is spent dealing with the potential for security holes: one web page may not make a request to a site on another domain—a page loaded on hackerparadise.com may not (and should not) make a request to gmail.com. This holds back developers who now see the web as a paradise of open data easy for computers to parse: bringing Twitter and Flickr streams together is far more difficult if your page cannot read from both of these domains.

Ajax makes the modern web possible. It allows a developer to display a web page, get more data, and update the page without reloading the entire page. It causes web developers to think about sites as bits of data to expose in a variety of formats—HTML, JSON, and XML. Or perhaps, it makes the web less the web and more the operating system: the web is no longer a set of pages of information (Berners-Lee and Nelson's vision) but a set of interfaces to data. APIs matter more when there's no page for a search engine to read. Thus, perhaps, AJAX has made the web more interactive and less human-readable.
links connected to geotemporal content, offering a non-exclusive front-end for contributing to, organizing, and exploring independent repositories. While HyperCities hosts and stores some data locally, one of the central aims of the project is to host metadata connections to content stored and maintained in external repositories and on external servers. These servers range from commercially available platforms (such as Google's 3D warehouse, YouTube, and Flickr) to library and archival platforms for maps, GIS data, oral histories, videos, photograph collections, and other media files. In this way, HyperCities provides connective tissue for the community of geospatial time travelers by leveraging the extensive development of data repositories and social networks.

The server back-end (written in PHP and running off a MySQL database) is limited to pulling new data to display and

From the Docverse to the Dataverse: APIs

response = simplejson.loadurl('http://search.twitter.com/search.json?q=home')
for tweet in response['results']:
    for tag in tweet['entities']['hashtags']:
        tweet['text'] = 'quote=It was the best of times, it was the worst of times.'

    communities = lookup(tag, network)
    simplejson.dump(communities, response)

(D) The opening ceremonies of the 2012 Olympics contained a performance called "Frankie and June Say 'Thanks Tim'," a tribute to Tim Berners-Lee's invention of the World Wide Web, which brought the eponymous protagonists together. At the end of the show, a house in the center of the stage lifted to reveal Berners-Lee himself at a computer. One wonders if, as he waved to the crowd, what passed through his head was that the messages Frankie and June sent on their smartphones were not part of the original web he had inputting any changes a user might make to the objects being displayed. The front-end is almost a complete application itself because it contains the display logic. We might think of it as a viewer for certain data formats, the same way KML can be viewed in Google Earth, ArcMap, and a host of other GIS applications. It is not only fairly easy to use HyperCities with different data sources, but it is also possible to pull the data from the back-end into any geographically aware environment.

2011: Social Media Mapping

Social media refer to a broad category of participatory communication and information technologies with (potentially) global diffusion of information sharing and data exchange. While it's easy to dismiss social media (Twitter, Facebook, YouTube, etc.) as superficial and amateurish, it is imagined: Berners-Lee's web was a set of documents people read with their eyes, not with their iPhone apps. What the web looks more and more like now is a series of APIs, in which data is exposed for machines to parse and interpret for humans.

APIs, or Application Programming Interfaces, are standards by which programs or web sites expose data for other programs' consumption. Facebook, Google Maps, Yelp, Twitter, and Flickr (to name just a few) expose their data through APIs. The smartphone apps market and social media could not exist without APIs; one of Twitter's biggest uses is applications built on its own API. With the proliferation of APIs, we can make the claim that data is much easier to repurpose than software.

But what can you really do with an API? All APIs have
becoming evident that they can be harnessed both singularly and in aggregate to fundamentally transform participation and even the notion of the public sphere. Part of the reason is that social media differ profoundly from traditional broadcast media such as newspapers, radio, television, and film by dint of their decentralization of authority, public accessibility, diffusion, ease of use, immediacy, scale, and, oftentimes, ephemerality. As the 2011 protests in North Africa and the Middle East have made clear, social media have changed the ways in which news and information are disseminated across the world and raised fundamental questions about who constitutes the public sphere, how we know and characterize historical change, and how we develop critical lenses for assessing social media that neither reduce them to epiphenomena nor naively celebrate them as the realization of digital democracy.

