Digital Humanities and Academic Change

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I once wrote, "It might be said, with Kafkaesque irony: I went to sleep one day a cultural critic and woke the next metamorphosed into a data processor."[1] In retrospect, the wrong note in this observation was the personal pronoun. The person of metamorphosis should have been the *we* of the academic humanities and, more broadly still, of the academy as a whole.

My argument is that the new digital technologies are changing the humanities in the manner of what the U.S. Centers for Disease Control and Prevention might call *vectors*—i.e., carriers, viruses, bugs. They transmit alien disciplinary genes from other paradigms of knowledge. To adapt Nabokov's guess about the true nature of Kafka's insect (i.e, beetle, not cockroach): it is as if we woke to find ourselves metamorphosed into a bug, but then woke again the second day to discover that the bug had hidden wings able to bear us aloft to a new vision of a broader humanities.[2]

For lack of a better term, I will call such a new vision the *global humanities*.

Buggy Little Projects

But one step at a time. We might begin merely with an evolutionary explanation of the impact of the digital humanities—one of incremental changes introduced into the humanities from within—and see how far it takes us. In fact, such an explanation takes us quite far.

The evolutionary metaphor is apt because the origin of the digital humanities as a field was not unlike Darwin's origin of species: a scramble to find any niche in which to survive. In the past two decades, I have known and admired many pioneering innovators in the digital humanities who came from starting points as diverse as media studies, literary studies, textual studies, computational linguistics, classics, history, art, information science, library studies, education, engineering, and computer science. Yet, in almost all cases, we are talking about individuals (or small groups) with *buggy little projects*. I refer to software, Web sites, digital archives or editions, databases, etc. that began in a state of sustained, if not perpetual, "beta"-release somewhere between a grant proposal and a usable product. Plagued by problems of efficiency, scalability, standardization, interface design, documentation, preservation strategy, and security, such projects were proofs of concept sometimes before there was a concept.

A partial list of buggy little projects that I myself created or collaborated on at UC Santa Barbara includes:

- *Voice of the Shuttle (VoS)*, a portal for humanities online resources initiated in 1994 as static HTML pages;

- *VoS* (version 2), re-designed in 2001 as a dynamic, database-to-HTML Web site (as it were, "Web 1.5");

- other database-driven Web sites such as *The Romantic Chronology* and the UC Santa Barbara English Department Web site created (or migrated to databases) between 1999 and 2001;

- recent Web 2.0-style projects that extend the paradigm of database-driven Web sites in the direction of today's blogs and wikis (e.g., *The Agrippa Files*, based on the WordPress blog engine, and the *English Department Knowledge Base*, based on the MediaWiki program best known as the platform of Wikipedia);

- and new immersive, virtual-world technologies such as the Second Life campus created for my English Department in 2007 in a project led by my colleague Rita Raley.[3]

However revolutionary their initial promise, such projects were indeed evolutionary because they set loose swarms of little changes that did not always move in the same direction and that often led to impasses or dead ends. The evolutionary path of the digital mutation, as it were, is littered with the dead bodies of hung servers, hacked sites, and aborted classes.

Even so, there really were new species of life to arise from such early projects. Those with the most impact, I believe, emerged at a different level than the high-altitude concepts— e.g., *sign, text, form, media, culture*, and *subject*—usually treated in discussions of the digital humanities and new media. Indeed, they are less concepts than elementary working methods or protocols. I will inventory these under two headings: *research and teaching practices* and *administrative organization*.

Practice 2.0

The following are some of the research and teaching practices in the humanities that, while respecting their originating paradigms (e.g., writing as the base model of "authoring"), mutate those paradigms under the influence of the digital:

- *Writing → Authoring/Collaborating*. In the digital era, *writing* evolves into *authoring* (as in the expression, "Web author"). Good authoring on the Web, for instance, combines the acts of writing, designing, image editing, and programming (at least at the source-code level of template pages and CSS stylesheets). Increasingly, therefore, good authorship requires collaboration. It is team work.[4]

- *Reading → Social Computing*. The main finding of the UC Transliteracies Project on online reading that I currently direct is that the weighted center of the reading experience in the

digital age is shifting from documents as such to the *margins* of documents. Made literal in the "sidebar" of a blog or the "wall" of a Facebook page, these un- or underdocumented margins host *friends, comments, blog rolls, trackbacks, tags*, and other indicators of a vast resurgence of collective reading and annotating. Increasingly, online reading is "social computing."[5]

- *Interpreting → Data-mining/Modeling*. As preface, we can note that while such recent humanistic movements as poststructuralism, the new historicism, and cultural criticism have been skeptical of meaning, they have generally not carried that skepticism over into any substantive change in their assumption that the proper business of the humanities remains the *interpretation* of meaning. It's just that one now interprets "meaning" in scare quotes (as a construction, ideology, contingency, etc.). This applies even in the case of theorists who are directly skeptical about interpretation itself. In the area of media history/theory, for instance, Friedrich Kittler's *Discourse Networks, 1800/1900* is an oxymoronic anti-hermeneutical interpretation that reads the onset of modernity as a turn away from the embrace of innate meaning ("the mother's tongue," Kittler calls it) toward an encounter with carrier-waves of noise taking on only the semblance of meaning through arbitrary signal modulation.[6] Yet, at a minimum, such anti-hermeneutical hermeneutics has at least given the digital humanities the philosophical cover it needs to try out genuinely different modes of inquiry that are either non-interpretive or that position interpretation as something other than the *end* of the act of knowledge. I refer to such modes as building, modeling, simulating, sampling, or experimenting. Relevant are recent discussions of the digital humanities such as Willard McCarty's *Humanities Computing*, Geoffrey Rockwell's "What is Text Analysis, Really?" Jerome McGann and Lisa Samuel's "Deformance and Interpretation," and Stephen Ramsay's "Algorithmic Criticism."[7] To use McCarty's master term, it's not about interpreting; it's about *modeling*. That is, the digital humanities do not channel pre-existing meaning, but instead iteratively tweak the signal in the channel until it either models our understanding of pre-existing pattern (e.g., what constitutes personification in Ovid) or discovers unexpected anomalies generative of new meaning. Rockwell, McGann, Samuels, and Ramsay emphasize the generative: we algorithmically "deform" the signal in a mode of "disciplined play" to see if anything interesting, surprising, or unknown happens to make us rediscover what we thought we had understood.

