1. HUMANITIES TO DIGITAL HUMANITIES

DIGITAL HUMANITIES IS BORN OF THE ENCOUNTER BETWEEN TRADITIONAL HUMANITIES AND COMPUTATIONAL METHODS.

WITH THE MIGRATION OF CULTURAL MATERIALS INTO NETWORKED ENVIRONMENTS, QUESTIONS REGARDING THE PRODUCTION, AVAILABILITY, VALIDITY, AND STEWARDSHIP OF THESE MATERIALS PRESENT NEW CHALLENGES AND OPPORTUNITIES FOR HUMANISTS. IN CONTRAST WITH MOST TRADITIONAL FORMS OF SCHOLARSHIP, DIGITAL APPROACHES ARE CONSPICUOUSLY COLLABORATIVE AND GENERATIVE, EVEN AS THEY REMAIN GROUNDED IN THE TRADITIONS OF HUMANISTIC INQUIRY. THIS CHANGES THE CULTURE OF HUMANITIES WORK AS WELL AS THE QUESTIONS THAT CAN BE ASKED OF THE MATERIALS AND OBJECTS THAT COMPRISE THE HUMANISTIC CORPUS.

CONFRONTING the massive transformation of knowledge, society, and culture that is underway in the digital age, this book takes stock of this new world as well as anticipates future developments in the Digital Humanities. Building on earlier generations of computational approaches to humanities research—with emphasis on the creation, preservation, and interpretation of the cultural record—the Digital Humanities has greatly expanded the potential power and reach of the humanities disciplines, both within the academy, and, just as importantly, outside its walls.

Even though we recognize the game-changing implications of the adjective "digital," it is on the "humanities" that our attention is concentrated in this chapter. As they developed from their classical and early modern precursors, the disciplines that make up the modern humanities—including, but not limited to, literature, philosophy, classics, rhetoric, history, and studies of art, music, and design—have sought to define culture and help us gain a greater understanding of the human experience. The humanities are siblings of the sciences in their embrace of intellectual rigor and free inquiry. But while the humanities do not shun empirical methods, they have rarely been characterized by the strictest forms of empiricism. Within their fold there has not only been room but also a sense of urgency regarding the need to confront questions of worth, cultural significance, and deeper meaning. Humanists engage with questions of value and interpretation, with the realms of rhetoric as well as logic, with subjective judgment alongside attention to verifiable truths. The spectrum of humanistic thought, like that of scientific investigation, encompasses the gamut of beliefs regarding the nature of knowledge, the world, and the human ability to establish understanding with various degrees of certainty. Digital capabilities have challenged the humanist to make explicit many of the premises on which those understandings are based in order to make them operative in computational environments.

This chapter opens with a discussion of what precisely we mean by the humanities in the broadest sense and then moves on to a historical account of the earliest attempts to meld humanistic inquiry with digital technologies. In moving past the first generations of Digital Humanities practice, we shift to outlining the implications of design, and specifically design for transmedia modes of argumentation, as a model for contemporary work. The emphasis on design depends on robust technological environments in order to manifest across media, so we discuss

how the basics of computation and processing affect the design and implementation of Digital Humanities projects. These projects engage with any number of different methodologies and approaches, but here we concentrate on four: curation, analysis, editing, and modeling as central to contemporary humanistic inquiry. These intertwinings of scholarly method, computational capacity, and new modes of knowledge formation combine to make possible what we term the Generative Humanities, a mode of practice that depends on rapid cycles of prototyping and testing, a willingness to embrace productive failure, and the realization that any "solutions" generated within the Digital Humanities will spawn new "problems"—and that this is all to the good. Finally, we conclude this chapter by making the argument that the Digital Humanities may well function as a core curriculum for the 21st century.

From Humanism to the Humanities

While the foundations of humanistic inquiry and the liberal arts can be traced back in the West to the medieval trivium and quadrivium, the modern human sciences are rooted in the Renaissance shift from a medieval, church-dominated, theocratic worldview to a human-centered one. The philosophical systems of Renaissance thought, mirrored in the graphical structure of monocular perspective, had human subjects at their core. The gradual transformation of early humanism into the disciplines that make up the humanities today was profoundly shaped by the editorial practices involved in the recovery of the corpus of works from classical antiquity, many preserved in Greek and Arabic manuscripts in Byzantine and Islamic centers of learning. As the first universities were established in the High Middle Ages and monastic scriptoria were joined by university-based scribal shops working under the *pecia* system as well as by courtly scriptoria, a publishing industry arose that fostered a reading public interested in secular as well as scientific and literary matters. The development of vernacular languages and literary forms further expanded the compass of humanistic expression, with the poetry of Dante, Petrarch, and Chaucer as well as the translations of texts from Latin, Greek, Old English, Norse, French, German, and other languages finding their place alongside the classical canon. The wellsprings of humanism were fed by many sources, but the meticulous (and, sometimes, not-so-meticulous) transcription, translation, editing, and annotation of texts

were their legacy. The printing press enabled the standardization and dissemination of humanistic cultural corpora while promoting the further development and refinement of editorial techniques. Along with many other scholars, we suggest that the migration of cultural materials into digital media is a process analogous to the flowering of Renaissance and post-Renaissance print culture.

The shift from humanism to the institutionally sanctioned disciplinary practices and protocols that we associate with the humanities today is best described as a gradual process of subdivision and specialization. Carried out in the course of the modernization of the medieval university, the process was powerfully inflected by the rise of princely academies in the 16th and 17th centuries, and, in their wake, of learned societies and national academies in the 18th and 19th centuries. Each of these had their own licenses on knowledge, as well as professional rituals, meetings, and publications. By the second half of the 19th century, with industrialization in full swing and the building of public school systems and public universities underway in Europe and the United States, the humanities began to assume their contemporary guise. This is the era in which the study of literature, philosophy, and classics was split off from the natural and physical sciences, even as "history" and the historical disciplines came to be understood as expressions of *Wissenschaft* in the double sense of a "science" and a discipline endowed with a distinctive toolkit for grappling with the cultural record.

