VERSITA

HUMAN AFFAIRS *22*, 111–121, 2012
DOI: 10.2478/s13374-012-0011-6

21ST-CENTURY HUMANITIES: ART, COMPLEXITY, AND INTERDISCIPLINARITY

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Abstract: This article contends that the evolution toward interdisciplinary collaboration that we are witnessing in the sciences must also occur in the humanities to ensure their very survival. That is, humanists must be open to working with scientists and social scientists interested in similar research questions and *vice versa*. Digital humanities is a positive first step. Complexity science should be the next step. Even though much of the ground-breaking work in complexity science has been done in the natural sciences and mathematics, it can, if critically adapted, provide the needed metaphor for a broad integration of disciplines, humanistic and otherwise. Given its almost a-disciplinary nature, a complexity approach to the research problems in the humanities necessarily breaks down silos. Moreover, it can restore and reframe the seamless intellectual fabric sought by researchers before the atomization of the various disciplines in the nineteenth-century academy.

Keywords: complexity science, digital humanities, technology, art, literature

Introduction

In a recent article entitled "University 2.0," John Unsworth, an early proponent and leader in digital humanities, develops a concept he calls "information friction," a phenomenon brought about by those "factors impeding the movement of information in various forms from one place to another" (Unsworth 2008, 229). Unsworth identifies the humanities as the place where such friction is highest and where the academy dedicates the smallest amount of lubricating resources creating a digital divide between the sciences and the humanities, that is, a deep "disparity in access to information based on demographic factors," which in Unsworth's case are fields of study (cf. Mossberger 2003, xi). Further, he likens the humanities to the under-industrialized South of the pre-civil war era with its devalued currency and genteel poverty. A closer look at the state of the humanities bears Unsworth's concerns out. Co-authored articles among colleagues of the same field are rare, articles written across disciplines make up a small percentage of humanities work (this is especially so when it comes to humanities and sciences), and collaborative grants beyond the digital humanities remain uncommon.

The difficulty with Unsworth's hypothesis, if his intent is to convey a message to humanities researchers, is that he is speaking a different language from most humanists. When he uses the word "information," he is employing a very different metaphor than humanities researchers do—no small matter given that all disciplines, including the sciences, make use of metaphor in communicating their findings. Given their enthusiastic adoption of the information metaphor, their use of information technologies, and their recognition that the lifeblood that flows through and energizes all systems is information, the sciences have been able to establish new and exciting linkages in fields like bioinformatics, nanotechnology, and complexity science. In the humanities, however, we hesitate to embrace information technology in its most innovative forms, and we deploy our own unique, field-specific metaphors so far removed from the information metaphor that result in the stubborn defense of academic silos with the attendant digital divide highlighted by Unsworth. My position is that the evolution toward interdisciplinary collaboration we are witnessing in the sciences must also occur in the humanities to ensure their very survival. Paraphrasing Steven Johnson in his seminal work on innovation, the key to innovation and creativity is "not to sit around in glorious isolation and try to think big thoughts. The trick is to get more people to the table" (Johnson 2010, 42). That is, humanists must be open to working with others, including scientists and social scientists, interested in similar research questions.

Digital humanities, as I describe below, is a positive first step. Complexity science should be the next step. Even though much of the ground-breaking work in complexity science has been done in the natural sciences and mathematics, it can, if critically adapted, provide the needed metaphor for a broad integration of disciplines, humanistic and otherwise. I agree wholeheartedly with William H. Newell's controversial contention

> that complex systems and phenomena are a necessary condition for interdisciplinary studies. An interdisciplinary approach is justified only by a complex system. So if a behavior is not produced by a system or the system is not complex, interdisciplinary study is not required (Newell 2001, 1).

Given its almost a-disciplinary nature, a complexity approach to the research problems in the humanities necessarily breaks down silos. Moreover, it can restore and reframe the seamless intellectual fabricsought by researchers before the atomization of the various disciplines in the nineteenth-century academy.