- *Critical Judgment → Information Credibility*. This is a large topic in information science and communication studies today, especially in the era of Web 2.0. The question is: how do we know that any of the blogs, wikis, and so forth communicating Web 2.0's so-called "wisdom of crowds" and "rule of many" are actually either wise or ruly?[8] As I am learning from the *Credibility and Digital Media Project* in the communication department on my campus, critical judgment now requires assessing credibility, reputation, and authority through complex new trust technologies and metrics of social trust.[9]

- *Peer Reviewing → Commenting.* Some science disciplines now publish first in online unrefereed forums, then referee later for journals.[10] At the other extreme, the humanities are the tortoise in the race because their cardinal publication form is the monographic print book, which appears after years of writing followed by months of peer review and further months of press production. However, declining monograph sales and increasing access to online forums now provide an incentive even for humanists to publish first on the Web in a mix of peer-reviewed and non-peer-reviewed, proprietary and open-access venues. The Web 2.0 ethos of "crowd sourcing" (another phrase for "wisdom of the crowd") also changes the equation. The convention of expert peer review is hybridizing with that of post-publication "comments" by readers, expert or not.[11] In other words: just get it out there, and let it be vetted by survival of the fittest.

- *Teaching → Co-developing.* Finally, I instance just one aspect of change in pedagogy. One of the most remarkable differences of teaching with the new technologies is that they supplement the usual closed discursive circuit of the instructor-talking-to-the-student (and vice versa) with an open circuit of the instructor-*and*-student talking to others. As I put it in my *Laws of Cool*, teacher and student stop looking just at each other and "turn shoulder to shoulder" to build something allowing "them to look *through* it to a public able to look in reverse at *them*."[12] In my experience, the resulting change in the dynamics of teaching—which no longer just delivers knowledge but imparts a role model for producing knowledge—is remarkable. Every experienced instructor, I think, treasures in memory a small repertory of "best" classes that sustain the meaningfulness of their lives as pedagogues (a word, we remember, that descends from a time when the pedagogue was a slave). The classes thus haloed in my own memory were previously luminous seminars, supplemented by a few lectures. Now I count among my blessings a growing number of lab-style, project-building classes in which it all came together—practice, discovery, community.

The humanities practices thus mutated in the digital age are so basic that their nature once seemed immutable, hardly requiring commentary. (*Of course* we write, read, interpret, criticize, peer review, and teach.) But even long-standing cultural practices change in generational-scale cycles akin to those studied by *Annales* historians or economic historians—e.g., the approximately 40 years between the rise of "close reading" theory in the 1930s and of poststructuralism in the 1970s. On that clock, the interval is about right for the digital mutation to take hold today in fundamental humanities research and teaching practices. Yet, however significant, the mutations I have so far described are indeed evolutionary because they only extend well-understood underlying practices. It's like imagining how a creature first designed to graze close to the ground might develop an extended neck and end up a giraffe. We can easily imagine mono-writing and -reading extending into multi-authoring and social computing, interpretation into modeling, expert peer review into demotic commentary, and so on—all the way to Web 2.0's imagined goal of a universal "social graph" (a concept already so overextended that one media arts and technology student I work with has begun referring to it in homophonic jest as the "social giraffe").[13]

Organization 2.0 ("Center-Based" Departments)

The digital humanities are also incubating another kind of evolution—this one in what might be called the disciplinary unconscious of the humanities: administration and organization. Management, after all, is the unacknowledged knowledge of the humanities: that which preoccupies much collective thought and discourse but rarely manifests as legitimate humanistic theme.[14] Just beneath the horizon of disciplinary consciousness, however, new digital humanities practices are now fomenting new organizational forms.

There are several levels at which to consider such forms. At the micro-level, for instance, the management of a class is reorganized by course management software, the pedagogical use of wikis and blogs, and content management systems facilitating the kind of co-development work I have already mentioned. But I will focus on a level of organizational form that sits just above that of the individual scholar or course and may reasonably be called the main organizational muscle of the humanities: the department. Unlike in the sciences, where the department is complemented by a wider repertory of organizational forms with semi-autonomous identity (e.g., a major lab, grant project, or multi-disciplinary cluster or institute), in the humanities the department is usually supplemented by just one weaker organizational shadow of itself: the "program," which normally lacks the permanent funding lines needed to hire faculty on its own. The critical question, therefore, is: how have the digital humanities evolved the humanities *department*?

One answer is that the digital humanities have improvised organizations *outside* or *between* departments—organizational entities, however, that nevertheless premise the department as the operational norm (a kind of negative norm) from which to draw faculty and students and to which they are finally responsible for the advancement of those faculty and students. Such outlier entities—institutes or centers for "technology in the humanities," for example—may be called institutionally homeless programs. The phrase is a frank admission that the digital humanities often start in some corner-, basement-, adjunct-, satellite-, or wing-facility clinging to the side of a library, information-technology service unit, or interdisciplinary humanities center—i.e., some previously established facilitating organization between departments. Digital humanities entities in this mold also often rely on precarious campus funding and/or serial extramural grants that the humanities are structurally ill-prepared to sustain (e.g., because grant-writing and -administration does not count in the normative workload of humanities faculty). The general rule is that the digital humanities have arisen in the institutional seams of the academy.

Another answer, which my own experience allows me to trace in more detail, has been for the digital humanities to change the organizational form of the department itself. Though I have started or collaborated in the start-up of inter-departmental (and inter-campus) organizations, my primary organizational strategy has stemmed from the conviction that the digital humanities will ultimately matter, or not at all, *inside* the department. In 1996–98, I exploited the combination of an external job offer and a NEH Teaching with Technology grant to win what in retrospect was a crucial argument with my campus administration. My main

line of argument was that a robust university information-technology strategy required more than central campus facilities such as computer labs and IT agencies. It also required investing—or, at least, cost-sharing—in smaller digital programs and resources homed in mainstream humanities departments. The department, after all, is where humanities scholars primarily live and work. There is a world of difference between scheduling class visits to a campus lab and walking down the hall with one's students into a departmental "studio" (as I called the first computing facility started in our department). So, too, there is a vast difference between requesting permission for experiments on a campus server and improvising projects on a departmental server with its smaller trust community of users and higher tolerance for failure. My secondary contention was that the humanities needed to develop their own technology projects "in house" because, however buggy the results, it would give its community the close familiarity with technology needed to think about and through it. My motto about IT at the time was: *not tool, but lens*.

