Emerging Disciplines: Shaping New Fields of Scholarly Inquiry in and beyond the Humanities

Collection Editor:
Melissa Bailar

Emerging Disciplines: Shaping New Fields of Scholarly Inquiry in and beyond the Humanities

Collection Editor:
Melissa Bailar

Authors:

Melissa Bailar
Caroline Levander
Aniruddh Patel
Mary Poovey
Todd Presner
Pamela Sheingorn
Daniel L Smail
hermann herlinghaus

Online:
< http://cnx.org/content/col11201/1.1/ >

C O N N E X I O N S

Rice University, Houston, Texas

Collection structure revised: May 13, 2010
PDF generated: February 6, 2011
For copyright and attribution information for the modules contained in this collection, see p. 135.

Table of Contents

Chapter 1

Introduction[1]

In 2006, the Consortium of Humanities Centers and Institutes, along with the University of Chicago, held a conference entitled "The Fate of Disciplines." Grounded in the long history of disciplinarity in the academy, the conference sought to theorize relations between residual and emergent disciplines and to contemplate the future shape and texture of disciplinary formations and the university structures that contain (and, some would say, constrain) them.

The conference's keywords set the terms of discussion. More than fixed "content" or objects of study, and not reducible to a "method," academic disciplines tend to exist in uneasy relation to the institutional structures, such as departments or schools, created to administer them. Conference speakers concluded that disciplines, neither separable from nor reducible to such institutional moorings, exist in tension with the institutional structures that sustain them, and it is in this tension that their transformative promise lies.

The other keyword, "fate," signaled a sense of the foreordained, predetermined nature of the disciplines' future—a future that is in some way a destiny, fixed in the natural order of the cosmos, and a natural outgrowth of the past. As Andrew Abbott observes in *Chaos of Disciplines* (2001), calls for disciplinary change and transformation have been part of the American university system since the 1920s. Indeed, such calls have been one of the academic disciplines' most enduring characteristics. Over a quarter century ago, Clifford Geertz observed how disciplinary boundaries had dramatically blurred even in his lifetime, and he concluded in 1980 that the procedures then used to analyze our objects of study had merged to the point of forming what he termed "a vast continuous field of interpretation." The modern American research university came into being from 1880 to 1910, with Johns Hopkins, Chicago, Stanford, and Rice as examples. This event coincided with the emergence of major professional associations governing the disciplines, including the Modern Language Association in 1883, the American Historical Association in 1884, and the American Anthropological Association in 1902.

But challenges to these disciplinary formations of the research university and the professional association were almost immediate. Interdisciplinary committees were common on university campuses by the 1940s, and emendations of the disciplinary system in the form of area studies emerged during the same decade. The enduring intellectual lure of what often were termed "shadow disciplines" has led scholars from Lynn Hunt to Judith Butler to caution against wholesale rejection of traditional disciplinary forms. As Hunt reminds us, it is the certainty of disciplinary borders that makes new disciplinary configurations imaginable. New practices, according to Hunt, will not mean anything if the humanities dissolve into an "undifferentiated pool of cultural studies." Butler expressed concern that eroding the prominence of well-established disciplinary structures such as departments enables the erosion of professional norms like tenure, academic freedom and faculty dissent.

As "The Fate of the Disciplines" made clear, while relations between residual and emergent fields are anything but settled, these relations are part of larger historical fluctuations that aren't going to be resolved anytime soon. The fate of disciplines, then, is to be internally bound up in these larger institutional processes.

[1]This content is available online at <http://cnx.org/content/m34253/1.5/>.

The September 2009 symposium "Emerging Disciplines" and this collection of its expanded presentations attend to a slightly different set of concerns. The focus here is less on the waxing and waning of the disciplinary moon and more on those forms of knowledge that do not fit comfortably or even uncomfortably within the disciplinary regimes that have evolved over the last hundred years.

C. P. Snow coined the phrase "two cultures" to capture the idea that there are two cultures in the structure of knowledge that root themselves into different, often opposing camps, with regard to the set of epistemological presuppositions they employ. Snow coined the term in 1959, but the phenomena he was describing are, of course, much older. The idea that there are two cultures was a creation of the modern world; this concept was gradually institutionalized in universities. At the end of the eighteenth century, most scientists, as Eric Mielants observes, did not see religion and science as incompatible knowledge systems; it was transformations within the European university system that gradually isolated knowledge practitioners into different camps. In 1795, the Institut de France, for example, designated the natural sciences, literature and the arts, and the social sciences as belonging to distinct and different intellectual spheres. Meanwhile, the rise of specialized journals and the exclusion of the amateur nobleman from the scientific community after 1850 were part of a reallocation of intellectual resources for the new university, which acquired almost complete monopoly over the production and dissemination of knowledge by the end of the nineteenth century.

Thus, as Immanuel Wallerstein and Richard Lee observed, this two-culture formation is itself a product of modernity, and a longer view reveals that knowledge organization did not always fit neatly in the disciplinary boxes we have created in modern times. But such habits of thought are currently being revisited, and epistemological debate about the kind of intellectual-built environment that will most effectively support knowledge production and dissemination has become a topic of central concern.

This is our concern here, and the following papers will, in different ways, ask us to consider the following: What new ways of knowing become available when we leave assumptions about disciplinary order behind? What environmental circumstances give rise to new knowledge practices, and how might these practices alter disciplinary modes of knowledge production? And finally, what knowledge do we need to acquire to think effectively about the disciplinary models, like "two cultures," that have served as central pillars of modern knowledge systems? While these papers examine a broad range of research questions and approaches, each has unanticipated points of overlap with others. These points of convergence, originating from what our current institutional structures have encouraged us to see as distinct realms, become evident when disciplinary boundaries are pressed upon and when disparate fields are brought together in temporary but potentially far-reaching collaborative exchange.

1.1 Bibliography

Abbott, Andrew Delano. *Chaos of Disciplines.* Chicago: University of Chicago Press, 2001.

Butler, Judith. "Critique, Consent, Disciplinarity." *Critical Inquiry* 35.4 (2009): 773-795.

Chandler, James and Arnold I. Davidson, (Eds.) *The Fate of Disciplines.* Issue of *Critical Inquiry* 35.4 (2009).

Geertz, Clifford. "Blurred Genres: the refiguration of social thought," *American Scholar* 49 (1980): 165-179.

Hunt, Lynn. "The Virtues of Disciplinarity." *Eighteenth-Century Studies* 28.1 (1994): 1-7.

Lee, Richard E. and Immanuel Maurice Wallerstein. *Overcoming the Two Cultures: Science versus the Humanities in the Modern World-System.* London: Paradigm, 2004.

Mielants, Eric. "Reaction and Resistance: The Natural Sciences and the Humanities 1789-1945." In: Lee, Richard and Wallerstein, Immanuel (Eds.) *Overcoming the Two Cultures: Science versus the Humanities in the Modern World-System.* London: Paradigm, 2004. 34-55.

Snow, C.P. *Two Cultures and the Scientific Revolution.* London: Cambridge UP, 1993.

Chapter 2

On the Possibilities for a Deep History of Humankind[1]

In the mid-nineteenth century, as the great French historian Victor Duruy sat down to revise the general history of the world text used in French schools, he found himself facing a question few historians since antiquity had had to contemplate: when should history begin? "Scarcely twenty or thirty years ago," he wrote, "unexpected discoveries have forced us to break all the old systems of chronology."[2] He was alluding to the time revolution that began in 1859, when the short Biblical chronology, over the space of a decade or so, was abandoned as a geological truth.[3] To the new geology was joined the new archaeology, an approach to the past that challenged the very framework of history's chronology. "A science born yesterday," Duruy wrote, "has pushed the birth of humanity back to an age where the measure of time is no longer given by means of a few generations of men, as it is today, but instead by hundreds of centuries."[4] His predecessors had all written in the comfortable certainty that human history was as old as the earth, and that both began in a moment of creation in 4004 B.C. Not twenty years earlier, Duruy himself had published a new edition of a sacred history according to the Bible.[5] When he took up the task of revising world history for the French curriculum, he was one of the first historians to stand on the precipice of time, contemplating, in his own words, "an obscure and terrifying antiquity."[6]

When Duruy's concise universal history was published in 1873, the field of history stood at a crossroads. What the Comte de Buffon had once called "the dark abyss of time" (*le sombre abîme du temps*), clearly, was not an abyss. It was more like a rift valley, with new land unmistakably visible on the other side. As an awareness of deep human time filtered into the practice of history during the waning decades of the

[1] This content is available online at <http://cnx.org/content/m34256/1.4/>.

[2] Victor Duruy, *Abrégé d'histoire universelle, comprenant la révision des grandes époques de l'histoire depuis les origines jusqu'à 1848*, nouvelle édition (Paris: Hachette, 1873), 3: "Il y a vingt ou trente années seulement que des découvertes inattendues ont forcé de briser tous les vieux systèmes de chronologie."

[3] Important studies of the time revolution include Stephen Toulmin and June Goodfield, *The Discovery of Time* (New York: Harper Row, 1965); Claude Albritton, *The Abyss of Time: Changing Conceptions of the Earth's Antiquity after the Sixteenth Century* (San Francisco: Freeman, Cooper, 1980); Paolo Rossi, *The Dark Abyss of Time: The History of the Earth and the History of Nations from Hooke to Vico*, trans. Lydia G. Cochrane (Chicago: University of Chicago Press, 1984), Stephen Jay Gould, *Time's Arrow, Time's Cycle: Myth and Metaphor in the Discovery of Geological Time* (Cambridge, Mass.: Harvard University Press, 1987); and Thomas R. Trautmann, *Lewis Henry Morgan and the Invention of Kinship* (Berkeley: University of California Press, 1987), esp. 32-35 and 205-30.

[4] Duruy, *Abrégé*, 4: "Cette science née d'hier a donc reculé la naissance de l'humanité vers une époque où la mesure du temps n'est plus, comme de nos jours, donnée par quelques générations d'hommes, mais où il faut compter par des centaines de siècles."

[5] Victor Duruy, *Histoire sainte d'après la Bible*, 2nd ed. (Paris: Hachette, 1856).

[6] Duruy, *Abrégé*, 4: "une vague et effrayante antiquité." The question of how French historians responded to the challenge of deep time has been little studied, to my knowledge. For the situation in the United States and England, see Daniel A. Segal, "Western Civ and the Staging of History in American Higher Education," *American Historical Review* 105 (2000): 770-805, and Doris Goldstein, "Confronting Time: The Oxford School of History and the Non-Darwinian Revolution," *Storia della Storiografia* 45 (2004): 3-27.

nineteenth century, general historians like Duruy found ways to acknowledge the new findings. But they had no idea what to do with them, because deep human time did not fit the pre-existing frame used in the field of history.

By the 1930s, historians had come to a jury-rigged solution, resolving the problem of narrative by using the idea of the "Neolithic Revolution" to claim that human history itself came into being with the invention of agriculture and civilization.[7] For the preceding half-century, however, historians floundered. In Duruy's case, the few token paragraphs he devoted to humanity's deep time were grafted clumsily onto the front end of the history.[8]

Today, the gulf between history and prehistory is no longer terrifying, but it remains nearly as deep as it was in 1873. The inability to close the breach in time was one of the signal failures of history-writing in the twentieth century. In the decades after 1960, the field of history gradually set about the task of recuperating histories that had been invisible to previous historians writing in the Judeo-Christian tradition: histories of women, peasants and workers, marginals, minorities, subalterns, and all those whom Eric Wolf once called the "people without history."[9] These moves have enriched the field. But because the peoples of the Paleolithic "belonged" to another discipline—archaeology—they remained invisible to the historian's eye. Because their culture is extinct, moreover, the peoples of the Paleolithic aren't a visibly suffering minority and have no need for justice. This political state of non-being renders them uninteresting to historians moved by advocacy.

If the discipline we call History is a political discipline designed to explain the modern condition, then there is little need for a deep history. But if History is an anthropological discipline designed to explain the human condition, as I believe, there is an urgent need to recuperate the history of Paleolithic peoples, to bring them into the purview of historical studies in the same way that we have brought in Incans, Africans, peasants, and all the peoples who have been denied historicity. This is the task of deep history.

A deep history is any history framed in the full spectrum of the human past, from the present day back to early hominins, australopiths, and beyond. A deep history is not just the study of the Paleolithic era, or everything before the turn to agriculture. Archaeologists and paleoanthropologists already do that. It is instead a philosophical perspective, an invitation to contemplate the entire span of human history within a single frame and treat it as part of the same narrative. For this reason, particular histories focusing on narrower spans of more recent time can contribute to deep history as long as they frame questions in the right way. Deep histories are genealogies. As genealogies, they span the narrow evidentiary bases and the methodological rules that have cut human history into isolated segments.

In the reflections below, I shall begin with a brief historical analysis of why the short chronology typical of the study of history was maintained, with rare exceptions, across the twentieth century. I offer this study on the grounds that the task of designing a deep history will be clearer if we understand why it has taken so long for historians to accept the full implications of the time revolution of the 1860s. Here, I shall focus on trends in the discipline of history, though it is important to acknowledge that for much of the twentieth century, archaeologists were just as interested as historians in clinging to a methodological division of time. According to this division of labor, historians were confined to the short time of written evidence. Archaeologists, in turn, limited themselves to the periods associated with unwritten evidence and had little interest in studying societies that left written records. With this survey in hand, we can more easily appreciate how to move forward in developing a new architecture for the writing and practice of deep history. The key task is to outline a mode of history-writing that escapes the style, much in vogue for thirty years and more, whereby historians plot their histories according to ideas of birth, origins, and revolutions. The use of such metaphors renders deep time invisible. What we need to develop anew is a genealogical instinct.

In his 1962 work, *The Idea of Prehistory*, the archaeologist Glyn Daniel posed this rather plaintive question: "Why do historians in a general way pay so little attention to this fourth division of the study of the human past; while recognizing ancient history [why] do they not give more recognition to prehistory?...

[7] V. Gordon Childe, *Man Makes Himself* (London: Watts, 1936).

[8] I have explored some of these issues at greater length in *On Deep History and the Brain* (Berkeley: University of California Press, 2008).

[9] Eric R. Wolf, *Europe and the People Without History* (Berkeley: University of California Press, 1982).

Historians are taking a long time to integrate prehistory into their general view of man."[10]

To answer this question, we need to go back more than a century and consider the trends afoot as the modern practices of history and archaeology took shape. When History formed as a discipline in the late nineteenth century around the three divisions of History's short chronology—ancient, medieval, and modern—it adopted as its signature method the analysis of written sources. In a manual of historical studies published in 1897, probably the most influential of its kind, the historians Charles Langlois and Charles Seignobos argued, "the historian works with documents. Documents are the traces which have been left by the thoughts and actions of men of former times... For want of documents the history of immense periods in the past of humanity is destined to remain for ever unknown. For there is no substitute for documents: no documents, no history."[11] Or in the words of V.A. Renouf, "historians get their knowledge from written documents. No history of any country can be written unless its people have left some such record of their activities."[12]

This seems logical enough. Yet it is important to realize that this claim represents a significant departure from previous understandings of historical evidence. Universal history, as practiced in the Judeo-Christian tradition, was never defined by methodology. It was defined as a subject: the genealogy of humankind. By way of example, consider the *History of the Franks*, written by Gregory of Tours around 590 CE.[13] Though the work was a particular history devoted to the lineage of the Frankish kings of Gaul, Gregory began his account with Genesis and continued through the Flood, the generations of Noah, and the story of Moses and the Children of Israel wandering in the deserts of Sinai. His account of the Hebrew race gradually leads up to the Romans and then, by stages, back down to the race of the Franks. Particular histories like Gregory's ended up focusing on the twigs and branches of the family tree, but the genealogical instinct was common in works of history in medieval and early modern Europe.

Since history was a subject and not a methodology, rules of evidence mattered little. As late as 1885, as all academia was beginning to fragment into disciplines, the American historian George Park Fisher recommended that young historians learn how to use written documents such as registers, chronicles, inscriptions, and literature, but he also advised them to consult oral tradition; material structures such as altars, tombs, and private dwellings; and language, using the techniques of comparative philology. History, in Fisher's view, was written from a broad spectrum of evidence. To this, Fisher added a recommendation to use indirect evidence, to tease historical conclusions out of an array of recalcitrant sources.[14]

So in 1897, why did Langlois and Seignobos narrow down the sources of history so radically to documents alone? History, in trying to recast itself as a methodologically rigorous science, was undoubtedly keeping up with the fashions of the day. But the narrowing of evidence had a second consequence, for it helped to exclude prehistory from the ambit of history. As Langlois and Seignobos put it, "for want of documents the history of immense periods in the past of humanity is destined to remain for ever unknown."[15] Writing in 1897, they knew that this was untrue. Their famous contemporary, the French archaeologist Gabriel de Mortillet, had already used the substantial evidence at hand to classify the phases of the Stone Age by tool type. Perhaps, then, their insistence on documentary evidence was an epistemological sleight-of-hand, a ruse, motivated by their pre-existing desire to preserve the realm of history from the vague and terrifying antiquity of which Victor Duruy had spoken. Whatever the motivation, we can see how humanity's deep history broke apart at practically the same moment that it became thinkable.

So here we have an initial answer to the question posed by Glyn Daniel. In the centuries leading up to the time revolution of 1859, human history was whole and genealogical. In the decades following the time revolution, the subject of history was fragmented along disciplinary lines. Nowadays, history is housed in at least two departments, History and Anthropology. Disciplines, much like cubist paintings, take a unified subject and fracture it on methodological lines. Where the subject of human history is concerned,

[10] Glyn E. Daniel, *The Idea of Prehistory* (London: Watts, 1962), 134.

[11] Charles V. Langlois and Charles Seignobos, *Introduction aux études historiques* (Paris: Hachette, 1897). I used the English translation, *Introduction to the Study of History*, trans. G.G. Berry (New York: Holt, 1898), 17.

[12] V.A. Renouf, *Outlines of General History*, 2nd ed., ed. William Starr Myers (New York, 1909), 2.

[13] Gregory of Tours, *The History of the Franks*, trans. Lewis Thorpe (Harmondsworth: Penguin, 1974).

[14] George Park Fisher, *Outlines of Universal History, Designed as a Text-Book and for Private Reading* (New York, 1885), 3.

[15] Langlois and Seignobos, *Introduction*, 17.

the methodological division doubles as a chronological division. Archaeologists and anthropologists take responsibility for the Great Before. Historians limit themselves to the Everything After. Despite the enthusiasm for interdisciplinarity these past few decades, there has been very little thought devoted to bringing interdisciplinarity to the study of human history.

Accompanying the disciplinary turn was the well-known shift in subject from the genealogy of kings and battles to the rise of nations. The genealogical mode of writing history used by Gregory of Tours and others is a style of thinking that naturally creates an interest in "first things." The new mode of history writing that emerged in the later nineteenth century, in sharp contrast, was historically myopic. Metaphorically, it took the form of what biologists would call an ontogeny: a developmental history describing the birth and maturation of a single organism. Where a genealogy describes the deep history of a lineage, an ontogeny writes the biography of a single entity cut adrift from its lineage. The new mode of history writing, in this vein, took form as the biography of nations, a fitting subject for an age that saw the rise of nationalism and the emergence of universal education. Through the metaphor of ontogeny, it became possible to imagine that national histories have founding moments and key transitions. Surveying the histories written in France, England, the United States, and elsewhere in the West in the decades leading up to 1900, it is striking how histories written in a semi-genealogical mode gave way, over the space of several decades, to histories rife with metaphors of origin and birth.[16]

All national history curricula have their own roots in the late nineteenth century, in the work of figures like Victor Duruy, George Park Fisher, and other historians who were instrumental in defining the patterns of history instruction. It is understandable that history curricula, then as now, should emphasize moments of national origins. Nations, after all, are bodies. But leaving aside nations, what was the birth date for history as a whole? In the first half of the twentieth century, this was an issue of some moment in the United States, as many universities adopted "Western Civ" as their basic history course. In the 1920s, the Australian archaeologist Gordon Childe offered historians the twin ideas of the Neolithic Revolution and the Urban Revolution in Mesopotamia, and his style of periodization spread rapidly through U.S. textbooks, general histories, and curricula from the 1930s onward. The current Social Studies curriculum in New York State, for example, begins officially in Mesopotamia in 4,000 B.C. In Texas, no dates are given for some of the early happenings, but the earliest subject covered is the "Neolithic Agricultural Revolution."[17] In almost all Western Civ and World History textbooks today, history comes into being in the Neolithic.

The Paleolithic, in this mode of writing, is a historyless period: a prologue. The idea that some human societies could exist outside of history intrigued nineteenth-century German historical philosophers. In Leopold von Ranke's famous phrase, Asians were the "people of the eternal standstill."[18] So were Africans, Australian Aborigines, American Indians: indeed, practically everyone who wasn't of European origin. It was an odd feature of the new history that historicity, if it was to be accorded to some peoples, had to be denied others.

The idea that only some peoples have history is blatantly erroneous. You don't have to have much acquaintance with Paleolithic and Neolithic archaeology, let alone Incan and African archaeology, to realize that all human societies are full of history, even those whose histories we must reconstruct with the most fragmentary unwritten evidence. Thanks to the ontogenetic style of writing history, however, the idea that there is a time before history, and then a history, has worked its way into our curricula and our habits of thinking about the past. The errors into which this has led us have been legion. In recent years, we have swept away the instinct to deny historicity to non-Europeans; except, of course, where Paleolithic peoples are concerned.

In proposing a deep history there is a temptation to prescribe. We *ought* to have historians, archaeologists,

[16] In general, see Ernest Breisach, *Historiography: Ancient, Medieval and Modern*, 2nd ed. (Chicago: University of Chicago Press, 1994). The shift in patterns of historical writing, and in particular the transformation in the underlying biological metaphors used to describe the pattern of history, merit further research. For a preliminary study, see my "Genealogy, Ontogeny, and the Narrative Arc of Origins," forthcoming.

[17] See http://www.emsc.nysed.gov/ciai/socst/pub/sscore2.pdf (<http://www.emsc.nysed.gov/ciai/socst/pub/sscore2.pdf>), page 94, accessed 28 December 2009; Texas Administrative Code, Title 19, Part II, Chapter 113, Texas Essential Knowledge and Skills for Social Studies, Subchapter C, High School, p. C-15; see http://ritter.tea.state.tx.us/rules/tac/chapter113/index.html (<http://ritter.tea.state.tx.us/rules/tac/chapter113/index.html>), accessed 11 September 2009.

[18] See Arthur F. Wright, "The Study of Chinese Civilization," *Journal of the History of Ideas* 21 (1960): 233-55, here 245.

and anthropologists in a single department. We *ought* to work in teams so as to bridge the methodological divisions that break human history into pieces. Most of this is so obvious as to need no comment; it's the implementation that would be complicated. Before we set about the task of restructuring academic space, the intellectual architecture must be solidly constructed. The first task is to define the narrative arc of a deep history, something that clearly baffled Duruy and generations of textbook authors after him.

The narrative arc of modern history-writing, as noted above, follows the arc of ontogeny. As a practical matter, what this means is that histories—especially but not exclusively works of synthesis such as textbooks, general histories, and introductory survey lectures—frame their subjects using metaphors of origin, birth, roots, revolution, invention, and the like. The key feature of the ontogenetic metaphor is that it proposes a shift from nothingness to being or from stasis to change, a shift projected onto a moment of birth or conception. The nation was an early target for the ontogenetic metaphor: by the late nineteenth century, the idea of the birth of nations was making its way into chapter titles, section headings, and book prologues. The metaphor eventually found its way into book titles, such as Ferdinand Lot's famous 1948 work, *The Birth of France*.[19] But the metaphor was readily exported for use in other areas. Western Civilization (via the Neolithic Revolution) was an early beneficiary, and the metaphor soon spread beyond this to other entities, ideas, and systems. Over the last fifty years, the list has become long indeed: for medieval Europe alone, claims have been made identifying the period as the point of origin for civil society, the state, commerce and trade, banking, cities, individualism, universities, the modern nuclear family, scientific method, law and justice, human rights, citizenship, colonialism, fashion, and even persecution.

The ontogenetic metaphor struck a chord in the historical imagination of the latter half of the twentieth century. Books using ontogenetic metaphors became foundational texts. For medieval European history, such works as Robert S. Lopez's *The Birth of Europe* and Joseph Strayer's *On the Medieval Origins of the Modern State* spring to mind.[20] Even a cursory bibliographic examination will show that recourse to talk of birth and origins has become dense in all fields of history in recent decades.[21] Used in titles or massaged into the architecture of arguments, ontogenetic metaphors help create the energy that can drive whole fields of historical inquiry, as scholars engage in fierce debates about the points of origins of human rights, intolerance, or the modern world system. Yet the use of the metaphor comes with a price. An evocation of birth can project nothingness or historylessness onto the other side of the divide. It flattens the long tail of history before the origin into an inconsequential prelude.

Ontogeny, clearly, is anathema to a deep history of humankind. More to the point, if we must have origins, they ought to be human origins rather than the ersatz and self-congratulatory origins associated with modernity. The modern practice of history has borrowed its signature metaphors from biology, and biology, once again, provides a metaphorical alternative: that of phylogeny. Where ontogeny is a biographical vision, focusing on the life history of organisms or systems, phylogeny is a lineal vision describing a succession of changing forms. Ontogeny generates historical myopias and illusions of novelty. Historians who incautiously retail metaphors of birth and origin are liable to imagine that world trade systems were insignificant before the sixteenth century, that mass consumption did not exist before the eighteenth century, that egalitarian and democratic ideas could not have existed before 1789, and so on. Phylogenetic styles of writing history, in contrast, see broad continuities in various domains even while acknowledging that the Paleolithic amber trade was not as vast as the modern diamond trade, that patterns of consumption in ancient Rome took

[19] Victor Henri Ferdinand Lot, *Naissance de la France* (Paris: Fayard, 1948).

[20] Robert S. Lopez, *The Birth of Europe* (New York: M. Evans, 1962); Joseph S. Strayer, *On the Medieval Origins of the Modern State* (Princeton: Princeton University Press, 1970).

[21] Typical titles include Immanuel M. Wallerstein, *The Modern World-System: Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century* (New York: Academic Press, 1974); Neil McKendrick, Jon Brewer, and J.H. Plumb, *The Birth of a Consumer Society: The Commercialization of Eighteenth-Century England* (Bloomington: Indiana University Press, 1982); Christopher A. Bayly, *The Birth of the Modern World, 1780-1914: Global Connections and Comparisons* (Oxford: Blackwell, 2003); Lynn Hunt, *Inventing Human Rights: A History* (New York: Norton, 2007). Ontogenetic metaphors don't always appear in book titles, though they are evident in arguments, e.g. Jürgen Habermas, *The Structural Transformation of the Public Sphere: An Inquiry into a Category of Bourgeois Society*, trans. Thomas Burger with the assistance of Frederick Lawrence (Cambridge: MIT Press, 1989); Thomas Laqueur, *Making Sex: Body and Gender from the Greeks to Freud* (Cambridge, Mass.: Harvard University Press, 1990); Kenneth Pomeranz, *The Great Divergence: China, Europe, and the Making of the Modern World Economy* (Princeton: Princeton University Press, 2000); Gregory Clark, *A Farewell to Alms: A Brief Economic History of the World* (Princeton: Princeton University Press, 2007).

different forms than they do today, and that forager egalitarianism is not like modern democracy. Change is always more visible, and more interesting, when viewed against an invariant background. The most significant difference between ontogeny and phylogeny lies in the fact that phylogeny presupposes a constant dialogue between humans and the ecosystems of which they form a part. In this view, many of the events and trends that pass as novelties in the ontogenetic style of writing history turn out to be normal ecological processes dependent on things like population density and the distribution of resources. Deep histories coalesce easily around the narrative spiral that emerges when one imagines a constant evolutionary dialogue between organism and ecosystem, where the organism itself is constantly shaping and reshaping the very ecosystem of which it is a part, and the ecosystem, in turn, constantly shapes the organism.