The apparatus

In his recent book, *The Three Cultures: Natural Sciences, Social Sciences, and the Humanities in the 21st Century* (2009), Harvard psychologist Jerome Kagan points out that in the sciences, "a new apparatus often leads to significant observations and new concepts" (Kagan 2009, 25), while in the humanities and social sciences "social conditions that alter the existing arrangements of people and their motives, beliefs, emotions, and actions are more important sources of fresh ideas." While this may have been the case prior to personal computing and the development of a robust World Wide Web, it is no longer so. In the recent past, humanists could enjoy a comfortable division of labor. We could focus on "human practices, meanings, and relations" and leave the realm of the non-human things

to the scientists (cf. Paulson 2001, x). We could focus on "culture" in the form of beauty, truth, and love and leave the mundane things like rocks, insects, and machines to the natural scientists. Fortunately or unfortunately, however, a relatively new apparatus is leading to significant changes in the humanities as well. Information technology is proving to be the apparatus that not only alters but drives the social conditions that then, by extension, changes human motives, beliefs, emotions, and actions. This is especially the case in countries where Internet connectivity reaches as high as 80-90%. I am by no means suggesting that other technologies have not impacted what it is to be human; they have because they are of course part and parcel of human reality. Information technology, however, has made us more aware that the lines dividing nature and the world of man-made things are fuzzy at best and probably never existed, and that it is quite possible that beauty (computer art) and love (internet dating sites) can be tied to a machine. The impact of information technology is also more all encompassing than seminal technologies like the railway, or the radio, or the motion picture. Indeed, one might say that it encompasses all of those other technologies as a deliverer of information. And information is, as N. Katherine Hayles puts it, "the connective tissue holding the system together" (Hayles 1991, 6), as well as the energizing force. There are very few aspects of modern life in the Western world that are not touched by information technology or the Internet. Just as information technology, and all technologies for that matter, has the tendency to shape what we as humans do, we, too, have the opportunity to shape information technology. The relationship is dialectical, not dichotomous.

Digital humanities and the Gutenberg Parenthesis

There are several ways in which humanists can seize the opportunity to shape information technology. First, we can analyze it, a machine, as a subject of our research with the understanding that we do not exist separately from our technologies, and those technologies are not derived from some mythically deterministic, invasive forces bent on eradicating the biologically human, or nature, or culture. We are our technologies and they are we. They do not detract from what it is to be human because they are part of the human experience, nor do they detract from artistic expression because it, too, is part of our essence. Second, we can learn to employ information technology as an effective new tool in humanities research. If, for example, a German literary expert has maintained the centrality of Theodor Fontane's influence on nineteenth-century arts and letters, what happens when researchers can data-mine a significantly larger sampling of fiction, literary and otherwise? We could confirm or deny such research claims by mining the larger sample for relevant themes and style, among other things. If such research sounds like it exists a bit too close to the science end of the continuum of academic research, I suggest that we need not concern ourselves with such a continuum, but rather with the seamless fabric I refer to in the introductory paragraph. Lui Lam (2008, 4) writes in his work on complexity in the humanities, "knowledge knows no separating boundaries". Information technology or "the apparatus" as Kagan refers to it, is having the effect of erasing any such boundaries and continua along with them. Finally, humanities researchers can use information technology to help us develop innovative ways of presenting research that go beyond the black and white article or monograph. I am in no way rehashing the tired argument that the "book is dead," but visualization techniques can

help us show the arguments we make about the centrality of Fontane, for example, in a more engaging way to a much broader audience. Why publish research results in a book format with a publication run of 1000 to 2000 copies when those same results can be presented on the Web in a more compelling format and enjoy an exponentially larger readership?

What I have suggested above is generally referred to as the digital humanities, the most widely accepted definition of which is in Wikipedia.org:

> An area of research, teaching, and creation concerned with the intersection of computing and the disciplines of the humanities. Sometimes called humanities computing**,** the field has focused on the digitization and analysis of materials related to the traditional disciplines of the humanities. Digital Humanities currently incorporates both digitized and born-digital materials and combines the methodologies from the traditional humanities disciplines with tools provided by computing such as data visualization, information retrieval, data mining computational analysis) and digital publishing (http://en.wikipedia.org/wiki/Digital_humanities).

One will note by its seemingly incongruous name, and most certainly by the large, interdisciplinary nature of the projects in this field, that digital humanities is an area of research that has the effect of breaking down the humanities silos, thereby mitigating some of the pessimism regarding collaborative research expressed in the introductory paragraph.