The immediate result of winning the case with my administration was the start-up in 1996–98 of my department's Transcriptions Project on "literature and the culture of information." Transcriptions is now an intradepartmental "center" (recently renamed Literature.Culture.Media Center) with its own physical space, research agenda, and curricular track or "specialization" in our English major.[15] On its model, several similar intradepartmental centers/specializations have since arisen, each with its own topical theme but most invested in information technology as a primary instrument of research and teaching. These include the department's Early Modern Center, American Cultures and Global Contexts Center, and two recently created proto-centers named Literature & Environment and Literature & Mind. In progress are plans for possible additional research/teaching clusters that may grow into intradepartmental centers.[16] These centers have re-created my department into one of the most distinctively restructured humanities departments in the United States (a finding of the department's most recent external review).

The intradepartmental centers I describe share some combination of the following attributes:

- *Centers self-organize from the bottom up*. They spring from nascent concentrations of strength in the department—e.g., clusters of faculty and graduate students who have been meeting in ad hoc reading groups and are just waiting to crystallize. Put inversely, centers are *not* started by top-down administrative fiat, though the conditions and incentives for bottom-up self-organization can be seeded by an enterprising chair or dean. The challenge for a department then becomes supervising such bottom-up activity without killing the goose that lays the golden egg—e.g., through insisting on some form of review and the periodic rotation of leadership.[17]

- *Centers evolve intellectually around a topic (or staged series of topics) instead of just fields and periods*. Of course, fields and periods continue to be important architectural principles in humanities departments. But adding *topic* generates new kinds of job searches, research programs, and curricular tracks. My department now routinely defines

half its job searches by topic and half by field/period. In 2007–08, for example, we ran searches in "Literature and Environment" and "Medieval Literature"; and in 2008–09 for "Literature and Media" and "Renaissance Drama."

- *Centers create projects, especially digital projects*. While centers stage talks, colloquia, conferences, and other humanities "talking events," they also create concrete projects such as online sites or editions, software applications, journals, curricular tracks, and pedagogical experiments. Focusing on projects alters the ecology of knowledge-production in the humanities so that talking events are repositioned as part of the process for making projects while, reciprocally, projects (especially buggy ones) supply a reason for further talking, brainstorming, and research publications leading to new project iterations. Some of the major projects recently started by my department's centers include the English Broadside Ballads Project (EBBA), the UC Transliteracies Project, and the online *Journal of Transnational American Studies*.[18]

- *Centers are collaborative*. The operative research/teaching unit in a center is a cluster of scholars working across fields and periods. For smaller or mid-size departments, this strategy has the additional advantage of creating critical masses of interest compensating for the lack of deep bench strength in individual fields/periods. There may not be six or more romanticists, in other words, but there may be a romanticist, an eighteenth-century scholar, a medievalist, a modernist, and others all collaborating on such topics (hypothetically) as "early media," "environmental justice," "disease and culture," "migration cultures," and so on.

- *Centers vertically integrate faculty, graduate students, and undergraduates*. In an early experiment, for instance, Transcriptions awarded stipends to a few undergraduates in its curricular specialization to work on digital projects under the supervision of a graduate student, who in turn was supervised by a faculty member. All three levels of personnel convened in working meetings that were as much about the undergraduates teaching their betters as the reverse.[19] An especially robust, mature version of this model now typifies our Early Modern Center. On any given day, the center hosts a combined cast of undergraduates, graduate students, and faculty all working together on the online EBBA project.

- *Centers are entrepreneurial*. Several of the centers and projects mentioned above are funded by NEH, University of California system-wide, or other grants ranging in size from small to large. Indeed, acquiring even a small amount of extramural support can have the effect of winning university cost-matching that would not otherwise be available. (One thing that humanists discover when they break out of their individual carrels to start collaborative projects is that there is a fair amount of non-routine funding circulating in universities looking for a reason to exist in some particular location. Acquiring an extramural seed grant, as it were, gives such funding a reason to exist *here*.) Even if no extramural support is achieved in the near term, the very process of applying for grants generates detailed plans that substantially strengthen research and teaching and prepare for future opportunities.

- *Centers are anchor points for interdepartmental collaboration.* I call this the "strong tinker toys" model of cross-departmental collaboration. The idea is not to build strength in new intellectual areas by exiling the best minds into inter-, meta-, or para-organizational entities located outside departments. Instead, the goal is to build up thick nodes of people (in this case, working in the digital humanities) inside a particular department; then link by elective affinity with similar nodes forming in other departments. The result will be a network of informal and formal collaboration much more robust than would otherwise be possible—a network through which faculty, students, ideas, and resources are swapped on an everyday basis. It is through this strategy that my English department has built up strong collaborative networks with such other nodes of interest in digital technology on our campus as art, film and media studies, and media arts and technology. My recent courses and projects, for instance, regularly draw graduate students from all of the above.

- *Centers have a public humanities dimension.* Because they focus on topics that are urgent enough to motivate bottom-up organization and can be explained to grant agencies, centers tend to reach beyond the scholarly community to address a wider public. This accords well with the nature of the Internet, especially in its Web 2.0 form. For example, the *EBBA* project was created by our Early Modern Center to focus on recent interest in the history-of-book field in "ephemera" (in this case, broadside ballads). But this research interest also speaks indirectly to the general contemporary interest in ephemera, e.g., blogs.

As a result of the above intradepartmental center model, I now work in a department where faculty and graduate students normally identify with one or more topical research clusters alongside their fields/periods; where collaborative work meaningfully complements monographic work; where talk leads to hands-on building (and vice versa); where one has substantive intellectual engagements with scholars outside one's own area; where I learn from cool, tech-savvy undergraduates as much as they from high-literate me; and where the usual academic command chain of the academy (from president or chancellor down) gets scrambled in new circuits that involve collaborations with students, grant officers, and members of the public representing broader spheres of interest.

Nonetheless, the above-described reorganization of the humanities department is of the same genus as the extra-departmental solutions focused on by other first-generation digital humanists. I merely interjected the experience of working at the "seams," as I put it above, inside the departmental structure—specifically, at the seams between existing literary fields, periods, personnel levels, management structures, and so on.

Beyond Evolution: Alien Knowledge

The evolutionary metaphor only takes us so far, however. At a certain point, a paradigm change really does take place. The digital humanities, I believe, may finally have reached the threshold of fulfilling their long-delayed promise of making a fundamental, rather than incremental, difference to the humanities at large. As in the case of any threshold moment, however, the evidence is not all in. I can at present only scout over the hill and report on early indications.