Since 2011, our team has developed a contemporary mapping project called “HyperCities Now,” which geolocates, streams, and archives social media data from providers such as Twitter, YouTube, and Flickr. The project began with the protests in Tahrir Square in late January of 2011: what if we could listen to, map, and amplify the voices in the streets of Cairo in real-time and, then, archive those voices for scholars to study in the future? To do so, “HyperCities Now” began to stream and capture real-time social media feeds related to events from places around the world. We have archives of more than 450,000 tweets from Egypt over about 18 days of the Revolution, nearly a half-million from Libya, 660,000 in the weeks following the earthquake and tsunami in Japan, and hundreds of thousands from other events around the world, ranging from Anzac Day 2011 in New Zealand to the

a picture) is a “resource,” and has its own URL, which allows it to be accessed and modified. Developers discover resources through a search and then focus on one resource to read or modify. This granularity has limits: it’s harder to retrieve or access multiple items at once. It takes multiple queries to a RESTful API to alter the locations of multiple photographs, or to retrieve the profiles of many users who tweet with a particular hashtag. REST, a beautiful form in Fielding’s dissertation, provides the developer with a small toolset. REST can be both an opportunity and a challenge to developers, restricting the scale and scope of their ambitions. Ironically, this increases the load on companies who serve APIs.

All this results, indirectly, from Berners-Lee’s original work. He started us on the road to REST by
2011 riots in London, and most recently, millions of tweets from Hurricane Sandy, the Boston marathon bombings, and the 2013 protests in Turkey. 

Unlike broadcast news in which a reporter "goes on location" to retrieve the story, social media allows users to broadcast their own experiences in real-time from a place they are currently in. In this regard, it creates a new public sphere of voices and listeners who would never have been able to "hear" one another. We archived about 40,000 unique voices coming out of Egypt over the 18 days of protests and more than 200,000 unique voices from Japan. As an interactive, qualitative visualization, the goal of HyperCities Now is to foreground the ephemeral individual voice as it flashes up on the screen every few seconds, but it also gives users the power to listen to and analyze a staggering cacophony of voices developing the protocol that these APIs use, HTTP (HyperText Transfer Protocol). In HTTP, a resource (like a webpage, or a tweet), has a "URL" (Uniform Resource Locator), which can be accessed using a "method." Berner-Lee's original specification, HTTP 0.9, had only one method, GET: readers' browsers would GET a page for them to read. Documents arrived on the web through protocols beyond the web itself.

HTTP 1.0 added the "POST" method, which made the web interactive. POST allowed users to POST data to an interactive program masquerading as a web page, and get back content based on what they had submitted—such as airplane tickets or a new blog POST. POST made the web interactive, and most content creation through APIs happens through POST. (Nowadays, we have twenty-five other methods, but GET and POST are the most widely supported.) GET made users readers; POST made users writers and consumers, or whatever we might call those who submit (another strange word at the bottom of web forms) data for Facebook to track (the consumed consumer?).

Instead of web pages for human beings to read, RESTful APIs make web sites into interfaces to data. APIs matter more when there's no page for a search engine to read, or the data is locked down behind corporate walls. Now, we build applications to trawl through APIs for information. As the web has become more interactive, we require more technology to interact with the web. This is no longer a docuverse, but a dataverse.
clients. Over time, the idea of completely separating the back-end from the front-end became a goal, as it seemed to be a sensible way of preserving the data and allowing others to develop customized user experiences. In other words, we wanted users to be able to create, populate, and maintain their own instances of HyperCities. Ultimately, these multiple instances might form a "constellation" of sites that knew

The HyperCities Network/Nexus

http://hypercities.atu.ucla.edu/provider/collections/test/production
http://hypercities.atu.ucla.edu/provider/collections/C9207

(You can use something like the URL above, you can search for data or download the data from a specific collection in HyperCities. You can even modify it, provided you have the privileges. You can download your collection as a KML file, edit it, and re-upload it. All this is due to the magic of the HyperCities API.)