Within this universe, the edifice of the humanities was firmly anchored in classical philology with fields such as archaeology, art history, and linguistics emerging only gradually from the shadow of textual studies. At the turn of the 20th century, in the Anglophone context, departments of literature began to be established as departments of, first, medieval and Renaissance and, later, modern philology. Focused primarily on the study of language and rhetoric, they soon became organized by national literature groupings and by media. Though their roots reach back to Goethian notions of *Weltliteratur* and to 19th century departments of comparative philology, comparative literature departments begin to emerge on the worldwide stage during the interwar period, in the midst of political upheaval, resurgent nationalism, and the threat of totalitarianism. A key moment in this history is marked by the post-World War II diaspora that saw classically trained philologists such as Erich Auerbach, Leo Spitzer, and René Wellek cross the Atlantic to take up positions in leading American universities.

Significantly, text-based disciplines and studies (classics, literature, philosophy, the history of ideas), make up, from the very start, the core of both the humanities and of the Great Books curricula instituted in the 1920s and 1930s. (For all their importance to the history of civilization, "Great Dance Performances" or "Great Architecture" never formed the basis of liberal arts curricula.) In other words, modern concepts of humanistic knowledge were built on authoring, narrative, and textual models specific to the medium of print, with the monograph gradually supplanting commentaries and critical editions as the inviolable touchstone of scholarly knowledge and achievement. Such models were, and still are, deemed to provide essential skills in rhetoric and analysis considered crucial in training for the professions of law, clergy, military, and statesmanship. By the mid-20th century, the modern research university assumed its present form, with segmented humanities departments separated from the natural and social sciences as well as from vocational and professional schools. Digital work challenges many of these separations, promoting dialogue not only across established disciplinary lines but also across the pure/applied, qualitative/quantitative, and theoretical/practical divides.

But to make the argument for why the humanities remain more necessary than ever, we have to go beyond mere bromides celebrating the inherent value of cultural tradition or the inherent value of a familiarity with certain achievements from the cultural-historical past. No matter how imperiled by vocationalism, cost-cutting administrators, or the self-inflicted wounds of internecine battles, the humanities must survive because they embody distinctive modes of producing knowledge and distinctive models of knowledge itself. We refuse to take the default position that the humanities are in "crisis," in part because this very rhetoric of crisis has persisted for well over a century, however many mutations it has undergone. Jeremiads regarding the decline of educational standards, the failure of students and faculty alike to adequately embrace humanistic ideals, and the demise of tradition may well be inherent to the process of education itself. *Digital_Humanities* adopts a different view: It envisages the present era as one of exceptional promise for the renewal of humanistic scholarship and sets out to demonstrate the contributions of contemporary humanities scholarship to new modes of knowledge formation enabled by networked, digital environments.

Beginnings of Digitization

The first waves of the humanities' engagement with networks and computation embraced pioneering work from the late 1940s and the models that inspired archival projects at Oxford in the early 1970s. Over subsequent decades, the humanities continued to imagine the digital as a way of extending the toolkits of traditional scholarship and opening up archives and databases to wider audiences of users. These activities typically focused on corpus building, on creating standards for text encoding, and on building databases that could facilitate work on humanistic corpora, as librarians and information specialists developed machine-readable records, file formats, and systems that could support these ventures.

Gathering momentum from the late 1980s through the start of the 21st century, a first wave of Digital Humanities developed, critiqued, and disseminated ways of structuring humanities data to dialogue effectively with computation. Database tools provided the foundation of the first Digital Humanities projects that were seeded around the world. Though this work was varied in nature, there were common, salient features: a concern with textual analysis and cataloging, the study of linguistic features, an emphasis on pedagogical supports and learning environments, and research questions driven by analyzing structured data. The migration of materials into digital forms and the extension of traditional methods of editing and analysis, enhanced by automation, took precedence. Important initiatives included the Perseus project, which converted the corpus of classical literature into digital form; the Women Writers Project, which created archives in which famous and obscure writers could coexist alongside an apparatus of cross references to their publications and textual borrowings; and The Valley of the Shadow, which posed questions about the role of primary documents in the work of cultural historians. Scholars then expanded and began to devise collaborative, multi-authored, cross-platform work on topics within their areas of specialization as well as to engage with emerging forms of digital culture. In this they were like the contemporary artists, poets, and musicians making imaginative use of algorithms to generate new works and taking advantage of communications networks to craft telematic projects or works in cross-media formats.

The advent of the Web in the early 1990s accelerated the transition in digital scholarship from processing to networking. The need for standards and conventions took on urgency, just as the need for a uniform gauge of rail or a point-size

system for the casting of metal type or a common telegraphic code had in earlier moments of technological development. The graphical user interface introduced new possibilities and expectations. Games, entertainment, and immersive virtual environments all migrated online. Expectations about the quality of graphics rose as bandwidth opportunities exploded. The development of innovative, multimedia expressions of humanistic research in digital environments had to mature alongside these advancements. New tools and methods, new ways of thinking and working—what might be called "theory in practice"—all needed time to move beyond text-based models and immerse themselves in the multidimensional world of the Web. Scholars began to wrestle with the methods of mass-media art, corporate platforms, and entertainment, wondering if they should ignore them, make use of them, or counter them. The struggle is still underway.