Since an example might help explain what I mean by this narrative spiral, let us reflect for a moment on the human body, one of many domains of inquiry that provide a ready base for a deep historical perspective. Animal bodies are always undergoing physical changes, as natural selection tunes the body to a changing environment; if the changes are substantial enough, a new species results. Contemplating the human body from Homo habilis forward, physical anthropologists have described a set of transformations that resulted from the growing human propensity to use tools, where tool-use, by changing the way in which humans released calories from foodstuffs, generated feedback effects on the body itself.[22] The human evolutionary biologist Richard Wrangham has vividly argued that the harnessing of fire (a special kind of tool) some 1.8 million years ago explains an especially important cascade of transformations that dramatically reshaped the body of Homo erectus and altered human sociality.[23] As digestion increasingly took place outside the stomach, through cutting, pounding, and especially cooking, the gut itself shrank, along with the jaw, the teeth, and the muscles associated with biting. The body itself became less robust. Strikingly, many of the bodily devices that primates use to send social signals atrophied or vanished in hominins at around the same time: canines and bristly hair, for example, used by dominant males to maintain social hierarchies and (probably) the pheromones or swellings that indicate oestrus in females. The new human body suited the egalitarian social structure that was itself a product of fire and tool use.[24]

This doesn't mean that displays disappeared. One of the most striking features of the archaeological record since the Upper Paleolithic (ca. 50,000 years ago) has been the growing density of human-made devices for extending or redefining the edges of the human body through ornaments, clothes, weapons, and (probably) tattoos; later, these devices extended to shoes, armor, pierced ears, smoothly shaven faces and legs, perfumes, wigs, and, eventually, plastic surgery. The changing forms of display and the transformations in material culture that underpin them are the result of many factors, one of which was the return of social hierarchy, albeit in a different form. Hierarchy, in turn, was a product of increasing population densities, an ecological factor linked to changing patterns of food production as well as climate change.

Sketched out above is just a glimpse of how we might write a history narrating the long phylogenetic dance among body, society, and ecosystem. Developed in a more robust form, this kind of narrative spiral could link the physical anthropology of the hominin body to postmodern studies of the body as a social construct. In a sense, what the history reveals is that the body has *always* been a social construct, regardless of whether culture's influence operated indirectly, via transformations in the genotype, or directly on the body itself. The idea of a deep history is that a similar approach, eschewing ontogeny, can apply in a wide array of human domains, such as patterns of migration and colonization, material culture, foodways, family, gender and sexuality, communication, political forms, economic exchange, music, religion, and so on.

In his famous formulation, the biologist Ernst Haeckel proposed that "ontogeny recapitulates phylogeny," namely, that the biological history of a species is mirrored in the successive forms taken by one of its members as the organism develops from fetus to adult. The theory itself was suggested by fish-like gill slits found in human and other tetrapod fetuses. Though recapitulation in this sense has long since been abandoned as a plausible biological theory, it has had a strangely persistent after-life in the discipline of history. History's continuing reliance on ontogenetic metaphors of birth, origins, and roots, which have become increasingly

[22] A standard work here is Richard G. Klein, *The Human Career: Human Biological and Cultural Origins*, 3rd ed. (Chicago: University of Chicago Press, 2009).

[23] Richard G. Wrangham, *Catching Fire: How Cooking Made Us Human* (New York: Basic Books, 2009).

[24] In general, see Christopher Boehm, *Hierarchy in the Forest: The Evolution of Egalitarian Behavior* (Cambridge, Mass.: Harvard University Press, 1999).

common in recent historical writing, suggests how the field as a whole operates under the belief that the only history worth telling is the biography of the most recent organism within the lineage, such as the nation or the modern world system. A deep history is an antidote to this strangely compressed and shallow understanding of human historical time, a view of history that seeks to make history historical again.

Chapter 3

From Transatlantic Histories of "Intoxication" to a Hemispheric "War on Affect": Paradoxes Unbound[1]

Together with the eastern slopes of the Andes, the Amazonas and Orinoco regions offer the greatest richness of psychoactive plants in the world. They have been enlightening and tormenting conquerors, colonizers, chroniclers, merchants, the Catholic Church, transatlantic trading companies, chemists, biologists, artists, and writers for more than five hundred years—long before the twentieth century (culminating in the so-called "war on drugs") introduced its international system for distinguishing illicit narcotics from licit ones.

Psychoactive substances provide a revealing postcolonial lens for looking into humans' ecological and social relationships with plants and for reexamining the colonization of the New World. The prominence of these substances in history—substances eventually turned into transatlantic commodities and catalysts for new ways of life in the centers of "progress"—indicates the shifting conflict scenarios that bind modernity to a colonial past and a global present. Meanwhile, the Western hemisphere has become the center of controversy over narcotics.

Why, then, has critical cultural reflection (or, more specifically, such disciplines as Latin American literary and cultural studies, area studies, postcolonial or subaltern studies, and political philosophy) paid only fitful attention to the matter? While cultural critics are accustomed to thinking of globalization in terms of power configurations related to capitalism, coloniality, the nation-state, Otherness, gender, immigration, and the mass media, most have neglected the formative role of modern struggles over drugs in these regards.

As far as omissions in Hispanic literary and cultural studies are concerned, are we perhaps dealing with a phenomenon of disavowal—as, for example, the inclusion of Fernando Ortiz's famous *Cuban Counterpoint: Tobacco and Sugar* into the academic canon might suggest? Ortiz's 1940 book, labeled an anthropological and historical masterpiece by Malinowski,[2] became a cornerstone in the 1970s and 1980s for the reorientation of Latin Americanist literary scholars. At issue was the search for a new, non-metropolitan branch of cultural studies: transculturation studies (or the popularization of the anthropological term "transculturation," as discussed in Ortiz's book, in U.S. literary and cultural studies of Latin America), inspired by Angel Rama's *Transculturación narrativa en América Latina* (1982).[3] However, there was one thing missing in numerous post-traditional approaches to the work of the Cuban anthropologist and his narrative reinvention of tobacco and sugar as "cultural personae": an awareness that Ortiz's declaration of tobacco and sugar as the allegorical couple representing a locally and globally informed, transcultural identity of Cubans and other Caribbean peoples was actually a reflection on two of modernity's powerful psychoactive substances. His was an interest

[1] This content is available online at <http://cnx.org/content/m34250/1.4/>.

[2] Fernando Ortiz, *Cuban Counterpoint: Tobacco and Sugar* (Durham and London: Duke University Press, 1995); Bronislaw Malinowski, "Introduction," in Ortiz, *Cuban Counterpoint*, lvii-lxiv.

[3] Angel Rama, *Transculturación Narrativa en América Latina*, (México, D.F.: Siglo Veintiuno Editores, 1982).

in a kind of Latin American epistemic, ethnographic, and economic protagonism in the global venture, in which such products from the "underdeveloped" world would stimulate and embellish the culture of the European and North American centers.

Since affective expectations and aversions haunt scholarly work beneath its performed "objectivity," fear of the possible delusion of the idea of the self-conscious subject might have played a part in the disavowal of Ortiz's most obvious idea. There has also been, in part, a rather narrow secularism in Latin American scholars' turn to cultural studies, which has led to the prevalent association of narcotics and stimulants with those irrational spheres that belonged to religion or vanity but not modern culture. If, on the other hand, readers of Ortiz's book had taken note of Walter Benjamin's "Capitalism as Religion" and "Surrealism," and especially of his far-reaching concept-figure of a "dialectics of intoxication,"[4] different ideas about modernity's inherent transgressions and singular counterpoints of psychoactives offered to the West by peripheral cultures might have come our way several decades sooner.

The shifting relationships among psychoactives, modernity, and globalization cannot be understood simply by looking into the heated vocabulary related to "illicit flows and criminal things" (to use van Schendel and Abraham's recent book title[5]), the narcotics economy, or the "war on drugs." According to DeGrandpre's *The Cult of Pharmacology: How America Became the World's Most Troubled Drug Culture* (2006),[6] a cultic view came to reign in the twentieth century under the allegedly objective label of pharmacology, which classified drugs as either angels or demons (ibid., viii). "The pharmaceutical industry, the tobacco industry, modern biological psychiatry, the biomedical sciences, the drug enforcement agencies, and the American judicial system... have come to embrace a cult of pharmacology, not as a conspiracy but as a de-facto religious belief system" (ibid.). Here we have the first paradox: science on the one hand and belief or fear on the other, each coupled with powerful interests. In the course of his study, DeGrandpre points to the establishment of a discursive order that resembles Edward Said's idea of orientalism. At issue is a mechanism for making Otherness available to judgment by affectively constructing it in the first place. In Said's case, colonial discourse provided a dark, mysterious Orient, which eventually served colonialism's practical interests and deepest drives. DeGrandpre applies the figure of "orientalism," common among postcolonial scholars, to the trajectories of mystification that have come to characterize a main part of the modern history of narcotics. Psychoactives have become, by means of social and ideological imagination, a hyperbole—a symbol for excess—qualifying their cultivators and users as a dangerous "Other" that calls for moral scrutiny, restriction, and even coercion. This mode of trivial judgment must be reconsidered, though the task is complex and there seems to be no central vantage point.

From one particular case—cocaine—we can draw a few epistemological and transhistorical links.

The story of cocaine starts with *Erythroxylum coca*, the coca plant.[7] (Cocaine the alkaloid, the derivative first extracted from coca leaves in 1860, has a different history, which I will bracket for a moment.) Coca is an innocuous-looking plant, growing in small shrubby bushes to a height of four to six feet in wet, humid areas. It flourishes mainly on the eastern slopes of the Andes throughout the region stretching along the western side of South America from Colombia down through Peru to Bolivia and reaching as far east as the first stages of the Amazon Basin (ibid., 3). The historical heart of the coca region is the Peruvian *montaña* and the Bolivian *yungas*.

This story begins well before the sixteenth century, when the Spanish invaders of Ancient Peru were impressed by the Incans' regular use of the coca leaf. Studies have dated this beginning to about 20,000 years ago, when hunting and gathering groups first moved into the central Andes of South America.[8] Coca

[4]See Hermann Herlinghaus, *Violence Without Guilt: Ethical Narratives From the Global South* (New York: Palgrave Macmillan, 2009), 11-19.

[5]Willem van Schendel and Itty Abraham (eds.), *Illicit Flows and Criminal Things: States, Borders, and the Other Side of Globalization* (Bloomington: Indiana University Press, 2005).

[6]Richard DeGrandpre, *The Cult of Pharmacology: How America Became the World's Most Troubled Drug Culture* (Durham–London: Duke University Press, 2006).

[7]See Dominic Streatfeild, *Cocaine: An Unauthorized Biography* (New York: Thomas Dunne Books/St. Martin's Press, 2001), 2ff.

[8]See Joseph Kennedy, *Coca Exotica: The Illustrated Story of Cocaine* (Cranbury, NJ–London: Associated University Press/Cornwall Books, 1985), 13-19; Tim Madge, *White Mischief: A Cultural History of Cocaine* (New York: Thunder's Mouth Press, 2001), 23.

could hardly have been overlooked if these groups conducted a rudimentary testing of plants by tasting the leaves, which would have shown coca could numb the sting of a cut lip or reduce toothache pain. Those gatherers also became aware that coca could be chewed to increase physical energy and mental alertness, and to fight hunger and cold; infused to remedy stomach disorders; and employed to ward off parasites. Some of the earliest direct archaeological evidence of coca leaf use dates to 2500-3000 B.C., both to the ceramic lime pots and figurines of coca chewers (with cheeks bulging on one side) linked to the Valdiva culture on the coast of Ecuador and to the Asia I cemetery site on the south-central coast (Peru), where bodies were wrapped with mats that held personal belongings, including snuff trays, tubes, and bags filled with coca and powdered lime. The presence of lime indicates that users knew the leaves would yield their greatest effects when chewed in combination with an alkaline powder,[9] meaning that experimentation "with the leaf" must have taken place even earlier and that chewing coca was already part of an ongoing social practice.

Joseph Kennedy, writing about coca use in public ceremonial gatherings conducted by shamans in La Florida, the first urban center in Peru, states that "coca was a firmly established part of Peruvian life at least 2,000 years before the birth of Christ,"[10] when nomadic hunting and gathering had almost completely disappeared. It was here that—together with extensive settlements and agricultural activities—trade networks developed, facilitating the flow of goods and services across the Andes. By this time, coca was high on the list of those items taken from the eastern slopes across the Amazon Basin and toward the Pacific coast. As Rivera Cusicanqui has emphasized and as Taussig remarks in his book on shamanism and colonialism,[11] ancient trade routes constituted mobile transcontinental frontiers, serving as zones of formal and informal exchange of foods, herbs, medicines, magical practices, and other services, successively reactivated in the course of the last millennia. Alternately combated and appropriated by Christian missionaries and trading companies, and intercepted and overridden by colonial and later national borders, they have constituted zones of movement and conflict up to the present. These residually persistent trade routes represent a kind of submerged yet active global contact zone. Informal globalization thus started thousands of years ago.

The Incan empire emerging from the Cuzco valley in the twelfth century made clear even then how thoroughly a single plant could become central to political interest. In the fourteenth century, when the Incans' influence extended across the territory stretching from northern Ecuador to central Chile and integrated millions of Indians across hundreds of tribes and cultures, they faced the challenge of how to combine expansion, administrative and logistic integration, and ceremonial sanctification. The coca leaf turned out to be of invaluable help in these endeavors.[12] It became the divine plant, catalyzing biochemical effects, desire, power, and myth, to be distributed henceforth in restricted form. Vast territories of the Andean world adopted a politics of organizing and circumscribing trade, with coca being the strategic commodity and denominator for control purposes: a single culture trait, physiological stimulant, and medical device shared by many of the tribes under Incan rule. And as Garcilaso de la Vega writes, "it was unlawful for any of the local people to use coca without permission from the [Incan] governor."[13] In his *Comentarios Reales*, coca ("cuca") ranks higher than gold and silver: it is "*la principal riqueza del Perú*."[14]

Although millions had chewed the leaf before the rise of the Tawantinsuyu (the Incan empire), the Incan state combined life and coca most thoroughly—politically, economically, spiritually, medicinally, and sexually. This was the situation that the Spanish invasion—what the Incans called *Pachakuti*, or the total disruption of space and time—terminated in 1532-33. The Catholic Church was suspicious of a "magic plant" that seemed even more dangerous than the fruit that led Adam and Eve into Original Sin. Since it looked profane and unappealing, it had to possess a dark side. For the Indian people, coca was associated with the concept of *huaca*—a sacred quality resident in a thing, place, or person.[15] Ecclesiastical authorities and Church people

[9] See Kennedy, *Coca Exotica*, 15; Streatfeild, *Cocaine*, 4, 11.

[10] Kennedy, *Coca Exotica*, 16.

[11] See Silvia Rivera Cusicanqui, *Las fronteras de la coca: Epistemologías coloniales y circuitos alternativos de la hoja de coca* (La Paz: Universidad Mayor de San Andrés/Ediciones Aruwiyiri, 2003); Michael Taussig, *Shamanism, Colonialism, and the Wild Man: A Study in Terror and Healing* (Chicago–London: University of Chicago Press, 1987).

[12] See Kennedy, *Coca Exotica*, 20-24.

[13] Garcilaso de la Vega, "El Inca," *Royal Commentaries of the Incas* (Austin: Texas University Press, 1966), 330.

[14] Garcilaso de la Vega, "El Inca," *Comentarios reales*, intro. y notas de María Dolores Bravo Arriaga (México, D.F.: SEP, Dirección General de Publicaciones y Bibliotecas/UNAM, Coordinación de Humanidades, 1982), chapter XV.

[15] Joseph Kennedy, *Coca Exotica*, 26.

were upset with this pagan concept of the sacred that ran counter to their idea of God's transcendence as a reign of purity. Chewing coca daily, or "offering the plant to idols" (viewed as demons),[16] was suspicious. At stake were conflicting concepts not simply of divinity (monotheism vs. polytheism) but also of materializing (or suppressing) relationships with the divine; in other words, the tension between Christian representation and pagan enactment of the divine—a delicate matter of political theology.

From the outset of colonization, the war waged by the Spanish Crown and the Church against the use of coca was nurtured by a scholastic—that is, doctrinal—drive. But colonial governments had to give the problem a somewhat different spin for reasons related to the lucrative nature of the growing coca trade, the popularity of the leaf, and its potential for helping people carry out hard work. The colonialists' coercion of Indian laborers into gold and silver mines, where they were forced to endure extreme hardships, was abetted considerably by providing the laborers with coca rations. Promotion of coca leaves by European and Creole merchants as a stimulant and appetite suppressant helped destroy traditional food-exchange cycles.[17] Other factors uprooting the culture of communities turned coca into a treatment for increasing hunger pains and a more or less efficient remedy for a long list of disasters caused by colonial rule.

The above sketches a scenario in which political history linked to the early transatlantic and hemispheric rise of globalization grates against and violently transforms a cultural history that developed from a regional universe of non-modern contours across millennia. One of the results, along with the extermination of uncountable communities, was a tectonic change in what we might call "social ecology," or the ways in which—and the degree to which—a society relies on its relationships (especially physiological and psychocultural relationships) with the environment. In cultural terms, at issue is the complexity of "bodily" *and* "embodied" relationships both between and across humans and environments. "Social ecology" thus became one of the disaster zones on which Western libidinal imagination would feed, as Western colonialism destroyed self-sustained socio-ecological communities and autochthonous cultural traditions. William G. Mortimer, in his *History of Coca* (1914), used as a frontispiece for his book a nineteenth-century mythical drawing of an Indian princess: "Mamma Coca offers the divine plant to the Old World."[18] In the case of this picture, a projection of desires onto a mythical Other served the needs of colonial imagination, which thus displaced or sublimated actual violence and destruction.

The Andean coca leaf would first hit modern world markets in the mid-nineteenth century, and today we date the global emergence of vast circuits of illicit cocaine to the 1950s.[19] Because coca leaves travel badly and deteriorate quickly, "outside South America, they remained a fabulous idea"[20] well into the nineteenth century. When coca finally entered the global commodity chain, its extensive cultivation in Peru helped reproduce systems of Indian tributary serfdom on plantations where grueling labor and climatic conditions were the rule.

Coca did not function as a catalyst, as did many other commodities, of the "psychoactive revolution." The term refers to the production, exchange and consumption of psychoactive substances as they figured at the core of Western expansion and colonization and as they eventually became an enabling condition of modernity.[21] Narcotics fetishism characterized the transatlantic politics of the world's governing elites from about the mid-seventeenth to the late nineteenth century, when concerns about manufacturing and taxing drugs rather than suppressing them were dominant. "Drug taxation was the fiscal cornerstone of the modern state, and the chief financial prop of European colonial empires" (ibid., 5). There have been, above all, three such substances: alcohol, nicotine, and caffeine (9). Due to the degree to which they became neurochemical stimulants and psycho-cultural factors around the world, they have been the most resistant to prohibition. Coffee and tea keep the contemporary Western world on the go, just as coca chewing still keeps part of the

[16] See Garcilaso de la Vega, "El Inca," *Comentarios reales*, chapter XV.

[17] See Kennedy, *Coca Exotica*, 36-38.

[18] See W. Golden Mortimer, *History of Coca: "The Divine Plant" of the Incas* (San Francisco: Fitz Hugh Ludlow Memorial Library, 1974), ii.

[19] See Steven Topik, Carlos Marichal, Zephyr Frank, eds., *From Silver to Cocaine: Latin American Commodity Chains and the Building of the World Economy, 1500–2000* (Durham–London: Duke University Press, 2006), 321-346.

[20] Madge, *White Mischief*, 31, 33.

[21] David T. Courtwright, *Forces of Habit: Drugs and the Making of the Modern World* (Cambridge–London: Harvard University Press, 2001), 2, 53-60.

Andes on the go.[22]

Then there are the "little three" regulated substances: opium, cannabis, and coca (in elaborated form, heroin, hashish, and cocaine), which have become prohibited.[23] The profit-driven globalization of psychoactive plants and their derivatives, many of which came from the New World, transformed habits, affected the fantasies of millions of people, and influenced the environment. Narcotics were indispensible commodities and psychoactive agents, destined both to second the practices of colonization and become fuels of industrial civilization. At the other extreme, the use of narcotics, along with tobacco, coffee, alcohol, and to a lesser degree opium and cannabis, would rank at the center of socio-economic change in Western Europe and the United States, becoming a daily habit for masses of middle-class consumers—those who came to represent the modern individual in his or her exposure to the experiences of urbanization and industrialization. When Europe and the U.S. discovered cocaine, coca developed into a famous transatlantic commodity as well, shortly before domestic legislation and international treaties brought about the "psychoactive counterrevolution" of the twentieth century (ibid., 5, 184).

This is where Sigmund Freud's early writings—later excluded from the *Standard Edition of the Complete Psychological Works of Sigmund Freud*—enter our story. Twenty-four years before Freud wrote his 1884 essay, "Über Coca,"[24] Albert Niemann, a chemistry graduate student in Göttingen, had isolated the alkaloid cocaine from a large amount of coca leaves.[25] He described it in 1860 as "colourless transparent prisms" and noted: "Its solutions have an alkaline reaction, a bitter taste, promote the flow of saliva and leave a peculiar numbness, followed by a sense of cold when applied to the tongue" (ibid., 49). Curiously, the young Freud, who wrote six papers on cocaine between 1884 and 1887 and held public lectures on the subject at Vienna's physiological and psychiatric societies, became an important advocate of cocaine use, recommending it to Western doctors and consumers as a beneficial and pleasurable commodity. In "Über Coca," Freud, starting with a historical and phenomenological account of the coca leaf's use among Peruvian Indians and even referring to Garcilaso de la Vega's *Comentarios Reales*,[26] discusses the exhaustive biomedical experiments on the effects of coca and cocaine that were undertaken between 1860 and 1887. He then writes:

> *The psychic effect of cocainum muriaticum in doses of 0.05–0.10g consists of exhilaration and lasting euphoria, which does not differ in any way from the normal euphoria of a healthy person. The feeling of excitement, which accompanies stimulus by alcohol is completely lacking [...]. One senses an increase of self-control and feels more vigorous and more capable of work; on the other hand, if one works, one misses that heightening of the mental powers which alcohol, tea, or coffee induce. [...] This gives the impression that the mood induced by coca [cocaine; the author] in such doses is due not so much to direct stimulation as to the disappearance of elements in one's general state of well-being which cause depression. [...]*
>
> *I have tested this effect of coca [cocaine; the author], which wards off hunger, sleep, and fatigue and steels one to intellectual effort, some dozen times on myself (ibid., 60).*

Here we are not concerned with the biomedical parameters and potencies of cocaine. Rather, we seek to gain a new framework for problematization. Freud's deliberations on cocaine help place psychoactive substances in a still larger perspective—their strange relationship with psychoanalysis, which is seen not as a way of talking about individual anxieties and the symbolic sublime but as a possibility of conceptualizing cultural and social criticism. In that regard, the young Freud's interest in coca leaves and cocaine stands in telling contrast to his later psychoanalytical research and writing. At issue is a historico-conceptual juncture at which Freud has to make a decision about the direction of his future work. From a contemporary perspective, this is not an either/or decision so much as the development of a strategic angle from which

[22] Streatfeild, *Cocaine*, 6.
[23] Courtwright, *Forces of Habit*, 31.
[24] Sigmund Freud, *Cocaine Papers*, ed. Robert Byck (New York and Scarborough, Ontario: Meridian, 1974), 47-73.
[25] Madge, *White Mischief*, 46-49.
[26] Freud, *Cocaine Papers*, 50.

to talk about one complex problematic. His subject has to do with understanding modernity in terms of transgression/repression.

During the 1880s, Freud was concerned about the psychic effects that moderate doses of cocaine could exert as a stimulant that "steels one to intellectual effort," provides euphoria without successive depression (ibid., 61, 62), and shows promise as a positive treatment for hysteria and melancholia (64, 65). Freud eventually lost intellectual interest in the stimulant and turned to culture as neurosis, arguing in *Civilization and Its Discontents* (1930) that modern Western civilization had become "neurotic," or compulsively marked by symptoms of repression. Was Freud writing with an increasing perception of policies directed at restricting and prohibiting cocaine and other substances? Now, if we consider that the "psychoactive counterrevolution" regarding some—but not all—narcotics was mainly launched during the 1910s to the 1930s (almost simultaneous with Freud's mature reflections on culture and society), we might ask about links between conflicts over narcotics and the affective developments, or repressions, taking place at the heart of Western modernity. If repression is essential to civilization and if Freud saw culture's repressive agency as necessary for securing the "primacy of the intellect," self-consciousness, and the sublimation of instinctual drives, what begins to emerge is the conflict scenario in which both psychoactives and neurosis are crucial factors in the negotiation of hegemonies at the turn of the twentieth century. Is not the social, collective, geopolitical, market-driven pharmacological *regulation of affect* the actual scenario through which unconscious strata are formed and regulated, placing the problem somewhere other than in the individual psyche whose traumatic core Freud had extrapolated onto society? In other words, as historical colonialism and then modern imperialism have taught us, does not modernity's drive to take hold of an uneven world consist more of a proactive management of affects and embodied imagination than of "necessary" repression and sublimation?

At issue is hegemonic "management" striving to achieve the power to distribute affect unequally and asymmetrically across centers and peripheries and across ethnic, gender, and class lines. Such control points toward a possibly shifting relationship in the twentieth century between sublimation as (self-)containment of qualified, "full" citizens on the one hand, and a sophisticated biopolitical control of populations at both the centers and the margins of the highly developed territories of the West. In sum, I suggest that the breaking down of the strict division between modern psychoanalysis and biology/neurophysiology might have been an implicit issue for Freud, and that it merits further study.

There are other hints of globalization's paradoxical history. The transatlantic dynamics of expansion and "modernization" merit consideration in relation to an affective venture and a psycho-economic apparatus whose *movens* are desires striving for "objectification." We might think, for example, of the concept of the "open secret" or "public secret," which refers to a cultural dynamic "where much is known but unacknowledged."[27] "Modern Western history revolves around a deep split in the secret in which truth's dependence on untruth is ethnically and geographically divided between north and south."[28] At issue are the mechanisms by which desires of projection, expansion, and domination, the limits of the utterable, desirable, and performable, and that which remains secret or excluded have all been channeled into and distributed in the present. As to psychoactive substances, the primary problem would then be—culturally speaking—neither their unchangeable (for example, religious) essences nor their inherent power of pernicious contamination, but rather the regulation of affect according to social, (bio)political, economic, and moral criteria and particular contexts. The regulation of affect is as much a matter of language and representation as it is a question of secrecy and mystification. In one sense, colonization and modernity's ascent have relied on the unprecedented commerce and consumption of transatlantically empowering psychoactives, fueling—not by chance—the most obstinate dream worlds and superlatives of "development." But looking backward from the twentieth century's scenarios of selective restriction and coercive control, we cannot but ask what happened at a certain invisible conjuncture where things started to turn around. There is no simple response, but we are certainly dealing with something quite contrary to a "natural development," say, politics that have become increasingly rationalized on the basis of solid insights into the nature of benevolent narcotics versus pernicious and deadly ones.