Inasmuch as it combines humanities methodologies with the information technology tools best mastered by computer scientists, digital humanities is an early interdisciplinary development for humanities researchers along the lines of those taking place in the sciences. It is a helpful first step for the humanities because of its employment of information technology.[1] It recognizes the centrality of the information technology and the Internet and the fact that together they have "altered the existing arrangements" by disturbing and perhaps even eliminating what has come to be known as the Gutenberg Parenthesis—a term coined by Lars Ole Sauerberg in the context of discussions directed toward finding common interdisciplinary footing among literary, media, and cultural studies scholars.

The Gutenberg Parenthesis is a Renaissance phenomenon in which "a cultural realm" was developed "where it [was] felt that cultural products ... should be original, independent, autonomous compositions—the individual achievement and the individual property of those who create them" (Pettitt 2007, 2). It was, and in many respects still is, the era of the book in which we captured the word on the page and, if it was an expensive page, we surrounded the words with an elaborate gilt frame. We then glued and bound those framed pages in a book and placed it on a shelf in a library to be used by those who enjoyed access to such repositories of bound knowledge. The Gutenberg Parenthesis provided for the control of information by limiting access to a select group. What information technology as "the apparatus" has done to alter Kagan's "existing arrangements" in the world of the

[1] I understand that interdisciplinarity is not entirely new to the humanities, but generally our interdisciplinarity is characterized by partnerships with fields that comfortably work together, fields with "shared theoretical assumptions about the centrality of culture." Digital Humanities, on the other hand, addresses "the more serious interdisciplinary problem," that is, it addresses "the relation of the more human, social and cultural aspects of the world to its more nonhuman, natural, and technical features," as William Paulson writes in Literary Culture in a World Transformed (2001). It is impossible to separate the tool from the cultural artifact; such interaction is a hallmark of digital humanities.

human—and in humanities research as well—is to erode the authority of the printed text as the dominant form of information delivery. It has loosened the control of information, and it has opened access to a larger audience. What it has done for humanities research in terms of issues is fundamental. It has changed and continues to change people's "motives, beliefs, emotions, and actions"—those things Kagan identifies as representing the essence of the humanities. Without going to the extreme that Leah Marcus goes when she posits the "collapse of the fixed, authoritative text" (Marcus 1995, 392) at the hands of information technology, I argue that digital humanities acknowledges the text but shuns its fixed nature, while at the same time embracing the changes in the ways outlined above.

There is however a paradox here. While on the one hand, information technologyhas had the effect of destroying the Gutenberg Parenthesis, it has also had the effect of beginning to repair the intellectual fabric referred to above. This is of course partly a result of the mixing of metaphors—fabric versus parenthesis—but it is nonetheless significant. Information technology eliminates the contemporary bracket of the Gutenberg Parenthesis, while at the same time it begins to repair the intellectual fabric that was rendered in pieces with the extreme specialization in fields of knowledge that occurred in the nineteenth-century, Western academy and were then solidified in the twentieth. The rise of new interdisciplinary fields like bioinformatics and nanotechnology are examples of the reparative nature of information technology in this respect. Without the development of fast and powerful electronic computers, such fields would not exist. Digital humanities addresses this paradox as well. It exploits the rift caused by the opening up of information through developments like the World Wide Web, and it takes advantage of the fabric repairby bringing two seemingly disparate fields together, but it does not necessarily go far enough by itself in its exploitation of the repair.

Complexity science and the humanities

But the humanities needs more. I suggest that complexity science, properly adapted, can bring the humanities into the twenty-first century because it emphasizes the interdisciplinarity and the computer modeling necessary for truly modern research. Mitchell Waldrop (cf. 1992), in his work on complexity science, addresses its reparative nature, when he emphasizes the underlying unity of knowledge that "would ultimately encompass not just physics and chemistry, but biology, information processing, economics, political science, and every other aspect of human affairs." He refers to the type of scholarship that can result from complexity science as being "almost medieval" (*ibid*., 67) in that it brings together fields long since separated into different disciplines, which by definition were "developed precisely to study the individual facets or sub-systems" (Newell 2001, 2). If such a repair could happen, "it would be a way of knowing the world that made little distinction between biological sciences and physical sciences—or between either of those sciences and history or philosophy" (Waldrop 1992, 67). It therefore creates that long sought after ground on which one can construct a comprehensive understanding of the most important issues facing humanity. In this sense, complexity is a-disciplinary. William Newell embraces Waldrop's inclusion of humanistic fields of research in the world of complexity science. He points out that "authors, painters, and performers" have always made"sense of their unique location