In the late 1990s, projects began to appear that harnessed the digital to create visualizations, geospatial representations, simulated spaces, and network analyses of complex systems. For example, repository development on a massive scale, such as that undertaken by Europeana, engages multiple partners and stakeholders to make cultural legacy available to broad publics for a wide range of purposes. Questions about how to infuse the technological underpinnings of these approaches with humanistic methods and values remain. Challenges lie everywhere and, with them, opportunities to once again make explicit the value of humanistic modes of inquiry, thought, and creativity. How might the history of ancient scroll design and late medieval page layouts reshape our imaginings of the expressive possibilities of digital scrolling or digital page units? Can computational and digital environments be designed to capture the fluidity of an intercultural dialogue between diasporic peoples? What lessons can be carried over from successful forms of interactive media into the world of teaching or into the communication of research and historical knowledge to the public-at-large? What media forms and modalities of engagement might a critical edition of an audio recording assume? We see such questions and the many others that accompany them as harbingers of renewal, signs that this is a galvanizing moment to be a humanist involved in devising, designing, and deploying new tools; in opening expanded modes of inquiry unthinkable under pre-digital conditions; and in forging innovative, multimodal approaches to traditional questions (about authorship, influence, dissemination patterns) through the as-yet-unrealized possibilities of digital platforms.

Transmedia Modes of Argumentation

Printed books and humanistic scholarship have a shared history. For centuries, humanists have worked with formats—the printed page, the bound codex—that have remained essentially consistent. But communication in digital environments has required the invention of new forms, tools, and schemata. The lack of conventions and the opportunity to imagine formats with very different affordances than print have not only brought about recognition of the socio-cultural construction and cognitive implications of standard print formats, but have also highlighted the role of design in communication. Modeling knowledge in digital environments requires the perspectives of humanists, designers, and technologists.

In the 21st century, we communicate in media significantly more varied, extensible, and multiplicative than linear text. From scalable databases to information visualizations, from video lectures to multiuser virtual platforms, serious content and rigorous argumentation take shape across multiple platforms and media. The best Digital Humanities pedagogy and research projects train students both in "reading" and "writing" these emergent rhetorics and in understanding how they reshape and remodel humanistic knowledge. This means developing critically informed literacies expansive enough to include graphic design, visual narrative, time-based media, and the development of interfaces (rather than the rote acceptance of them as off-the-shelf products). The second half of the 20th century saw the development of such literacies in fits and starts. They now move front and center inasmuch as the advent of Digital Humanities implies a reinterpretation of the humanities as a generative enterprise: one in which students and faculty alike are *making things* as they study and perform research, generating not just texts (in the form of analysis, commentary, narration, critique) but also images, interactions, cross-media corpora, software, and platforms.

Because Digital Humanities is a generative practice, it demands an additive pedagogy. Students still have to be trained in the persuasive use of language, to write effectively in long forms, but they also need to be able to craft what Roman rhetoricians called the *multum in parvo*—the aphorism, the short form, that which distills the long and the large into compact form. This is not only to address the (perhaps apocryphal) short length of the contemporary attention span—was there ever a golden age of rapt audiences with limitless patience? rhetorical treatises from classical antiquity suggest that there wasn't—but also the realities of a wired

world in which the "real estate" available for text and images is ever-shifting and in which argumentation must be able to expand and contract as a function of shifting constraints and technological affordances. Roman teachers of rhetoric would have no difficulty in understanding this challenge, but they might well wonder about our devaluation of the oral component of their ancient art. In the era of pervasive personal broadcasting, the art of oratory must be rediscovered. This is because digital networks and media have brought orality back into the mainstream of argumentation after a half-millennium in which it was mostly cast in a supporting role vis-à-vis print. YouTube lectures, podcasts, audio books, and the ubiquity of what is sometimes referred to as "demo culture" in the Digital Humanities all contribute to the resurgence of voice, of gesture, of extemporaneous speaking, of embodied *performances* of argument. But unlike in the past, such performances can be recorded, disseminated, and remixed, thereby becoming units of polymorphous exchange and productive mutation.

Digital Humanities necessarily partakes in and contributes to the "screen culture" of the 21st century. From stationary computer monitors to mobile tablets, postage stamp sized-LCDs on communication devices to dynamic, building-sized imagescapes, screens have become pervasive in contemporary life. What this means is that the visual becomes ever more fundamental to the Digital Humanities, in ways that complement, enhance, and sometimes are in tension with the textual. There is no either/or, no simple interchangeability between language and the visual, no strict subordination of the one to the other. Words are themselves visual but other kinds of visual constructs do different things. The question is how to use each to its best effect and to devise meaningful intertwinglings, to use Theodor Nelson's ludic neologism. The visual does not necessarily represent an advance over the capabilities of text. It is simply a different, distinct medium for thinking, communicating, and working, with its own rigors and histories, its own skill-sets and language, and its own freedoms and constraints.

The suite of expressive forms now encompasses the use of sound, motion graphics, animation, screen capture, video, audio, and the appropriation and remixing of code that underlies game engines. This expanded range of communicative tools requires those who are engaged in Digital Humanities work to familiarize themselves with issues, discussions, and debates in design fields, especially communication and interaction design. Like their print predecessors, format conventions in screen environments can become naturalized all too quickly, with the result that

the thinking that informed their design goes unperceived. Though there is no "natural" way to interweave text, images, sound and moving images, there exists a range of available genre models from experiments unique to the digital realm to ones that draw upon prior moments in the history of print and cinematic conventions. Digital design expresses concepts by means of the multitude of ways in which it layers media, structures information, and articulates navigational strategies. Though not every project requires a custom approach or platform, attention to the design of arguments is a fundamental feature of Digital Humanities research.