APIs make data consumable in other forms. A mobile application, another website, a desktop application, and the like can all read and edit the same data source. The public interface of HyperCities, what you see when you launch the application, is just one interface to our storage engine.

Consuming and providing APIs, HyperCities is part of a network. On the consumption end, we acquire map imagery from Google as well as ArcGIS and WMS-compliant map servers. On the producing end, HyperCities can export collections as standard KML files or as KML tours to play in Google Earth. HyperCities is a storage engine and an interface, and the

about and recognized one another, allowing data to be found and shared across the constellation.

While motivated by an intellectual goal, our repurposing of the API began in earnest around the time that Google announced that version two of the Maps API would no longer be supported. Google Maps version three has a completely different architecture from version two, and we realized

two are designed to communicate only through a specific interface, namely—the API. HyperCities is a nexus of parts, connective tissue between APIs. Why reuse code this way? Using others' APIs requires us to write and maintain less code, but it also creates a fragile network of dependencies, a house of cards in code. HyperCities is both part of a network of interrelated tools, and a network itself.

And yet, when APIs change, the cost of the network becomes apparent. Attempting to upgrade to version three of the Google Maps API has taken months and months of developer time; it was less an upgrade and more a rewrite. We didn't succeed, and so we decided to divorce HyperCities from its dependence on Google by allowing the developer community to create instances of HyperCities that run on any map front-end.

Even with all these points of failure, networking APIs make each part less vulnerable. With the API, even if we fail to do the upgrade, data will still be accessible through the server API. Google Earth should still read the tours HyperCities produces. Modular parts both make a network possible and also insulate themselves from too much exposure to the network; this networked, API-focused design negotiates a tension between independence, interdependency, and addiction. HyperCities is all of these things.
the upgrade would require a massive rewrite of the HyperCities application. Because the front-end relied on components we could not control and which changed all-too-frequently (the Google Maps API and the Google Earth plugin), the project was inherently fragile. We realized that another way to preserve the data against changes in the front-end was to make it possible to present the data in a variety of formats. This shifted the problem of preservation from one of maintaining the visual representations of HyperCities data to opening it to a variety of visual representations using different tools. It also allowed members of the developer community the opportunity to set up, administer, and customize their own HyperCities instances.

As the final stage of the HyperCities project, the team released the source code to the storage engine and the browser as open source projects, available on GitHub, a public source code hosting website, with a fully documented RESTful API. Among other things, it may function as a robust KML editor for geotemporal content. We imagine the final life of HyperCities will be as a publicly-available tool that can be installed on any server for accessing and storing geotemporal data and associated narratives. Users will have access to the API for developing their own clients and modifying the storage engine to work with other geo-browsers, something that will help to preserve data stored in HyperCities by making the data easier to port between formats that each browser can read. As such, developers may create new instantiations of HyperCities and thus make new kinds of geotemporal narratives.

With this consumer-agnostic API, HyperCities data is no longer a tenant of only Google's world; a developer may write a program for viewing a HyperCities collection using code and imagery from another provider. For example, the open-source mapping library OpenLayers can incorporate imagery from OpenStreetMap licensed under the Open Data Commons Open Database License. We have also written an OpenLayers-based browser, which has been released as an open source project and provides an opportunity for creating a HyperCities "liberated" from Google. Even if the master's tools cannot dismantle the master's house, separating these two components gives us our choice of masters, and allows us to open our doors to others.