[27] Rosemary Hennessy, "Open Secrets: The Affective Cultures of Organizing on Mexico's Northern Border," *Feminist Theory*, vol. 10.3, (2009), 2.

[28] Michael Taussig, *Defacement: Public Secrecy and the Labor of the Negative* (Stanford: Stanford University Press, 1999), 78.

Walter Benjamin offers a different approach (as does Nietzsche, if you like) to the concept of "intoxication." Both thinkers remind us that among the single most powerful, toxic stimulants of the individual and collective psyche in the Western world we find the Christian (the Pauline, properly speaking) invention of guilt and atonement and, in modernity, a never-ending catalogue of anxieties and fears. Such thoughts resonate in a *contrastive* way with certain of today's prescripts that tendentiously rank drugs as either devilish or angelical. According to Benjamin's rarely consulted fragment, "Capitalism *as* Religion,"[29] for example, capitalism cannibalizes Christianity at the point where it makes an overarching "sense of guilt pervasive" in the concept figure of a guilt/debt spiral that generates a cult of utilitarianism "without truce and without mercy."[30] In my recent book, *Violence Without Guilt*, I placed Benjamin's early thinking on religiosity and violence in a global perspective, arguing that the "rise" and "fall" of psychoactive substances contribute to historicization and analysis within both transatlantic and hemispheric frameworks of what I call a "modern war on affect" that fuels particular imaginaries and strategies by which a colonial unconscious is refashioned over time. In my view, today's hegemonic cultural formations (diverse and contradictory as they are) necessarily reproduce a phantasmic, singularly powerful phenomenon: "affective marginalization," which connects colonization and modernity in a variety of ways. "Affective marginalities" are in no way unified or easily nameable as "them" or "others." In fact, the ubiquity and relative fluidity of what is marginalized in affective terms provides a socially and politically efficient case of "symptom construction," to refer to Freud again, in which anxieties and feelings of guilt can be displaced through projection onto others.

A significant means of thinking about affective marginalization comes from new trends in literature, film, and music, including hemispheric "narco-narratives." I recently coordinated a conference, *New Narrative Territories, Affective Aesthetics, and Ethical Paradox*, at the University of Pittsburgh for mapping out what "narco-narratives" could mean. These narratives at first seem to be dedicated to hemispheric drug traffic; however, they pose, in an unfamiliar way, a number of central conceptual issues, such as affective marginalization and forms of contemporary violence that have grown immanent and thus invisible.

In the end, is not today's hemispheric "war on drugs" a strikingly erratic prolongation of a larger "war on affect"[31] that has shaped modernity's strategies of psycho-economic and geopolitical domination? No doubt, the "war on drugs" has violently interfered in the "distribution of the sensible"[32] on a global scale. Hasn't this war become a sensitive arena shaken by the most exorbitant of desires and outcomes, where economic struggles, fantasies related to Original Sin and guilty territories and populations, and geopolitical punishment are being restaged and played out anew? We only have to look to Hollywood's retelling and partial prefiguring of the ways in which hemispheric conflicts over narcotics are publicized today. The global North's fear of intoxication is often predicated on imageries that hypostasize the South's intoxicating power.

Affective marginalization works in highly flexible terms, for it circumscribes both those in the South who, under conditions of unequal global exchange, make their living by cultivating and trading illicit substances, and those others, predominantly inhabiting the North, who indulge in the pleasures of illicit consumption. To an extent, affective marginalities can be understood as those that carry the burden of sustaining negative affects for the Other and act as potential or imagined trespassers that allow ruling desires and anxieties to occupy a morally safe place.[33] Those carrying the burden can be profane actors in sacred territories or subjects and communities positioned at the low end of the class spectrum, the ethnic scale, or the geopolitical map, or otherwise serving as targets of stigmatization. Our initial considerations on the "deep" history of relationships between humans and the coca plant in the hemisphere might suggest a contrastive lens through which the dominant Western tradition of affective "Orientalization" can be reconsidered. In both Christianity and capitalism, the discursive and imaginary construction of an intoxicating or intoxicated Other is pervasive and open-ended. On the one hand, there has been much criticism of modernity's rampant exploitation of human labor and natural resources across the globe. But on the other, the critical awareness of

[29] Walter Benjamin, "Capitalism as Religion," in *W. B., Selected Writings*, vol. 1, eds. Marcus Bullock, Howard Eiland, Michael W. Jennings (Cambridge and London: Harvard University Press, 2004).

[30] See Uwe Steiner, *Walter Benjamin* (Stuttgart–Weimar: Verlag J. B. Metzler, 2004), 170.

[31] Herlinghaus, *Violence Without Guilt*, 3-28.

[32] See Jacques Rancière, *The Politics of Aesthetics: The Distribution of the Sensible*, trans. Gabriel Rockhill (London and New York: Continuum, 2004).

[33] Herlinghaus, *Violence Without Guilt*, 12-15.

modern manipulation and regulation of the neurochemical resources that sustain the bodies of "modernity's citizens" is still incipient. It is from this vantage point that "transatlantic histories of intoxication" have to be scrutinized anew.

More immediately, the "war on affect" as it is linked to narcotics conflicts in the Western hemisphere challenges current discussions in hemispheric Americas Studies for three reasons. First, it provides a multilayered global scenario that not only has genuine hemispheric contours but that also has strongly and somewhat unexpectedly become fused with cultural, cinematic, and literary imaginaries in both the South and the North. Second, it provides a lens for rehistoricizing Western modernity under the joint markers of colonization/modernization and affective subject fashioning that allows for more subtle and precise insights into delicate issues of citizenship, violence, bare life, sustainability, and the representation of conflicts and values in relation to contemporary history's "open secrets." And third, the heterogeneous realm of hemispheric narco-narratives poses weighty conceptual and ethical questions that shed new light on some of the most intricate problems of our global world. Such considerations lead me to end—provisionally—with a question that Walter Benjamin asked in his essay "Surrealism" (1929): "The dialectics of intoxication are indeed curious. Is not perhaps all ecstasy in *one* world humiliating sobriety in the world complementary to it?"[34]

[34]Benjamin, "Surrealism: The Last Snapshot of the European Intelligentsia," *W. B., Selected Writings*, vol. 2-1, 210.

Chapter 4

Discussion of Smail and Herlinghaus Papers[1]

Audience: Professor Smail, could you elaborate on what's at stake in your attempt to create the methodology of deep history? I understand why it's used in African history, in Native American history, and in other histories with no documentary source base, and why it is used as a counter-narrative for people without history. How does your methodology challenge national histories and histories of American or European exceptionalism?

Smail: What deep history does for peoples without history, in the most common sense of the term, is evident. But it is meant to be as much a political act of collaboration as it is a means of giving a voice to someone. Challenging national histories is a big part of it. Last year one of my students suggested that the Middle East conflicts are fueled by the national histories that came into being in the late nineteenth century. A history centered on humanity transcends that. National histories have a certain role, but they do generate the identities that create conflicts.

Audience: I'm struck by the relationship between textuality and history that Dr. Smail describes and the idea of "I write; therefore, I am." I write; therefore, there is history, as well as implications for existence.

Smail: The question of how writing entered into history is fascinating. By the time of Lynn Hunt's textbook, the notion that writing creates history is dominant, not only because it creates the sources that we use in history, but because we train our students in how to read texts. Arguments from the late nineteenth century that are repeated over the course of the twentieth century suggest that this is the case because writing fixes memory. Therefore, writing perhaps creates the sense of guilt that spurs leaders to act in ways that are "better" than those of their predecessors, and these actions have historical weight. In this argument, writing has the Lamarckian effect of passing on memories in efficacious ways. Though this is true, this argument is merely one way in which history can be framed. Remember that in the 1830s and earlier, writing was considered to be a gift from God; it was presented, not invented. Coming to grips with the fact that writing was invented was one of the traumas of the time revolution.

The destruction of archives has been tied to the destruction of whole peoples. Think about what happened to the archives of Jews and Muslims in medieval and 16^{th}-century Europe. The Muslim population of Al-Andalus eventually dissolved into the Christian population, in part because of the destruction of Muslim archives. Writing itself becomes highly symbolic. I write; therefore I am, and therefore, if I destroy everything you've ever written, you are not.

Audience: It seems to me that once you suggest various causes and effects, you're positing yourself as smarter than your subjects.

Smail: Histories don't begin at birth moments, and we must recognize that we choose to begin our histories at moments that suit needs of convenience and not historicity. People who work in paleontology roll their eyes and ask, "How can you start at such a recent time?" My choices for beginnings are based

[1] This content is available online at <http://cnx.org/content/m34249/1.2/>.

on my expertise, but the model itself could run back much further. The field of big history does this well, because it begins with the big bang. The courses that are taught in it tend to spend at least 25 percent of their time on geology and environment. I tend to center my big history on humans, but because of what I call the phylogenetic model, my histories are open to the non-human. The genealogical instinct in the book of Genesis is to use the descendance of humankind as the frame for writing history. In some respects, the reaction against that method created the short histories and predominance of birth moments that we have now.

Audience: One of the features of the ontogenetic temptation is the close intertwining of story-telling and historical disciplines. It seems that one of the exciting horizons that deep or big history approaches is the possibility that our perception of knowledge might not be limited to language-based, narrative models. Is there a media revolution in terms of historical method and practice, where a narrative history is no longer the norm? Are there new modes of history that re-think how story-telling interlocks with other layers of description and other models of how historical knowledge can be imagined?

Herlinghaus: Connecting the phenomenology of narcotics or the ecology of psychoactive substances with deep history can broaden the framework of modern epistemology, subjectivity, story-telling, and many other issues. Stretching back genealogically allows for different perceptions to emerge, including, for example, those of subjectivity. Social and ecological decisions on narcotics use are made by people in specific contexts, and deep history allows a different context of subjectivity to come to the fore. In the case of intoxication through narcotics, where would we locate the human versus the non-human? If narcotics are non-human, they don't become human by ingestion; rather the human being becomes something hybrid and different from what we have been calling the modern subject. A different concept of storytelling might reveal other ecological and bodily relationships among human communities, the environment, and conflict.

Smail: As Hermann said, the body-mind distinction is problematic. Goods and consumption make for rich deep histories, because the history of goods takes us back seamlessly 6,000 years. They also make for interesting phylogenetic histories, because goods intertwine with human bodies in the way that narcotics often do. The archaeologist Clive Gamble said that without goods, there are no humans; the two are so tightly linked that their histories are inseparable. For example, fasteners, such as bone pins and buttons, have an extraordinary phylogeny, expanding in an environment of human taste and human use. You could look at history from the point of view of the fastener, as if it were a prion or virus that has harnessed the energy of human societies for its own evolution. Paul Connerton's book, *How Societies Remember*, has a brilliant discussion of ways to frame histories or narratives that are not centered on writing alone.

Audience: Might the concept of "man the hunter" figure into the changing frames of history?

Smail: In part because of what was happening with trans-anthropology, European history cut itself off from anthropology, and a wall was erected between the two fields. The changes in titles of histories are also tied to the Second World War. A survey of titles reveals that questions on the origins of human rights faded away in an extraordinary way. How can you write about the origins of human rights in 1951, with such a specter hovering over Europe? Later these questions return.

Chapter 5

What Is Cultural Economy?[1]

At the outset, let me say what "cultural economy" is *not*. Cultural economy is *not* the study of the artifacts and institutions—such as literary texts, media forms, or the publishing industry—that are assumed to reside in some relatively autonomous domain called "culture." In fact, cultural economy takes as its initial premise the claim that "culture" cannot be separated from the other two concepts that have traditionally organized the social and cultural sciences: the economy and the social.[2] Once we assume that these three concepts, as well as the ontological entities and practices to which they refer, are interrelated in complex ways, it no longer seems adequate to analyze individual discourses, events, institutions, or texts in the kind of hermetic environments that traditional disciplines create. Cultural economy thus examines economic institutions, practices, and texts *as* cultural entities, just as it explores the economic dimensions *of* cultural practices and products. And it also investigates the ways that these intersections emanate from and inform *social* forms, including forms of government, modes of persuasion, and ways of knowing and failing to know the world.

Next it may be helpful to examine what cultural economy *resembles*, because the new approach of cultural economy is certainly not the first attempt to treat economic practices as cultural or social forms. In fact, the ongoing financial crisis has generated a veritable avalanche of cultural commentary about economic matters, some of which overlaps with my work and that of my colleagues. The discipline of sociology includes both the sociology of financial markets and the study of such organizations as trading floors. (David Stark's Center for Organizational Innovation at Columbia University is one manifestation of this.) In some English departments, faculty practice what Martha Woodmansee and Mark Osteen have called the "new economic criticism."[3] Finally, in anthropology, some scholars stress the anthropology of markets or the culture of finance, others conduct ethnographies of stock traders, and still others call their work the social studies of finance. Such work, wherever it is found in U.S. universities, also has an international counterpart (with important centers in Edinburgh, Paris, and London), is simultaneously institutionalized (in such centers as Stark's at Columbia, the Economic and Social Research Council professorial fellowship at Edinburgh, and so on) and has a presence on the web (in, for example, the Social Studies of Finance network). There is already at least one journal devoted to scholarship in this area (*Journal of Cultural Economy*) and at least one annual conference (the Social Studies of Finance Conference). A growing number of listservs disseminate calls for papers on related topics; these promise conferences such as the one I am helping to organize in the spring of 2010 in New York, special issues of journals, and collections of working papers. If not a discipline, cultural economy (or, as it may also be called, the social studies of finance or financial anthropology) certainly constitutes a publishing opportunity.

Rather than trying to draw fine distinctions among the various enterprises mentioned above, I will identify

[1] This content is available online at <http://cnx.org/content/m34260/1.4/>.

[2] The "Editorial Statement" of the *Journal of Cultural Economy* states that "the three main organizing concepts of the social and cultural sciences [are] culture, economy, and the social." *Journal of Cultural Economy* 1.3 (2008), n.p.

[3] Mark Osteen and Martha Woodmansee, "Taking Account of the New Economic Criticism: An Historical Introduction," in *The New Economic Criticism: Studies at the Intersection of Literature and Economics*, Mark Osteen and Martha Woodmansee, eds., (London: Routledge, 1999), 3-50.

their most obvious areas of overlap and a broad methodological difference that divides them, then provide two examples of the kind of work associated with this general field. I will conclude with a brief consideration of how the traditional organization of academic disciplines in U.S. universities makes it difficult to incorporate this field into the existing disciplinary arrangement.

A quote from the website of the Social Studies of Finance, which emanates from Donald Mackenzie's working group at the University of Edinburgh, helps illustrate the domain these enterprises share and suggests one distinguishing feature:

> *To understand the creation, development, and effects of financial markets we need more than the perspectives of economics or of a "behavioural" finance that is rooted in individual psychology. Markets are cultures. Behaviour in them is often strongly gendered. Spatial concentrations such as the City of London are of great importance. The long history of financial markets can place modern developments in context. Markets and governments interact in important ways. The "science"' and "technology" of markets—the practical applications of finance theory; information infrastructures; and so on—is crucial. Legal frameworks matter a great deal. Networks of people who know each other personally often play economically significant roles. "Social studies of finance" is the application to financial markets of the social-scientific disciplines that study phenomena like the above—disciplines such as anthropology, gender studies, geography, history, politics, social studies of science, sociolegal studies, and sociology.*[4]

In 2003, the UK Economic and Social Research Council awarded Mackenzie a professorial fellowship to research this field; the fellowship supports this site and a group of post-doctoral students who work with Mackenzie.

As this description suggests, the social studies of finance group tends to view "culture" through the lens of the "social-scientific disciplines" and thus to apply to the culture of the market methods traditionally used by the social sciences: ethnography, ethnology, historical analysis, and the investigation of the social construction of concepts (a method I associate with science studies). The most comparable project in the humanities disciplines is probably the so-called "new economic criticism," an enterprise defined, in an anthology published under that name, as occupying "the intersection of literature and economics."[5] The essays collected in the anthology suggest that, even by 1999, this intersection was already sprawling: the volume includes essays about metaphorical economies (Lyotard's "libidinal economy"), capitalist markets (the financing of modernism), and treatments of the signifying dimension of money (money and semiosis in eighteenth-century German language theory). What unites these essays is the authors' determination to adapt the methodologies associated with the humanities—textual interpretation, historical analysis, the demystifying and deconstructive impulses associated with the linguistic turn—to the events, texts, and components of market economies.

Because the humanities disciplines use methods that feature texts and interpretation and the social science disciplines rely on practice- and description-oriented methodologies, the two sets of disciplines approach the intersection of economics, culture, and the social in different ways. This methodological rift—along with the even greater distance between the methodological assumptions of the humanities and those of the hard sciences and mathematics—constitutes an important impediment to attempts to incorporate this enterprise into the existing disciplinary arrangement of U.S. universities. Before examining those impediments in some detail, let me give you two examples of how cultural economy (or whatever we decide to call it) looks in practice. The first is my recent essay for a forthcoming collection of papers on the relationship between modernity and liberalism. The essay is entitled "Stories We Tell about Liberal Markets: The Efficient Market Hypothesis and Great-Men Histories of Change."[6] In the essay, I provide an historical account of the rise of the efficient market hypothesis and argue that the way this history has typically been narrated (as the

[4] School of Social and Political Sciences, University of Edinburgh, "Social Studies and Finance," http://www.sociology.ed.ac.uk/finance/index.html (<http://www.sociology.ed.ac.uk/finance/index.html>) (accessed 12/16/09).

[5] Osteen and Woodmansee, **The New Economic Criticism.**

[6] Forthcoming in *The Peculiarities of Liberal Modernity in Britain: Essays in Honour of Patrick Joyce.* Edited by Simon Gunn and James Vernon (Berkeley: University of California Press, 2010).

triumph of a few pioneering economic geniuses) perpetuates certain paradoxes that lie at the heart of modern liberalism. Briefly, the efficient market hypothesis is a theory, formulated by economists and generally stated mathematically, that claims that financial markets are efficient and self-regulating, with stock prices serving as a kind of epistemological barometer because they reflect all the information about individual companies and the market as a whole. This theory allows economists to determine (and to diagram on a graph) what they call the "efficient frontier" (the points at which an investor's returns are maximized in relation to minimized points of risk). In ways too complicated for me to rehearse here, the efficient market hypothesis is the basis of the portfolio theory of investing (which says that an investor should evaluate the return and risk of an entire portfolio, not individual stocks), the Black-Scholes-Merton formula for pricing options (which enables investors to price futures and other kinds of derivatives), and the entire set of assumptions that led investment banks to develop and trade the complex financial products—credit default swaps, collateralized debt obligations, mortgage-backed securities, and other structured investment products—whose misuse has nearly destroyed the global economy during the last several years.

The essay is an attempt to flesh out the historical, political, legal, and epistemological contexts in which an academic theory was gradually translated into the mathematical formulae and assumptions that led the so-called quants (financial engineers) to develop derivatives and various kinds of structured investment products. The events I describe span the period between 1776, when Adam Smith formulated what looks like a model of market equilibrium (the "invisible hand"), and 2009, when government officials, bank executives, and ordinary people continued to dig their way out of the rubble of foreclosed homes, lost jobs, and outright fraud left behind by the missteps inspired by the efficient market hypothesis. These events include the forty-four–nation acceptance of the Bretton Woods agreement (which, in 1944, made the U.S. dollar the world's reserve currency); the 1974 passage of ERISA, the Employee Retirement Security Act (which required U.S. companies to set aside and invest money to fund their employees' retirements); the 1999 repeal of the Glass-Steagall Act (which had previously separated ordinary commercial banks from their investment banks); the rise of U.S. business schools, where the academic discipline of economics gradually joined managerial science as the core of the curriculum; the mathematization of economics; and the rise of professional financial advisors. Against the backdrop of policies associated with the supply-side economics championed in the 1980s by Ronald Reagan and Margaret Thatcher, the regulatory permissiveness associated with the Bush-Clinton-Bush administrations in the next decades, and the rapid displacement of nation-state oversight by the rule of self-interested multinational corporations in the 1990s, real-life manifestations of the efficient market hypothesis began to *shape* the market that the theory was supposed to *describe*. Gradually, the premises of the efficient market hypothesis became a self-fulfilling prophecy—even as its shortcomings planted the destructive seeds that would cause most economists to abandon it virtually overnight. As recently as 2007, Peter L. Bernstein, one of the great champions of this thesis, could celebrate its triumph (in distinctly ominous terms): "it may sound ironic," Bernstein wrote in the introduction to *Capital Ideas Evolving*, "but as investors increasingly draw on Capital Ideas [the assumptions implicit in the Efficient Market Hypothesis] to shape their strategies, to innovate new financial instruments, and to motivate the drive for higher returns in relation to risk, the real world is on a path toward an increasing resemblance to the theoretical world described in *Capital Ideas* [the title of Bernstein's earlier book]."[7] A year later, George Soros, whose dissenting voice had long been crying in the wilderness, insisted that the efficient market hypothesis was *only* a theory. "While it is possible to construct theoretical models along [the] lines [of the thesis]," Soros wrote in *The Crisis of 2008*, "the claim that those models apply to the real world is both false and misleading."[8] For Soros, the fall of the investment house Lehman Brothers in September 2008 decisively demonstrated the dynamic he had been seeing for over a decade: as Bernstein triumphantly claimed, the implementation of the efficient market hypothesis in modern investments, instruments, and innovations had actually created a recursive effect, in which the theory was **shaping** what it ought merely to **describe**. Logically enough, when the institutions that created the instruments began to collapse, the credibility of the theory vanished too. "The demise of Lehman Brothers conclusively falsifies the efficient market hypothesis," Soros announced.[9]

[7] Bernstein, *Capital Ideas Evolving*. (Hoboken, N.J.: John Wiley and Sons, 2007), xviii.

[8] George Soros, *The Crash of 2008 and What It Means: The New Paradigm for Financial Markets* (New York: Public Affairs, 2009), Kindle Electronic edition, location 797.

[9] Soros, *The Crash of 2008*, location 1521-24.

In "The Stories We Tell about Liberal Markets," I explain in more detail how those financial instruments—the alphabet soup of CDOs, CDSs, ABSs, and SIPs—released the destructive potential of the efficient market hypothesis into the global economy. Here I will instead consider the stories people tell about these events. Even though the efficient market hypothesis insists that the activities of individuals don't matter—because the autonomous system of the market is self-organizing and controlled—histories of this thesis almost all take the form of great-men narratives, which chronicle the "pioneering," "heroic," or "villainous" contributions of individual men (and they are almost all men). The paradox whereby a set of conventions emphasizing individual achievements persists in narratives about the self-regulating capital market thus repeats (and illuminates) one of the central paradoxes of liberalism's individualism: in this model, some people can be sufficiently "creative" and "heroic" to become *characters* who merit narrative attention, but neither these traits nor the narratives that celebrate (or excoriate) them depart from the larger patterns of liberalism. What these narratives reveal is that the competition presented as "natural" to the free market system encourages creativity *only* in the terms that liberalism allows. The creativity that registers in this system as worthy of narrative attention is strictly that which furthers the "evolution" of liberalism's primary institutions.

The reason this paradox matters is that our preference for great-men narratives reinforces a desire to identify individual culprits or saviours. This in turn prevents us from understanding that the problems masked by the embrace of the efficient market hypothesis are systemic, not the result of individual transgressions. Systemic problems require systemic solutions, not simply the prosecution of individuals who have taken advantage of loopholes written into the system itself. Great-men narratives also prevent ordinary people from realizing that we also bear responsibility for what has happened. When ordinary people assume that finance is just too difficult to understand, they implicitly accept peripheral roles in the financial activities that actively affect their personal well-being. These stories matter because they perpetuate the idea that some individuals rightfully exercise more agency than others, just as the hypothesis that these stories (ironically) endorse perpetuates the idea that whatever the market does is (somehow) right.

My second example offers an alternative to the great-men narratives of the financial crisis. In an essay entitled "From New Deal Institutions to Capital Markets," forthcoming in *Accounting, Organizations, and Society*, Martha Poon argues that it was the adoption by Fannie Mae and Freddie Mac, the two government-sponsored mortgage agencies, of a particular formula for determining the risk that would-be home-owners posed that led to the distinction between "prime" mortgages and "subprime" mortgages.[10] It was this distinction, in turn, that enabled mortgage originators to assign different interest rates to different kinds of borrowers, and purchasers of these mortgages to expect different kinds of returns from them. These differential interest rates, along with the array of mortgage products created to enable even unemployed borrowers to secure a mortgage, rendered one group of mortgages attractive to large-scale investors because their higher risk meant that they yielded higher returns; attracted to these high-risk, high-return mortgage-backed securities, investment banks were able to generate huge profits by using them to collateralize (and thus leverage) their own borrowing from other investment banks, local governments, and pension funds. As we now know, the interest rates that enticed unqualified borrowers into the housing market were kept artificially low at first by low- or no-interest teaser rates, which had to reset if lenders were to make good on the loans secured against them. When these rates reset in the fall of 2006, borrowers began to default, the subprime mortgage industry collapsed, investment banks discovered that their own highly leveraged wagers had lost value, and credit markets froze. Unable to borrow money for its day-to-day operations, the investment bank Bear Stearns collapsed, Fannie Mae and Freddie Mac were nationalized, Lehman Brothers failed, the insurance giant AIG had to be bailed out by the U.S. government, Congress refused to pass legislation designed to pump money into the system (the TARP, or Troubled Asset Relief Program), global stock markets tanked, and everyone's 401(k) lost 40 percent of its value.

How could the adoption of a system for producing a credit score be responsible for this disaster? Poon demonstrates that what lay behind the predatory lenders and the greedy investment bankers was a new calculative infrastructure that created the investment subprime—"at once a class of consumers, a set of 'exotic' mortgage products, and a class of mortgage backed securities—as a visible and fluid network of

[10] Martha Poon, "From New Deal Institutions to Capital Markets: Commercial Consumer Risk Scores and the Making of Subprime Mortgage Finance," *Accounting, Organizations and Society* (2009), doi:10.1016/j.aos.2009.02.003.

high-stakes financial action" (2-3). This infrastructure, in turn, was produced when the mortgage industry as a whole adopted a single metric for evaluating the relative chance that individual borrowers would default on their loans. The FICO credit bureau score, a commercially available consumer risk assessment tool, was originally one among many such metrics; the three companies that market credit scores under the brands of Trans Union, Equifax, and Experian initially offered competing metrics. In 1995, however, Freddie Mac decided to adopt FICO in order to standardize underwriting practices in federally sanctioned lending. FICO was then adopted by other lenders and rating agencies (including not only the three companies I just listed, but also Standard and Poor's, the equity rating agency), and by 2003 it had become the industry standard—in part because it could easily be operationalized through proprietary, automated underwriting software (Loan Prospector). With the adoption of FICO, credit-by-screening, or the case-by-case evaluation of potential borrowers as individuals, was replaced by credit-by-risk, an automated, quantitative assessment of risk pools that did not even require individual interviews. Once in place, the score scale FICO created not only discriminated between a group of loans designated "prime" and those designated "subprime"; it also made it possible for loan originators to devise products for which members of the second group could qualify. In Poon's words, "once 'creditworthiness' is expressed through a statistical scale of gradated risk, a loan can be arranged for people who are of low credit quality; that is, for those who would not be considered particularly 'creditworthy' from a screening point of view. Screening is a *risk minimizing* strategy; statistical lending is a *risk management* strategy, that is, one that embraces risk" (14). With lenders embracing risk and packaging (and pricing) mortgages according to risk pools, the pieces were in place for investment banks to buy up, then bundle and slice these pools of mortgages, and then to use them to collateralize their own heavily leveraged bets.