My own awakening to paradigm change occurred exactly on March 16, 2004, which I recall with unusual precision because it marked a mental tipping point in my career as a humanist. In the decade before that date, the "strong tinker toys" model of the digital humanities I described above—i.e., building strong nodes in departments to enable strong linkages with nodes in other departments—had led to increasing collaboration between my English department and other programs. Gradually, the character of the collaboration became more formal, shifting, for example, from experiments like the "Many Wolves" Web-authoring collective I started in the early years as a kind of ham-radio club for digital enthusiasts to co-programmed events, conferences, and other activities, and finally to full-blown initiatives such as the University of California Digital Cultures Project and later the Transliteracies Project.[20] Increasingly, too, networks of such activity in the humanities and arts linked up with compatible networks in departments located in other divisions on campus, including computer science, communication, political science, and sociology (as well as such hybrid entities as media arts and technology). A pivotal role was played by the UCSB Center for Information Technology and Society (CITS), which was founded in 1999 specifically to partner the digital social sciences, digital humanities and arts, and engineering.[21] Also important was the new extramural incentive for collaboration across divisions represented by a new generation of federal, private, and industry grants promoting interdisciplinary technology research (e.g., National Science Foundation Integrated Graduate Education, Research, and Training [IGERT] grants, National Endowment for the Humanities grants focused on digital technology, MacArthur Foundation grants targeting the educational or social implications of digital technology, etc.).[22] The evolutionary soup, as it were, became supersaturated, ready for the spark that would precipitate discontinuous paradigm change.

In my own case, that spark came on the day after the Ides of March, 2004, when I sat at a small seminar table with other early movers of digital technology on my campus from different divisions. The meeting had been convened by CITS for a purpose that its founding director, Bruce Bimber (a political scientist), announced as follows:

> We are interested in the possibility of forming a new research group that might seek extramural funding for one or more projects on a central theme we believe to be of interest to a number of faculty. Our interest is understanding in a general way the meanings and practices of participation in online life.[23]

The meeting participants—who would eventually go on to collaborate in initiatives that include the UCSB PhD Emphasis in Technology and Society and UCSB Social Computing

Group (the latter affiliated with the Transliteracies Project)—began on that day with self-introductions or demonstrations of their research.[24] The critical moment (in my perspective) occurred when one of my humanist colleagues offered a subtle, brilliant textual interpretation modulating from close reading to theoretical and cultural commentary. At that point, a computer scientist rocked back in his chair, folded his arms, and, after a pause, asked: "What was that for?"

I should clarify that the computer scientist was one of the most genuinely open-minded, curious, and interdisciplinary—if also frank—scholars I have known: Kevin Almeroth, associate director of CITS and later associate dean for advancement and planning of the UCSB College of Engineering. The question was abrupt, but not hostile or reductive. From an engineering perspective, it meant approximately: "What does interpretation build? Make happen? Do?"

I recall a sense of ships passing in the night—very large, hard-to-turn ships called Humanities and Engineering with fundamentally different understandings of knowledge-seeking. However interdisciplinary humanists have tried to be in recent years, after all, their interdisciplinarity has primarily domesticated other knowledges to the act of interpretation. Interpretation of one sort or another always turns out to be the goal. Humanists concentrate on interpreting things in a fuller or different light rather than on the building, modeling, experimenting, quantifying, and other activities that typify other divisions of knowledge.

Also at that near-Ides of March meeting—in a kind of *Et tu, Brute* moment—a sociologist colleague asked (translating loosely): "where are the thousands of other samples needed to make that literary reading statistically valid?" Again, large disciplinary ships passed in the night.

The lessons I took away from this meeting may be summarized as follows:

- "Interdisciplinary studies" has until now rarely, if ever, been truly interdisciplinary. It has not had to face up to the disparity of knowledge paradigms between the major divisions of academic knowledge: the sciences, engineering, social sciences, and humanities and arts. Such disparity has been buffered because the interdisciplinary borrowing or poaching of ideas has proceeded in such a way that the standard of knowledge is always homed within one division or the other. Nothing has to be proved across divisions—e.g., by a humanist to an engineer or social scientist.[25]

- However, a variety of academic and social forces currently drive the different divisions of knowledge into ever closer conjunction. The interdisciplinary ethos of the new generation of grant competitions mentioned above, for example, communicates the combined economic, political, and cultural zeitgeist of contemporary business (whose "postindustrial" firms reward cross-disciplinary, collaborative teamwork), globalism (with its sense that global warming, disease, or hunger must be addressed on many fronts), the new public networked knowledge (as in Wikipedia or the open source movement), and other recent expressions of the sense that the public good can no longer be directed by any single

expertise, governmental or otherwise. In management-speak, having to prove one's research across divisions—humanist to engineer to social scientist—has been incentivized.

- But such incentive is uniquely facilitated, channeled, catalyzed, accelerated, recognized, and manifested all at once by digital technology (it is hard to assign the degree of causality while in the midst of the change).[26] Once, humanists and artists produced essays, books, short stories, or paintings; while social scientists produced surveys and interviews leading to essays/books; and engineers produced datasets and models leading to papers, grants, and perhaps patents. Now everyone produces "files." More fully: all the divisions of research share a common digital apparatus of knowledge-gathering, -organizing, -filtering, -pattern discovery, -publication, etc. And the more advanced the research or the more researchers seek cross-disciplinary grants, the more the very nature of the digital technologies involved demand robust collaboration. Every researcher can individually use a word processor, that is, but it requires a full team of researchers with diverse skills in programming, database design, visualization, text-analysis and -encoding, statistics, discourse analysis, Web-site design, ethics (including complex "human subjects" research rules), etc., to pursue ambitious digital projects at a grant-competitive level premised on making a difference in today's world. Humanists working on collaborative teams with engineers and social scientists will thus need to contribute perceived value. And such value, as in any value transaction (even if only intellectual), requires conversion into a common currency of knowledge. If my currency is *interpretation*, and yours is *data* or *models*, then for the time being—until more stable institutional arrangements catch up—digital technology is serving as the market in which knowledges are traded. A common calculation today, for example, might be: "we have an innovative project on data-mining social networks, but we need sociologists who research the Internet, humanists who specialize in discourse analysis, and artists who work on advanced data visualizations to be co-principal investigators."