within a complex system by expressing its meaning to them in their work," and humanities researchers who take these works as their objects of study seek to place them into their web of influences in order to determine meaning (cf. Newell 2001, 11). Humanists, in other words, have always thought in terms of patterns and their work, whether they express in such terms or not, deals with systems. Indeed, as Hodge posits, "the humanities," even through the era of the separation of the disciplines that took place after the scientific revolution, "remained a refuge for a complexity ontology in which both problems and solutions were irreducibly complex" (Hodge 2007, 2). While scientists in the era Hodge highlights were busy reducing the whole to its smallest identifiable particles and hoping to gain understanding from that method, humanists understood that meaning is not necessarily gleaned through reduction. The "thing," Kant notwithstanding, gains its meaning *vis à vis* other "things," that is, within in the context of the system in which it exists. It is the configuration of relationships among the system's components, whether that system is a novel or a cell that determines the system's essential meaning. In that scientists and humanists have potentially complementary interests in the study of complexity, humanities research is a natural fit for complexity science. Indeed, I suggest that the humanities should be a leader in complexity science, driving the identification of the most pressing issues.

The question for humanities scholars is, of course, what is complexity science and how is a science related to the humanities? Melanie Mitchell defines complexity science most succinctly:

> It is an interdisciplinary field of research that seeks to explain how large numbers of relatively simple entities organize themselves, without the benefit of any central controller, into a collective whole that creates patterns, uses information, and, in some cases, evolves and learns (Mitchell 2009, 4).

By extension then, a complex system is a system in which large networks of components with no central control and simple rules of operation give rise to complex collective behavior, often called emergent behavior, sophisticated information processing, and adaptation via learning or evolution.

The history of complexity science is relatively brief. It is a twentieth-century research development, the intellectual offspring of cybernetics, in a way, that seeks to go beyond the reductionism that so dominated the natural sciences from the scientific revolution to Einstein. John Gribbin (2004, xviii) calls it "the most profound change in science since Galileo and Newton" representing "a shift toward understanding how things work by building upward from simple things to more complex things, instead of breaking things down into their components". As William Paulson (2001, 38) writes, "the Newtonian paradigm, by suggesting that wide ranges of phenomena could at least be understood to be caused by the deterministic motion of bodies, held out the hope that certainty could be attained by the reduction of the complex into the simple". Such an approach is the opposite of complexity science. Gribbin provides a most helpful, albeit simplistic example to demonstrate the complexity approach:

> A heap of wheels and levers would not in itself be a complex system, even if the heap consisted of all the pieces needed to make a racing bike. The simple pieces have to be connected together in the right way, so that they interact with one another to produce something that is greater than the sum of its parts. And that's complexity founded upon deep simplicity (Gribbin 2004, 147).

This is not to suggest that an analysis of the separate parts as discrete objects has no value. But the mantra of complexity science is that the whole is greater than the sum of its parts. The obvious question is, what do wheels, levers, systems, and information have to do with the arts and the humanities?

Several of the above aspects relate to the humanities. First, the humanities are not reductionist. The complexity science mantra has been an accepted truth in the humanities since time immemorial. Indeed the appreciation of the complexity of the whole lies at the heart of the humanities. As Harvard biologist E. O. Wilson writes in *Consilience: The Unity of Knowledge* (1998, 54), "The love of complexity without reductionism makes art; the love of complexity with reductionism makes science." When faced with a great work of literature, painting, or music, analysis certainly can lead to a breaking down into smaller parts, but humanist researchers recognize that the work of art must be experienced as a whole. It is appropriate to analyze metaphor, for example, in a work of literary fiction, but metaphor is only a thread in the tapestry of the work—interesting by itself, but not yielding of the effect of the entire work. Complexity science, by Wilson's above definition, would appear to be more art than science. In reality, however, it transcends that simple dichotomy—both methodologies should be applied for a more complete understanding of the research object.

Beyond an appreciation of the whole, humanities research also embraces the patterns Mitchell emphasizes in her definition of complexity science. Kagan points out that whereas traditional scientists rely on single features with their distinct explanations and methodologies, humanists study the patterns he identifies as "the unique arrangement of ideas, symbols, institutions, and practices with a special history in a particular place" (Kagan 2009, 28). My last monograph, for example, seeks to fix information technologies within just such a web in contemporary Germany—the book is simply an analysis of the patterns surrounding and created by information technology in a given time and place. In fact, pattern identification and analysis is so central to the humanities that complexity science researchers are merely following the lead of the humanities. As a complexity researcher, Len Fisher (2009, 155) longs to "distinguish patterns within the depths of complexity" so that they may be used "as paths to guide us through the maze", or, to use my metaphor, as a guide through the seamless intellectual fabric.