Poon's conclusions are sobering. "It is not quantification, model building, or numerical expression as information *per se*, that should be linked to increased channels for high-risk investment in the mortgage industry," she writes. "Nor can responsibility for the changes be flatly pinned on the [government-sponsored enterprises, like Freddie Mac]. . . . It is the pioneering journey of FICO scores throughout the industry that has integrated, assembled, and aligned different market agents. The integrity of the chain . . . is what has rendered these diverse agents capable of engaging together in a distinctive and coherent, globe spanning circuit of productive subprime real estate finance" (17). Then she concludes: "In this view, the protracted globe-spanning credit crisis . . . should be studied first and foremost as the temporary achievement of a tightly calculated system of financial order, not as disorder" (19).

While Poon and I would surely disagree about many things —she is interested in the formal properties of technical systems, not "grander" themes like liberalism—Poon and I are engaged in projects more alike than different. Both of us, for example, want to understand how elements of the financial infrastructure have been naturalized—how they have been built into the financial system in ways that make it impossible for individual actions to counteract them. No individual's actions can be either "heroic" or decisively "villainous" because no individual can act outside the system that is increasingly tightly organized by both the (economic) assumption that financial interconnectedness is algorithmically rational and the tools (like the FICO scores) that make it so.

Integrating projects like Poon's and mine into the existing array of academic disciplines will be difficult. As I suggested above, method poses an enormous challenge. Typically, the social sciences take their methodological clues from the sciences, and, even when social scientists like Poon focus on the social construction of entities such as the calculative apparatus of credit scores, the goal is to produce a description that is as accurate—and, by implication, as objective—as possible. In the humanities, which have long emphasized interpretation, objectivity is rarely embraced as the primary outcome. Because most humanists' objects of analysis derive their identity from a degree of indeterminacy, moreover—they cultivate ambiguity as part of their identity as aesthetic objects—an analyst's ability to generate an accurate description is either merely a first step toward interpretation or entirely beside the point. As long as social scientific and humanities disciplines define their enterprises in opposition to each other, their methodologies will continue to pull in opposite directions; and, as long as this is the case, it will be difficult for disciplinary curricula to absorb more than a few outlying courses that depart so radically from the disciplinary norm.

But the greatest challenge to any effort to incorporate cultural economy into existing academic curricula

emanates from the role mathematics now plays in the discipline of economics. Even though economists did not embrace mathematics until the 1970s, mathematics is now central to economics and to the subdiscipline of financial economics. Pick up any advanced textbook on finance or investing, and the first thing you will see are mathematical equations. The problem posed by the centrality mathematics now assumed in financial economics is not that people who are good at description and interpretation are rarely good at math. The problem is that a deterministic mathematical model, which is what equations are, has to make several assumptions in order to claim that equations are relevant to the real world of finance. The first assumption of mathematical modelling is that real-world examples can be captured by a financial type (x); this removes any anomalies that might make the real-world instance unpredictable. Second, mathematical modelling assumes that future events will repeat past events and that any event that does vary from past events is a one-off (thus irrelevant) departure from the norm. Third, it assumes that markets are rule-governed—that is, efficient (that they enjoy perfect liquidity, infinite credit, and no counterparty risks). All of these assumptions can be summarized thus: mathematical models assume—and produce—abstract space, not the complex, probabilistic, socio-historical, and self-reflexive world where real-life events, including financial events, occur.[11] It is difficult to see how a discipline that embraces mathematics in order to gain legitimacy as a science can ever be incorporated into any other discipline that seeks to understand—whether through description or interpretation—the anomalies that socio-historical conditions generate. As one Wall Street trader put it when home foreclosures began to mount: "You cannot model human behavior with mathematics. There's no computer model that will ever tell you whether someone will pay their mortgage. And there never will be. The risk will always be there. You cannot calculate it. Risk and reward are beyond the intellectual limits of a computer."[12]

At most, I think, any instances of cultural economy, the social study of finance, or whatever we decide to call it will appear at the boundary that separates the humanities and the social sciences. As long as the present configuration of the disciplines obtains, individuals who practice economics (most of whom aspire to be called scientists, *not* social scientists and certainly not humanists) will have little respect for this emergent enterprise—even if it helps humanists, social scientists, and the larger population understand the complex ways that financial systems affect our lives.

[11] Thanks to Edward LiPuma for formulating these points about mathematics. Private electronic correspondence.

[12] Lawrence G. McDonald, *A Colossal Failure of Common Sense: The Inside Story of the Collapse of Lehman Brothers* (New York: Crown, 2009), 134.

Chapter 6

Digital Humanities 2.0: A Report on Knowledge[1]

Thirty years ago, the French philosopher and literary theorist Jean-François Lyotard published a prescient "report on knowledge" called *The Postmodern Condition*. Originally commissioned by the Conseil des Universités of the government of Quebec, the report was an investigation of "the status of knowledge" in "computerized societies" (3). Lyotard's working hypothesis was that the nature of knowledge—how we know, what we know, how knowledge is communicated, what knowledge is communicated, and, finally, who "we" as knowers are—had changed in light of the new technological, social, and economic transformations that have ushered in the post-industrial age, what he calls, in short, postmodernism. Much more than just a periodizing term, postmodernism, for Lyotard, bespeaks a new cultural-economic reality as well as a condition in which "grand narratives" or "meta-narratives" no longer hold sway: the progress of science, the liberation of humanity, the spread of Enlightenment and rationality, and so forth are meta-narratives that have lost their cogency. This itself is not an original observation; after all, Nietzsche, Benjamin, Adorno, Horkheimer, Foucault, and others have variously shown where the fully enlightened world ends up. What sets Lyotard apart is his focus on how knowledge has been transformed into many "small" (and even competing and contradictory) narratives and how scientific knowledge in particular has become transformed into "bits of information" with the rise of cybernetics, informatics, information storage and databanks, and telematics, rendering knowledge something to be produced in order to be sold, managed, controlled, and even fought over (3-5). In these computerized societies (remember this is 1979: the web didn't exist and the first desktop computers were just being introduced), the risk, he claims, is the dystopian prospect of a global monopoly of information maintained and secured by private companies or nation-states (4-5). Needless to say, Google was founded about twenty years later, although ostensibly with a somewhat different mission: to make the world's information universally accessible and useful.

Lyotard articulated one of the most significant contemporary struggles—namely, the proprietary control of information technologies, access and operating systems, search and retrieval technologies, and, of course, content, on the one hand, and the "open source" and "creative commons" movement on the other. Beyond that, he drew attention to several other changes that have affected what he considered to be the state of knowledge in postmodernism: first, the dissolution of the social bond and the disaggregation of the individual or the self (15); second, the interrogation of the university as the traditional legitimator of knowledge; and third, the idea that knowledge in this new era can only be legitimated by "little narratives" based on what he calls "paralogy" (a term that refers to paradox, tension, instability and the capacity to produce "new moves" in ever-shifting "language games"). While I will not evaluate Lyotard's argument extensively here, I do think it's worth underscoring these points because, perhaps surprisingly, they apply just as much to 2009 as they did to 1979. After all, the social bond today is fundamentally realized through interactions with distributed and equally abstracted networks such as email, IM, text messaging, and Facebook that

[1] This content is available online at <http://cnx.org/content/m34246/1.6/>.

are accessed through computers, mobile phones, and other devices connected to "the grid." It has become impossible to truly "de-link" from these social networks and networking technologies, as the self exists "in a fabric of relations that is now more complex and mobile than ever before . . . located at 'nodal points' of specific communication circuits. . . . Or better [Lyotard says] one is always located at a post through which various kinds of messages pass" (15).

Lyotard's discussion of the role of the university in postmodernism has become increasingly relevant over the last three decades. The university is no longer the sole, and perhaps not even the privileged, site of knowledge production, curation, stewardship, and storage. Traditionally an exclusive, walled-in institution, the university legitimates knowledge while reproducing rules of admission to and control over discourses. Not just anyone can speak (one must first be sanctioned through lengthy and decidedly hierarchical processes of authorization), and the knowledge that is transmitted is primarily circulated within and restricted to relatively closed communities of knowers (Foucault calls them "fellowships of discourse"). True statements are codified, repeated, and circulated through various kinds of disciplinary and institutional forms of control that legitimize what a "true statement" is within a given discipline: before a statement can even be admitted to debate, it must first be, as Foucault argued repeatedly, "within the true" (224). For an idea to fall "within the true," it must not only cite the normative truths of a given discipline but—and this is the crux of this essay—it must look "within the true" in terms of its methodology, medium, and mode of dissemination. Research articles can't look like Wikipedia entries; monographs can't be exhibitions curated in Second Life. At least not yet . . .

Thankfully, universities are far from static or monolithic institutions and, as Lyotard and others point out, there is plenty of room for an imaginative reinvention of the university, of disciplinary structures, and research and pedagogical practices. This imaginative investment lies in the ability to "make a new move" or change the rules of the game by, perhaps, arranging or curating data in new ways, thereby developing new constellations of thought that "disturb the order of reason" (61). The next part of this article will address precisely what this might mean for the work of the Digital Humanities today.

For now, I want to articulate the third and final point that I adopt from Lyotard, namely the problem of legitimation. Wikipedia can stand as a synechdoche for the problems of knowledge legitimation: who can create knowledge, who monitors it, who authorizes it, who disseminates it, and whom does it influence and to what effect? Legitimation is always, of course, connected to power, whether the power of a legal system, a government, a military, a board of directors, an information management system, the tenure and promotion system, the book publishing industry, or any oversight agency. Not only are modes of discourse (utterances, statements, arguments) legitimized by the standards established by a given discipline, by its practitioners, and by its history, so are the media in which these discursive statements are formulated, articulated, and disseminated. The normative medium for conveying humanities knowledge (certainly in core disciplines such as literature and literary studies, history, and art history, but also philosophy and the humanistic social sciences, as they have been codified since the nineteenth century) is print: the printed page—linear, paginated prose supported by a bibliographic apparatus—is the naturalized medium, and the knowledge it conveys is legitimated by the processes of peer review, publication, and citation. This is not necessarily a problem—it certainly works, makes sense, and is authoritative. But we should also remember that this medium wasn't always used and won't always be: think, for example, of rhetoric and philosophy, grounded in oral and performative traditions, or of "practice-based" disciplines such as dance, design, film, and music, in which the intellectual product is not a print artifact. In much the same vein, Digital Humanities denaturalizes print, awakening us to the importance of what N. Katherine Hayles calls "media-specific analysis" in order to focus attention on the technologies of inscription, the material support, the system of writing down ("aufschreiben," as Friedrich Kittler would say), the modes of navigation (whether turning pages or clicking icons), and the forms of authorship and creativity (not only of content but also of typography, page layout, and design). In this watershed moment of transformation, awareness of media-specificity is nearly inescapable.

Far from suggesting that new technologies are better or that they will save us (or resuscitate our "dying disciplines" or "struggling universities"), Lyotard concludes his report with a call for the public to have "free access to the memory and data banks" (67). He grounds the argument dialectically, as technologies have the potential to do many things at once: to exercise exclusionary control over information as well as

to democratize information by opening up access and use. This, I would argue, is the persistent dialectic of any technology, ranging from communications technologies (print, radio, telephone, television, and the web) to technologies of mobility and exchange (railways, highways, and the Internet). These technologies of networking and connection do not necessarily bring about the ever-greater liberation of humankind, as Nicholas Negroponte asserted in his wildly optimistic book *Being Digital* (1995), for they always have a dialectical underbelly: mobile phones, social networking technologies, and perhaps even the hundred-dollar computer will not only be used to enhance education, spread democracy, and enable global communication but will also likely be used to perpetrate violence and even orchestrate genocide in much the same way that the radio and the railway did in the last century (despite the belief that both would somehow liberate humanity and join us all together in a happy, interconnected world that never existed before [Presner]). Indeed, this is why any discussion about technology cannot be separated from one about power, legitimacy, and authority.

Rather than making predictions, I would like to turn to the state of knowledge in the humanities in 2009. My relatively recent arrival in this discussion, after centuries of thought on this topic, constitutes, in fact, a unique vantage point from which I can begin: today, the changes brought about by new communication technologies—including but hardly limited to web-based media forms, locative technologies, digital archives, social networking, mixed realities, and now cloud computing—are so proximate and so sweeping in scope and significance that they may appropriately be compared to the print revolution.[2] But our contemporary changes are happening on a very rapid timescale, taking place over months and years rather than decades and centuries. Because of the rapidity of these developments, the intellectual tools, methodologies, disciplinary practices, and institutional structures have just started to emerge for responding to, engaging with, and interpreting the massive social, cultural, economic, and educational transformations happening all around us. Digital Humanities explores a universe in which print is no longer the exclusive or normative medium in which knowledge is produced and/or disseminated; instead, print finds itself absorbed into new, multimedia configurations, alongside other digital tools, techniques, and media that have profoundly altered the production and dissemination of knowledge in the Arts, Humanities, and Social Sciences (see, for example, the Digital Humanities Manifesto, Figs. 1 and 2).

I consider "Digital Humanities" to be an umbrella term for a wide array of practices for creating, applying, interpreting, interrogating, and hacking both new and old information technologies. These practices—whether conservative, subversive, or somewhere in between—are not limited to conventional humanities departments and disciplines, but affect every humanistic field at the university and transform the ways in which humanistic knowledge reaches and engages with communities outside the university. Digital Humanities projects are, by definition, collaborative, engaging humanists, technologists, librarians, social scientists, artists, architects, information scientists, and computer scientists in conceptualizing and solving problems, which often tend to be high-impact, socially-engaged, and of broad scope and duration. At the same time, Digital Humanities is an outgrowth and expansion of the traditional scope of the humanities, not a replacement for or rejection of humanistic inquiry. I firmly believe that the role of the humanist is more critical at this historic moment than ever before, as our cultural legacy as a species migrates to digital formats and our relation to knowledge, cultural material, technology, and society is radically re-conceptualized. As Jeffrey Schnapp and I articulated in various instantiations of the Digital Humanities Manifesto, it is essential that humanists assert and insert themselves into the twenty-first century cultural wars (which are largely being defined, fought, and won by corporate interests). Why, for example, were humanists, foundations, and universities conspicuously—even scandalously—silent when Google won its book search lawsuit and effectively won the right to transfer copyrights of orphaned books to itself? Why were they silent when the likes of

[2]Web-based media forms refer to any media produced and broadcast on the web, ranging from YouTube videos to Wikipedia. Many of these media are also viewable on mobile devices and, increasingly, search technologies are keyed to physical location. With a GPS-enabled mobile phone, for example, geographically relevant content can be uploaded and downloaded. Digital archives are steadily moving from being "digital silos" to becoming interoperable repositories, allowing for materials to be aggregated and integrated across collections. With the innovations of Google and Amazon, to name two examples, cloud computing no longer stores data on single machines or a limited number of servers but in the (virtually) infinite "cloud," rendering data accessible anywhere, at anytime. Finally, the explosion of social networking sites allows for real-time interaction with friends, creating online communities composed of personal networks. Mixed reality applications such as Second Life integrate real-world social networking with embodied experiences of navigation, gaming, and moving through virtual spaces.

Sony and Disney essentially engineered the Digital Millennium Copyright Act, radically restricting intellectual property, copyright, and sharing? The Manifesto is a call to humanists for a much deeper engagement with digital culture production, dissemination, access, and ownership. If new technologies are dominated and controlled by corporate and entertainment interests, how will our cultural legacy be rendered in new media formats? By whom and for whom? These are questions that humanists must urgently ask and answer.

Like all manifestos, especially those that came out of the European avant-garde in the early twentieth century, the Digital Humanities Manifesto is bold in its claims, fiery in its language, and utopian in its vision. It is not a unified treatise or a systematic analysis of the state of the humanities; rather, it is a call to action and a provocation that has sought to perform the kind of debate and transformation for which it advocates. As a participatory document circulated throughout the blogosphere, the three major iterations of the Digital Humanities Manifesto are available in many forums online: Versions 1.0 and 2.0 exist primarily as Commentpress blogs, and Version 3.0 is an illustrated, print-ready PDF file, which, as of this writing, has been translated into four languages and widely cited, cribbed, remixed, and republished on numerous blogs. The rationale for using Commentpress was to make some of the more incendiary ideas in the Manifesto available for immediate public scrutiny and debate, something that is facilitated by the blogging engine's paragraph-by-paragraph commenting feature, resulting in a richly interlinked authoring/commenting environment. In a Talmudic vein, the comments and critiques quickly overtook the original "text," creating a web of commentary and a multiplication of voices and authors. By Versions 2.0 and 3.0, the authorship of the Manifesto had extended in multiple directions, with substantial portions authored by scholars in the field, students, and the general public. Moreover, since the Manifesto was widely distributed in the blogosphere and on various Digital Humanities listservs, it instantiated one of the key things that it called for: participatory humanities scholarship in the expanded public sphere.

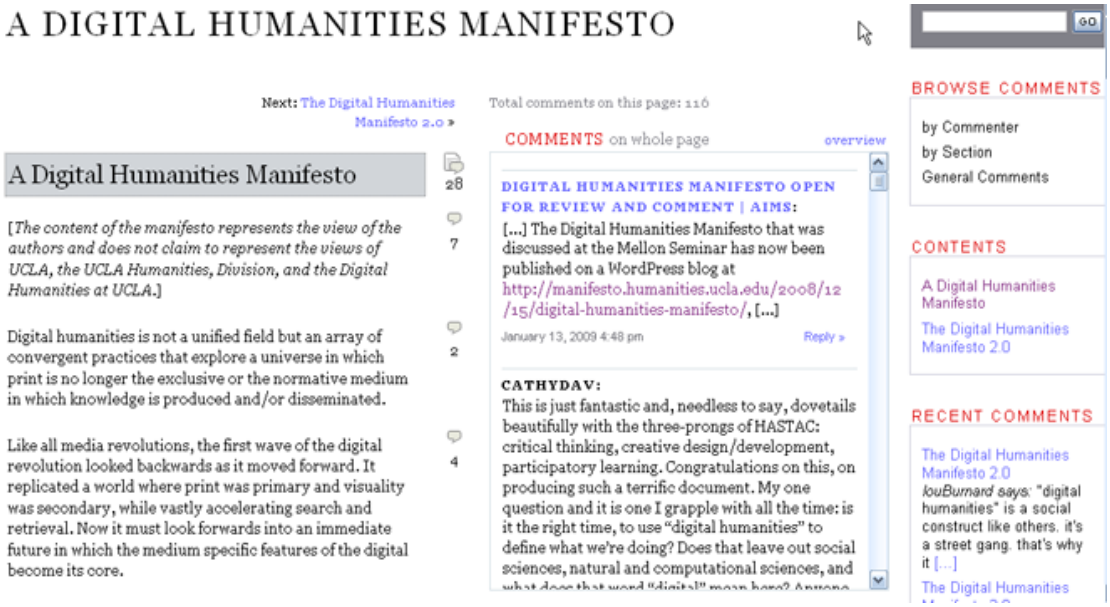

Figure 6.1

http://manifesto.humanities.ucla.edu/2008/12/15/digital-humanities-manifesto/[3]

[3] http://manifesto.humanities.ucla.edu/2008/12/15/digital-humanities-manifesto/

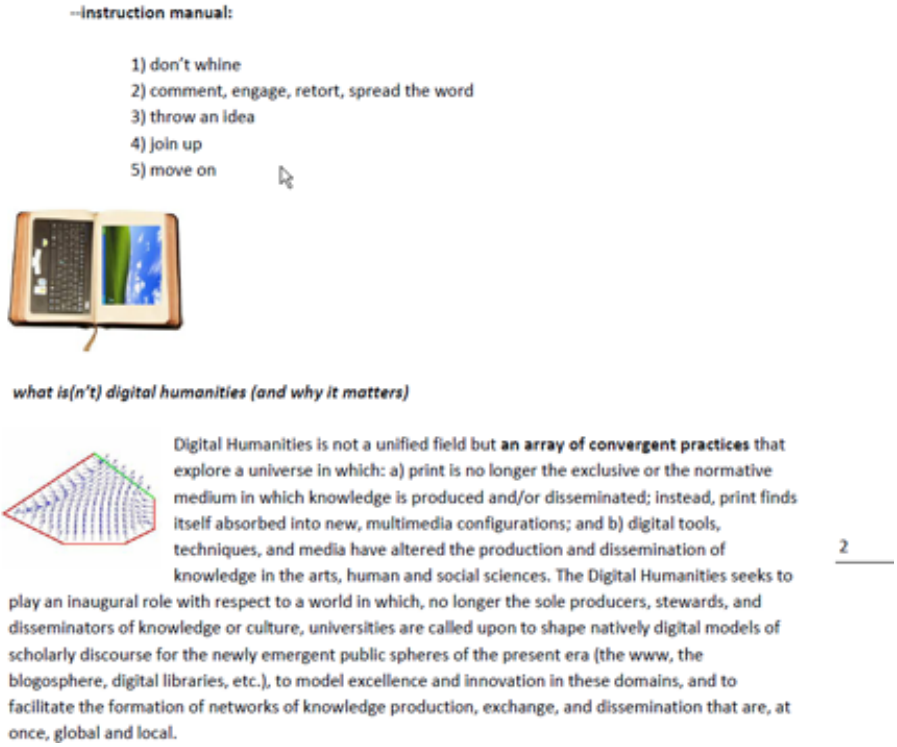

Figure 6.2

PDF Version 3.0: http://digitalhumanities.ucla.edu/images/stories/mellon_seminar_readings/manifesto%2020.pdf[4]

Reflecting on the Manifesto nine months later, I believe it is not only a call for Hhmanists to be deeply engaged with every facet of the most recent information revolution (Robert Darnton points out that we are living through the beginnings of the *fourth* Information Age, not the first), but also a plea for humanists to guide the reshaping of the university—curricula, departmental and disciplinary structures, library and laboratory spaces, the relationship between the university and the greater community—in creative ways that facilitate the responsible production, curation, and dissemination of knowledge in the global cultural and social landscapes of the twenty-first century. Far from providing "right answers," the Manifesto is an attempt to examine the explanatory power, relevance, and cogency of established organizations of knowledge that were inherited from the nineteenth and twentieth centuries and to imagine creative possibilities and futures that build on long-standing humanistic traditions. It is not a call to throw the proverbial baby out with the bathwater, but rather to interrogate disciplinary and institutional structures, the media of knowledge production and modes of meaning making and to take seriously the challenges and possibilities set forth by the advent of the fourth Information Age. The Manifesto argues that the work of the humanities is absolutely critical and, in fact, more necessary than ever for developing thoughtful responses, purposeful interpretations, trenchant critiques, and creative alternatives—and that this work cannot be done while locked into restrictive disciplinary and institutional structures, singular media forms, and conventional expectations about the purview, function, and work of the humanities.

The Manifesto in no way declares the humanities "dead" or placed in peril by new technologies; rather, it argues, the humanities are more necessary and relevant today than perhaps any other time in history. It

[4] http://digitalhumanities.ucla.edu/images/stories/mellon_seminar_readings/manifesto%2020.pdf

categorically rejects Stanley Fish's lament of "the last professor" and the work of his students, such as Frank Donoghue, which claims that the humanities will soon die a quiet death. To be sure, we must be vigilant of the "corporate university" and distinguish our Digital Humanities programs from the "digital diploma mills" (Noble), but we must also demonstrate that the central work of the humanities—creation, interpretation, critique, comparative analysis, historical and cultural contextualization—is absolutely essential as our cultural forms migrate to digital formats and new cultural forms are produced that are "natively digital." Fish and Donoghue make an assessment of the end of the humanities based on the fact that its research culture, curricular programs, departmental structures, tenure and promotion standards, and, most of all, publishing models are based on paradigms that are quickly eroding. Indeed, they are not wrong about their assessment, which is quite convincing when we start from the crisis of the present and look backwards: academic books in the humanities barely sell enough copies to cover the cost of their production, and the job market—as the 2009 MLA report attests—betrays the worst year on record for PhDs hoping to land tenure-track positions in English or Foreign Literature departments (Jaschik). What this evidences is certainly a crisis, but the way out is neither to surrender nor to attempt to replicate the institutional structures, research problems, disciplinary practices, and media methodologies of the past; rather, it may be to recognize the liberating—and profoundly unsettling—possibilities afforded by the imminent disappearance of one paradigm and the emergence of another. The humanities, rather than disappear as Fish predicts, can instead guide this paradigm shift by shaping the look of learning and knowledge in this new world.

Instead of facilely dismissing either the critical work of the humanities or the potentialities afforded by new technologies, we must be engaged with the broad horizon of possibilities for building upon excellence in the humanities while also transforming our research culture, our curriculum, our departmental and disciplinary structures, our tenure and promotion standards, and, most of all, the media and format of our scholarly publications. While new technologies may threaten to overwhelm traditional approaches to knowledge and may, in fact, displace certain disciplines, scholarly fields, and pedagogical practices, they can also revitalize humanistic traditions by allowing us to ask questions that weren't previously possible. We see this, for example, in fields such as classics and archaeology, which have widely embraced digital tools such as Geographic Information Systems (GIS) and 3D modeling to advance their research in significant and unexpected ways. We also see it in text-based fields like history and literature, which have begun to draw on new authoring, data-mining, and text-analysis tools for dissecting complex corpora on a scale and with a level of precision never before possible.

While the first wave of Digital Humanities scholarship in the late 1990s and early 2000s tended to focus on large-scale digitization projects and the establishment of technological infrastructure, the current second wave of Digital Humanities—what can be called "Digital Humanities 2.0"—is deeply generative, creating the environments and tools for producing, curating, and interacting with knowledge that is "born digital" and lives in various digital contexts. While the first wave of Digital Humanities concentrated, perhaps somewhat narrowly, on text analysis (such as classification systems, mark-up, text encoding, and scholarly editing) within established disciplines, Digital Humanities 2.0 introduces entirely new disciplinary paradigms, convergent fields, hybrid methodologies, and even new publication models that are often not derived from or limited to print culture.

Let me provide a couple of examples based on my own work on a web-based research, educational, and publishing project called HyperCities (http://www.hypercities.com[5]). Developed through collaboration between UCLA and USC, HyperCities is a digital media platform for exploring, learning about, and interacting with the layered histories of city spaces such as Berlin, Rome, New York, Los Angeles, and Tehran. It brings together scholars from fields such as geography, history, literary and cultural studies, architecture and urban planning, and classics to investigate the fundamental idea that all histories "take place" somewhere and sometime and that these histories become more meaningful and valuable when they interact with other histories in a cumulative, ever-expanding, and interactive platform. Developed using Google's Map and Earth APIs, HyperCities features research and teaching projects that bring together the analytic tools of GIS, the geo-markup language KML, and traditional methods of humanistic inquiry.[6] The central theme

[5] http://www.hypercities.com/

[6] An Application Programming Interface (API) allows programmers to build on, customize, and incorporate existing software

is geo-temporal analysis and argumentation, an endeavor that cuts across a multitude of disciplines and relies on new forms of visual, cartographic, and time/space-based narrative strategies. Just as the turning of the page carries the reader forward in a traditionally conceived academic monograph, so, too, the visual elements, spatial layouts, and kinetic guideposts guide the "reader" through the argument situated within a multi-dimensional, virtual cartographic space. HyperCities currently features rich content on ten world cities, including more than two hundred geo-referenced historical maps, hundreds of user-generated maps, and thousands of curated collections and media objects created by users in the academy and general public.