Designing Digital Humanities

Like the word "writing," the word "design" encompasses an array of activities from the everyday to the highly specialized. "Big D" design ranges from the business plans and systems of "design thinking" to the "design sciences," which include engineering and human-computer interaction, to the cultural critique and speculative provocations of "critical design." In between are myriad professional specializations and academic domains. Digital Humanities projects most closely involve communication/graphic/visual designers who are concerned with the symbolic representation of language, the graphical expression of concepts, and questions of style and identity. Interaction/user experience designers, with their focus on interface, behavior, and digital systems, and media designers who combine communication and interaction also bring expertise that is critical to the design of operations and environments that structure the ways in which ideas come into being.

In generative mode, these designers shape structural logics, rhetorical schemata, information hierarchies, experiential qualities, cultural positioning, and narrative strategies. When working analytically, their task is to visually interpret, remap or reframe, reveal patterns, deconstruct, reconstruct, situate, and critique.

To design new structures of argumentation is an entirely different activity than to form argumentation within existing structures that have been codified and variously naturalized. All forms of design share a propositional orientation that is well-suited to the challenges that come with designing new structures, for design asks: "What if?" Each design iteration plays out an answer to the question: "What happens when...?" In a world with fluid contours, humanists, designers and technologists working together can move beyond considering what can be done with the tools at hand to ask: "What can we imagine doing that may not yet be possible?"

For digital humanists, DESIGN is a creative practice harnessing cultural, social, economic, and technological constraints in order to bring systems and objects into the world. Design in dialogue with research is simply a technique, but when used to pose and frame questions about knowledge, design becomes an intellectual method. In the hundred-plus years during which a self-conscious practice of design has existed, the field has successfully exploited technology for cultural production, either as useful design technologies in and of themselves, or by shaping the culture's technological imaginary. As Digital Humanities both shapes and interprets this imaginary, its engagement with design as a method of thinking-through-practice is indispensable. Digital Humanities is a production-based endeavor in which theoretical issues get tested in the design of implementations, and implementations are loci of theoretical reflection and elaboration.

In addition to modeling the platforms, tools, databases, and other information structures on which digital projects are built, designers understand the possibilities and limitations of each of the specific media forms employed in such projects. Digital humanists have much to learn from communication and media design about how to juxtapose and integrate words and images, create hierarchies of reading, forge pathways of understanding, deploy grids and templates to best effect, and develop navigational schemata that guide and produce meaningful interactions. Not every digital humanist will become a designer, but every good digital humanist has to be able to "read" and appreciate that which design has to offer, to build the shared vocabulary and mutual respect that can lead to fruitful collaborations. Understanding the rhetoric of design, its persuasive force and central role in the shaping of arguments, is a critical tool for digital work in all disciplines. But rhetoric is a distinctly humanist skill, one that ventures out into new directions in a digital environment that the humanist of the 21st century is called upon to master.

A number of influential 20th century media culture experiments that combine the visual and the verbal in equal measure provide a glimpse at the potential of collaborations between design and the humanities. The confluence of Marshall McLuhan's words with Quentin Fiore's images and book design in *The Medium is the Massage* could be seen as a precursor to contemporary Digital Humanities work, both for the form of its argument and for its collaborative production, orchestrated by producer Jerome Agel. Similarly, John Berger's book *Ways of Seeing* is meant to be both viewed and read in what could be considered a prototypical transmedia project: The book was originally a BBC television series. And while graphic novels

and comics are by definition a combination of words and pictures, Scott McCloud's *Understanding Comics* is a noteworthy graphic nonfiction essay: it enacts an analysis of the interplay between text and image in spatialized sequential narratives through the use of text and image in a spatialized sequential narrative.

Each of these projects brought new forms of argumentation to the static page. But the screen culture of Digital Humanities is often dynamic and time-based, drawing on a multitude of traditions of media practice. Here, the aesthetics and technics of film and video are particularly relevant. Being able to block out sequences and actions, light and frame shots, edit for sense and rhythm, and compose and produce music and sound—this and more comprise the fundamentals of moving image production. Techniques for editing shots to create scenes, narratives, or emotional effects, mixing in sound, virtual simulations, and other special effects to create a cohesive whole are the essence of what is referred to as "post-production." One need only consider the subtle and tightly controlled interplay among words, sound, and images of films such as Chris Marker's *Sans Soleil* or Errol Morris' *Fast Cheap & Out of Control* to understand that these techniques are—as with design—about more than simply production: They are the means with which to investigate and articulate an idea.

The addition of other graphic supports such as charts, graphs, and animations, which are often essential in making a Digital Humanities argument, tend to extend the process even beyond the classical structures of film and television aesthetics into the hybridized realms of the motion graphic or information visualization. An early example of this mixing is Charles and Ray Eames's short film *Powers of Ten* which combined a filmic first person perspective with didactic narration and information graphics to create a complete work whose sum is greater than its parts—what designers refer to as the gestalt. Now, distributed digital systems make it possible to combine live data streams and interactive systems in which real-time input can be displayed on maps, projection systems, and immersive 3-D environments, animated by means of a rich array of "born digital" visual effects. Processing embedded sensor input or engaging with feeds from social media challenges the very concept of the archive which has now come to encompass the realm of live, unfolding events. The design of each of these dynamic aspects is not simply a display or interface "problem" to be "solved"—it is, as with *Powers of Ten*, the embodiment of a project's argument and methodology.