When Fisher suggests that there are two ways to distinguish such patterns, he inadvertently strikes at the difficult divide for the humanities to overcome. Fisher (cf. *ibid.*) points out that we can distinguish patterns with our imaginations or with statistics. Information technology, as I have pointed out earlier, helps bring the imagination in line with the statistical reality. While I am not suggesting that a purely "mathetic" approach is needed, I do believe that we are beginning to see, and will continue to see more commonly, the confluence of the aesthetic and the mathetic or, to use Fisher's words, the confluence of the imaginative with the statistical. Scholars like Steven Johnson bolsters such claims when he reminds us that humans are, at bottom, pattern recognizers. It is not only our great skill, but "pattern recognition comprises the bulk of our neural circuitry" which is why pattern recognition, as opposed to thinking through logical combinations, lies at the heart of artificial intelligence research as well (cf. Johnson 2001, 127).

Another divide in terms of terminology that needs to be overcome is the word "system." As Newell (2001, 4) points out, scientists are comfortable with systems thinking. Humanists,

on the contrary, are not generally interested in behavior that is "regular, predictable, and lawful," rather humanities research tends to focus on the "idiosyncratic, unique, and personal". Again however, complexity science researchers shun the traditional path of the natural scientists. Complexity science is interested in systems, but not in linear systems that are in equilibrium. The nearest a living being ever gets to equilibrium, for example, is death—not a focus of complexity science which prefers to look at a system's movement from life to death rather than the static, dead system (cf. Gribbin 2004, 111).

When speaking in terms of systems, it would seem that we have two choices in the humanities as we approach a work of art. First, we can take the work of art itself as a system. For example a work of literary fiction can be viewed as a system of metaphors, characters, plot devices, etc.—a matter discussed in greater detail below. Or second, humanities researchers can, as I did in my latest monograph, place a text, an author, a social phenomenon, or an apparatus, for that matter, within a contextual web consisting of historical, philosophical, aesthetic, and consumer influences—this last agent is the focus of Paulson's theory outlined below. Newell recommends such an approach when he suggests that scholars and artists "visualize themselves as looking for the distinctive features of a particular location within a complex system" (Newell 2001, 4). A system consisting of historical, philosophical, and aesthetic influences, among others, is by no means linear, that is, history + philosophy + aesthetics does not necessarily equal the work of art. Such a system is also by no means in a state of equilibrium. As is the case with any complex system, the agents mentioned above are not static—they change over time and sometimes, in keeping with chaos theory, small changes can lead to large effects.

The discussion of chaos is another point at which the humanities and complexity science merge. Hayles reminds us that chaos in the scientific usage "denotes not true randomness" as is suggested in the traditional understanding of the word chaos, but rather "the orderly disorder characteristic of complex systems" (Hayles 1991, 1).[2] In this way, chaos is not simply the opposite of order as we have understood it in the Western scientific tradition. There is a yin and yang interplay between order and chaos not recognized in our assuredly dichotomized Western world. Capturing this interplay, the computer scientist Christopher G. Langton coined the phrase "edge of chaos" to denote that mysterious "something" that makes life and mind possible. Please note again that Langton is a scientist speaking of "mysterious things" and working with elegant metaphors like "edge of chaos." Langton posits that the "edge of chaos" exists in that interplay between order and disorder that is characteristic of all complex systems, be they economies, minds, bodies, or works of art. In scientific terms, in the molecule composed of two parts hydrogen and one part oxygen, the "edge of chaos" is that state between ice where atoms are locked into place and water where they randomly roil (cf. Waldrop 1992, 293).

Another common visual example of the edge is a pile of sand sitting on a table in a state of equilibrium. Gribbin (2004, 169) describes such a system as "just about as boring as the equilibrium systems of classical thermodynamics". What would make such a sand pile interesting is pouring additional grains of sand on it until the sand covers the table and begins to fall off the edge in landslides.

[2] Although opinions vary, chaos is often considered a critical component of complex systems.