As a Digital Humanities 2.0 project, HyperCities is a participatory platform that features collections that pull together digital resources via network links from countless distributed databases. Far from a single container or meta-repository, HyperCities is the connective tissue for a multiplicity of digital mapping projects and archival resources that users curate, present, and publish. What they all have in common is geo-temporal argumentation. For example, the digital curation project "2009-10 Election Protests in Iran" (see Fig. 3) meticulously documents, often minute-by-minute and block-by-block, the sites where protests emerged in the streets of Tehran and other cities following the elections in mid-June. With more than one thousand media objects (primarily geo-referenced YouTube videos, Twitter feeds, and Flickr photographs), the project is possibly the largest single digital collection to trace the history of the protests and their violent suppression. It is a digital curation project that adds significant value to these individual and dispersed media objects by bringing them together in an intuitive, cumulative and open-ended geo-temporal environment that fosters analytic comparisons through diachronic and synchronic presentations of spatialized data. In addition to organizing, presenting, and analyzing the media objects, the creator of the project, Xarene Eskandar, is also working on qualitative analyses of the data (such as mappings of anxiety and shame) as well as investigating how media slogans used in the protests were aimed at many different audiences, especially Western ones.

Election Protests in Iran

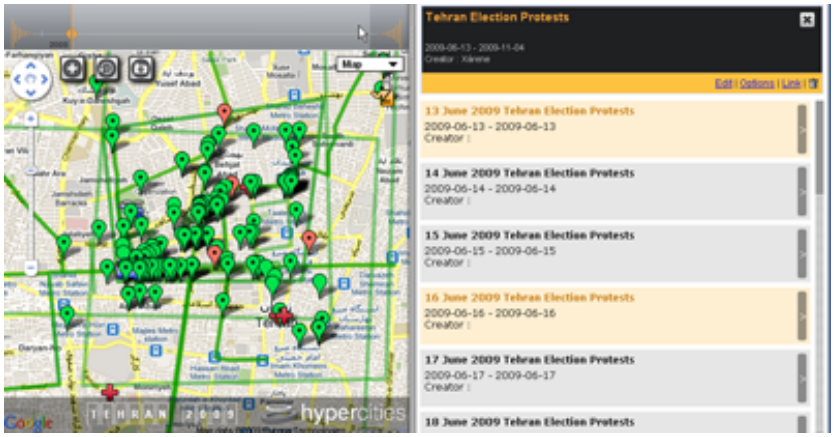

Figure 6.3

YouTube video on this collection: http://www.youtube.com/watch?v=qkEN02dGOlU[7]
Permalink to this collection in HyperCities: http://hypercities.ats.ucla.edu/#collections/13549[8]

code into their own applications. In 2005, Google released its map API, which let programmers invent their own mapping "mash-ups" using the basic content and technologies developed by Google.

[7] http://www.youtube.com/watch?v=qkEN02dGOlU

[8] http://hypercities.ats.ucla.edu/#collections/13549

Another project, "Ghost Metropolis" by Philip Ethington (see Fig. 4), is a digital companion to his forthcoming book on the history of Los Angeles, which starts in 13,000 BCE and extends through the present. Ethington demonstrates how history, experienced with complex visual and cartographic layers, "takes" and "makes" place, transforming the urban, cultural, and social environment as various "regional regimes" leave their impression on the landscape of the global city of Los Angeles. The scholarship of this project can be fully appreciated only in a hypermedia environment that allows a user to move seamlessly between global and local history, overlaying datasets, narratives, cartographies, and other visual assets in a richly interactive space. Significantly, this project—a scholarly publication in its own right—can be viewed side-by-side with and even "on top of" other projects that address cultural and social aspects of the same layered landscape, such as the video documentaries created in 2008-09 by immigrant youth living in Los Angeles' historic Filipinotown. The beauty of this approach is that scholarly research intersects with and is enhanced by community memories and archiving projects that tend, at least traditionally, to exist in isolation from one another.

Ghost Metropolis

Figure 6.4

YouTube video on this collection: http://www.youtube.com/watch?v=iogP_YvKs1w[9]

Permalink to this collection in HyperCities: http://hypercities.ats.ucla.edu/#collections/15165[10]

HyperCities is also used for pedagogical purposes to help students visualize and interact with the complex layers of city spaces. Student projects exist side-by-side with scholarly research and community collections and can be seen and evaluated by peers. These projects, such as those created by my students for a General Education course at UCLA, "Berlin: Modern Metropolis," demonstrate a high degree of skill in articulating a multi-dimensional argument in a hypermedia environment and bring together a wide range of media resources ranging from 2D maps and 3D re-creations of historical buildings to photographs, videos, and text documents (see Fig. 5). What all of these projects have in common is an approach to knowledge production that underscores the distributed dimension of digital scholarship (by dint of the fact that all of the projects make use of digital resources from multiple archives joined together by network links), its interdisciplinary, hypermedia approach to argumentation, and its open-ended, participatory approach to interacting with and even extending and/or remixing media objects. Moreover, with the exception of the last, all of these HyperCities projects are works-in-progress, something that underscores the processual, iterative, and exploratory nature of Digital Humanities scholarship.

[9] http://www.youtube.com/watch?v=iogP_YvKs1w
[10] http://hypercities.ats.ucla.edu/#collections/15165

The Controversy over Rebuilding the Royal Palace in Berlin (Student Project)

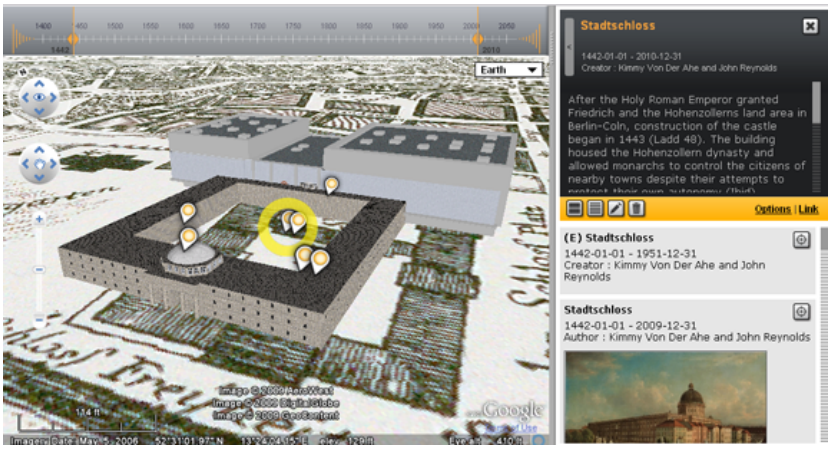

Figure 6.5

YouTube video on this collection: http://www.youtube.com/watch?v=iFtG9HnhwTM[11]

Permalink to this collection in HyperCities: http://hypercities.ats.ucla.edu/#collections/18712[12]

This transformation in Digital Humanities scholarship is something that roughly parallels the development of the web from relatively static, read-only portals and stand-alone applications for the display of content to participatory platforms that foster collaborative production across media environments through the repurposing of both content and software. The birth of Web 2.0 has been well articulated by technology gurus such as Tim O'Reilly as well as leaders in the field of Digital Humanities such as Cathy Davidson and David Theo Goldberg, the co-founders of the virtual consortium HASTAC (Humanities, Arts, Science, and Technology Advanced Collaboratory), both of whom are fierce advocates of "Humanities 2.0." Humanities 2.0 refers to generative humanities, a humanistic practice anchored in creation, curation, collaboration, experimentation, and the multi-purposing or multi-channeling of humanistic knowledge. By rejecting the affect-neutral, Enlightenment myth of simply relaying disembodied information and, instead, emphasizing design, multimediality, and the experiential, Digital Humanities 2.0 seeks to expand the affective range to which scholarship can aspire.

Let me now return to and further elaborate the three observations about the state of knowledge that I distilled from Lyotard's report on "computerized societies": first, the status of the social bond; second, the status of the university and, in particular, the place of the Humanities; and third, the question of knowledge legitimation. The three are deeply entangled and cannot be fully disaggregated. By social bond, at least in the context of the university, I am not referring to uses of social networking applications like Facebook (which, in my opinion, is as much of a data-harvester and miner of personal information as it is a social technology); rather, I mean the transformation of scholarly practice from individuals working and writing in isolation to team-based approaches to research problems that cannot be conceptualized, let alone solved, by single scholars. Here, we are beginning to see the emergence of finite, flexible, and nimble "knowledge problematics" that do not derive from or reflect entrenched disciplinary lines, methodological assumptions, or scholarly silos. I see these knowledge problematics as "virtual departments," which exist only for a finite period of time, are agile, and are constantly built and dismantled. To use a term from the emergent field

[11] http://www.youtube.com/watch?v=iFtG9HnhwTM

[12] http://hypercities.ats.ucla.edu/#collections/18712

of digital cultural mapping[13], they might function as "overlays" on existing departments and institutions, connecting distant scholars and communities together and creating new feedback loops or among between them. It is imperative that we imagine concrete ways of reinventing the "social bond" at the university as an expanding set of networks that can be variously mobilized and also dispersed. The finitude of the social bond is just as important as its mobilization, because departmental and disciplinary structures must be flexible, nimble, adaptable, and, ultimately, mortal in order to foster innovation.

This not only affects the state of disciplines but also the status and role of the university in scholarly creation. In its best form, the university does not merely "store" and "transmit" knowledge but rather is a site of contestation, experimentation, and imaginative creation and re-creation. But today, many of the most innovative and impactful research technologies (at least for humanists and probably social scientists as well) are being developed by private industry, leaving the scholars and librarians to be consumers and users of these technologies. As Johanna Drucker has cogently argued, the design of new research environments cannot be left to technical staff and private corporations, as if this were somehow not intellectual work or not something in which we as scholars should be invested. The very word processing tools that I use to write this paper are not value-neutral; Word, PowerPoint, Outlook, web-browsers, web applications like Google, Wikipedia, Facebook, Second Life, and even markup and programming languages like HTML, XML, Java, and C++ are all culturally contingent technologies for knowledge production and dissemination. You may not agree with or care about the knowledge being produced here, but regardless, we—as humanities scholars—have barely started to grapple with the massive assumptions built into and implications of these technologies and languages and their social and cultural practices. We barely know what *can* be thought using these technologies, let alone what *cannot* be thought. The only thing that can be said with certainty is that these technologies weren't designed by and for humanists. I suggest that if we apply the same kind of rigorous, media-specific, social, cultural, and economic analyses that we have honed to study print culture to not just emerging but already prevalent technologies, we can begin to understand the status of knowledge in our "computerized societies" of 2009. Beyond "studying" such technologies, we must actively engage with, design, create, and even hack the environments and technologies that facilitate humanities research and knowledge production.

Finally, let me turn to the issue of knowledge legitimation, which is where Digital Humanities encounters the most resistance, skepticism, and denial. Most humanities scholars have been trained in "Normal Humanities" (to somewhat loosely apply Thomas Kuhn's formulation to our disciplines). "Normal Humanities" means clearly defined and legitimated research based on past achievements, on stabilized ways of knowing and communicating this knowledge, and on general agreement about what counts as and what looks like a research problem. I would venture that the vast majority of scholarship is not really novel but falls into "Normal Humanities," obeying both the tacit and explicit rules of disciplinarity, media form, scholarly citation, and the accepted theoretical and methodological paradigms of a given field. Many people get tenure and are promoted by doing "Normal Humanities" well. What we are seeing today, however, is much more than a "paradigm shift." We are at the beginning of a shift in "standards governing permissible problems, concepts, and explanations" (Kuhn, 106), and also in the midst of a transformation of the institutional and conceptual conditions of possibility for the generation, transmission, accessibility, and preservation of knowledge. To be sure, "traditional" humanities knowledge will not go the way of Ptolemy's computations of planetary position or phlogiston theory, since the transformation in humanities paradigms is not, strictly speaking, based upon the "incommensurability" with what came before. Rather, the transformation alters the ways in which the humanities articulates and investigates problems as well as the institutional and media structures that facilitate problem-solving in the first place. Within the transition period, there will, of course, be much searching for the fundamentals of the field as well as the emergence of competing and overlapping paradigms, but when the transition is complete, as Kuhn predicts with regard to scientific revolutions, "the profession will have changed its view of the field, its methods, and its goals" (85). A new "Normal Humanities" will have emerged.

[13]The emergent field of Digital Cultural Mapping brings together the analytic tools of Geographic Information Systems (GIS) and traditional methods of humanistic inquiry in order to investigate a wide-range of cultural, historical, and social dynamics through space-time visualizations. See, for example, UCLA's new program in Digital Cultural Mapping: http://keckdcmp.ucla.edu/ (<http://keckdcmp.ucla.edu/>).

Let me end by throwing down the gauntlet and arguing that Wikipedia is not only a model for the humanities but also for the university today. To be sure, there are other examples that I might have mentioned, but Wikipedia is probably the most pervasive, non-corporate, digital technology platform for knowledge generation. Far from a web-based encyclopedia for "intellectual sluggards" engaged in a "flight from expertise" (to quote Michael Gorman, former President of the American Library Association [qtd. in Stothart]), Wikipedia, I believe, represents a truly innovative, global, multilingual, collaborative, knowledge-generating community and platform for authoring, editing, distributing, and versioning knowledge. To date, it has more than three million content pages, more than three hundred million edits, over ten million registered users, and articles in 47 languages (Wikipedia Statistics). This is a massive achievement for eight years of work. Wikipedia could, in fact, be a model for rethinking collaborative research and the dissemination of knowledge at institutions of higher learning, which are all too often fixated on "individual training, discrete disciplines, and isolated achievement and accomplishment" (Davidson and Goldberg, 14).

Wikipedia represents a dynamic, flexible, and open-ended network for knowledge creation and distribution that underscores process, collaboration, access, interactivity, and creativity with an editing model and versioning system that documents every contingent decision made by every contributing author. But you perhaps object: The content is amateurish, open to anyone, and, hence, cannot be trusted. Why would we want to abandon credentialing and expertise? And I reply: The point is not credentialing versus amateurness (or expertise versus crowd-sourcing); it's the fact that expertise and credentialing are distributed and shared in a way that increases the depth, scope, duration, and impact of both. Moreover, consensus never finally arrives when the system keeps an ongoing and ever-expanding record of each change and, significantly, always exposes its own conditions of possibility for knowledge production. At this moment in its short life, Wikipedia is already the most comprehensive, representative, and pervasive participatory platform for knowledge production ever created by humankind. That's worth some pause and reflection.

The point here is not that Wikipedia is "the answer" to the crisis of the humanities or that humanities scholarship should turn into Wikipedia entries; rather, it's that Wikipedia represents a very different model for creating, authorizing, and distributing knowledge; Google Earth and HyperCities represent others; social technologies, virtual worlds, and creative commons authoring environments offer still others. A central part of the work of the humanities must be to create and interrogate new models for knowledge production in our "computerized" societies of 2009. Not only do we have to rethink *how* knowledge gets created, we also have to rethink *what* knowledge looks (or sounds, feels, or tastes) like, *who* gets to create knowledge, *when* it is "done" or transformed, *how* it gets legitimated and authorized, and *how* it is made accessible to a significantly broader (and potentially global) audience. The twenty-first century university has the potential to generate, legitimate, and disseminate knowledge in radically new ways on a scale never before realized, involving technologies and communities that rarely (if ever) were engaged in a global knowledge-creation enterprise. We have just begun to do this. And that's what Digital Humanities 2.0 is fundamentally about.

6.1 References

Darnton, Robert. "The Library in the New Age." *New York Review of Books* 55.10, June 12, 2008.

Davidson, Cathy. "Humanities 2.0: Promise, Perils, Predictions." *PMLA* 123.3 (2008): 707-17.

Davidson, Cathy and David Theo Goldberg. *The Future of Learning Institutions*. Cambridge: MIT Press, 2009.

Digital Humanities Manifesto Commentpress versions 1.0 and 2.0: http://manifesto.humanities.ucla.edu/2008/12/15/digital-humanities-manifesto/[14] (accessed September 9, 2009).

"Digital Humanities Manifesto." Commentpress versions 1.0 and 2.0. Institute for Future of the Book. http://www.digitalhumanities.ucla.edu/images/stories/mellon_seminar_readings/manifesto%2020.pdf[15] (accessed September 9, 2009).

[14] http://manifesto.humanities.ucla.edu/2008/12/15/digital-humanities-manifesto/

[15] http://www.digitalhumanities.ucla.edu/images/stories/mellon_seminar_readings/manifesto%2020.pdf

Donoghue, Frank. *The Last Professors: The Corporate University and The Fate of the Humanities*. New York: Fordham Press, 2008.

Drucker, Johanna. "Blind Spots." *The Chronicle of Higher Education*. April 3, 2009. http://chronicle.com/article/Blind-Spots/9348[16] (accessed September 9, 2009).

Fish, Stanley. "The Last Professor." *The New York Times*. January 18, 2009. http://fish.blogs.nytimes.com/2009/01/18/the-last-professor[17] (accessed September 9, 2009).

Foucault, Michel. "The Discourse on Language." *The Archaeology of Knowledge*. Translated by A.M. Sheridan Smith. New York: Pantheon Books, 1972.

Hayles, Katherine N. *Writing Machines*. Cambridge: MIT Press, 2002.

HyperCities. http://www.hypercities.com[18] .

Jaschik, Scott. "Disappearing Jobs." *Inside Higher Education*. December 17, 2009. http://www.insidehighered.com/news/2009/12/17/mla[19] (accessed December 22, 2009).

Kittler, Friedrich. *Discourse Networks 1800/1900*. Translated by Chris Metteer with Chris Cullens. Palo Alto: Stanford University Press, 1990.

Kuhn, Thomas S. *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press, 1996.

Lyotard, Jean-François. *The Postmodern Condition: A Report on Knowledge*. Translated by Geoff Bennington and Brian Massumi. Foreword by Fredric Jameson. Minneapolis: University of Minnesota Press, 1991.

Negroponte, Nicholas. *Being Digital*. New York: Vintage, 1996.

Noble, David. *Digital Diploma Mills: The Automation of Higher Education*. New York: Monthly Review Press, 2001.

O'Reilly, Timothy. "What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software." 2005. http://oreilly.com/web2/archive/what-is-web-20.html[20] (accessed September 9, 2009).

Presner, Todd. *Mobile Modernity: Germans, Jews, Trains*. New York: Columbia University Press, 2007.

Stothart, Chloe. "Web Threatens Learning Ethos." *Times Higher Education*. June 22, 2007. http://www.timeshighereducation.co.uk/story.asp?sectioncode=26&storycode=209408[21] (accessed September 9, 2009).

Wikipedia Statistics. http://en.wikipedia.org/wiki/Special:Statistics[22] (accessed September 9, 2009).

[16] http://chronicle.com/article/Blind-Spots/9348
[17] http://fish.blogs.nytimes.com/2009/01/18/the-last-professor
[18] http://www.hypercities.com/
[19] http://www.insidehighered.com/news/2009/12/17/mla
[20] http://oreilly.com/web2/archive/what-is-web-20.html
[21] http://www.timeshighereducation.co.uk/story.asp?sectioncode=26&storycode=209408
[22] http://en.wikipedia.org/wiki/Special:Statistics

Chapter 7

Discussion of Poovey and Presner Papers[1]

Audience: Your papers addressed the future and the development of new approaches for research. Might you elaborate on this?

Poovey: There is nothing more epistemologically interesting than finance, which is about manipulating temporality, inefficiencies, and points of disconnection that occur globally. People make money by taking advantage of the transient inefficiencies that circulate within what is represented as an efficient market. If you want to study the future and think about the possibilities for optimism, then it's important to understand the ways in which optimism is undermined by certain systematic practices of capital accumulation and various financial manipulations. The possibilities for intervention exist, but not the means. An individual could not have intervened in the process by which the FICO score became institutionalized. We must develop a new form of optimism that is not based on the individual.

Presner: This idea can also be approached from the question of whether narrative is a necessary component of thinking about history. What happens when narrative is embedded in many different media forms? Phil Ethington's *Ghost Metropolis* is an example of deep history, since it stretches back ten thousand years. It is also non-systematic since the content of HyperCities includes curated materials organized by academics alongside community-annotated narratives. A teenager who made a Flickr photostream of himself in historic Filipinotown might be talking about the same location that Ethington addresses, but ten thousand years later. This heterogeneity enhances the way in which we think about these deeply-layered place histories. One narrative cannot possibly capture the richness of the palimpsests of cultural and social meaning built into any location. The HyperCities project shows that a place history cannot be represented in a single medium and opens up the community of discussants.

Audience: Todd, is there a strong causal link between the two halves of your paper, one about a shift in the objects of knowledge production, and the other about a shift in the methods? In other words, does the fact that we're now studying cultural objects other than printed texts produce a distributed mode of scholarship? And, on the other hand, does that distribution of scholarship produce a shift in the objects of our disciplinary procedures?

Presner: I wouldn't reduce it to a causal relationship, but the two do exist in a productive tension. The attention to modes of inscription and ways of thinking about navigation, distribution systems, even the fragility of the object have a higher stake in an environment in which new technologies are emerging and others are becoming unreadable. Think of the very rapid change in storage and retrieval systems, including Beta, VHS, DVD, CD, and digital media. The shift in method and the shift in the study of object go hand in hand.

Audience: Mary, you listed methodologies associated with social sciences but not methodologies from the study of literature. The shorthand for literary reading was signaled by the use of the words "stories" and

[1] This content is available online at <http://cnx.org/content/m34248/1.2/>.

"narrative." You brought up the idea that the world is slowly becoming theory, rather than the other way around; that in some sense, we are living in fiction. Is there value to listing appropriate methodologies that we can crosshatch into the social sciences or the study of the economy? The word "emergent," for me, comes from Raymond Williams' suggestion that before the social fact is apparent to us, it is visible in structures of feeling.

Poovey: The methodologies associated with the humanities are more obvious, turning on interpretation primarily—but not exclusively—of textual objects, comparative analysis, and the analysis of the relationship between language and other modes of expression, including the affective, gestural, and pictorial. Raymond Williams is indeed a precursor of this symposium, but in thinking about emerging disciplines, consider not only his thoughts on emergent versus residual, but also on what goes into a culture. In my university, the methodologies associated with the humanities and literary studies in particular (insofar as those might be encapsulated by the linguistic turn, deconstruction, and Theory) are under attack from within the institution, including from some people within the humanities. It's important to consider how to reinvigorate the methodologies of the humanities in ways that sustain attacks.

Audience: Professor Poovey, you mentioned that economics didn't integrate mathematics until the 1970s. In the 70s, liberalism declined with the upswing in conservative thought, particularly Nixon's Southern strategy, in which he used populist arguments to put down liberal ones. While economics is a social indicator, its use of numbers and statistics give the impression that it is immutable. Is there a correlation between that upsurge in conservatism and the use of mathematics in economics?

Poovey: This is a very exciting thought. I take it that you're referring to social liberalism and social conservatism, not free-market ideology. Another paradox is that social conservatism began to rise in part as an endorsement of a liberal market ideology that says that markets should be free to operate. It would be interesting to think about the role of statistics and mathematics in that as well.

Audience: It's important to distinguish between statistical methods and a mathematical model in economic theory. Why wouldn't cultural economy and cultural analytics wholeheartedly embrace the statistical method, not to the exclusion of other methodologies, but as a way to cross the social science/humanities divide?

Poovey: I agree that statistical modeling and analysis will help the humanities move away from a purely interpretation- or meaning-based analysis of text. Some of my colleagues and I are sponsoring dissertations that use statistics to chart, for example, the occurrence of the word "sublime" at critical moments. In the eighteenth century, "sublime" is almost everywhere, but when it drops out of the vocabulary, a set of aesthetic theories begins to take its place. There is a distinction between mathematics proper, which is the study of abstractions, and statistical analysis. Mathematics is also key to bridging this divide, especially mathematics as it has been adopted by finance.

Chapter 8

Music, Biological Evolution, and the Brain[1]

8.1 Abstract

This essay offers a novel theoretical perspective on the evolution of music. At present, a number of adaptationist theories posit that the human capacity for music is a product of natural selection, reflecting the survival value of musical behaviors in our species' past (e.g., Wallin et al., 2000). In sharp contrast, a prominent nonadaptationist theory of music argues that music is a human invention and is biologically useless (Pinker, 1997). I argue that research on music and the brain supports neither of these views. Contrary to adaptationist theories, neuroscientific research suggests that the existence of music can be explained without invoking any evolutionary-based brain specialization for musical abilities. And contrary to Pinker's claim, neuroscience research suggests that music can be biologically powerful. By biologically powerful, I mean that musical behaviors (e.g., playing, listening) can have lasting effects on nonmusical brain functions, such as language and attention, within individual lifetimes. Music is thus theorized to be a biologically powerful human invention, or "transformative technology of the mind."

8.2 1. Introduction

The past decade has witnessed a rapid rise in cognitive and neuroscientific research on music. This has led to renewed interest in evolutionary questions about music, which originate with Darwin's discussion of the topic in *The Descent of Man* (1871). There are now several adaptationist theories arguing that musical behaviors originated via biological evolution due to their survival value for human ancestors. In contrast, nonadaptationist theories propose that musical behaviors are a human invention. The most prominent such theory, that of Steven Pinker (1997), regards music as a pleasure technology built from pre-existing brain functions (such as language, emotional vocalization, etc.), and posits, "As far as biological cause and effect are concerned, music is useless" (p. 528).

Pinker's idea that music is an invention built from existing brain functions provides a useful null hypothesis for evolutionary debates over music. His assertion that music is biologically useless, however, is problematic. While Pinker was likely referring to music's impact on human biology over evolutionary time, as opposed to within the lifetime of individual humans, his writing does not make this distinction. Furthermore, the metaphors he uses to describe music (e.g., "auditory cheesecake," or "recreational drugs") imply a view of music as having little biological significance at either evolutionary or individual timescales.[2]

[1] This content is available online at <http://cnx.org/content/m34255/1.7/>.

[2] While Pinker's (1997) characterization of music as auditory cheesecake seemed to trivialize music, in more recent writings he has been more careful about assessing the value of music in human cultural life, noting, "The arts could be evolutionary

A central point of this essay is that discussions of the biological significance of music should conceptually distinguish music's effects over evolutionary time from its effects within individual lifetimes. The need for this distinction is driven by evidence from neuroscience. Neuroscientific research suggests that music is an invention that builds on diverse, pre-existing brain functions, rather than a trait that originated via processes of natural selection. This is consistent with Pinker's thesis. However, growing evidence from neuroscience also suggests that music is biologically powerful, meaning that it can have lasting effects on nonmusical abilities (such as language or attention) during the lifetime of individual humans. Importantly, these effects can be observed not only in trained musicians but also in ordinary individuals who engage regularly with music. Thus, I believe that music should be regarded as a biologically powerful human invention or "transformative technology of the mind." (For brevity, henceforth I refer to this idea as TTM theory.)

This essay is organized as follows. Section 2 introduces the evolutionary puzzle of music. Section 3 explains why neuroscience research suggests that music is an invention rather than a biological adaptation. Section 4 provides examples of the biological power of music. Section 5 suggests why music can have lasting effects on nonmusical brain functions. Section 6 provides a non-genetic explanation for why music is so pervasive in human culture. The essay concludes with a brief discussion of the relevance of a Darwinian perspective for the modern biological study of human music.