Digital media have become the meta-medium par excellence, able to absorb and re-mediate all previous forms in a fluid environment in which remixing and culture jamming are the common currency. In the realm of Digital Humanities practice, designing the cultural record is an act of thinking, and design processes become multivalent. This openness, an outgrowth of the iterative and (almost) infinitely mutable and expansive nature of digital media, stands in contrast to inherited notions of "writing" or "picture-making" or "printing"—all of which are stabilizing practices with slow refresh rates. If texts in their broadest sense can be thought of as "media scripts," then the specific medium that instantiates that script can change, evolve, morph, and even turn back upon itself. The rewritable substrate of digital media enables iterative work to hitherto unprecedented degrees, introducing the software term "version" into units of scholarly production.

The field of Digital Humanities may see the emergence of polymaths who can "do it all": who can research, write, shoot, edit, code, model, design, network, and dialogue with users. But there is also ample room for specialization and, particularly, for collaboration. The generation now cursed with the label "digital natives" will surely develop the capacity to become comprehensive digital humanists. The fact that digital projects of any substantial scale benefit from and, indeed, often require team-based approaches troubles traditional concepts of authorship in the humanities, which are still fixated, by and large, on single-authored achievements. The academic world has developed sophisticated (though hardly perfect) modes in the sciences to credit multiple authors, but colleges and universities now need to develop ways of acknowledging intellectual contributions in team environments for digital humanists, a micro-credit and a macro-credit system for intellectual labor that functions as a viable form of capital in a reputation economy as well as in a scholarly world. Technical imagination and expertise partner with discipline-specific forms of knowledge in Digital Humanities projects: projects in which each contributor plays a vital role in setting the research agenda, and in which contributors build big mosaics out of tesserae consisting of specialized skills and expert knowledge.

One caveat is worth noting. The positive demand for expanded skill-sets could have profoundly negative effects on scholarship if it becomes the academic equivalent of a neo-liberal speedup in which ever more quantitative metrics are used to push "education workers" into acquiring technological skills without commensurate pay, skills which they are then held accountable for, both within and outside of tenure tracks. Likewise, the continuing resistance within post-secondary

educational institutions to recognize Digital Humanities work as equivalent to long-established forms of scholarship could translate into an expectation that certain disciplines devoted to the study of the contemporary, such as media and visual studies, become Digital Humanities departments, irrespective of whether the most promising research questions within the field are well-suited to such a framing. The fact of the matter is that Digital Humanities bears no privileged relation to modern or contemporary cultural corpora; on the contrary, it is indifferent as to whether its objects of study are performance videos from the 1960s or pottery shards from a Mycenaean archaeological site from the 2ND millennium BCE. Digital Humanities is an extension of traditional knowledge skills and methods, not a replacement for them. Its distinctive contributions do not obliterate the insights of the past, but add and supplement the humanities' long-standing commitment to scholarly interpretation, informed research, structured argument, and dialogue within communities of practice.

In this rapidly changing research environment, it is necessary to acknowledge the new shapes that knowledge production is assuming, to set reasonable and flexible expectations regarding experimentation and innovation, and to devise a reward structure for team-based collaboration that includes recognition of the value and skills of participants in accord with the significance of their contributions. Older "service-based" models of staff conceived in contrast to scholars qua *auteurs* are being challenged and rightly so. The cultural politics of academic institutions are shifting, indeed, but we must be attentive to inadvertent consequences. Projects that are dependent on deliverables as their only measure of success are likely to be at odds with a research mission that supports innovation and imaginative, risk-taking work. Intellectual challenges, not technical ones or metrics based on the mere on-time delivery of products, have always driven and will continue to drive the development of the Digital Humanities.

Computational Activities in Digital Humanities

Digital Humanities projects can be described by sketching their structure at several levels. These begin with basic computation (programming, processing, protocols) and extend through the levels of organization and output that form the basis of most users' experience (interface, devices, networks). The foundational layer, COMPUTATION, relies on principles that are, on the surface, at odds with humanistic methods. Specifically, computation depends on disambiguation at every level, from

encoding to the structuring of information. Explicit step-by-step procedures form the basis of computational activity. However, ambiguity and implicit assumptions are crucial to the humanities. In the intersection between these two domains, humanists have given in to the demands of a process that requires that they work in accord with its methods. What is less-often noted is that computational methods have been altered in significant ways by humanist approaches. Indeed, this is a challenge for the development of the Digital Humanities, namely the ways in which ambiguity, interpretation, contingency, positionality, and differential approaches can be embodied in computation.

The second level involves PROCESSING in ways that conform to computational capacities, and these were explored in the first generation of digital scholarship in stylometrics, concordance development, and indexing. This processing activity takes advantage of the ability of computers to automate certain tasks useful in answering the sorts of research questions that were initially being asked by humanities scholars. In the first phase of digital activity, sorting, searching, calculating, and matching were basic operations performed on texts or data. The introduction of structured data for analysis and display in the family of what are known as markup languages added a dimension to this activity, introducing interpretation into the digitized stream of keyboarded characters. The insertion of these "tags" allowed manipulation of the content and the performance of an interpretive act.

Both computational foundations and processing activities have endured, but other platforms, tools, and infrastructures have also developed to support curation, analysis, editing, and modeling. These depend upon the basic building blocks of digital activity: DIGITIZATION, CLASSIFICATION, DESCRIPTION and METADATA, ORGANIZATION, and NAVIGATION. Designing and building digital projects depend on knowledge of these fundamentals and on a nuanced understanding of the networked environments in which the projects will develop and variously reside.

Curation, Analysis, Editing, Modeling

Curation, analysis, editing, and modeling comprise fundamental activities at the core of Digital Humanities. Involving archives, collections, repositories, and other aggregations of materials, CURATION is the selection and organization of materials in an interpretive framework, argument, or exhibit. The capacity with digital media to create enhanced forms of curation brings humanistic values into play in ways that

were difficult to achieve in traditional museum or library settings. Rather than being viewed as autonomous or self-evident, artifacts can be seen being shaped by and shaping complex networks of influence, production, dissemination, and reception, animated by multilayered debates and historical forces.