In sum, digital technology is on the threshold of making a fundamental difference in the humanities because it indeed serves as the vector that imports alien paradigms of knowledge. In terms of objects of inquiry, it brings into play whole new classes or levels of phenomena—e.g., quantitatively defined structures, forms, and cycles.[27] In terms of analytical procedures, digital technology introduces modeling and other kinds of activities to complement interpretation. And in terms of the output or product of knowledge, digital technology expands the repertory of the monograph, essay, and talk (the staples of the humanities) to include programs, databases, visualizations, graphs, maps, etc. Of course, it is unlikely that the ultimate result will be the unquestioned incorporation of other knowledge paradigms in the humanities. Rather, the goal is for the humanities to engage, question, and adapt such paradigms—at times *using* them and at others *performing* them in some complex blend of imitation, irony, critique, and commentary. What might a critical database be, for example? Or a tragic or beautiful one?

At the current time, my own experiments in using digital technology to transfer engineering, social science, and other alien knowledge paradigms into the humanities are still in the lab. My laboratory for early, experimental work is pedagogy—especially the series of courses I have been teaching at both the undergraduate and graduate levels called "Literature+." These are combined theoretical and practical classes that literally culminate in the lab (my department's computing studios), where students working in teams take a literary work and use digital technology to build a project that (as required by the assignment) is anything other than standard literary interpretation. As explained in the course description on the wiki sites for these courses:

> Because of the recent, shared emphasis in many fields on digital methods, scholars in the humanities, arts, social sciences, and sciences increasingly need to collaborate across disciplines. This course reflects theoretically and practically on the new digitally facilitated interdisciplinarity by asking students to choose a literary work and treat it according to one or more of the research paradigms prevalent in other fields of study.

Some of the projects that have been created by students include:

- The Textones Project (assigns musical values to parts of speech in Shakespeare's sonnets to create analytical soundscapes of individual poems).

- The Borges Modeling Project (adapts a short story by Jorge Luis Borges as a film in which the parts of speech in the original text are mapped analytically over a corresponding typology of film techniques).

- The Berlin Project (models the formal features of Jason Lutes's graphic novel *Berlin: City of Stones* through analytical image, film, and text adaptations—e.g., video animations that transform static forms into temporal durations).

- The Alice Project (models the rules of spatial narrative underlying Lewis Carroll's Alice tales and their later film adaptations in order to reveal the generative constraints of "nonsense" art through analytical diagrams and montages).

- The Ringu Transmission Project (creates an interactive timeline to track the new global production, publication, and dissemination patterns represented by the international Ring phenomenon, a proliferating, self-organizing set of novels, films, video games, and manga).

- The Close Reading Revisited Project (applies text-analysis, visualization, automatic translation, and plagiarism-detection tools to transform/deform texts analytically—e.g., into word-trees, word influence maps, tag clouds, punctuation patterns, etc.)

- The Emigrants Project (plots the travels of the characters in W. G. Sebald's novel *The Emigrants* as a set of "Google Lit Trips" or annotated itineraries in Google Earth).

A fuller discussion of the above project-building courses and their intellectual and institutional rationale is available in my recent essay titled "Literature+."[28]

Again, these are just sightings from the threshold. But what lies beyond the far edge of the digital humanities as they are now influencing the general humanities? Here I can only offer a prophecy or, less grandly, a guess—at once a prognostication and a wish. I believe that the digital humanities serve as the carrier for a larger vision of the humanities that can be called "global humanism," where *global* substitutes for *universal*. Global humanism is not an older classical or Enlightenment universal humanism—the idea that, as Sir Joshua Reynolds said, there is a "central form" of humanity.[29] And it is also not the twentieth-century modernizing ideal of a melting-pot or fusion humanism. Global humanism is instead what might be called, paradoxically, *universal diversity* or *multiculturalism*. Of course, *diversity* and *multiculturalism* are overused terms in the humanities today. But that does not mean they are just banal or politically correct. They are very much *alive* and up for grabs because the larger transdisciplinary social and semantic frameworks in which their humanistic sense is just one contender are still in the process of collision and adjustment. *Diversity* and *multiculturalism* as understood in the academic humanities, for instance, abut uncomfortably with the usage of those terms in such other contexts as neo-corporatism and neo-nationalism—i.e., the kind of thinking that operationalizes multiculturalism in affirmative and/or defensive formations of the sort: "diversity teams" and "immigration reform."

The most relevant aspect of this issue here is that the methodological correlative of global humanism (whatever position one takes on its substantive themes) is the disciplinary version of diversity: interdisciplinary studies. Classical universal humanism, we recall, was ruled by a master-knowledge, philosophy, presumed to organize the discrete knowledges of the *trivium* and *quadrivium* into a single understanding of the cosmos and of man's place in it. Similarly, neoclassical humanism subscribed to the Enlightenment faith in an underlying, single nature (whether or not designed by God) that subordinated particular knowledges to the ascendant modern philosophy: science. But understanding global humanism today requires a diversity rather than harmonium of disciplinary methods—e.g., economic, social, political, historical, cognitive, cultural—able to reveal the seams *between* alternative understandings of the "human." Indeed, it may be that we do not have meaningful diversity unless we sense that lived experience refuses to fit in any single, stable organization of the variety of human knowledges—the kind of variety, for instance, that has been much impoverished in recent decades by the pan-economic panaceas of neoliberalism. A case in point would be so-called "marginal" peoples who have almost no global economic or political presence but possess enormous local cultural, aesthetic, and historical presence only uneasily meshed with the pan-economic institutions and trading mechanisms of the new global world order. Understanding the full diversity of humanity requires full commitment to methodological diversity. More, it may be that the thoughtful pursuit of such secondary diversity is the unique contribution of intellectuals to today's global order.

It remains to be seen whether there is room in today's global "networked society," as Manuel Castells calls it, for a global humanism that can not only supplant universalism but staunch what has recently rushed like blood into a wound: the neo-nationalist and -funda-

mentalist tyrannies Castells calls the "power of identity."[30] The methodological diversity demanded by the digital humanities is one way to bring us to the brink of facing this issue. Shall there be a world that is "One," as Neo (the hero of the *Matrix* films) augurs? Or shall we be many ones trading knowledge of ourselves through a plural methodology, poly-epistemology, or (in digital-speak) extensible protocol? That is the question, if not for the ages, then for our age of the digital humanities.