It is worth clarifying some points regarding TTM theory's claim that music can shape brain function. It is obvious that engaging in any humanly-invented activity (e.g., kite flying) changes the brain within individual lifetimes, because learning and memory are instantiated by changes in neural networks, e.g., in the pattern of synaptic connections between neurons. Thus, TTM theory does not simply claim that musical behaviors change the brain. (This is trivially true: even learning a simple tune involves changing brain networks in some way in order to store the memory of the tune.) Nor does TTM theory simply claim that learning music results in lasting structural changes to the brain. (This claim would hardly be novel, given the growing evidence of experience-dependent changes in brain structure caused by learning a musical instrument, e.g., Hyde et al., 2009.) Rather, TTM theory claims that music is a human invention that can have lasting effects on such nonmusical brain functions as language, attention, and executive function, and is concerned with explaining the biological mechanisms underlying these effects.

The qualification of "lasting" effects is important, because this distinguishes TTM theory from theories concerned with the short-term effects of music on other cognitive abilities (e.g., Thompson et al., 2001). That is, TTM theory is concerned with musically driven neurobiological changes that impact other brain functions over the course of months or years, not over the course of a few minutes. In this regard, TTM theory has some parallels to neurobiological theories of reading, another human invention with salient impact on the brain within individual lifetimes (Dehaene and Cohen, 2007). Indeed, reading can be considered another transformative technology of the mind, because it is a human invention built from existing brain systems (such as those supporting visuospatial cognition and language) that impacts a variety of mental abilities (Mar et al., 2008; Patel, 2008:400; Dehaene, 2009).

Of course, music is much older and far more widespread than reading and appeals to humans from infancy. Also, unlike reading skills, basic musical abilities develop without any special instruction (Bigand and Poulin-Charronatt, 2006). These facts make the claim that music is a human invention seem odd. Yet other theories view ancient and universal human communication systems as inventions. For example, Tomasello (2008) has proposed that language originated as an invention based on communicative interactions between primates who had a special socio-cognitive ability for sharing actions and goals with others ("shared intentionality"; see also Lee et al., 2009). In common with such "language as invention" theories, TTM theory proposes that a complex and universal human trait can originate as an invention rather than as a biological adaptation. However, to my knowledge, all "language as invention" theories leave open the possibility that language, once invented, led to co-evolutionary changes in the brain that were aimed at supporting the acquisition of language (cf. Deacon, 1997). Indeed, the idea that our brains have been modified over evolutionary time to support the acquisition of language is favored by at least ten converging lines of evidence (Patel, 2008:358-366). TTM theory, in contrast, posits that there has been no evolutionary modification of our brains specifically aimed at facilitating musical abilities. Instead, music is viewed as a technology that is

by-products, and be among the most valuable human activities for all that" (Pinker, 2007, p. 170).

learned anew by each new generation of human minds. This view is congenial to the tremendous diversity of musical practices that have been described by ethnomusicologists (e.g., Titon, 1996; Nettl and Stone, 1998) and to the seemingly endless growth and development of music as a human art form (Ross, 2007). It is important to note, however, that TTM theory does not amount to the claim that humans are musical blank slates. Since music is theorized as building on preexisting brain functions (such as language and auditory scene analysis[3]), processing predispositions relevant to these other functions are likely to be reflected in the structure and processing of human music (cf. Reynolds, 2005; Dehaene and Cohen, 2007).

A final conceptual point about TTM theory concerning the fundamental question of why humans are drawn to musical behaviors merits discussion here. TTM theory claims that music can have lasting effects on nonmusical brain systems, but it does not propose that humans engage in music in order to produce these effects. Rather, as discussed in section 6 below, TTM theory posits that people are drawn to music because of its emotional power and because of its efficacy for ritual and memory. The lasting effects on nonmusical abilities are thus a *consequence* of how music engages the brain, not a *cause* of musical behavior. A better understanding of how and why these effects occur is of interest both for basic brain science and for designing musical activities to address problems in nonmusical domains, i.e., in scientifically-based music therapy (Leins et al., 2009).

8.3 2. The evolutionary puzzle of music

Like language, music is a human universal that reaches deep into our species' past (Nettl, 2000). Recent excavations have revealed bone flutes dating to the late Pleistocene era (∼40,000 ybp, Conard et al., 2009). Cross-cultural and developmental research indicates that listening to and/or making music has a profound appeal to most members of our species, starting early in life (Blacking, 1973; Trehub, 2003). Thus, one can predict with some confidence that the few remaining uncontacted tribes of humans, when finally described by anthropologists, will have music as part of their behavioral repertoire.

For those interested in the evolutionary foundations of human behavior, such observations are puzzling. Musical activities lack any obvious survival value. Why then is music so pervasive in human life? Are we musical today because music helped our ancestors survive? Has the human mind been shaped by natural selection for music? Darwin (1871) was the first to wrestle with these questions, noting that "as neither the enjoyment nor the capacity of producing musical notes are faculties of the least direct use to man in reference to his ordinary habits of life, they must be ranked among the most mysterious with which he is endowed" (p. 1207).

In *The Descent of Man*, Darwin offered an adaptationist theory of music's origins based on principles of sexual selection (see Kivy, 1959, for a discussion of these ideas in a larger historical framework). For the next century, scholarly discussion of music and evolution was relatively sparse but began to stir again with the rise of cognitive studies of music (e.g., Roederer, 1984). Interest in the topic has grown considerably in the past decade, reflecting the explosion of cognitive neuroscience research on music (Peretz, 2006). Indeed, since 2000, two scientific volumes of essays have been devoted to the evolution of music (Wallin et al., 2000; Vitouch and Ladinig, 2009), and the topic has been addressed in many other books and scholarly articles (e.g., Pinker 1997; Hauser and McDermott, 2003; Mithen 2005; Fitch, 2006, 2010; Hagen and Hammerstein, 2009; Kirschner and Tomasello, in press). Several adaptationist and nonadaptationist proposals are now in existence; some of the more prominent ones are reviewed below.

8.3.1 2.1 Adaptationist proposals

The first evolutionary theory for music was offered by Darwin in *The Descent of Man* (1871). Darwin drew an analogy with birdsong and theorized that music arose in our ancestors via mechanisms of sexual selection. He wrote: "Musical tones and rhythm were used by the half-human progenitors of man, during the season of courtship, when animals of all kinds are excited by the strongest passions" (p. 1209). Darwin speculated

[3]The process by which the human auditory system organizes sound into perceptually meaningful elements or sources (Bregman, 1990).

that wordless courtship songs predated our linguistic abilities and that such singing provided the scaffolding upon which language itself evolved. This idea of a musical protolanguage has proved of enduring interest to scholars researching the evolution of language and music (e.g., Brown, 2000(a); Mithen, 2005; see Fitch, 2010, for an overview and a recent version of the musical protolanguage theory). Indeed, the idea of a shared origin for language and music is pre-Darwinian, dating at least as far back as French enlightenment writings in the 1700s (Thomas, 1995). Commencing with Darwin, however, scholars have explored the idea within an evolutionary framework, proposing theories for how such a form of communication could have evolved and seeking to explain how it could further evolve into articulate language and fully developed music. Such theories view music as having a biological rather than a purely cultural origin and posit that musical behaviors had survival value for our ancestors.

This section focuses on the three most prominent adaptationist theories of music, based on sexual selection, parental care, and group cohesion. These theories have been proposed and explored independently but are not mutually exclusive. Indeed, musical protolanguage theories often invoke all three such theories to account for the biological origin of musical behavior.

As noted above, the sexual selection theory of music originated with Darwin. Sexual selection has the appeal of being able to explain the evolution of elaborate traits that seem nonadapative, or even maladaptive, in the daily struggle for existence, yet that are beneficial in the competition for mates (the peacock's tail is a classic example). The sexual selection theory of human music has been explored by Miller (2000) and others and continues to attract interest.

A second set of adaptationist proposals concerns parental care rather than sexual selection. As often noted by biologists, human infants are born remarkably early in their biological development compared to other primates, possibly due to constraints on the size of the birth canal imposed by bipedalism (Mithen, 2005). Dissanayake (2008) and Falk (2004) have pointed to the cross-cultural importance of vocal communication in human infant care, whereby adults use melodious and rhythmic affect-laden utterances ("motherese") to soothe or arouse prelinguistic infants. Positing that such vocalizations had adaptive value for infant survival, these authors propose that music has its origins in vocalizations aimed at caring for infant offspring.

A third set of adaptationist proposals concerns possible benefits of music to group cohesion. Humans, like most other primates, live in groups where individual competition is balanced with cooperation. Humans are unusual, however, in having relatively low degrees of in-group genetic relatedness (due to high gene flow between groups), yet depending to a large degree on in-group cooperation in order to survive and outcompete other groups (Richerson and Boyd, 2005). There has been much recent interest in the idea that music may have served as a mechanism to promote social cohesion within groups (e.g., Brown, 2000(b)). This idea was first clearly articulated by Roederer (1984), who pointed to "the value of music as a means of transmitting information on emotional states and its effect in congregating and behaviorally equalizing masses of people." Dunbar (in press) has argued that group singing and dancing replaced physical grooming in ancestral human groups, when increasing group size made physical grooming of allies impractical. According to this view, song and dance led to endorphin release (mimicking the neural effects of physical grooming). This in turn promoted bonding, because endorphins, "as a byproduct of their role in pain control...have the property of making us feel warm and well disposed towards others who share...the experience that stimulates their production" (cf. Cohen et al., 2009, Kosfeld et al., 2005).

One appeal of the social cohesion idea is that music is often a social activity among humans, especially in small-scale cultures, and experimental work suggests that musical group activities promote cooperation between group members on subsequent nonmusical tasks (e.g., Wiltermuth and Heath, 2009; Kirschner and Tomasello, in press). Furthermore, music has certain design features that distinguish it from language, such as discrete pitches (allowing voices to blend together in song) and a distinct beat (enabling synchronized movement through time), which facilitate coordination between individuals and can promote a shared sense of identity and purpose (McNeill, 1995; Bispham, 2006).

Social cohesion hypotheses are currently a focus of much interest within music cognition, mirroring a growing interest within biology in natural selection at the level of social groups (e.g., Wilson and Wilson, 2007; Wilson et al., 2008). Several variant hypotheses have developed. Cross (2009), for example, draws on ethnomusicological literature and emphasizes music's efficacy in managing situations of social uncertainty,

i.e., situations in which linguistic interaction might give rise to conflict. He also emphasizes the role of music as a training ground for social cognition (cf. Boyd, 2009). Merker (2000), in contrast, draws on observations of chimpanzee group vocal displays and theorizes that music may have originated in our ancestors from synchronous calls aimed at mate attraction (see also Merker et al., 2009). Hagen and Hammerstein (2009) draw on comparative data from nonhuman primates and carnivorous mammals thought to be ecologically similar to human ancestors, and suggest that music may have arisen from group vocal territorial advertisements (for antecedents of this idea, see Geissmann, 2000).

Another version of the social cohesion hypothesis is notable for the relatively small degree of biological specialization for music that it proposes (Kirschner and Tomasello, in press). According to this view, music originated as an invention in ancestral human groups. Because music promoted group cohesion and survival, it acted as a cultural (vs. biological) adaptation, so that musically-oriented groups outsurvived other groups. Subsequently, due to feedback between cultural group selection and biological natural selection, there was selection for individuals who were biologically predisposed toward musical behavior.[4] Thus, according to Kirschner and Tomasello, modern humans are hypothesized to have "an innate proclivity for musical sounds and actions" without necessarily having any other brain specializations for music processing (cf. Trehub and Hannon, 2006).[5]

For the sake of brevity, a critique of the above theories is not provided here (the interested reader is referred to Patel, 2008: 368-371). For the current purposes, the relevant point is that all despite their different points of emphasis, all adaptationist proposals view the human mind as having been specifically shaped by evolution to support musical behavior.

8.3.2 2.2 Nonadaptationist proposals

In sharp contrast to adaptationist theories, nonadaptationist theories of music posit that there has been no natural selection for musical abilities in our species. Herbert Spencer implicitly took this position (even prior to the publication of Darwin's *Origin of Species*) in his essay, "On the origin and function of music" (Spencer, 1857). Spencer argued that music grew out of the rhythms and cadences of impassioned speech and launched a debate that engaged Darwin and many other scholars (for a fascinating discussion, see Kivy, 1960, 1964, and Rehding, 2000).

Some thirty years later, William James voiced a nonadaptationist view of music in *The Principles of Psychology* (1890). James regarded the human love of music as "a mere incidental peculiarity of the nervous system" (Vol. 2, p. 419) and asserted: "It has no zoological utility...it is a pure *incident* of having a hearing organ...it has entered the mind by the back stairs, as it were, or rather [has] not entered the mind at all, but got surreptitiously born in the house" (Vol. 2, p. 627).

A modern descendant of James' view is that of Pinker (1997: 528-538), which has become the most prominent nonadaptationist theory of music. Pinker's proposal starts with the theory that many human mental faculties have been direct targets of natural selection. Music is chosen as a counterexample and is argued to be a human invention that is universal because of its link to pleasure: "Music appears to be a pure pleasure technology, a cocktail of recreational drugs that we ingest through the ear to stimulate a mass of pleasure circuits at once" (p. 528). In a later essay, Pinker (2007) elaborates this point to propose that music and many other human arts are "by-products of two other traits: motivational systems that give us pleasure when we experience signals that correlate with adaptive outcomes...and the technological know-how to create purified doses of these signals..." (p. 171).

Pinker's proposal is notable for its specificity in suggesting the nonmusical foundations upon which music builds. These are: 1) the prosodic component of language, 2) auditory scene analysis, 3) emotional calls, 4) habitat selection, and 5) motor control.[6] According to Pinker, music brings us pleasure because it "tickles the

[4] See Richerson and Boyd, 2005, Ch. 6, for a general discussion of gene-culture coevolution in the context of human cooperative behavior.

[5] The foregoing discussion of several adaptationist theories is necessarily brief, and readers desiring a wider and deeper discussion of adaptationist ideas are referred to the primary literature cited above.

[6] Pinker also allows for the possibility that the love of music is a chance byproduct of the wiring of our brains, e.g., "some kind of...short-circuit or coupling that came along as an accident of the way that auditory, emotional, language, and motor

sensitive spots" of these faculties. Specifically, 1) music has prosody-like properties, and the brain rewards the analysis of prosodic signals (patterns of linguistic rhythm and intonation) because prosody is an important component of language; 2) music is rich in harmonic sounds (sounds in which frequency components are integer multiples of some fundamental frequency), and the brain rewards the analysis of such sounds because harmonicity is an acoustic cue used to identify sound sources, an important part of auditory scene analysis; 3) music can evoke strong emotions because it contains pitch and rhythm patterns that resemble our species' emotional calls, and 4) because it contains sound patterns reminiscent of evocative environmental sounds (e.g. "safe" or "unsafe" sounds, such as thunder, wind, or growls); 5) musical rhythm engenders rhythmic movement (e.g., in dance), and such movement is rewarded by the brain because rhythmic motor patterns are associated with biologically meaningful behaviors, such as walking, running, or digging.

Pinker's proposal is much more detailed than that of James (1890), informed as it is by the century of cognitive science research that separates the two books. (For example, Pinker discusses in detail the influential music-cognition theories of Lerdahl and Jackendoff, 1983.) Nevertheless, James and Pinker arrive at a similar view of the biological significance of music. James wrote that music has "no zoological utility," and Pinker asserts, "As far as biological cause and effect are concerned, music is useless." Perhaps James and Pinker were referring to evolutionary utility as opposed to utility during the lifetime of individual humans, but their writings do not specify this. Furthermore, Pinker's metaphor of music as a recreational drug implies a view of music as having a rather superficial relationship to human biology.

There are now several nonadaptationist theories of music, each offering distinct hypotheses about the brain systems upon which music builds. Livingstone and Thompson (2009), for example, argue that music builds on a recently evolved human theory of mind ability to serve the primary purpose of affective engagement. Panksepp (2009), in contrast, emphasizes music's connection to evolutionarily ancient socio-emotional brain circuitry. There are other nonadaptationist proposals (e.g., Sperber, 1996), but none systematically considers music's power to shape human brain function. It is on this point that TTM theory differs from existing nonadaptationist theories of music.

8.4 3. Music as a human invention

Given the debates over the evolutionary status of music, it is parsimonious to adopt the null hypothesis that there has been no natural selection for musical abilities in our species and then ask if there is enough evidence to seriously challenge this null hypothesis. When this strategy is applied to language, there appears to be enough evidence to refute the null hypothesis, as reviewed in Patel (2008: 358-366).

What of music? To some, the universal and ancient nature of human music may imply that it originated as a biological adaptation. The danger of such an assumption is illustrated by another remarkable human trait, namely the control of fire. This trait extends deep into our species' past and is found in every human culture, yet few would dispute that it arose as an invention rather than a biological adaptation. The universality of the trait can be explained by the fact that it provides things that are universally valued by humans, including the ability to cook food, keep warm, and see in dark places. The example of fire-making teaches us that when we see a universal and ancient human trait, we cannot simply assume that it has been a direct target of natural selection (Patel, 2008: 356).[7]

It is tempting to think that brain specialization for certain aspects of music cognition (Peretz, 2006) and the existence of genetically-based deficits of music perception (Drayna et al. 2001; Peretz et al., 2007) point to natural selection for music. Yet upon closer examination, these facts provide no compelling support for adaptationist theories. Here, reading and writing provide useful analogies. These are indisputably

circuits are packed together in the brain" (p. 538).

[7] Wrangham (2009) has argued persuasively that the control of fire and the invention of cooking by human ancestors led to co-evolutionary changes in physiology, such that modern humans are now biologically adapted to eating cooked food. He argues that cooking makes certain animal proteins more digestible and softens food, which reduces the cost of digestion. Consequently, our gut shrank over evolutionary time, allowing valuable metabolic energy to be diverted to our brains, which could then grow larger, since brains are energetically very expensive. The idea of a human invention leading to co-evolutionary changes in body and brain is an interesting one, though TTM theory does not take this approach when considering the biological impact of music.

human inventions, probably no more than about six thousand years old, making them too young to be associated with any evolutionary brain specialization for these abilities. Yet brain imaging studies of literate individuals have shown that certain aspects of reading, e.g., recognizing written characters, are associated with functional specializations in specific brain regions (Dehaene and Cohen, 2007; cf. Stewart et al., 2003). This specialization is clearly a product of experience-dependent neural plasticity, i.e., long-lasting changes in neurons and brain networks driven by experiences within an individual lifetime (Dehaene, 2009). Furthermore, certain reading disorders have a genetic component (Fisher and Franks, 2006), even though one can be confident that humans have not undergone natural selection for reading abilities. That is, specific genes can influence brain circuits that happen to be important for a complex human ability without any implication of natural selection for that ability.

The examples of fire-making and reading show that the evolutionary null hypothesis for music is not challenged by music's universality, age, association with some degree of brain specialization, or its influence by specific genes. Challenges to the null hypothesis thus must come from other sources. Patel (2008: 367-400) reviewed a wide range of evidence in this regard, including data from neuroscience, infant studies, and animal studies, and argued that at present the null hypothesis for music could not be rejected.

Rather than rehearse those arguments here, sections 3.1 and 3.2 below take a different approach and illustrate two lines of research that support the idea of music as an invention. These studies illustrate a comparative approach to the evolutionary biology of music (McDermott and Hauser, 2003; Justus and Hutsler, 2005). The basic logic of this approach is as follows: If one can show that an aspect of music cognition is rooted in other, nonmusical human brain functions or is shared with other species, then it is parsimonious to assume that this aspect has not been shaped by natural selection for music. This approach is particularly powerful when applied to aspects of music which seem domain-specific, i.e., not related to other types of cognition, such as tonality processing and synchronization of movement to a musical beat (Peretz and Coltheart, 2003; Bispham, 2006).

8.4.1 3.1 Tonality processing: connections to language

Most of the world's musical systems use discrete pitches and intervals to create melodies, with the pitches drawn from musical scales of five to seven tones per octave (Reck, 1997). A widespread feature of music is the *differential* use of scale pitches such that some are perceived as more stable or structurally significant than others (Krumhansl, 1990). This differentiation of scale pitches in terms of stability or prominence has been termed a "tonal hierarchy," and implicit knowledge of such hierarchies develops without any special musical training (Tillmann et al., 2000). This knowledge contributes to our subjective impressions that tones in a musical context have abstract perceptual properties, such as tension or resolution, that are distinct from standard psychophysical tone properties such as "higher or lower" or "louder or softer."

Krumhansl and Cuddy (in press) argue that "tonal hierarchies...play a central role in how musical sequences are perceived, organized, remembered, and how expectations are formed during listening." Furthermore, they note that this way of organizing pitch is unique to music, an assertion supported by the fact that language, which can use pitch in highly structured ways, has nothing resembling tonality (cf. Patel, 2008, Ch. 2). Indeed, Peretz and Coltheart (2003) have proposed that processing of tonality in music uses domain-specific brain mechanisms. This view is supported by neurological cases in which brain damage selectively impairs tonality processing while leaving more basic forms of auditory processing, as well as language processing, intact (e.g., Peretz, 1993).

Neuroimaging of healthy individuals has challenged a domain-specific view of tonality processing, however. This challenge commenced with a study that directly compared brainwave ("event-related potential," or ERP) activity associated with syntactic processing of language and tonal-harmonic processing of music and found a surprising degree of overlap (Patel et al., 1998). Subsequently, neuroimaging studies using a variety of techniques (e.g., MEG, fMRI) have suggested overlap in brain areas involved in linguistic syntactic processing and musical tonal-harmonic processing (e.g., Maess et al., 2001; Koelsch et al., 2002; Tillmann et al., 2003; Patel, in press(b)). The apparent paradox between data from neurological patients (which support a domain-specific view of tonality) and from neuroimaging (which support a non domain-specific view) led to the "shared syntactic integration resource hypothesis" or SSIRH (Patel, 2003). The SSIRH posits

that language and music rely on domain-specific structural knowledge stored in long-term memory (e.g., knowledge of words and their syntactic features or chords and their harmonic relations), but that integration of words or musical tones into hierarchical structures during auditory processing relies on shared, limited neural resources (see Patel, in press (a), for further details and Patel, 2008, Ch. 5, for a full treatment). The SSIRH posits that cases of neurological dissociation result from damage to domain-specific representations, while the similar brain responses seen in neuroimaging studies of healthy individuals reflect shared processes of structural integration operating on these domain-specific representations. Crucially, the SSIRH makes testable predictions, including the prediction that simultaneous structural integration demands in language and music should lead to processing interference. To date, these predictions have been supported by both behavioral and neural studies (Koelsch et al., 2005; Steinbeis and Koelsch, 2008; Fedorenko et al., 2009; Slevc et al., 2009).

Recently, further evidence for overlap between linguistic syntactic processing and musical tonality processing has emerged from clinical studies, including neuroimaging research on specific language impairment (Jentschke et al., 2008), intracranial EEG studies of epileptic patients (Sammler, 2009), and behavioral studies of agrammatic Broca's aphasia (Patel et al., 2008).[8] Given this growing evidence for links between tonality processing and linguistic syntactic processing, it is worth stepping back and asking why such connections should exist. After all, instrumental music and linguistic sentences serve different communicative ends and are built from distinct raw materials (e.g., musical tones vs. syllables). Furthermore, the hierarchical structures that organize tones vs. words have been argued to be quite different (Jackendoff, 2009, though see Rohrmeier, 2007, for a different view). Why then would the processing of structural relations in music and language engage similar brain mechanisms?

A notable similarity between tonality and linguistic syntax is the existence of abstract structural categories that organize sequences of events. In tonality, for example, structural categories such as the tonic (the most stable pitch in the tonal hierarchy) or leading tone (an unstable pitch in the hierarchy) can be realized by any pitch. For example, the pitch B4 (493.9 Hz) can serve as either the tonic or leading tone of a melody, depending on prevailing tonal hierarchy. Language also has abstract structural categories, such as grammatical subject and object, that can be realized by a variety of words.

In both domains, abstract categories play an important role in mental processes involved in sequence comprehension. To take one example, in processing a melody one may expect a tonic as the next note (vs. expecting a specific tone frequency in Hz), and in processing language, it is possible to expect a grammatical object as the next word (vs. expecting a particular word) (Huron, 2006; Gibson, 2006). To take another example, in both domains incoming categories vary in how easy they are to integrate into the existing structural representation of the sequence (Bigand et al., 2003; Koelsch et al., 2007; Gibson, 1998; Levy, 2008). According to the SSIRH, difficult structural integrations in both domains draw on a shared pool of limited neural resources (see Patel, in press (a), for details).

To recap, tonality involves domain-specific *knowledge*: the long-term knowledge of tonal hierarchies, for example, is specific to music. Yet online processing of tonal relations appears to share mechanisms with language processing, possibly because tonality, like linguistic syntax, deals in abstract categories that are processed in terms of hierarchical structures. The deeper lesson, in terms of exploring links between music cognition and other domains, is the importance of distinguishing domain-specific representations from non-domain-specific processing mechanisms. Indeed, in the case of tonality, non domain-specific mechanisms may be important not only for online processing, but also for the acquisition of knowledge. According to Krumhansl and Cuddy (in press), two psychological principles underlie the development of tonal hierarchies in the mind of a listener: the use of cognitive "reference points" and mechanisms of statistical learning. They note that neither principle is unique to music, but that the application of these principles to music results in domain-specific musical knowledge. In other words, tonal music may represent a case of the mind creating domain-specific knowledge via non domain-specific processes (cf. McMullen and Saffran, 2004).

[8] The studies of music perception in aphasia have focused on patients with left hemisphere brain damage and "agrammatic comprehension," i.e., difficulty understanding the meanings of sentences based on their grammatical structure, rather than difficulty understanding the meanings of individual words. For example, such patients, if told the sentence "The girl on the chair was greeted by the man," would understand that the sentence referred to a girl, a chair, a man, and an act of greeting, but would be unsure of who did what to whom. See Patel et al., 2008, for further discussion.

8.4.2 3.2 Entrainment to a musical beat: connections to vocal learning

In every human culture there is some form of music with a periodic beat pattern, to which people synchronize their rhythmic movements, e.g., in dance (Nettl, 2000).[9] Musical beat perception and synchronization (BPS) is an example of the entrainment of rhythmic action to rhythmic sound. BPS does not appear to be an offshoot of language. Language has rich rhythmic structure and can involve tight temporal coordination (e.g., in conversational turn-taking), but does not have temporally periodic beats and does not elicit periodic rhythmic movement from listeners (Patel, 2008, Ch. 3). Notably, BPS (e.g., head bobbing and foot tapping to music) emerges without any special instruction in humans, which makes it an intriguing topic of study from the standpoint of evolutionary biology. Has the human brain been specifically shaped to support this ability?

This question is particularly salient since BPS is distinct in a number of ways from other examples of animal entrainment in nature, e.g. the synchronous chirping of katydids (Greenfield and Schul, 2008). For example, human synchronization to music is very flexible in terms of tempo, is a response to complex sound sequences (not just pulse trains), and is truly cross-modal since it often involves silent rhythmic movement in response to sound. No other species combines these features in their natural entrainment behavior (Patel et al., 2009a). Furthermore, familiar domestic animals such as dogs and cats show no tendency for spontaneous rhythmic movement to music, even though they have lived with humans and their music for thousands of years. Indeed, BPS has been proposed to be a uniquely human ability (Bispham, 2006), reflecting natural selection for musical behavior in our species, perhaps in the service of promoting group cohesion (cf. Dunbar, in press and section 2.1 above).