ANALYSIS refers to the processing of text or data: Statistical and quantitative methods of analysis have brought close reading of texts (stylometrics and genre analysis, collation, comparison of versions for author attribution or usage patterns) into dialogue with distant reading (the crunching of large quantities of information across a corpus of textual data or its metadata). Analysis is often conjugated with visualization in order to give graphical legibility to analytical results. Many of the tools for visualization are still adopted wholesale from business graphics or from the social and natural sciences, but this is beginning to change as data visualization assumes an evermore central role in Digital Humanities scholarship. The recent surge of interest among digital humanists in mapping, for example, is indicative of a trend that recognizes the importance of developing geo-temporal visualizations and mapping platforms to analyze complex social, cultural, and historical dynamics.

EDITING has been revived with the advent of digital media and the Web, and will continue to be an integral activity in textual as well as time-based formats. The parsing of the cultural record in terms of questions of authenticity, origin, transmission, or production is one of the foundation stones of humanistic scholarship upon which all other interpretive work depends. But editing is also productive and generative, and it is the suite of rhetorical devices that make a work. Editing is the creative, imaginative activity of making, and as such, design can be also seen as a kind of editing: It is the means by which an argument takes shape and is given form. Genetic editions, in which variants, versions, pentimenti, and amendments can be incorporated into a display or trail of evidence have been the dream of literary scholars since the rise of scientific philology in the 19TH century. Tools for the realization of such complex forms of intellectual gamesmanship are changing and improving rapidly. The potential for their full realization even beyond the confines of the textual record will revitalize long-standing traditions of humanistic work and allow humanists to re-approach these traditions in innovative ways with new research questions and tools.

MODELING highlights the notion of content models—shapes of argument expressed in information structures and their design. A digital project is always an expression of assumptions about knowledge: usually domain-specific knowledge

given an explicit form by the model in which it is designed. Thus a project dedicated to analyzing the correspondence of a famous artist might assume a chronological shape, which is one model of a human life. Or it might be organized around correspondents and relationships, another way of weighting the data. Or it could be structured by place of origin and receipt, as a geospatial network. The building blocks of digital work will each be molded by the model of knowledge which they need to serve. Even basic questions about file formats, image resolution, metadata, and classification schemes to structure the digital materials are intimately bound to the argument made by what is referred to here as a "content model." The phrase means just what it appears to mean: a model by means of which shape is conferred upon a given set of cultural contents. Do we organize music files by playlists or by artist? By performer or composer? The playlist model fixes files in an order that makes searching for a particular artist difficult, and classical music might be more logically organized by composer than by performing artist. Each of these represents a distinctive information model that privileges one or another feature of the content.

The organization of information in a file or data system does not have to conform to its display within an interface. At the level of interface, one might well create a design that is based on the behaviors that end-users might plausibly display with respect to the information. Do they want to search (look for a particular thing) or browse (wander about in a collection to see what might be of interest)? Such distinctions are the bedrock upon which interaction design is built. The knowledge for carrying out the implementation of these designs comes from computer science, information studies, graphic and media design, human-computer-interaction, and cognitive studies. The form that knowledge takes in digital environments and the arguments it expresses in its information structures can be deeply infused with humanistic values, but only if humanists are involved. If simply handed off to technologists or left to functionaries or commercial interests, many basic requirements for humanist scholarship and pedagogy will be lost. The misguided collector annoyed by the mass of handwritten annotations created by readers in the margins of medieval manuscripts and incunabula who elects to erase them eliminates forever the commentary of famous and insignificant figures alike. In a digital world, choices about what remains and what is eliminated, what is made accessible, how and in what form, are just as enduring and just as potentially enhancing or damaging.

Additionally, modeling carries a specific meaning in the creation of simulated and virtual environments. Rendering immersive models of historical sites,

archaeological projects, cultural monuments, or imagined worlds in fly-through, multidimensional forms are vivid possibilities of the digital environment. So are the multiplayer worlds of games in which participants make virtual real estate and its contents, creating systems of value, social relations, and lived experiences in avatar-inhabited landscapes. Humanities work in such environments allows questions of uncertainty and analysis to enter into play. The role of speculation in the use of fragmentary evidence mustered for virtual reconstruction gets amplified through the capacities of digital media. Digital humanists engage with these environments not only because of their pedagogical and research values, but also because humanist sensibilities are needed to challenge the seductive force of seamless presentation and to inject criticality and skeptical faculties into otherwise "naturalized" unnatural constructs.

The graphical user interface, still common in a world of distributed and embedded computing platforms, has put tremendous pressure on this generation of scholars and teachers to be attuned to sophisticated visual literacy. Even the most text-centric academic will admit the existence of visual rhetoric, but the skills to read interfaces, databases, and other content models are still very underdeveloped. Understanding the way one structures the relationships among data, the ways in which users input and access information, and the physical and conceptual design of such systems all-too-often slips away into the abstraction. Yet graphical interfaces have been central to the humanities for centuries. What, after all, are indexes, tables of contents, and foot- and endnotes if not information storage and retrieval strategies? The classification systems that scholars and librarians have evolved over the centuries and their direct relationship to the arrangement of physical book stacks, not to mention whether those stacks are open or closed, are all evidence of the design of information and its access as central concerns of the humanities. Yet with computers and networks, these same issues of information and access may be perceived as mere technical concerns, and the benefit of a humanist perspective is lost. Navigation and organization are interdependent; creating digital wayfinding, like environmental signage, calls on a combination of intellectual and design skills.