**Thick Mapping in the Digital Humanities**

Until recently, mapping in the humanities was deeply bifurcated between what might be called, on the one hand, a "quantitative" approach using data analysis and visualization techniques adopted from the field of Geographic Information Systems (GIS, for short), and, on the other, what might be called "metaphorical mapping," variously articulated in cultural studies through theorizations of space and place, critiques of spatial systems, and critical cartography studies. The first is often dismissed as "positivistic," as uncritically importing methods of the social sciences into the interpretative and critical domain of the humanities with insufficient regard to the ideological biases of such information and visualization systems. At the same time, the second is dismissed by practitioners of spatial analysis on the grounds that it never actually engages with any spatial methods or mapping tools, neither designing environments for analysis nor creating "humanistic" systems for probing spatial relations.

Over the past couple of years, blended approaches have started to emerge in the digital humanities, which situate and investigate historical questions on spatial platforms, without uncritically embracing or cavalierly dismissing GIS. Richard
Marciano and David Theo Goldberg’s “T-RACES” project, for example, brings together the history of redlining maps produced by the Home Owners’ Loan Corporation in the 1930s with archival documents linked to census tract, in order to reveal the complex ways in which exclusionary spaces were created throughout the US to preserve racial homogeneity.

Here, a massive archive of American racial history has been geo- and temporally marked-up in a discovery and historical visualization platform built on the Google Maps engine. Another project, “Digital Harlem,” also a historical mapping archive, was developed by four historians at the University of Sidney (Stephen Garton, Stephen Robertson, Graham White, and Shane White) “to visualize and explore the spatial dimensions of everyday life in Harlem during its heyday, 1915–1930.” To do so, the team created a series of dynamically populated, searchable map layers organized into three meta-categories: people, places, and events. Users can mix and match materials on historical maps and discover correlations, patterns, and trends that would not be discernible without tools for spatial analysis. Other projects—such as the US Holocaust Memorial Museum’s Darfur genocide map and George Mason’s Archive of Hurricanes Katrina and Rita—utilize the Google Maps/Earth platforms to document and investigate contemporary crises with participatory dimensions for the contribution of data.

Beyond Google, OpenLayers, an open source mapping platform with a global developer community, and Harvard’s WorldMap, an ambitious, open source platform for exploring, visualizing, and publishing geographic information, are setting new standards for the preservation, dissemination, and analysis of networked geo-data. At the same time, major “spatial research centers” crossing the humanities, architecture, urban planning, geography, and design have begun to crop up, such as Harvard’s Center for Geographic Analysis, Stanford’s Spatial History Project (part of its Center for Spatial and Temporal Analysis), Duke’s Wired! Group (focused on dynamic visualizations of the past through modeling and design of urban environments), Columbia’s Spatial Information Design Lab, MIT’s Senseable City Lab, UCLA’s Experiential Technologies Center, and multi-institutional collaborations such as the Virtual Center for Spatial Humanities. Each supports a range of spatial projects built on interdisciplinary methodologies coming from computational analysis and GIS, interactive design and four-dimensional modeling, information visualization, and statistical processing—all of which are part of the burgeoning field of “digital humanities.”

The HyperCities project is part of this blended trend. HyperCities essentially allows users to examine the historical layers of city spaces and tell stories in an interactive, hypermedia environment. The central theme is geotemporal argumentation, an endeavor that cuts across a multitude of disciplines and relies on new forms of visual, cartographic, and time/space-based narrative strategies. To date, HyperCities features rich content on more than two dozen world cities, including more than 400 georeferenced historical maps, thousands of user-generated maps, and tens of thousands of curated collections, narratives, and media objects created by users in the academy and general public.

The Spatial Turn in the Humanities

When Edward Said published Culture and Imperialism in 1993, he justifiably maintained that “most cultural historians, and certainly all literary scholars, have failed to remark the geographical notation, the theoretical mapping and charting of territory that underlies Western fiction, historical
writing, and philosophical discourses of the time.” According to Said, cultural criticism needs to “affirm both the primacy of geography and an ideology about the control of territory” (78). Why? In order to fully appreciate and critique the spatial matrix of modernity constituted by the broad forces of nationalism, imperialism, and colonialism. Modernity, for Said, is not merely a temporal indicator or periodizing concept but very much about specific colonial histories of power and control exerted on bodies in places.