Yet neurobiology suggests that BPS may have hidden connections to brain systems with other "day jobs." Specifically, BPS may build on the brain circuitry for complex vocal learning, a trait shared by humans and only a few other groups of mammals and birds. Vocal learning is associated with specific evolutionary modifications to the brain (Jarvis, 2009) and, like BPS, involves a high degree of neural integration between the auditory and motor systems (Patel et al., 2005). The "vocal learning and rhythmic synchronization hypothesis" (Patel, 2006) posits that vocal learning provides a neurobiological foundation for BPS. One prediction of this hypothesis is that non-vocal-learning species, which includes all non-human primates, are incapable of BPS. While direct tests of this prediction are still needed via training studies involving movement to music, some support is provided by a recent study that attempted to teach rhesus macaques to synchronize their finger movements to a metronome (Zarco et al., 2009). Despite more than a year of concerted training (six days/week, four hours/day), the monkeys were unable to learn to align their taps in time with the metronome signal—a task that is easy for humans, even young children with no musical training (McAuley et al., 2006).

Additional support for the vocal learning hypothesis has recently been provided by the discovery of entrainment to human music in several parrot species (Patel et al., 2009b, Schachner et al., 2009). Tempo flexibility was demonstrated in an experiment with a sulphur-crested cockatoo (*Cacatua galerita eleonora*), in which the tempo of a song was manipulated to create different versions ranging from twenty percent slower to twenty percent faster than the original song. The animal was able to synchronize its head bobs to the beat of the music at several different tempi. Synchronization occurred in "bouts," or periods of sustained entrainment, interspersed in longer episodes of dancing not synchronized to the beat. Interestingly, the non-synchronized dancing was dominated by a preferred tempo of rhythmic movement, and synchronization was best when the musical tempo was near this preferred tempo (Patel et al., 2009c), patterns that have also been observed in how human children move to music (Eerola et al., 2006). Thus, it appears that parrots may resemble human children (vs. adults) in terms of how they move to rhythmic music, though further research is needed to test this idea.

Crucially, parrots (as far as is known) do not entrain rhythmic movements to rhythmic sounds as part of their natural behavior, indicating that BPS does not require a brain that has been shaped by natural selection for this ability. Furthermore, modern neuroanatomical research suggests that vocal learning in birds and mammals uses homologous brain circuits involving the thalamus, striatum, and forebrain, despite the fact

[9] Periodic beat patterns need not be based on an isochronous (metronomic) pulse. For example, Balkan rhythms can have temporally-repeating cycles of beats, with each cycle having asymmetric time intervals between beats (cf. Patel, 2008: 98).

that the mammalian and avian lineages diverged over 200 million years ago (Jarvis, 2007). In other words, there seem to be genetic and neural constraints on how vocal learning is acquired in vertebrate brains, so that even when the ability arises in distantly related vertebrate groups, similar underlying brain mechanisms are at play. This idea of "deep homology" underlying vocal learning circuitry in birds and humans suggests that a brain shaped by evolution for vocal learning has "BPS potential" as a byproduct of its wiring (see Patel et al., 2009a, for further discussion).

8.4.3 3.3 Music as a human invention: summary

The above sections indicate that two core components of music cognition—tonality processing and entrainment to a musical beat—have strong relationships to nonmusical brain functions. Notably, while these aspects seem domain-specific to music at first glance, research grounded in neuroscience points to their underlying connections to nonmusical brain functions. Thus, these aspects of music cognition can be explained without invoking evolutionary brain specialization for music, which is consistent with the idea that music is an invention.

If music is an invention, then future research will show that every component of music cognition can either be related to a nonmusical brain function or be explained via learning in the absence of any evolutionary specialization for music. Of course, even if this is shown to be the case, music cognition as a whole will still be special because it creates a unique confluence of different processing components in the human mind. It is interesting to speculate that the nature of this confluence may vary in interesting ways across cultures and historical epochs, depending on which processing components a culture uses in building its musical system.

8.5 4. The biological power of music: two examples

Challenges to the most prominent nonadaptationist theory of music (Pinker, 1997), which views music as a "biologically useless" invention, come from studies showing that regular engagement with music can result in lasting changes to nonmusical brain functions. Importantly, such studies concern individuals who are not professional musicians. There has been a good deal of research on structural brain differences between professional musicians and non-musicians (e.g., Elbert et al., 1995; Schneider et al., 2002; Bengtsson et al., 2005; Stewart, 2008), with recent research supporting the idea that many such differences can be explained by experience-dependent neural plasticity (e.g., Hyde et al., 2009; Schlaug, Forgeard et al., 2009). The current focus, however, is on evidence that regular engagement with music can exert lasting effects on brain functions in a wider range of individuals (e.g., Sacks, 2007; Dalla Bella et al., 2009; Bradt et al., in press).

Before discussing neurological studies, it is worth saying a few words about the effect of regular music lessons on the cognitive abilities of children, a topic of great public interest. This issue has been explored experimentally by Schellenberg (2004). He conducted a study in which six-year-old first-graders were randomly assigned to weekly keyboard lessons, voice lessons, drama lessons, or no lessons for one year. Each child was tested twice on a standardized intelligence test: once before entering first grade, and once in the summer after first grade. This test had twelve subtests measuring a variety of nonmusical cognitive skills. Children in all groups showed IQ increases over time, as expected due to attending first grade, but those receiving music lessons gained significantly more IQ points than those taking drama or no lessons.[10] Based on the fact that the IQ gains in the music groups were seen across a majority of the twelve subtests, Schellenberg argued that music training influences a variety of non-domain-specific skills (e.g., memorization, fine motor skills) or general mental processes relevant to many different cognitive tasks, such as executive function (the ability to organize mental tasks, control impulses, etc.) and abstract reasoning (see Schellenberg, 2006, for further details).[11] Schellenberg's findings support the view that regular engagement with music influences a variety of nonmusical brain functions.

[10] The drama group, in contrast, outgained other groups in social skills, such as cooperating with peers. For further research on the possible cognitive benefits of drama training, see Goldstein et al., 2009-2010.

[11] Schellenberg (2006) is also recommended for its extensive discussion of the controversial "Mozart effect," whereby passive music listening has short-lived effects on certain nonmusical cognitive tasks.

8.5.1 4.1 Music and the recovery of brain functions after stroke

A recent study by Särkämö and colleagues (2008) provides evidence that regular listening to music can aid in the recovery of brain functions following stroke. These authors studied 60 patients with left or right hemisphere middle cerebral artery stroke,[12] who were randomly assigned to one of three groups. A music group listened to one hour of self-selected music per day, a story group listened to one hour of self-selected stories per day, and a control group had no additional treatment. (All three groups received standard stroke therapy.) Music therapists assisted in providing portable audio players and audio materials and in encouraging patients to listen. The experimental interventions lasted for two months, beginning soon after stroke onset. All of the patients were assessed on seven nonmusical cognitive tasks and eight mood measures, once soon after stroke onset and then again at three and six months post-stroke. The cognitive tasks examined verbal memory, short-term memory, language, visuospatial cognition, focused attention, sustained attention, and executive functions. The mood measures examined tension, depression, irritability, vigor, fatigue, inertia, confusion, and forgetfulness. All tests were administered by people unaware of which group the patients were a part.

The three groups showed no significant differences in any measures soon after stroke onset. However, at three and/or six months, significant differences emerged between groups on two cognitive tests and two mood measures. On the cognitive tests, verbal memory and focused attention were superior in the music group compared to the other two groups. On the mood measures, the music group showed significantly less depression and confusion than the control group. For other cognitive and mood measures, the groups showed comparable performance at three and six months, and in no case did the music group perform worse than the other groups.

These findings are striking because they suggest lasting positive effects of passive music listening on neural recovery after stroke. What physiological mechanisms might underlie these effects? Prior research with healthy individuals indicates that pleasurable music listening is associated with activation of reward areas of the brain (e.g., the ventral tegmental area) that project dopamine to wide regions of the cerebral cortex (Menon and Levitin, 2005). The authors thus speculate that the activation of the dopaminergic mesocorticolimbic system by music may have led to enhanced general arousal and mood and suggest that this in turn influenced performance on cognitive tasks. In support of this idea, they point to prior research with healthy individuals that finds links between music-induced positive arousal/mood and performance on nonmusical cognitive tasks (e.g., Thompson et al., 2001).

Two problems with this account, however, are that the prior research was concerned with *transient* effects of music on immediately administered cognitive tasks (i.e., effects lasting minutes, not days or weeks), and that the dopamine-arousal hypothesis cannot explain why the music group showed improvement on only the verbal memory and focused attention cognitive tasks. It is interesting to consider the possible role of hormones in the current findings because of their long-lasting effects on brain physiology. For example, the glucocorticoid hormone cortisol is secreted by the adrenal glands in response to stress, as a result of neuroendocrine signals from the brain. A major stroke is a life-changing event that seems likely to result in greatly elevated stress in the months following the stroke, due to loss of one's normal physical and mental abilities. This may in turn result in chronically elevated cortisol levels. Sustained high cortisol levels have deleterious structural effects on neurons in the hippocampus, a brain region rich in glucocorticoid receptors (Sapolsky, 2000) and involved in verbal memory in older adults (Zimmerman et al., 2008).

How does music enter this picture? Cortisol production is regulated by signals from the hypothalamus, a brain structure that is influenced by projections from the limbic system (brain structures involved in regulating emotion). The limbic system in turn is influenced by music (Peretz, 2010; Koelsch, 2010). The mechanisms underlying this influence remain unclear and may involve sensitivity of the limbic system to voice-like acoustic cues to affect, cues that occur in exaggerated form in music (cf. Juslin and Laukka, 2003). Interestingly, experiments with healthy individuals show that music listening immediately after a stressful event transiently reduces cortisol levels (Khalfa et al., 2003). Thus, one can hypothesize that regular music listening after stroke helps lower average cortisol levels, and these reduced levels facilitate

[12] Acute ischaemic MCA stroke in the left or right temporal, frontal, parietal, or subcortical brain regions, with no prior neurological or psychiatric diseases (mean participant age: 56 years).

hippocampal function. This could help account for the superior verbal memory of the stroke patients in the music-listening group. The superior performance of this group on sustained attention tasks remains to be explained, however. Neuroimaging research has shown that attentive listening to music recruits domain-general attentional networks (Janata et al., 2002), but it is not clear why or how regular activation of these networks by music would facilitate their operation during nonmusical tasks.

Humans are deeply social creatures, and thus one important question concerns possible increased benefits of social musical activities on cognitive and emotional function after stroke. That is, active engagement of patients in singing or playing instruments may have greater cognitive, emotional, and motor benefits on neural recovery than passive listening to music. In particular, it would be worth comparing live therapy vs. passive listening in terms of the cognitive and mood measures applied by Särkämö et al. If live therapy is substantially more beneficial, this would provide scientific evidence for the value of live music therapy in the post-stroke period.

8.5.2 4.2 Music and the recovery of verbal fluency in aphasia

Aphasia is a language impairment due to central neurological dysfunction. Given the importance of language to human communication, aphasia is a truly debilitating neurological disorder affecting over 100,000 stroke victims each year in the U.S. alone (Schlaug et al., 2008). Nonfluent aphasias generally result from lesions in the frontal lobe and/or its underlying white matter fiber tracts, and are characterized by limited, effortful verbal output, often in the face of otherwise intelligent behavior. Such patients have difficulty retrieving the words they want to say and assembling the words into coherent phrases. Yet a striking phenomenon in many such patients, known for over one hundred years, is that they can sometimes sing familiar songs with great fluency (Racette et al., 2006). This led to the development of a form of aphasia therapy known as melodic intonation therapy, or MIT (Albert et al., 1973), which embeds short phrases (e.g., "I love you") in "melodic" speech intonation patterns that rely on up-and-down movements between two discrete pitches. Patients practice such utterances intensively and regularly with a therapist, who gradually lengthens the phrases to span more syllables (Norton et al., 2009). The goal of the therapy is to improve fluency for both the trained phrases and for spontaneous, untrained utterances spoken in a normal fashion.

Two features of MIT that distinguish it from non-musical speech therapy are the use of melodic speech intonation and rhythmic tapping (i.e., while speaking the utterance, the patient also taps its rhythm using the hand that was unaffected by the stroke). Schlaug and colleagues have recently begun a set of studies aimed at measuring the efficacy of MIT versus a matched "speech repetition therapy" (SRT) without melodic intonation and tapping. In addition to quantifying MIT's versus SRT's effects on post-therapy measures of verbal fluency, the researchers are also measuring changes in brain physiology after the two therapies. Of particular interest in this regard is the extent to which MIT patients shift toward using right hemisphere circuits for speech after therapy. Prior neuroimaging research with normal individuals indicates that song and speech have different hemispheric biases, with song activating several right hemisphere regions not activated by ordinary speech (Callan et al., 2006; cf. Peretz, in press). Hence, one question of interest is the extent to which MIT recruits these regions to compensate for damaged left-hemisphere regions.

Preliminary data reported in Schlaug et al. (2008) support this idea by showing that a patient who underwent forty sessions of MIT showed greater verbal fluency and greater right hemisphere activation when speaking than did a patient who underwent SRT. Furthermore, Schlaug et al. (2009) have reported structural changes in the brains of several patients who underwent MIT. Specifically, these patients show an increase in the thickness of a large fiber tract (the right arcuate fasciculus) connecting the frontal and superior temporal lobes. Furthermore, there was a trend for a correlation between the degree of thickening and the degree of improvement in verbal fluency, though the trend did not reach statistical significance, possibly due to the small sample size (more patients are currently being studied).[13]

Since this research program is still in its early stages, the findings raise numerous questions, including the reliability of the above correlation when more patients are added and the degree to which changes in

[13]Structural measures of the right arcuate fasciculus were conducted before and after seventy-five sessions of MIT therapy using MRI diffusion tensor imaging (DTI) in living patients.

the right arcuate fasciculus are specifically driven by MIT (versus SRT or no therapy). Furthermore, the physiological basis of the observed fiber-tract thickening is not yet clear. For example, such thickening could be due to use-related increases in the number of axon collaterals in the fasciculus or use-related increases in the diameter of existing axons.[14] Nevertheless, the research of Schlaug and colleagues suggests that musical behaviors can have lasting effects on nonmusical brain functions after stroke. Furthermore, this research provides a model for studies seeking to examine the effects of music on other brain functions, as discussed in the next section.

8.5.3 4.3 The biological power of music: future directions

The two examples above suggest that music can have lasting effects on nonmusical abilities. The second example provides only preliminary data, but was included because it illustrates the kind of approach needed for studying the biological effects of music on brain function. Specifically, there is a need for experimental studies that combine longitudinal behavioral and neural measurements to examine how music influences nonmusical abilities in a lasting fashion (cf. Altenmüller et al., 2009). While studies that collect brain data are particularly valuable, purely behavioral studies are also useful if they lead to hypotheses for underlying neural mechanisms, as in the Särkämö study above. Well-controlled studies from the field of music therapy are of considerable interest in this regard (e.g., Bradt et al., in press).

While the examples above focused on adults, an important direction for future work concerns children, because their developing brains are even more malleable than those of adults (Huttenlocher, 2002). Indeed, music may be a particularly efficacious technology for shaping brain function in children because they are drawn to music from a very young age, meaning that it is relatively easy to get them to engage in musical behaviors repeatedly.

An example from research on dyslexia helps illustrate how music might benefit the nonmusical abilities of children. Research has revealed that many children with developmental dyslexia have reduced sensitivity to auditory cues related to the amplitude envelope of sounds, such as the rise-time of syllables (the rate of sound amplitude increase at syllable onset). This auditory deficit appears to be related to their dyslexia: individual differences in rise time discrimination are predictive of phonological awareness, even when factors such as age, verbal and nonverbal IQ, and vocabulary are controlled (Goswami, 2009). Thus, sensitivity to the details of speech amplitude envelopes may play an important role in speech comprehension and in the development of the phonological system (cf. Greenberg, 2006). Neural studies using EEG have shown that the right cerebral hemisphere is particularly adept at tracking the amplitude envelope of speech in normal children (Abrams et al., 2008) and that poor readers have a degraded neural representation of the speech amplitude envelope (Abrams et al., 2009).

What does this have to do with music? Rise-time is not only an important cue not only for speech, but also for music, e.g., in specifying the "perceptual attack" of musical sounds (Caclin et al., 2005). Thus, musical activities that make acoustic onsets salient and focus on the ability to accurately perceive such onsets, such as games involving clapping to syllable onsets of words in songs, may help refine brain networks involved in encoding amplitude patterns in ordinary speech (Goswami, 2009; cf. Overy, 2003; Tallal and Gaab, 2006). Experimental studies are needed to address this issue.

Studies of the biological power of music need not be limited to individuals with neural anomalies. There is considerable scope for the study of how music affects the development of nonmusical abilities in ordinary individuals, both children and adults (Moreno, 2009). For example, Moreno et al. (2009) recently conducted an experiment in which normal third graders were pseudo-randomly assigned to nine months of music vs. painting lessons. They found that after musical (but not painting) training, children showed enhanced reading and improved pitch discrimination in speech, with the latter improvement shown by both behavioral and neural measures. While the study of how music lessons influence the development of reading is of great practical interest, the relationship between musical training and proficiency at second-language learning also merits study (Patel and Iversen, 2007), as does the relationship between musical training and executive function (Bialystock and DePape, 2009). In addition to these cognitive effects of music, the influence of

[14] I thank Robert Turner for bringing this point to my attention.

group musical activities on the development of empathy and cooperative behavior also deserves research attention (cf. Kirschner and Tomasello, in press).

8.6 5. Why would music have lasting effects on nonmusical brain functions?

The preceding section provided two examples of the lasting effects of music on nonmusical cognitive abilities. I suspect that in the coming years, more and more evidence will accrue for the lasting effects of music on diverse aspects of human brain function. Thus, it is important to begin thinking about why music sometimes has these effects. That is, what mechanisms underlie these effects? A firm answer to this question requires a large set of empirical studies from which to draw inductive conclusions. In the meantime, however, it is possible to set forth some hypotheses that may help guide future work.

I hypothesize that one set of mechanisms involves the neuroendocrine system, i.e., the regulation of hormones by the brain. Music appears to have a strong influence on the human limbic system (Peretz, 2010; Koelsch, 2010), an emotional regulation system with diverse subcortical (e.g., hippocampus, amygdala, cingulate) and cortical (e.g. orbitofrontal cortex) components, which is influenced by many descending inputs from wide regions of the cerebral cortex (Damasio, 1994). The mechanisms by which music influences the limbic system remain to be understood and may revolve in part around music's ability to emulate emotionally significant vocal sounds (Juslin and Laukka, 2003; Snowdon and Teie, 2009), though this is clearly only part of the story. For the current purposes, the crucial point is that the limbic system projects to the hypothalamus, which in turn regulates the release of a broad range of hormones from the brain and various peripheral glands (e.g., oxytocin, cortisol, etc.). Hormones are blood-borne chemical messengers that can have long-lasting effects on a range of brain structures that have hormone receptors. For example, the hippocampus and amygdala have cortisol receptors, and chronically elevated cortisol (e.g., due to prolonged stress) can influence neuronal morphology and activity in these brain structures, as well as the birth of new cells in the adult hippocampus (Sapolsky, 2000). Since there is empirical evidence that listening to music can transiently reduce cortisol levels in adults and infants (Trehub and Nakata, 2002; Khalfa et al., 2003; Suda et al., 2008), this suggests one pathway by which regular musical listening may have lasting effects on the brain (cf. section 4.1 above). Of course, cortisol is just one hormone regulated by the brain, and it seems likely that many hormones (e.g., testosterone, vasopressin, etc.) are potentially influenced by music (Fukui et al., 2008). In all such cases, the critical point is that hormones can have long-lasting effects on the cells that they influence. Thus, neuroendocrine effects on the brain are conceptually and mechanistically distinct from transient neurotransmitter effects, e.g., the release of dopamine associated with musical chills ("goosebumps") (Blood and Zatorre, 2001; Salimpoor et al., 2009).

Of course, the fact that hormones *can* have long-lasting effects on brain structure or function does not mean that they always *do* have such effects. The degree to which neuroendocrine effects result in lasting changes to the brain likely depends on the state the brain is in when such effects occur. Rapidly changing nervous systems (e.g., the brains of healthy infants or of older adults in the period soon after a brain injury) may be particularly sensitive in this regard. Furthermore, there may be genetic factors (including variation in hormone receptor density) that influence tissue sensitivity to hormones.

Apart from neuroendocrine effects, I hypothesize that another way music can have lasting effects on nonmusical abilities is via mechanisms of neural plasticity, i.e. via use-dependent functional or structural changes in brain circuitry. (In contrast to neuroendocrine mechanisms, which can be activated by passive listening to music, plasticity-based mechanisms are likely to be driven by active engagement with music, e.g. via regular singing or playing of a musical instrument.) Modern neuroscience has shifted from a view of the brain as plastic only during early developmental periods to a view that recognizes a substantial degree of plasticity throughout the lifespan (Edelman, 1987; Draganski and May, 2008). The "permanent plasticity" of the brain means that the networks involved in our cognitive functions are malleable throughout life (though the degree of malleability in many brain areas may be substantially higher during early sensitive periods of development). According to TTM theory, music engages processing mechanisms shared with a wide range

of cognitive domains, such as language, attention, auditory scene analysis, and so forth. Hence, music has the opportunity to influence these domains by driving plasticity in brain networks that it shares with these domains.

Why would music drive plasticity in these networks? One idea is that music is often more exacting than other domains in terms of the degree of precision that it demands. For example, music and speech both involve the control of pitch, but music demands a higher degree of precision for both the control and perception of pitch than does ordinary speech (Patel, 2008, Ch. 4). Thus, musical experience may sharpen cortical and subcortical pitch processing mechanisms shared by music and language, leading to the observed superior processing of linguistic pitch contours by musicians (Wong et al., 2007; Patel and Iversen, 2007). Similar arguments may help explain why musically trained individuals show superior perception of speech in noise (Parbery-Clark et al., 2009) and other nonmusical auditory processing benefits.

Apart from the demands of high-precision processing, another factors that may promote music's ability to drive plasticity is the fact that musical behaviors are often frequently repeated (e.g., frequently singing or playing a particular piece) and often involve heightened emotion. Repeatedly engaging in high-precision processing in the context of heightened emotion seems likely to promote functional and structural changes to the brain.

8.7 6. A non-genetic explanation for music's universality

Thus far, this essay has argued that music is an invention. Yet if it is an invention, why is it universal in human culture? Section 3 pointed out that human cultural universals can originate as inventions, as illustrated by the control of fire. TTM theory posits that music resembles fire-making in being an ancient invention that has become universal because it provides things that are universally valued by humans. In the case of fire, these things include the ability to cook food, keep warm, and see in dark places. In the case of music, I suggest that the valued things it provides are mental rather than physical: namely, emotional power, ritual efficacy, and mnemonic efficacy.

8.7.1 6.1 Emotional power

Many people report listening to music for the emotion it induces (Juslin and Sloboda, 2001; Benzon, 2001). Emotions are important for humans everywhere from the very beginning of life, and hence one reason for music's universality may be its deep connection to the brain's emotional circuitry (Peretz, 2010, Koelsch, 2010). This connection could help explain the human proclivity for music without postulating any "innate proclivity for musical sounds and actions" (Kirschner and Tomasello, in press).

However, this is a rather unsatisfying explanation for music's universality, because it only serves to raise more questions. *Why* does music have these connections to the emotion circuits of our brains? Can the remarkable power of music to induce emotion be explained without appealing to an evolutionary specialization of the brain for music? In this regard, a recent theory of emotional induction by music is of interest (Juslin and Västfjäll, 2008). According to this "multiple mechanisms" theory, music can induce emotion in several different ways, namely via 1) expectancy and its fulfillment or violation; 2) activation of the brainstem by arousing acoustic features (e.g., sudden, sharp onsets); 3) association with past events; 4) visual imagery; or 5) acoustic cues that resemble the sounds of emotional voices. For the current purposes, the salient aspect of Juslin and Västfjäll's theory is that none of the proposed emotion-inducing mechanisms is unique to music. For example, focusing on the first mechanism, auditory expectation and its relationship to emotion may be a very general aspect of human cognition, not shaped *for* music but exquisitely exploited *by* music (see Huron, 2006, for a detailed theory, and Steinbeis et al., 2006, for empirical data linking musical expectancy to emotion). Focusing on the final mechanism, the authors postulate that this aspect of music's emotional power is due to brain mechanisms that evolved to perceive and respond to vocal affect (cf. Patel 2008b).

Thus, music's remarkable emotional power may arise via its ability to simultaneously engage multiple emotional mechanisms in our brains. While none of these mechanisms is unique to music, music may be unique in the way it temporally activates and coordinates these mechanisms. The result is a complex

emotional experience that can differ from our ordinary day-to-day emotions. This might help explain reports of "music-specific" or "aesthetic" emotions (Zentner et al., 2008), which seem qualitatively distinct from basic emotions associated with survival, such as happiness, sadness, fear, or anger.

8.7.2 6.2 Ritual efficacy

All human cultures have rituals, and music provides a very useful framework for certain types of rituals, independent of the emotional impact of the music *per se*. This is because music provides a structure that can easily be repeated on different occasions, and because musical behaviors are distinct from our ordinary communication. In modern culture, the group singing of "Happy Birthday" provides a familiar example. The performance and appreciation of this song is typically not concerned with the aesthetic or emotional qualities of the music. Rather, the song serves as a ritual that effectively means "we collectively recognize and celebrate your birthday."

8.7.3 6.3 Mnemonic efficacy

In addition to emotion and ritual, music often provides an important mnemonic device for storing long sequences of linguistic information, especially when written language is not available (Sloboda, 1985). In this regard, it is notable that music and song are part of most of the world's ancient oral traditions, e.g., epics and religious chants from diverse civilizations (Rubin, 1995). In our own culture, a familiar example of the mnemonic efficacy of music is the alphabet song, a tune used by many children to learn the order of letters in the alphabet. One indication of music's remarkable power to enter into human memory comes from clinical research with Alzheimer's patients. Experiments with such patients indicate that memory of songs is retained in substantial detail, even in the face of significant loss of episodic memories concerning the patient's own life (Cuddy and Duffin, 2005). The neural mechanisms behind music's mnemonic efficacy are in need of systematic research.

8.8 7. A Darwinian perspective on the biological study of music

Evolutionary discussions of music originate with Darwin, so it is fitting to end this essay with a comment on the relevance of Darwin's thinking to the current proposal. TTM theory proposes that music is an invention that builds on a diverse range of brain functions and has the ability to shape those functions. Thus, TTM theory, unlike Darwin's theory of music, is nonadaptationist. Yet it is thoroughly Darwinian in its focus on comparative biological research. As illustrated by section 3 ("Music as a human invention"), TTM theory grows from studies comparing music processing to brain processing in other domains (such as language) and studies comparing music processing to auditory processing in other species. TTM theory is thus committed to using Darwinian research methods to explore the neurobiological foundations of human music.