Theoretical Coda: Toward a Theory of Allogenetic Change

My simplified conceptual scheme of "evolutionary" versus "paradigm" change above is grounded in a general, contemporary model of change. A fuller formulation than is possible here would borrow from such contemporary explanations of change, innovation, or creativity as the following:

- revisionary evolutionary theory (including, e.g., Lynn Margulis's idea of species innovation by radical symbiosis),
- economic theories of cyclical or disruptive innovation (e.g., Joseph Schumpeter on "creative destructivity"),
- complexity theory (e.g., Ilya Prigogine on systems in disequilibrium),
- emergence theory (especially from a computationalist viewpoint, as in the work of John Holland or Douglas Hofstadter),
- poststructuralist theory (most notably the Deleuzian strain that influences such non-linear theories of history as Manuel de Landa's),
- cyborg theory (in the mode of Donna Haraway),
- and, of course, Thomas Kuhn's theory of paradigm change in the sciences.[31]

All these theories of change may be called postmodern because they share a dualistic intuition about change that can be parsed as follows. First, they hold that there is a category difference between normative, evolutionary, or incremental change, on the one hand, and non-linear, disruptive, or catastrophic change, on the other. They cleave the universe of change, we can say for short, into *organic* versus *non-organic* change. Then, secondly, they incline the ontological plane so that the status of "real" change is always assigned to wrenching non-organic changes biding their time beneath superficial organic changes, just waiting for a rupture in system or history through which to burst forth and make the universe anew. If one of the signature traits of postmodernism is anti-foundationalism, then such an inclination toward discontinuous change—toward a sliding of tectonic plates and quakings of the earth—is the ground of it all. Such is the belief system that postmodernism learned from the century of modern catastrophe from the World Wars to 9/11. Such, we may also say, is the closest postmodernism can come to the older intuition of change by miracle. Only, of course, postmodern change is a dark miracle: it is monstrous change.

Indeed, *monstrosity* aptly names the core logic by which the above-cited theories "demonstrate" (a word etymologically affiliated with *monster*) the non-organicism of real change.

In this logic—a successor to the Hegelian notion of antithesis that may have been the first distinctively modern theory of change—radical change is always *alien* change. Put abstractly: radical change occurs when that which is not known to exist (the alien) is demonstrated to exist, leading to a paradoxical existential quantifier (a term drawn from propositional logic) that might be formulated: *there exists that which does not exist*. This monstrous demonstration is the very proof theorem of the need for a supplementary logic not native to propositional logic: differential verb tense (*did* or *will* versus *does exist*), which is cognate with the intuition of change. Put viscerally rather than abstractly: picture the moment in Ridley Scott's first *Alien* film when the monster—in all its glistening, exoskeletal hideousness—explodes out of the torso of the unsuspecting crew member.[32] In postmodernity, it is the demonstration of the truly alien—cast as symbiont, cyborg, "companion species" (Haraway's gentler term), rhizome, or "terminator" (alluding to another Hollywood spectacle of postmodern change)—that generates a sudden, compressed sense of change. All the temporality of change that an older age might have elegized or prophesied is fired off at once in a sudden apprehension of change as singularity. In short, our recent theories of change are what Marcos Novak—a theorist of digital, temporally-mutating architecture—calls "allogenetic." They adore the nativity of alien change—in my present metaphor, of change as bug.[33]

I have argued in this essay that digital technology has caused (and/or expressed) evolutionary changes in the humanities, but that evolutionary changes incubate within themselves—like the alien in the crew member—an encounter with other disciplines that far exceeds the now domesticated familiarity of "interdisciplinary studies" to become a monstrous exodisciplinarity. Thus are the conditions set for a "new media encounter," as I have called it elsewhere, that heralds the discontinuous paradigm-change I call global humanities.[34]

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NOTES

[1] Alan Liu, *The Laws of Cool: Knowledge Work and the Culture of Information* (Chicago: U of Chicago P, 2004) 4.

[2] See Vladimir Nabokov, *Lectures on Literature*, ed. Fredson Bowers (New York: Harcourt Brace Jovanovich, 1980) 258–59. See also Leland De La Durantaye, "Kafka's Reality and Nabokov's Fantasy: On Dwarves, Saints, Beetles, Symbolism, and Genius," *Comparative Literature* 59 (2007): 315–31, retrieved 17 Jan. 2009, <http://complit.dukejournals.org/cgi/reprint/59/4/315>. An online copy of Nabokov's lecture on Kafka's "The Metamorphosis" can be found on Leni's Franz Kafka Page, 2000, retrieved 17 Jan. 2009, <http://victorian.fortunecity.com/vermeer/287/nabokov_s_metamorphosis.htm>.

[3] *The Voice of the Shuttle: Web Site for Humanities Research*, ed. Alan Liu, created 1994, University of California, Santa Barbara <http://vos.ucsb.edu> (only the later, database-driven version is now publicly accessible); *Romantic Chronology*, ed. Laura Mandell and Alan Liu, created 1995–96, Miami University, Ohio/University of California, Santa Barbara <http://english.ucsb.edu:591/rchrono/>; UC Santa Barbara English Department Web site, designed by Robert Adlington, Jeremy Douglass, Eric Feay, and Alan Liu,

created 2000 <http://www.english.ucsb.edu/>; *The Agrippa Files*, general ed., Alan Liu, created 2005, UC Santa Barbara, <http://agrippa.english.ucsb.edu/>; UC Santa Barbara *English Department Knowledge Base (EDKB)*, ed. Ryan Boyd, Kimberly Knight, Marthine Satris, and Benjamin Shockey, created 2007, <http://wiki.english.ucsb.edu/>; UC Santa Barbara English Department Second Life Campus ("UCSB Lane"), designed by Haru (Hyunkyung) Ji with Clayton Childress, Robin Chin, and Ron Robinson under the direction of Rita Raley, created 2007, <http://slurl.com/secondlife/Kerlingarfjoll/179/245/46>.

Projects started by digital humanists prior to the popularization of the Internet included an even earlier, no-Web stage of applications conceived primarily for standalone computers (e.g., early text-analysis or hypertext projects).

4 I have discussed team work as an ideal of the postindustrial workplace in Liu, *Laws of Cool*, esp. chapter 1, "The Idea of Knowledge Work." Cf. team production in the film industry or computer game design. *Template pages* are a component in an increasingly prevalent method of modern Web publishing: databases output their content into "templates" concocted from scripting code, which communicates with the database, and HTML formatting code, which presents material to the user. Such templates are essentially hollow molds for casting dynamically retrieved content. *CSS* stands for "Cascading Style Sheets," a method of augmenting and centralizing control over the formatting of Web pages.