In Said’s wake, much work has been done in the humanities—particularly in transnational and post-colonial studies—to examine the “spatial strata” of cultural production and power: one needs only think of studies such as Paul Gilroy’s “black Atlantic,” Arjun Appadurai’s “global ethnoscapes,” Homi Bhabha’s “location of culture,” James Clifford’s anthropological study of “routes,” Saskia Sassen’s and David Harvey’s studies of the global diffusion of capital, Fredric Jameson’s “geopolitical aesthetic” and (somewhat under-theorized) notion of “cognitive mapping,” Franco Moretti’s map-based analyses of the “spatialities of literature,” Stephen Greenblatt’s call for “mobility studies” to focus on questions of diaspora, exile, and displacement in literary and languages studies, not to mention renewed attention to psycho-geographies, imaginary landscapes, and practices of détournement rooted in situationist ideas of urban engagement and cognitive dissonance. And in the wake of Derrida and Foucault, poststructuralist notions of the instability of signifying practices and critiques of power dynamics have been rigorously taken up in the expansive fields of critical cartography studies and geography, as the work of J. B. Harley, Edward Soja, John Pickles, Denis Cosgrove, and others attests. And more recently, as both of these fields have deepened their interaction with visual studies, digital humanities, historical GIS, and information vi-

ualization, new areas of research have been catalyzed at the nexus of mapping technologies, politics, and design through the work of scholars such Laura Kurgan, Trevor Paglen, Anne Knowles, Annette Kim, Bill Rankin, and many others.

While this “spatial turn” in the humanities has clearly fostered many differentiated approaches to analyzing and mapping the imbrication of culture/power/space, what has been missing—at least up until recently—is a fundamental rethinking of the medium in which cultural criticism and historical investigations are undertaken. In other words, we cannot adequately study spatial systems, mapping conventions, landscapes of power and control, colonial networks, histories of emplacement and displacement, cultural flows and hemorrhages, sites of memory and oblivion without considering the media in which to map the complex interplay between lived and experienced spaces, representational spaces, and imaginary spaces. In fact, if we cast this problem more broadly, what’s at stake is the attention to media, materiality, and method in humanities scholarship, the very fundamental ways in which cultural-historical questions are articulated, investigated, and emplotted as arguments.

Bringing together spatial-temporal narratives, visual design and argumentation, embodied navigation, and curatorial strategies to imagine new modalities of engaging with the past and the present, these issues have been catalyzed by the digital humanities subfield variously called “Spatial Humanities,” “digital cultural mapping,” or simply “thick mapping.” What if the many, competing pasts saturated in a single place could be mapped onto and along streets, neighborhoods, and territories? What if, following Edward Casey, culture was reconnected to place and the movement of bodies in space and through time? To do so, we need a methodology and a medium that foregrounds time-layers, or sediment-
ed palimpsests, such that histories become proliferated as intertwining layers, making it possible to tell more than one story at the same time, or any number of possible stories. This does not mean that "anything goes" or that "what actually happened" no longer matters; instead, it gives way to richly interactive, multiplied stories in which the singularity of narrative succession has been abandoned in favor of extensible digital spaces that variously map, intersect with, and also disrupt physical, embodied spaces.