Each of these areas of activity—curation, analysis, editing, and modeling—is supported by the basic building blocks of digital activity. But they also depend upon NETWORKS and INFRASTRUCTURE that are cultural and institutional as well as technical. Servers, software, and systems administration are key elements of any project design. Compatibility and interoperability are essential for sustainable

work. The cultural dimensions of infrastructure are also factors to be considered. Museums, libraries, archives, and other institutional settings each have their own agendas, their own customs and conventions. Cultural differences can arise with partnering institutions, as well as across national and international communities of participants. Digital work takes place in the real world, and humanists once accustomed to isolated or individualized modes of production must now grapple with complex partnerships and with insuring the long-term availability and viability of their scholarship.

Prototyping and Versioning: Generative Humanities Ahead

The capacity for the rapid creation, testing, and reworking of Digital Humanities projects goes hand-in-hand with the flexibility, mutability, and extensibility of digital media. But with the development of more Digital Humanities projects comes a new, normative center in which tool sets are stabilizing. Curation, collection, and data management are cohering around shared standards, while concrete rationales for the production and deployment of Digital Humanities methodologies have emerged in the academy. This normalization points, in part, to the maturation of the Digital Humanities. However, one of the strongest attributes of the field is that the iterative VERSIONING of digital projects fosters experimentation, risk-taking, redefinition, and sometimes failure. It is important that we do not short-circuit this experimental process in the rush to normalize practices, standardize methodologies, and define evaluative metrics.

Whereas the first generation of Digital Humanities tended to specialize in discrete one-offs, digital humanists can now use networks and interoperable file-sharing standards and protocols to test new approaches with distributed users and developers at a time-and-distance scale previously unimaginable. Digital Humanities infrastructures encourage PROTOTYPING, generating new projects, beta-testing them with audiences both sympathetic and skeptical, and then actually looking at the results. Building on a key aspect of design innovation, Digital Humanities must have, and even encourages, FAILURES. Outside the normative core, there is space to iterate and test, to create precarious experiments that are speculative, ludic, or even impossible. That research can benefit from failure should not be any sort of surprise—stress-testing metals and other materials is what gives us bridges that don't collapse and buildings that stay up—but so too can the classroom

benefit from an academic culture that welcomes frequent (productive) failure. The methodologies of Digital Humanities are robust precisely because they place lasting pedagogical value in the creative, generative, and experimental processes of design-based research. Process is favored over product; versioning and extensibility are favored over definitive editions and research silos. The Digital Humanities capacity to ask, design, and model new research questions opens new possibilities for those who are willing to take risks. Too often in established cultural discourse, the experimental is absent or hastily erased, the dialogue already so well-established that new approaches are incremental at best. But it is not an experiment if it cannot fail.

Many of the most promising areas of the Digital Humanities have ample room for such risky undertakings. The key is to create the contexts that allow failing to be seen as something other than defeat. In the entrepreneurial culture of Silicon Valley, for example, failure is not only tolerated, it is massively funded—because the risks are worth it. Industry leaders factor the costs of failure into labor, resources, talent, and investment as a necessary part of their undertakings, recognizing the need for experimentation with uncertain outcomes. As Bill Coleman, who has had many wins but even more losses over the decades in the high-tech industry, notes, "You learn not just about failure and how to make things work, you learn the psychology of failure and how you react to it."

Accepting the psychology of failure is part of the life cycle of innovation. Yet when the academic culture of peer review and promotion runs up against budget realities and resource scarcity, skittishness about failure arises. Digital Humanities work embraces the iterative, in which experiments are run over time and become objects open to constant revision. Critical design discourse is moving away from a strict problem-solving approach that seeks to find a final answer: Each new design opens up new problems and—productively—creates new questions. Digital humanists take these matters as core tenets, knowing that the field we are engaged in is still in its early stages, both enabled and constrained by encounters with the techniques of computation. We are driven by the need to extend the reach and impact of that technology to forge ahead; when we arrive at the place where humanistic methods regularly inform computational approaches, we will have passed another exponential milestone.

Generative Humanities as the New Core

The uptake of digital tools and platforms does not "solve" long-standing problems in the academy as much as offer what engineers refer to as "work-arounds," provisional improvisations that allow whole systems to move forward without demanding perfection from every part. The iterative nature of the Digital Humanities is what makes this a once-in-a-generation moment to reinvigorate the idea of a core curriculum for undergraduates: to make them active participants and stakeholders in the creation and preservation of cultural materials. Why would the Digital Humanities want to wade into what feels like a never-ending academic culture war? In the United States in particular, we have never settled on what constitutes the "basic" things an educated person should know, and how that knowledge in turn develops the informed citizenry a democracy needs to thrive.

The last 50 years saw the growth of increasing discomfort with inherited curricula, which were rightly seen as constrained by issues of race, class, gender, and first-world biases rooted in Eurocentric traditions. An important battle took place—to open reading lists and discussion sections to a wider range of voices. Yet this call for openness and expansion dovetailed with the silo-ization of knowledge in the humanities as the baby boom generation hit the newly expanded higher education sector in the 1960s. Students clamored for relevance; activists demanded inclusion; and scholars responded by opening up their syllabi while at the same time narrowing their teaching to reflect and feed their specializations. Figures and movements formerly ignored precisely because of their supposedly "marginal" status became new objects of study. Perhaps more significantly, the perspectives of these once-excluded materials carried with them alterative methodologies and different value systems that shattered any illusion of a single belief system within humanistic thought.