5 The UCSB Social Computing research group is affiliated with (and in 2007–09 sponsored by) the UC Transliteracies Project: Research in the Technological, Social, and Cultural Practices of Online Reading that I direct. For the Social Computing Group, see <http://socialcomputing.ucsb.edu/> and <http://transliteracies.english.ucsb.edu/category/researchproject/workinggroupsindividual/socialcomputing>. For the main Transliteracies Project, see <http://transliteracies.english.ucsb.edu/>.

The Social Computing Group defines social computing as "the use of technology in networked communication systems by communities of people for one or more goals" <http://socialcomputing.ucsb.edu/?page_id=14>.

6 Friedrich A. Kittler, *Discourse Networks, 1800/1900,* trans. Michael Metteer with Chris Cullens (Stanford: Stanford UP, 1990).

7 Willard McCarty, *Humanities Computing* (Basingstoke: Palgrave MacMillan, 2005); Geoffrey Rockwell, "What is Text Analysis, Really?", *Literary and Linguistic Computing*, 18 (2003): 209–19; Jerome McGann and Lisa Samuels, "Deformance and Interpretation," in Jerome McGann, *Radiant Textuality: Literature after the World Wide Web* (New York: Palgrave, 2001): 105–35 (available online at http://jefferson.villagevirginia.edu/~jjm2f/old/deform.html); Stephen Ramsay, "Algorithmic Criticism," *A Companion to Digital Literary Studies*, ed. Ray Siemens and Susan Schreibman (Malden, MA: Blackwell, 2007): 477–91 (available online at http://www.digitalhumanities.org/companion/DLS/).

8 The canonical, if early and still inchoate, definition of Web 2.0 is Tim O'Reilly's "What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software," 30 Sept. 2005, O'Reilly Media, Inc., retrieved 8 Sept. 2006, <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>. *Wisdom of crowds* is a catch-phrase of Web 2.0, in part owing to James Surowiecki's *The Wisdom of Crowds: Why the Many Are Smarter than the Few and How Collective Wisdom Shapes Business, Economies, Societies, and Nations* (New York: Doubleday, 2004). *Rule of many, crowd-sourcing, hive-intelligence,* etc., are other common ways of expressing the Web 2.0 belief that knowledge now flows bottom-up from decentralized myriads rather than top-down from elites.

9 Funded by the MacArthur Foundation, the Credibility and Digital Media@UCSB Project at UC Santa Barbara (http://www.credibility.ucsb.edu/) is directed by Miriam Metzger and Andrew Flanagin, core members of the UC Santa Barbara Social Computing Group.

10 In physics and related disciplines, for instance, see especially *arXiv.org*, created 1991, Cornell University Library, <http://arxiv.org/>.

11 An early experiment along these lines was the advance publication of McKenzie Wark's *Gamer Theory*

(Cambridge, MA.: Harvard UP, 2007) in an online version called *GAM3R 7H30RY* (version 1.1, Institute for the Future of the Book, 2006, retrieved 26 Jan. 2009, <http://www.futureofthebook.org/gamertheory/>). Developed by The Institute for the Future of the Book, *GAM3R 7H30RY* appeared in an adaptation of the WordPress blog platform called CommentPress that allowed readers to comment on specific paragraphs of the book. Readers thus created what amounted to local discourse communities around Wark's paragraphs, themselves more vignette-like or aphoristic in their local center of gravity than normative academic prose. (For an analysis of CommentPress with a screenshot from *GAM3R 7H30RY*, see Kimberly Knight, "CommentPress," research report for the Transliteracies Project, University of California, 7 May 2008, retrieved 26 Jan. 2009, <http://transliteracies.english.ucsb.edu/post/researchproject/researchclearinghouseindividual/researchreports/commentpress2#more841>).

12 Liu, *Laws of Cool* 314.

13 In the discourse of Web 2.0, *social graph* is a peculiarly interesting term. It is an abstract, philosophical concept masquerading as a concrete, practical tool. Concretely, it is imagined as social network diagrams of the sort long known to sociologists (e.g., a diagram of nodes and links representing the pattern of relationships between people). The practical application is the visualization of "friend" networks, for example, on such social-networking sites as MySpace or Facebook. Abstractly and philosophically, however, *social graph* is the utopian dream of a universal social connectivity between all possible friends (and friends of friends) across different social networks and other arenas of online activity. This is especially the case whenever the notion is referred to as "*the* social graph," where the definite article has something of the messianic effect of "the One" in *The Matrix* movies by the Wachowski brothers. The dream is that logging onto the matrix of a social network will allow everyone to be "friends" with everyone, whether at one, six, or *n*-degrees of separation. On the idea of the social graph, see, for example, Brad Fitzpatrick, with David Recordon, "Thoughts on the Social Graph," 17 Aug. 2007, retrieved 19 June 2008, <http://bradfitz.com/socialgraphproblem/>.

I owe the phrase "social giraffe," and its poke at the overreaching idea of the social graph, to Pablo Colapinto, a PhD student in the UC Santa Barbara Media Arts and Technology Program. In 2008–09, Colapinto was the lead research assistant in the Bluesky subgroup of the Social Computing Group (for which, see n. 5 above).

14 Exceptions to the rule that academic organization cannot be thematized in humanistic inquiry include Evan Watkins, *Throwaways: Work Culture and Consumer Education* (Stanford, CA.: Stanford UP, 1993), and, more recently (among a fair number of other works about the conditions or institutions of academic work by humanists that have appeared in the last few years), Christopher Newfield, *Ivy and Industry: Business and the Making of the American University, 1880–1980* (Durham: Duke UP, 2003) and *Unmaking the Public University: The Forty-year Assault on the Middle Class* (Cambridge, MA: Harvard UP, 2008).

15 Transcriptions Project (Transcriptions: Literature and the Culture of Information), principal investigator, Alan Liu, initiated 1998, Department of English, UC Santa Barbara, <http://transcriptions.english.ucsb.edu>. The Transcriptions Web site is now in transition to a new site for its rebranding as the Literature.Culture.Media Center. See <http://lcm.english.ucsb.edu/>.

16 Early Modern Center <http://emc.english.ucsb.edu/>; American Cultures and Global Contexts Center <http://acc.english.ucsb.edu/>; Literature and the Environment specialization <http://lit-environ.english.ucsb.edu/>; Literature and the Mind specialization <http://mind.english.ucsb.edu/>.

17 My colleague, William Warner, innovated these governance policies for our department's centers when he was department chair in 2004–08.