> In this state on average the amount of sand in the pile stays the same, with the same amount falling off the edge as is being added from above. The system is in a state of self-organized criticality, feeding off a flow of energy carried by the new sand grains being dropped onto the pile (Gribbin 2004, 170).

The "edge of chaos" is the state of self-organized criticality; it is where one finds complexity—a class of behaviors in which the components of the system never quite lock into place, that is, are not in equilibrium, and never dissolve into turbulence. It is, according to Langton, the place where life has enough stability to sustain itself and enough creativity to deserve the name life (cf. Waldrop 1992, 293).

Such rhetoric is comfortably humanistic for scholars who are so inclined because the edge of chaos, where life is sustainable and enjoys an adequate level of creativity, also sounds suspiciously like the point where art exists. Drawing on the scientific example above, consider the typical "bodice-ripper" novel, for example. The system that consists of that novel and its consumer is locked into place. The metaphors in such novels are generally hackneyed, the plot is largely predictable, and the characters are for the most part stock. It is a system much like the static pile of sand on the table—as interesting as the equilibrium systems of classical thermodynamics. Consider, on the other hand, a popular, recent novel like Cormac McCarthy's *The Road* (2006). The metaphors are unique, the language is new (or so old that it appears new) and exciting, the characters are compelling, and the story leads not to a safe and happy ending for all, but to a place of uncertainty and further instability. Equilibrium is never attained. It exists, for the reader, at that trembling point between ice and water—like life.

Art, complexity, and information

Like the sand table, however, there must be a flow of energy between the object of art and its consumers serving as the equivalent of adding grains of sand. What keeps the work of art from being a piece of ice? After all, few things appear as stationary as a novel or a painting, for example. The answer lies in information and the way it flows between the work of art and its consumer. The agents in a complex system must be able to store and transmit information. "This need not involve actual speech. Cells in the communal slime [for example] communicate by sending chemical messages and the neurons in our brains communicate via electrical impulses" (Fisher 2009, 18). Information connects and energizes a complex system. The difficulty for most, however, is how to imagine this process when it comes to a work of art. Is there a literal swapping of information involving a feedback loop, or is it just metaphorical and in that case simply more of the same from humanities research?

Paulson makes a cogent case for the literal nature of the information feedback loop using modern information theory. He would agree with the central thesis of this article, that is, "what most significantly unites literature and science in our age of noise and chaos is the notion of complexity and its implications for interdisciplinary understanding" (Paulson 2001, 38). Information theory informs the complexity approach to the literature-science relationship. Mathematical information theory involves the quantification of information in terms of the number of binary bits required to encode it and the patterns formed by the encoding process. Paulson (*ibid.*, 39) concludes: "Information is thus a measure of a quantity of possibilities out of which a single actual message is selected; it is, in other words, a measure

of the uncertainty of a receiver that will be resolved by the reception of a given message". Art is at the same time ambiguous and communicative, and it is up to the receiver of the work of art to address the uncertainty due to the informational variety[3] offered by that work.

Such variety, both inside and outside of the work of art, "can lead to the emergence of new levels of meaning neither predictable from linguistic and genre conventions nor subject to authorial mastery" (*ibid.*, 43). And in this way art is like life—it is a system within another system that does not deal purely in communicative information. That would be equilibrium, and that would be uninteresting. Returning to Cormac McCarthy, there is variety in his texts in the form of neologisms and archaisms, the latter of which can be so obscure many assume they, too, are neologisms. He also uses irregular punctuation and often eschews capitalization. This is a somewhat superficial demonstration of Paulsons' theory, but it makes his point. For the reader or the agent in the system, the ability to decode such devices does not naturally exist. It has nothing to do with the competence of the reader, but with "the nature of literature" (*ibid.*, 48). One must work at interpreting the variety that alters the message. Artistic utterances such as those one finds in the works of McCarthy are, according to Paulson, almost pre-communicative because, "whereas writer and reader share the natural language in which the text is written, the reader does not yet possess the specifically literary codes pertinent to the diversity of that text" (*ibid.*, 48). Therefore, the reader of McCarthy will attain an understanding on one level but that understanding will be challenged by the "poetic diversity" of the work. It is in the construction of meaning from the various information channels that art allows for emergent behavior. The construction of meaning proceeds "by a process of self-organization," and if nothing else, emergence is a process whereby the agents of a complex system organize themselves into patterns (*ibid.*, 48).