The wars over the core have had two unexpected results. The first is that rather than replacing a restrictive body of knowledge with a more expansive one, the very idea of sharing common references or approaches waned. The wars over the core in the humanities have contributed to a malaise in which the humanities are widely perceived as "irrelevant," lacking the practicality of business, law, or medicine. Another effect has been to add ammunition to the forces that want to de-college the American populace, shunting as many students as possible into vocational tracks, in order to reserve higher education for elites. Yet the reality is that

graduates of whatever level will need to call upon more than vocational training if they are to steer their democracy through the challenges and opportunities that this highly networked, globalized, mobile, and ecologically fragile century offers. More than ever, we need the critical insights, creative designs, speculative imagination, and methods of comparative, historically informed study that shape humanistic modes of inquiry. Imagination and informed critical thought foster ways of thinking beyond received positions and claims to absolute authority. Digital, polyvocal expression can support a genuine multiverse in which no single point of view can claim the center. The principles of relativist approaches to knowledge, rooted in historically situated understanding, remain fundamental to (digital) humanism.

The phrase *Digital Humanities* thus describes not just a collective singular but also the humanities in the plural, able to address and engage disparate subject matters across media, language, location, and history. But, however heterogeneous, the Digital Humanities is unified by its emphasis on making, connecting, interpreting, and collaborating. This concentration on process and method might in fact be the way to develop a work-around for the creation of a core curriculum, a process which bogs down precisely on what appears to its varied partisans to be a zero-sum game. An Afro-Caribbean female novelist joining the syllabus means an English male metaphysical poet exits. In the eight semesters of the hypothetical student's college career, there are only so many class sessions. But the networked academy's very *allatonceness*—to use Marshall McLuhan's suggestive term referring to simultaneity and connectivity—offers a glimpse of a more elastic notion of curricula, one that extends past the walls of the academy and the time limits of degree programs. At the very same time that the battles over the core raged on, the entertainment and information industries flourished. The disconnect between methods of pedagogy inherited from cloisters and seminar rooms and those of a massively mediated culture is real. Digital humanists strive to bridge that gap.

The digital environment offers expanded possibilities for exploring multiple approaches to what constitutes knowledge and what methods qualify as valid for its production. This implies that the 8-page essay and the 25-page research paper will have to make room for the game design, the multi-player narrative, the video mash-up, the online exhibit and other new forms and formats as pedagogical exercises. Playful, imaginative, participatory work is not the enemy of education, but its exuberant and vital engine. New standards of assessment will be necessary as skills

change. We struggle less to remember facts than we do to remember where and how to find them—and how to assess their validity.

Ubiquitous networks have led and will continue to lead to evolutions in pedagogy precisely because they involve the outsourcing of memory. Writing transformed traditional modes of oral training; print technologies standardized everything from spelling to what constituted a "proper" copy of a text. We would be ignoring precedent completely if we assumed that the *allatonceness* of a vast and increasing digital archive accessible anywhere at any time will not affect the way that we learn. The best core curricula—whether or not based on classical models—strive to create students, and thereby citizens, who think with imagination, who manifest their thoughts as creative action, and whose analysis can lead to inventive, although hardly definitive, syntheses. These are precisely the goals that a digitally driven, generative humanities core espouses.

The technological aspects of the digital turn are not yet so normative that we can ignore the tools, interfaces, and the hard-, soft-, and wet-wares of this moment. But the generative humanities are emphatically not about training for a market. They are, instead, like all great pedagogies that preceded them, education for an environment. The social, political, and ecological challenges of the 21st century demand significantly more than textual analysis or recitations of inherited content. These problems (and opportunities) will need people trained to create synthetic responses, rich with meaning and purpose, and capable of communicating in a range of appropriate media, including but not limited to print. The exact content of the generative humanities qua core curriculum will always be a matter of negotiation and debate; and well it should be, for core curricula have always been in greater flux than their adversaries or diehard advocates care to admit. Some traditionalists will rankle at the idea that the humanist spirit—rather than humanities texts—will become the "core" of a generative humanities curriculum, but this century's explosion of a deep, rich, and meaningful digital culture is already proving them wrong. That spirit, as suggested throughout this chapter, consists of methods as well as content, with approaches that tolerate relativism and diversity in thinking, orders of experience, and, yes, fundamental values.

The generative aspects of Digital Humanities thus go a long way to addressing the much-lamented atomization and irrelevance of scholarship—that critique from all parts of the ideological spectrum that teaching and research are at

odds with one another, that scholarship itself has become relentlessly focused on the professional advancement of the scholar and is addressed only to others in an ever-shrinking pool of the like-minded and credentialed. Digital Humanities scholarship, on the other hand, promises to expand the constituency of serious scholarship and engage in a dialogue with the world at large. Even as it models ever-newer forms of professional expertise, Digital Humanities employs the best crowd-sourcing techniques to process, analyze, and publish materials that document and engage with the variance of the human cultural record. It promotes platforms for informed amateur scholarship, and it serves to make humanities research into something of a new multi-player online game with global reach and relevance. In its distributed form, Digital Humanities arrives through cellphone and other mobile applications as a deepening enhancement of daily experience, providing an interpretation of a public monument or work of cultural legacy, bringing the richness of scholarly expertise into new and decidedly public forms of use. In the world of current events and unfolding occurrences in the political or cultural sphere, rapid communication on digital platforms alters perception, opinion, values, and outcomes.

The digitization of the world's knowledge and its movement across global networks, no matter how incomplete or incompletely free, have transformed what we understand by and how we approach the humanities in the 21st century. We are continually creating new ways of accessing and assessing this new cultural production, which continually open up important new spaces for exploring humanity's cultural heritage and for imagining future possibilities using the transmedia methods and genres of the digital present. It is to these methods and genres that we now turn.