18 English Broadside Ballad Archive (EBBA), director, Patricia Fumerton, Department of English, University of California, Santa Barbara, initiated 2005, <http://emc.english.ucsb.edu/ballad_project/>; *Transliteracies Project* (Transliteracies: Research in the Technological, Social, and Cultural Practices of Online Reading), principal investigator, Alan Liu, initiated 2000, University of California Multi-Campus Research Group, <http://transliteracies.english.ucsb.edu>; *Journal of Transnational American Studies,*

University of California eScholarship Repository, sponsored by the UCSB American Cultures and Global Contexts Center and the Stanford University Program in American Studies <http://repositories.cdlib.org/acgcc/jtas/>.

[19] Participating in the here described research projects in 2001–02 were undergraduate teams consisting of Patrick Mirjahangir and Andi Rosenberger, supervised by graduate student Sharon Doetsch-Kidder; and Jeff Kent and Eric Overholt, supervised by graduate student Andrea Fontenot. Alan Liu was faculty supervisor. See the reports on these projects published in the *LCI Magazine*, an undergraduate research journal started by the Transcriptions Center, <http://transcriptions.english.ucsb.edu/curriculum/ lci/magazine/>. These research teams were an experiment funded by a small grant from the Division of Humanities and Fine Arts, UC Santa Barbara.

[20] The Many Wolves Web-authoring collective existed from 1993 to 1996. The collective's Web site is now available only in archived form on the Internet Archive, <http://web.archive.org/web/19990429092904/http://humanitas.ucsb.edu/projects/pack/pack.html>. The Digital Cultures Project, directed by my colleague William Warner, was a UC Multi-campus Research Group headquartered in the UC Santa Barbara English Department. It ran from 2000 to 2005; see <http://dcmrg.english.ucsb.edu/>. For the Transliteracies Project, see n. 5 above.

[21] Center for Information Technology and Society (CITS), UC Santa Barbara; see the center's home page, <http://www.cits.ucsb.edu/>.

[22] For the National Science Foundation's Integrative Graduate Education and Research Traineeship Program (IGERT), see <http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12759&org=NSF>. For National Endowment for the Humanities grants focused on digital technology, see the NEH Office of Digital Humanities (<http://www.neh.gov/ODH/>). In regard to the MacArthur Foundation, see the foundation's Digital Media and Learning Competition (<http://digitallearning.macfound.org/site/c.enJLKQNlFiG/b.3897207/k.95F0/Competition.htm>).

[23] E-mail from Bruce Bimber, founding director of CITS, 12 Mar. 2004.

[24] For the UC Santa Barbara PhD Emphasis in Technology and Society, administered by CITS, see <http://www.cits.ucsb.edu/education>. For the UC Santa Barbara Social Computing Group, see n. 5 above.

[25] For my fuller thoughts on interdisciplinarity, see chap. 6, "The Interdisciplinary War Machine," in my *Local Transcendence: Essays on Postmodern Historicism and the Database* (Chicago: U of Chicago P, 2008).

[26] The uncertainty of causality indicated here is symptomatic of moments of radical change when it is unclear whether a leading edge incites, manifests, or recognizes the movement of the main body. By analogy, the thorough rethinking of historical change called *historicism* in the late-eighteenth through nineteenth centuries used the word *Zeitgeist* ("spirit of the times") to indicate similar uncertainty. Can anything be said to cause anything else to change when it is the whole ambient mass—in substance or configuration—that seems to change? Might it not be better just to call any possible cause a "sign of the times"?

[27] Cf. the kinds of phenomena that Franco Moretti incorporated into literary history through his "distant reading" method even before needing to explore further the new digital technologies (e.g., in collaboration with his digital-humanist colleague at Stanford University, Matthew Jockers). On distant reading, see Moretti's *Graphs, Maps, Trees: Abstract Models for a Literary History* (London: Verso, 2005). My thanks to Matthew Jockers (consulting assistant professor in the Stanford University Department of English and also academic technology specialist at Stanford) for inviting me to sit in on one meeting of the faculty and staff research seminar on digital humanities he led at Stanford in fall 2006. Moretti was a member of the seminar. On the day I visited (5 October), I engaged with Moretti in stimulating to-and-fro about his methods after I had finished extemporizing about the digital humanities.

[28] Alan Liu, "Literature+," *Currents in Electronic Literacy* (Spring 2008), retrieved 19 Jan. 2009, <http://currents.cwrl.utexas.edu/Spring08/Liu>.

[29] Sir Joshua Reynolds, "Discourse III," *Discourses on Art*, ed. Robert R. Wark (1959; rpt. New Haven: Yale UP, 1975).

[30] Manuel Castells, *The Information Age: Economy, Society and Culture*, 3 vols. (Malden, MA: Blackwell, 1996–97). On the "power of identity," see esp. I: 22–25 and II (volume title: *The Power of Identity*).

[31] See Lynn Margulis and Dorion Sagan, *Acquiring Genomes: A Theory of the Origins of Species* (Basic, 2002); Joseph A. Schumpeter, *Capitalism, Socialism and Democracy* (New York: Harper and Row, 1975) [orig. pub. 1942]; Grégoire Nicolis and Ilya Prigogine, *Exploring Complexity: An Introduction* (New York: W. H. Freeman, 1989); John H. Holland, *Emergence from Chaos to Order* (Cambridge, MA: Perseus, 1998); Douglas Hofstadter and the Fluid Analogies Research Group, *Fluid Concepts and Creative Analogies* (New York: Basic, 1995); Manuel De Landa, *A Thousand Years of Nonlinear History* (New York: Zone, 1997); Donna J. Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991); Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 2d ed. enlarged (Chicago: U of Chicago P, 1970).

[32] *Alien*, dir. Ridley Scott, Twentieth Century-Fox, 1979.

[33] On companion species, see Donna J. Haraway, *The Companion Species Manifesto: Dogs, People, and Significant Otherness* (Chicago: Prickly Paradigm; Bristol: University Presses Marketing, 2003). I adopt the term "allogenesis" from an untitled talk by Marcos Novak on "transvergence" and "allogenesis" in the Digital Media Arts Lecture Series at the University of California, Santa Barbara, 4 Mar. 2002.

[34] Alan Liu, "Imagining the New Media Encounter," *A Companion to Digital Literary Studies*, ed. Ray Siemens and Susan Schreibman (Malden, MA: Blackwell, 2007): 325; also available online at <http://www.digitalhumanities.org/companion/DLS/>.