Conclusion

Paulson suggests, as I do, that interdisciplinarity can help with the informational variety—not just in the humanities, but in other fields as well. Interdisciplinary study is the process by which information and codes are exchanged across disciplinary boundaries in a search for new or deeper understanding because it is in the overlapping spaces that exist between disciplines where the frontiers of knowledge are located. By embracing an information approach, the humanities can overcome the information friction highlighted by Unsworth. Moreover, we can settle the "semantic war-zone" that is actively "policed by both sides" as described by Bob Hodge (2007, 2) in his article on complexity in the humanities. He notes, however, the assumption "that if complexity exists in science, it must mean something completely different from what it means in the humanities . . . so different as to be incomprehensible or unusable by humanists" (*ibid.*) is not the winning argument that critics of the complexity approach in

[3] Paulson uses the word "noise" where I use the phrase "informational variety." I changed his term because he tends to misuse it vis à vis modern information theory. For example, he suggests that readers must make patterns out of noise in order grasp more than the communicative level of artistic communication. According to information theory, noise is entirely random and therefore no patterns can be constructed from it. Despite this minor disagreement, Paulson's theory, with its emphasis on the multifaceted nature of artistic communication, is an effective means to help understand the emergent behavior associated with the contemplation and consumption of works of art.

the humanities think it is. On the contrary, "it symptomizes what needs to be challenged" via the concept of complexity. And there are difficulties to overcome. By combining the complexity approach with information technology, the humanities, digital and otherwise, can enter the 21st century and even lead the way in collaborative, interdisciplinary research because, we are, the original pattern seekers, and the original researchers of the human.

References

Fisher, L. (2009). *The Perfect Swarm: The Science of Complexity in Everyday Life*. New York: Basic Books.

Gribbin, J. (2004). *Deep Simplicity: Bringing Order to Chaos and Complexity*. New York: Random House.

Hayles, N. K. (1991). Introduction. In N. K. Hayles (Ed.). *Chaos and Order: Complex Dynamics in Literature and Science*, pp.1-33. Chicago: University of Chicago Press.

Hodge, B. (2007). The Complexity Revolution. *M/C Journal* 10.3. 18 Jul. 2010<http://journal.media-culture.org.au/0706/01-hodge.php>.

Johnson, S. (2001). *Emergence: The Connected Lives of Ants, Brains, Cities, and Software*. New York: Scribner.

Johnson, S. (2010). *Where Good Ideas Come From: The Natural History of Innovation*. New York: Riverhead Books.

Kagan, J. (2009). *The Three Cultures: Natural Sciences, Social Sciences, and the Humanities in the 21st Century*. New York: Cambridge UP.

Lam, L. (2008). Science Matters: A Unified Perspective. In M. Burguete and L. Lam (Eds.). *Science Matters: Humanities as Complex Systems*, pp.1-38. London: World Scientific.

Marcus, L. (1995). Cyberspace Renaissance. *English Literary Renaissance 25*, 388-401.

Mitchell, M. (2009). *Complexity: A Guided Tour*. New York: Oxford UP.

Mossberger, K. (2003). *Virtual Inequality: Beyond the Digital Divide*. Washington, DC: Georgetown UP.

Newell, W. (2001). A Theory of Interdisciplinary Studies. *Issues in Integrative Studies 19*, 1-25.

Paulson, W. (2001). *Literary Culture in a World Transformed: A Future for the Humanities.* Ithaca, NY: Cornell UP.

Paulson, W. (1991). Literature, Complexity, Interdisciplinarity. In N. K. Hayles (Ed.). *Chaos and Order: Complex Dynamics in Literature and Science*, pp. 37-53. Chicago: University of Chicago Press.

Pettitt, T. (2007). *Before the Gutenberg Parenthesis: Elizabethan-American Compatibilities.* Massachusetts Institute of Technology, Boston, MA. April 27. Plenary Lecture, 1-12.

Unsworth, J. (2008). University 2.0. In R. N. Katz (Ed.). *The Tower and the Cloud*, pp. 227-237. Educause.

Waldrop, M. (1992). *Complexity: The Emerging Science at the Edge of Order and Chaos*. New York: Simon & Schuster.

Wilson, E. O. (1998). *Consilience: The Unity of Knowledge*. New York: Knopf.

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