**Zoom and Thickness as Historical Methods**

Let's look at a Pharus map of Berlin from 1926. It is an extraordinarily detailed, five-colored, ink-printed map of Berlin, in which prominence is given to significant German architectural monuments and transportation networks (including railways, subways, and express roads). The former are represented as miniature, three-dimensional models, rendered in black ink and dusted with a brownish-gold tint: the Reichstag, the Victory Column, the Royal Castle, the Berlin Cathedral, and the Kaiser Wilhelm Memorial Church, among others. And over the map, we see railway stations rendered in red with their connecting lines spread out across the city. Interestingly, the main stations—Potsdamer, Anhalter, and Lehrter—have accompanying signs indicating their possible destinations both in Germany and beyond: Cologne, Frankfurt, Munich, and Hamburg, but also Paris, Basel, Vienna, and Saint Petersburg. Not only is Berlin connected to an international network of cities throughout Europe, but one can travel to these cities in any order one wants: from the Anhalter train station, Basel comes before Leipzig and Munich comes before Dresden. As part of an interconnected network, they do not demand a definitive order or a unitary direction; instead, they

can be experienced in any number of new temporal and spatial configurations. (Figs. 4 / 5)

Walter Benjamin surely saw maps like this, maybe even this one, as Pharus printed the most popular folding maps during the 1920s and 1930s, and is especially well-known for its pocket-sized maps of Berlin for the 1936 Olympics. In fact, Benjamin references a Pharus map in passing in his city montage, *One-Way Street*, a text that was completed in the same year, 1926, and uses the street as its organizing principle. But unlike the Pharus Map, in which one can actually follow the procession of a street much like the movement of a flâneur, Benjamin's urban meditations do not easily map onto the city or its traditional, cartographic representations. In *One-Way Street*, for example, the narrative begins quite zoomed in at the street level, at a filling station, before moving into a breakfast room, the Number 113, a visit to Goethe's house, memories of Chinese curios, the Mexican embassy, and a construction site. While many of these vignettes may have been derived or distilled from the vast signifiers of the urban landscape—"this space for rent,""Optician,""Lost-and-Found Office,""Post no bills!" and so forth—these signifiers certainly do not add up to produce a map that looks anything like the Pharus map. Instead, they offer various optics for seeing, remembering, and narrating the urban space, optics that are a function of experience, perception, and zoom level. For Benjamin, zoom becomes a historical method for narrating the city: zoomed in means close reading and close analysis of details, whereas zoomed out means macro-level, comparative perspectives. Zoomed out, one discerns structures and patterns of the city as a whole but compromises texture and precision; zoomed in, one sees locally but loses the view of the whole. Of course, there is no reason to privilege a single level of zoom; rather, we ought to consider
"zoomability" as a way of investigating space, one that is further enabled by (but not limited to) digital mapping and, thereby, considers history as places to be mapped, as sites for the employment of narratives as cartographies.

At the same time that he made use of zoom, Benjamin was also concerned with things unrepresented on and absent from the Pharus map: social and economic structures, childhood memories, emotions, fleeting images, tastes and smells, noises, textures, and other somatic experiences. One map is not "more realistic" or "more accurate" than the other; instead, we have different interpretative and symbolic systems for representing the spatio-temporal order of modernity: a planimetric map and a mental map. Through various strategies of selection, visualization, and interpretation, both produce the space that they ostensibly represent. The Pharus map is part of a spatio-temporal order that stretches back at least to the eighteenth century and has become naturalized in its cultural redundancy, utilitarian value, and political effi-
cacy: we have become used to looking at maps with a bird's eye perspective, a grid-like organization of streets, framed boundaries, a clear coordinate system, planimetric accuracy, and alignment to true north. The birth of cartographic reason is inextricable from the history of the territoriality of the nation-state, both its internal linkages and expansive—imperial and global—ambitions. The critical question remains: how can such a map (and, thereby, the construction of its history and the history of what it represents) be deconstructed and reanimated—that is to say, opened to the infinite number of non-simultaneous histories contained in every street, structure, and building, the innumerable voices and bodies that made these histories through their interactions and contingent encounters in such spaces?

While the Pharus map abstracts and excludes the kinds of experiences that Benjamin privileges in all of his city reflections, it is organized by the logic of a particularly modern spatio-temporal system in which the temporality of experience and expectation are both bound up and broken apart from one another. Every significant architectural monument and building is depicted in exactly the same way, as if to cast them all as part of the permanence of the past or the inheritance of history, what Benjamin calls, unsympathetically, "their enshrinement as heritage" (*Arcades Project*, 473). The past is given value because it is inherited, and every structure, even the most recent, is endowed with the temporality of the oldest (in this case, the Royal Castle), resulting in a kind of leveling effect in which the non-simultaneous becomes simultaneous. What is far more relevant for Benjamin's cityscapes and a central part of the "thick mapping" imagined here are the non-simultaneous, fractured histories that co-exist as "time layers" in any given present.

And there is another, decidedly modern spatio-temporal logic operating on the Pharus map: namely, the reconfiguration of space and time ushered in by the railway system. It would have made little sense to indicate Paris, Basel, Vienna, or even Leipzig and Hamburg on a Berlin map prior to the mid-nineteenth century. While these places could obviously be approached by carriage (something that easily took days), one didn't think of them as places already "in" Berlin. On this map, the railway stations are like wormholes: one goes in at Berlin and pops out in Paris. It is not coincidental, then, that Pharus privileged the railway system on the map, as there was arguably no technology of modernity that had more of an impact on the reconfiguration of space and time than the railway. In 1845, with the opening of a number of major rail lines around Paris, the poet Heinrich Heine famously declared railways to be "providential events" because they "killed" space and intimated the coming death of time.

The "new time" (*Neuzelt*) of modernity was both a break from the eschatological temporality of the past and the institution of a new, world standard time, something precipitated as early as 1842 in London with the creation of railway timetables. Acceleration, progress, and speed became the mottoes of the modern world, leading to the construction of an interconnected, globalized world in which Paris could be in Berlin and vice-versa. The material superstructures of modernity made of iron and glass were built to showcase transcendental size, speed, and mobility, but they also harbored this world's destructive capacities. The railway system is a fundamentally dialectical construction, embodying the hopes and dreams of the nineteenth century as well as the horror and catastrophes of the twentieth.

This dialectic is something that punctuates Benjamin's writings in exile, as he constructs a commemorative, imaginative geography of German places no longer occupied by
in the Tiergarten, prestigious cafes, and what he calls “street images” from “lived Berlin” (597). The idea of setting these out in a General Staff’s map is striking, as these kinds of maps were produced for military campaigns to illuminate the topographical features of the landscape, including information about populations and transportation networks. As far as I know, no such map of Benjamin's life has surfaced, although one could certainly argue that all of his experimental writings on travel and urban space (from the early city portraits to the Arcades Project) were attempts to not only map his life but also to think through what it might mean to write history in graphic form, to map culture and spatialize history, to bring together the experience, representation, and production of space. It is an avowedly non-mimetic, anti-developmental, non-linear model of imagining history as places to be mapped, one which is rooted in exile, displacement, and the disembodiment of the German/Jewish experience.

In recollecting “images” of his childhood in Berlin, Benjamin pauses on one train station in Berlin in particular: the Anhalter Bahnhof. When it was rebuilt and reopened in 1881, it was the largest, most expensive, and most opulent station in Europe. He writes: “The Anhalter terminus [refers to] the mother cavern of railroad stations, as its name suggested—where locomotives were at home and trains had to stop [anhalten]. No distance was more distant than when its rails con-
ported to the concentration camp of Theresienstadt. Although the iron and glass roof of the station collapsed during one of the last bombing raids of Berlin, the station was not completely destroyed, and, after the war, trains began running again as of August of 1945. They continued to run until 1952 when the tracks were cut by the division of Berlin and later by the erection of the Wall. After much debate, the ruined station was razed in 1961. Most of its remains were disposed of in the early 1960s, except for part of the front portal and the southbound railway tracks. These tracks were left to the forces of nature since their last use on May 17, 1952. For more than five decades, birch trees grew between the ruined tracks. It was not until 2008 that the urban wasteland between the former Anhalter and Potsdamer train stations was finally cleaned up and reclaimed by the city of Berlin for another future. (Figs. 6/7)

In this highly constricted but thickly layered place, one can move diachronically—much like archaeological coring—through a remarkable band of German/Jewish history, tracing contingent moments of encounter, interaction, mobility, and destruction. Although no longer visible, each time-layer coexists in this stratified place, from which one can move forward or backward. At the same time, one can also proceed synchronically, stopping at a particular time and moving.
horizontally through space, noting the closeness of the Anhalter train station to other layered structures and streets in Berlin, such as the Gestapo Headquarters on Prinz Albrechtstrasse in 1944 or Felice Bauer’s home in 1912. In this sense, the time-layers of the Anhalter station open downward as well as laterally, calling up the possibility of an infinite number of stories and encounters—in other words, thick maps. Like so many fraught, overdetermined places in Berlin, one discovers, in Benjamin’s words, “the crystal of the total event” (*Arcades Project*, 461), the dialectic of modernity.

What would it mean, then, to produce a cartographic history of modernity, not simply a history of modernity in maps but rather a practice of history that was spatial, a way of understanding events and cultural encounters by plotting them thickly onto maps? This line of thinking opens up an investigation of how modernity is not just a temporal designation (as in *Neue Zeit*) but also a practice of cartographic reasoning, spatial representation, and geographic persuasion and control. We might call it Neutraum (“new space”). It was Michelet, after all, who famously declared that “history is first of all geography.” And so by “thick mapping” I mean this quite literally: creating and interrogating maps, time-layers (Zeitschichten), spatial imaginaries, and geographies of movement and encounter in order to create geotemporal narratives that follow the expansive and particular spatial logic of a railway map, not unlike the “worm-hole” on the map that connects Berlin to Paris at the Anhalter Bahnhof in 1926.

If one takes space (rather than time) as the prerequisite of historical narrative, it becomes impossible to write unidirectional, developmental stories; instead, there is a nearly infinite proliferation of perspectives, stories, interactions, and possibilities. What would it mean to produce narratives that looked more like railway systems or webs, with a multiplicity of connecting segments, branches, nodes, and possible pathways to get from “here” to “there”? The result is a labyrinthine structure in which straying and contingency are the methodological starting points. The necessity of chronology, progress, teleology—or just the gentle, forward movement of a historical argument—gives way to spaces of possibility. It makes little sense to speak of “before” or “after” or necessity as a modality of movement; instead, we get temporally layered, spaces of possibility, marked by distance and proximity, contingency, simultaneity, and networks of connection. Not only can readers or viewers insert themselves at multiple points and look for their own orientation but the narratives themselves are multilayered, fractured, and open-ended. Thick mapping begins to look like an ever-expanding railway system that moves out and downward at the same time, giving rise to a participatory web of intersecting cities, voices, streets, memories, and narratives. This is the “humanities idea” behind the HyperCities digital mapping project.
Endnotes


13 http://salt.unc.edu/T-RACES/.

14 http://acl.arts.uwyo.edu/harlem/.


16 Restoring the term "culture" to its etymological roots of cultivating, tilling, and inhabiting, Casey argues that "we must, finally, put culture back in place." "How to Get from Space to Place in a Fairly Short Stretch of Time?" in: *Senses of Place*, eds. Steven Feld and Keith Basso (Santa Fe, New Mexico: School of American Research Press, 1996), 34.


18 In his seminal book, *The Image of the City* (Cambridge: MIT Press, 1970), Kevin Lynch articulated the ways in which mental geographies (personal associations, memories, desires) meld with and even structure the physical geographies of the city.


23 Such a project begins to approach the tripartite analysis of space as lived, perceived, and represented that Lefebvre articulated in *The Production of Space*, trans. Donald Nicholson-Smith (Cambridge: Blackwell, 1991).


28 Denis Cosgrove, *Apollo’s Eye: A Carto-