Before closing, it is worth asking what distinguishes TTM theory from the concept of exaptation, or a trait whose evolutionary origin is not related to its current use (Gould and Vrba, 1982). Feathers are an oft-cited example of an exaptation, as it has been theorized that these structures originated in the context of thermoregulation and were only later put to use (and directly shaped by natural selection) for flight (Gould and Vrba, 1982). Since TTM theory views music as an invention based on diverse nonmusical brain functions, each of which may have been shaped by natural selection, it considers music a type of exaptation. However, exaptation is not a specific enough term to capture the idea of a transformative technology. This is because exaptation (a term coined before our modern understanding of neural plasticity) does not connote the power of a novel trait to shape the biological systems from which it arose (cf. Lewontin, 2000). Furthermore, exaptation allows the notion of secondary adaptation (as in the feather example above), whereas TTM theory holds that that there has been no evolutionary modification of the brain aimed at supporting musical behavior.

Darwin himself was not an ultra-adaptationist; that is, he did not believe that every characteristic of an organism was a product of natural selection. (He differed from his contemporary Alfred Russell Wallace in

this regard [Gould, 1980].) For example, in *The Descent of Man*, Darwin wrote that "many cases could be advanced of organs and instincts originally adapted for one purpose, having been utilized for some distinct purpose" (p. 1208). That is, he implicitly recognized the concept of exaptation long before the term was coined by later evolutionary biologists. What Darwin did not foresee, however, was that human inventions could substantially influence the structure and function of the brain, albeit within the course of a lifetime. This remarkable fact lays the foundation for a biological approach to music and other human cultural phenomena (Wilson, 1998; Becker, 2004; Edelman, 2006; Smail, 2008). Understanding the biology of human inventions involves understanding how our evolved neural organization shapes those inventions *and* how our inventions in turn shape our brains within individual lifetimes. In exploring this fascinating dialectic, music is a particularly promising area of research.

8.9 Acknowledgments

Supported by Neurosciences Research Foundation as part of its research program on music and the brain at The Neurosciences Institute, where ADP is the Esther J. Burnham Senior Fellow. I am grateful to the following individuals for their insightful comments: Jennifer Burton, John Iversen, Sebastian Kirschner, Richard Lewontin, Bruno Repp, Oliver Sacks, Robert Sapolsky, Thom Scott-Phillips, Daniel Smail, Lauren Stewart, William Forde Thompson, and Ellen Winner. I also thank Melissa Bailar for thoughtful editing, and Fred Moody for his prompt and helpful input throughout the publication process.

8.10 References

Abrams, D.A., Nicol, T., Zecker, S., and Kraus, N. (2008). Right hemisphere auditory cortex is dominant for coding syllable patterns in speech. *The Journal of Neuroscience*, 28, 3958–3965.

Abrams, D.A., Nicol, T., Zecker, S., and Kraus, N. (2009). Abnormal cortical processing of the syllable rate of speech in poor readers. *The Journal of Neuroscience*, 29, 7686–7693.

Albert, M.L., Sparks, R.W., and Helm, N.A. (1973). Melodic intonation therapy for aphasia. *Archives of Neurology*, 29, 130-131.

Altenmüller, E., Marco-Pallares, J., Münte, T. F., and Schneider, S. (2009). Neural reorganization underlies improvement of stroke-induced motor dysfunction by music-supported therapy. *Annals of the New York Academy of Sciences*, 1169, 395–405.

Becker, J. (2004). *Deep Listeners: Music, Emotion, and Trancing*. Bloomington: Indiana University Press.

Bengtsson, S.L., Nagy, Z., Skare, S., et al. (2005). Extensive piano practicing has regionally specific effects on white matter development. *Nature Neuroscience*, 8, 1148-1151.

Benzon, W. (2001). *Beethoven's Anvil: Music in Mind and Culture*. New York: Basic Books.

Bialystock, E. and DePape, A. (2009). Musical expertise, bilingualism, and executive functioning. *Journal of Experimental Psychology: Human Perception and Performance*, 35, 565–574.

Bigand, E. and Poulin-Charronnat, B. (2006). Are we "experienced listeners"? A review of the musical capacities that do not depend on formal musical training. *Cognition*, 100, 100–130.

Bigand, E., Poulin, B., Tillmann, B., Madurell, F., and D'Adamo, D.A. (2003). Sensory versus cognitive components in harmonic priming. *Journal of Experimental Psychology: Human Perception and Performance*, 29, 159–171.

Bispham, J. (2006). Rhythm in music: What is it? Who has it? And why? *Music Perception*, 24, 125-134.

Blacking, J. (1973). *How Musical is Man?* Seattle: University of Washington.

Blood, A.J. and Zatorre, R.J. (2001). Intensely pleasurable responses to music correlate with activity in brain regions implicated with reward and emotion. *Proceedings of the National Academy of Sciences*, 98, 11818–11823.

Boyd, B. (2009). *On the Origin of Stories: Evolution, Cognition, and Fiction.* Cambridge, MA: Harvard University Press.

Bradt, J., Magee, W.L., Dileo, C., Wheeler, B. and McGilloway, E. (in press). Music therapy for acquired brain injury. *Cochrane Database of Systematic Reviews.*

Bregman, A.S. (1990). *Auditory Scene Analysis.* Cambridge, MA: MIT Press.

Brown, S. (2000(a)). The "musilanguage" model of music evolution. In: Wallin, N.L., Merker, B., and Brown, S. (Eds.), *The Origins of Music* (pp. 271-300). Cambridge, MA: MIT Press.

Brown, S. (2000(b)). Evolutionary models of music: From sexual selection to group selection. In: Tonneau, F. and Thompson, N.S. (Eds.), *Perspectives in Ethology.* 13: *Behavior, Evolution and Culture* (pp. 231-281). New York: Plenum Publishers.

Caclin, A., McAdams, S., Smith, B.K., and Winsberg, S. (2005). Acoustic correlates of timbre space dimensions: A confirmatory study using synthetic tones. *Journal of the Acoustic Society of America,* 118, 471–482.

Callan, D., Tsytsarev, V., Hanakawa, T., et al. (2006). Song and speech: Brain regions involved with perception and covert production. *NeuroImage*, 31, 1327–1342.

Cohen, E., Ejsmond-Frey, R., Knight, N., and Dunbar, R. (2009). Rowers' high: Elevated endorphin release under conditions of active behavioural synchrony. *Biology Letters*, doi: 10.1098/rsbl.2009.0670.

Cross, I. (2009). The nature of music and its evolution. In: Hallam, S., Cross, I., and Thaut, M. (Eds.), *The Oxford Handbook of Music Psychology* (pp. 3-13). Oxford: Oxford University Press.

Conard, N.J., Malina, M., and Münzel, S.C. (2009). New flutes document the earliest musical tradition in southwestern Germany. *Nature*, 460, 737-740.

Cuddy, L.L. and Duffin, J.M. (2005). Music, memory, and Alzheimer's Disease: Is music recognition spared in dementia, and how can it be assessed? *Medical Hypotheses,* 64, 229-235.

Dalla Bella, S., Kraus, N., Overy, K., et al. (2009). The Neurosciences and Music III: Disorders and Plasticity. *Annals of the New York Academy of Sciences*, Vol. 1169.

Damasio, A. (1994). *Descartes' Error: Emotion, Reason, and the Human Brain.* New York: Putnam.

Darwin, C. (1871). *The Descent of Man, and Selection in Relation to Sex.* In: Wilson, E.O. (Ed.). *From So Simple a Beginning: The Four Great Books of Charles Darwin.* New York: W.W. Norton (2006).

Deacon, T.W. (1997). *The Symbolic Species: The Co-evolution of Language and the Brain.* New York: W. W. Norton.

Dehaene, S. (2009). *Reading in the Brain.* New York: Viking.

Dehaene, S. and Cohen, L. (2007). Cultural recycling of cortical maps. *Neuron,* 56, 384-398.

Dissanayake, E. (2008). If music is the food of love, what about survival and reproductive success? *Musicae Scientiae* (Special Issue), 169-195.

Draganski, B. and May, A. (2008). Training-induced structural changes in the adult human brain. *Behavioural Brain Research,* 192, 137–142.

Drayna, D., Manichaikul, A., de Lange, M., Snieder, H., and Spector, T. (2001). Genetic correlates of musical pitch recognition in humans. *Science*, 291, 1969–72.

Dunbar, R.I.M. (in press). On the evolutionary function of song and dance. In: Bannan, N. (Ed.), *Music, Language and Human Evolution.* Oxford: Oxford University Press.

Edelman, G.M. (1987). *Neural Darwinism: The Theory of Neuronal Group Selection.* New York: Basic Books.

Edelman, G.M. (2006). *Second Nature: Brain Science and Human Knowledge.* New Haven: Yale University Press.

Eerola, T., Luck, G., and Toiviainen, P. (2006). An investigation of pre-schoolers' corporeal synchronization with music. In: Baroni, M., Addessi, A., Caterina R., and Costa, M. (Eds.), *Proceedings of the 9th International Conference on Music Perception and Cognition (ICMPC9)* (pp. 472–476). Bologna, Italy.

Elbert, T., Pantev, C., Wienbruch, C., Rockstroh, B., and Taub, E. (1995). Increased use of the left hand in string players associated with increased cortical representation of the fingers. *Science*, 270, 305–307.

Everett, D.L. (2008). *Don't Sleep, There Are Snakes: Life and Language in the Amazonian Jungle.* New York: Pantheon.

Falk, D. (2004). Prelinguistic evolution in early hominins: Whence motherese? *Behavioral and Brain Sciences*, 27, 491-503.

Fedorenko, E., Patel, A.D., Casasanto, D., Winawer, J., and Gibson, E. (2009). Structural integration in language and music: Evidence for a shared system. *Memory and Cognition*, 37, 1-9.

Fitch, W.T. (2006). The biology and evolution of music: A comparative perspective. *Cognition*, 100, 173–215.

Fitch, W.T. (2010). *The Evolution of Language*. Cambridge: Cambridge University Press.

Fisher, S.E. and Franks, C. (2006). Genes, cognition and dyslexia: Learning to read the genome. *Trends in Cognitive Sciences*, 10, 250-257.

Fukui, H. and Toyoshima, K. (2008). Music facilitates the neurogenesis, regeneration and repair of neurons. *Medical Hypotheses*, 71, 765–769.

Geissmann, T. (2000). Gibbon songs and human music from an evolutionary perspective. In: Wallin, N.L., Merker, B., and Brown, S. (Eds.), *The Origins of Music* (pp. 102–123). Cambridge, MA: MIT Press.

Gibson, E. (1998). Linguistic complexity: Locality of syntactic dependencies. *Cognition*, 68, 1-76.

Gibson, E. (2006). The interaction of top–down and bottom–up statistics in the resolution of syntactic category ambiguity. *Journal of Memory and Language*, 363-388.

Goldstein, T.R., Wu, K., and Winner, E. (2009-2010). Actors are skilled in theory of mind but not empathy. *Imagination, Cognition, and Personality*, 29, 115-133.

Goswami, U. (2009). Mind, brain, and literacy: Biomarkers as usable knowledge for education. *Mind, Brain, and Education*, 3, 176-184.

Gould, S.J. (1980). Natural selection and the brain: Darwin vs. Wallace. In: *The Panda's Thumb* (pp. 47-58). New York: Norton.

Gould, S.J. and Vrba, C. (1982). Exaptation— a missing term in the science of form. *Paleobiology*, 8, 4-15.

Greenberg, S. (2006). A multi-tier framework for understanding spoken language. In: Greenberg, S. and Ainsworth, W.A. (Eds.), *Listening to Speech: An Auditory Perspective* (pp. 411–433). Mahwah, NJ: Erlbaum.

Greenfield, M.D. and J. Schul. (2008). Mechanisms and evolution of synchronous chorusing: emergent properties and adaptive functions in Neoconocephalus katydids (Orthoptera: Tettigoniidae). *Journal of Comparative Psychology*, 122, 289–297.

Hagen, E.H. and Hammerstein, P. (2009). Did Neanderthals and other early humans sing? Seeking the biological roots of music in the loud calls of primates, lions, hyenas, and wolves. *Musicae Scientiae*, Special Issue 2009/10 "Music and Evolution," 291-320.

Hauser, M. D. and McDermott, J. (2003). The evolution of the music faculty: A comparative perspective. *Nature Neuroscience*, 6, 663–668.

Huron, D. (2006). *Sweet Anticipation: Music and the Psychology of Expectation.* Cambridge, MA: MIT Press.

Huttenlocher, P. (2002). *Neural Plasticity: The Effects of Environment on the Development of the Cerebral Cortex.* Cambridge, MA: Harvard University Press.

Hyde, K., Lerch, J., Norton, A., et al. (2009). Musical training shapes structural brain development. *The Journal of Neuroscience*, 29, 3019 –3025.

Jackendoff, R. (2009). Parallels and nonparallels between language and music. *Music Perception*, 26, 195–204.

James, W. (1890). *The Principles of Psychology.* New York: Dover Publications.

Janata, P., Tillmann, B., and Bharucha, J. (2002). Listening to polyphonic music recruits domain-general attention and working memory circuits. *Cognitive, Affective, and Behavioral Neuroscience*, 2, 121-140.

Jarvis, E.D. (2007). Neural systems for vocal learning in birds and humans: A synopsis. *Journal of Ornithology,* 148 (Suppl. 1), S35-S44.

Jarvis, E.D. (2009). Bird song systems: Evolution. In: L.R. Squire et al. (Eds.), *Encyclopedia of Neuroscience,* vol. 2, (pp. 217-225). Oxford: Academic Press.

Jentschke, S., Koeslch, S., Sallat, S., and Friederici, A. (2008). Children with specific language impairment also show impairment of music-syntactic processing. *Journal of Cognitive Neuroscience*, 20, 1940-1951.

Juslin, P. N. and Laukka, P. (2003). Communication of emotions in vocal expression and music performance: Different channels, same code? *Psychological Bulletin*, 129, 770–814.

Juslin, P. N. and Sloboda, J. A. (Eds.). (2001). *Music and Emotion: Theory and Research*. Oxford, UK: Oxford University Press.

Juslin, P. N. and Västfjäll, D. (2008). Emotional responses to music: The need to consider underlying mechanisms. *Behavioral and Brain Sciences*, 31, 559–621.

Justus, T. and Hutsler, J.J. (2005). Fundamental issues in the evolutionary psychology of music: Assessing innateness and domain-specificity. *Music Perception*, 23, 1–27.

Khalfa, S., Dalla Bella, S., Roy, M., et al. (2003). Effects of relaxing music on salivary cortisol level after psychological stress. *Annals of the New York Academy of Sciences*, 999, 374-376.

Kirschner, S. and Tomasello, M. (in press). Joint music making promotes prosocial behavior in four-year-old children. *Evolution and Human Behavior*.

Kivy, P. (1959). Charles Darwin and Music. *Journal of the American Musicological Society*, 12, 42-48.

Kivy, P. (1960). *Herbert Spencer and a musical dispute*. Masters Thesis, Yale University Deptartment of Music.

Kivy, P. (1964). Herbert Spencer and a Musical Dispute. *Music Review*, 23, 317-329.

Koelsch, S. (2010). Towards a neural basis of music-evoked emotions. *Trends in Cognitive Sciences*, 14, 131-137.

Koelsch, S., Gunter, T.C., von Cramon, D.Y., Zysset, S., Lohmann, G., and Friederici, A.D. (2002). Bach speaks: A cortical "language-network" serves the processing of music. *NeuroImage*, 17, 956–966.

Koelsch S., Gunter T.C., Wittforth, M., and Sammler, D. (2005). Interaction between syntax processing in language and music: An ERP study. *Journal of Cognitive Neuroscience*, 17, 1565-1577.

Koelsch, S., Jentschke, S., Sammler, D., and Mietchen, D. (2007). Untangling syntactic and sensory processing: An ERP study of music perception. *Psychophysiology*, 44, 476–490.

Kosfeld, M., Heinrichs, M., Zak, P.J., et al. (2005). Oxytocin increases trust in humans. *Nature*, 435, 673–676.

Krumhansl, C.L. (1990). *Cognitive Foundations of Musical Pitch*. New York: Oxford University Press.

Krumhansl, C.L. and Cuddy, L.L. (in press). A theory of tonal hierarchies in music. In: Popper, A.N., Fay, R.R., and Jones, M.R. (Eds.), *Music Perception: Springer Handbook of Auditory Research*. New York: Springer-Verlag.

Lee, N., Mikesell, L., Joaquin, A.D.L., et al. (2009). *The Interactional Instinct*. New York: Oxford University Press.

Leins, A.K., Spintge, R., and Thaut, M. (2009). Music therapy in medical and neurological rehabilitation settings. In: Hallam, S. et al. (Eds.). *The Oxford Handbook of Music Psychology* (pp. 526-535).

Lerdahl, F., and Jackendoff, R. (1983). *A Generative Theory of Tonal Music*. Cambridge, MA: MIT Press.

Levy, R. (2008). Expectation-based syntactic comprehension. *Cognition*, 106, 1126-1177.

Lewontin, R. (2000). *The Triple Helix: Gene, Organism and Environment*. Cambridge, MA: Harvard University Press.

Livingstone, S. and Thompson, W.F. (2009). The emergence of music from the Theory of Mind. *Musica Scientiae*, Special Issue 2009/10 "Music and Evolution," 83-115.

Maess, B., Koelsch, S., Gunter, T., and Friederici, A. D. (2001). Musical syntax is processed in Broca's area: An MEG study. *Nature Neuroscience*, 4, 540–545.

Mar, R., Djikic, M., and Oatley, K. (2008). Effects of reading on knowledge, social abilities, and selfhood. In: Zyngier, S. et al. (Eds.), *Directions in Empirical Literary Studies: In Honor of Willie van Peer* (pp. 127-137). Amsterdam: Benjamins.

McMullen, E. and Saffran, J. R. (2004). Music and language: A developmental comparison. *Music Perception*, 21, 289–311.

Merker, B. (2000). Synchronous chorusing and human origins. In: Wallin, N.L., Merker, B., and Brown, S. (Eds.), *The Origins of Music* (pp. 315–327). Cambridge, MA: MIT Press.

Merker, B., Madison, G., and Eckerdal, P. (2009). On the role and origin of isochrony in human rhythmic entrainment. *Cortex*, 45, 4-17.

McAuley, J.D., Jones, M.R., Holub, S., et al. (2006). The time of our lives: Lifespan development of timing and event tracking. *Journal of Experimental Psychology: General*, 135, 348-367.

McNeill, W. H. (1995). *Keeping Together in Time: Dance and Drill in Human History*. Cambridge, MA: Harvard University Press.

Menon, V. and Levitin, D.J. (2005). The rewards of music listening: Response and physiological connectivity of the mesolimbic system. *NeuroImage*, 28, 175-184.

Miller, G. (2000). Evolution of human music through sexual selection. In: Wallin, N.L., Merker, B., and Brown, S. (Eds.), *The Origins of Music* (pp. 329–360). Cambridge, MA: MIT Press.

Mithen, S. (2005). *The Singing Neanderthals: The Origins of Music, Language, Mind and Body*. London: Weidenfeld and Nicolson.

Moreno, S. (2009). Can music influence language and cognition? *Contemporary Music Review*, 28, 329-345.

Moreno, S., Marques, C., Santos, A., et al. (2009). Musical training influences linguistic abilities in 8-year-old children: More evidence for brain plasticity. *Cerebral Cortex*. 19, 712-723.

Nettl, B. (2000). An ethnomusicologist contemplates universals in musical sound and musical culture. In: Wallin, N.L., Merker, B., and Brown, S. (Eds.), *The Origins of Music* (pp. 463–472). Cambridge, MA: MIT Press.

Nettl, B. and Stone, R. (1998). *The Garland Encyclopedia of World Music (10 vols)*. New York: Garland Publications.

Norton, A., Zipse, L., Marchina, S., and Schlaug, G. (2009). Melodic intonation therapy: Shared insights on how it is done and why it might help. *Annals of the New York Academy of Sciences*, 1169, 431-436.

Overy, K. (2003). Dyslexia and music: From timing deficits to musical intervention. *Annals of the New York Academy of Sciences*, 999, 497-505.

Panksepp, J. (2009). The emotional antecedents to the evolution of music and language. *Musicae Scientiae*, Special Issue 2009/10 "Music and Evolution," 229-259.

Parbery-Clark, A., Skoe, E., Kraus, N. (2009). Musical experience limits the degradative effects of background noise on the neural processing of sound. *Journal of Neuroscience*, 29, 14100-14107.

Patel, A.D. (2003). Language, music, syntax, and the brain. *Nature Neuroscience*, 6, 674–681.

Patel, A.D. (2006). Musical rhythm, linguistic rhythm, and human evolution. *Music Perception*, 24, 99-104.

Patel, A.D. (2008). *Music, Language, and the Brain*. New York: Oxford University Press.

Patel, A.D. (2008b). A neurobiological strategy for exploring links between emotion recognition in music and speech. *Behavioral and Brain Sciences*, 31, 589-590.

Patel, A.D. (in press(a)). Language, music, and the brain: A resource-sharing framework. In: Rebuschat, P., Rohrmeier, M., Hawkins, J., and Cross, I. (Eds.), *Language and Music as Cognitive Systems*. Oxford: Oxford University Press.

Patel, A.D. (in press(b)). Advancing the comparative study of linguistic and musical syntactic processing. In: Rebuschat, P., Rohrmeier, M., Hawkins, J. and Cross, I. (Eds.), *Language and Music as Cognitive Systems*. Oxford: Oxford University Press.

Patel, A.D., and Iversen, J.R. (2007). The linguistic benefits of musical abilities. *Trends in Cognitive Sciences*, 11, 369-372.

Patel, A.D., Iversen, J.R., Chen, Y., and Repp, B.H. (2005). The influence of metricality and modality on synchronization with a beat. *Experimental Brain Research*, 163, 226-238.

Patel, A.D., Iversen, J.R., Wassenaar, M., and Hagoort, P. (2008). Musical syntactic processing in agrammatic Broca's aphasia. *Aphasiology*, 22, 776-789.

Patel, A.D., Iversen, J.R. Bregman, M.R. and Schulz, I. (2009a). Studying synchronization to a musical beat in nonhuman animals. *Annals of the New York Academy of Sciences*, 1169, 459-469.

Patel, A.D., Iversen, J.R., Bregman, M.R., and Schulz, I. (2009b). Experimental evidence for synchronization to a musical beat in a nonhuman animal. *Current Biology*, 19, 827-830.

Patel, A.D., Iversen, J.R., Bregman, M.R., and Schulz, I. (2009c). Avian and human movement to music: Two further parallels. *Communicative and Integrative Biology*, 2(6), 1-4.

Patel, A. D., Gibson, E., Ratner, J., Besson, M., and Holcomb, P. (1998). Processing syntactic relations in language and music: An event-related potential study. *Journal of Cognitive Neuroscience*, 10, 717–733.

Peretz, I. (1993). Auditory atonalia for melodies. *Cognitive Neuropsychology*, 10, 21–56.

Peretz, I. (2006). The nature of music from a biological perspective. *Cognition*, 100, 1–32.

Peretz, I. (2010). Towards a neurobiology of musical emotions. In: Juslin, P. and Sloboda, J. (Eds.), *Handbook of Music and Emotion: Theory, Research, Applications* (pp. 99-126). Oxford: Oxford University Press.

Peretz, I. (in press). Music, language and modularity in action. In: Rebuschat, P., Rohrmeier, M., Hawkins, J., and Cross, I. (Eds.), *Language and Music as Cognitive Systems*. Oxford: Oxford University Press.

Peretz, I. and Coltheart, M. (2003). Modularity of music processing. *Nature Neuroscience*, 6, 688–691.

Peretz, I., Cummings, S., and Dubé, M-P. (2007). The genetics of congenital amusia (or tone-deafness): A family aggregation study. *American Journal of Human Genetics*, 81, 582-588.

Pinker, S. (1997). *How the Mind Works*. London: Allen Lane.

Pinker, S. (2007). Toward a consilent study of literature. In: Gottschall, J. and Wilson, D.S. (Eds.), *The Literary Animal: Evolution and the Nature of Narrative*. Evanston: Northwestern Univ. Press.

Racette, A., Bard, C., and Peretz, I. (2006). Making non-fluent aphasics speak: Sing along! *Brain*, 129, 2571–2584.

Reck, D. (1997). *Music of the Whole Earth*. New York: Da Capo Press.

Rehding, A. (2000). The quest for the origins of music in Germany circa 1900. *Journal of the American Musicological Society*, 53, 345-385.

Reynolds, R. (2005). The evolution of sensibility. *Nature,* 434, 316-319.

Richerson, P.J. and Boyd, R. (2005). *Not by Genes Alone: How Culture Transformed Human Evolution*. Chicago: University of Chicago Press.

Roederer, J.G. (1984). The search for a survival value of music. *Music Perception*, 1, 350-356.

Rohrmeier, M. (2007). A generative approach to diatonic harmonic structure. In: *Proceedings of the 4th Sound and Music Computing Conference* (pp. 97–100). Lefkada, Greece.

Ross, A. (2007). *The Rest Is Noise: Listening to the Twentieth Century*. London: MacMillan.

Rubin, D. (1995). *Memory in Oral Traditions: The Cognitive Psychology of Epic, Ballads and Counting-out Rhymes*. New York: Oxford University Press.

Sacks, O. (2007). *Musicophilia: Tales of Music and the Brain*. New York: Knopf.

Salimpoor, V.N., Benovoy, M., Longo, G., Cooperstock, J.R., and Zatorre, R.J. (2009). The rewarding aspects of music listening are related to degree of emotional arousal. *PLoS One,* 4, e7487.

Sammler, D. (2009). The neuroanatomical overlap of syntax processing in music and language: Evidence from lesion and intracranial ERP studies. *MPI Series in Human Cognitive and Brain Sciences*, 108.

Sapolsky, R.M. (2000). Glucocorticoids and hippocampal atrophy in neuropsychiatric disorders. *Archives of General Psychiatry*, 57, 925-935.

Särkämö, T., Tervaniemi, M., Laitinen, S., et al. (2008). Music listening enhances cognitive recovery and mood after middle cerebral artery stroke. *Brain*, 131, 866-876.

Schachner, A., Brady, T.F., Pepperberg, I., and Hauser, M. (2009). Spontaneous motor entrainment to music in multiple vocal mimicking species. *Current Biology*, 19, 831–836.

Schellenberg, E.G. (2004). Music lessons enhance IQ. *Psychological Science*, 15, 511–514.

Schellenberg, E.G. (2006). Exposure to music: The truth about the consequences. In McPherson, G.E.(Ed.), *The Child as Musician: A Handbook of Musical Development* (pp. 111-134). Oxford, UK: Oxford University Press.

Schlaug, G., Forgeard, M., Zhu, L. et al. (2009). Training-induced neuroplasticity in young children. *Annals of the New York Academy of Sciences*, 1169, 205–208.

Schlaug, G., Marchina, S., and Norton, A. (2008). From singing to speaking: Why singing may lead to recovery of expressive language function in patients with Broca's aphasia. *Music Perception*, 25, 315–323.

Schlaug, G., Marchina, S., and Norton, A. (2009). Evidence for plasticity in white-matter tracts of patients with chronic Broca's Aphasia undergoing intense intonation-based speech therapy. *Annals of the New York Academy of Sciences*, 1169, 385-394.

Schneider, P., Scherg, M., Dosch, H.G., et al. (2002). Morphology of Heschl's gyrus reflects enhanced activation in the auditory cortex of musicians. *Nature Neuroscience*, 5, 688-694.

Slevc, L.R., Rosenberg, J.C., and Patel, A.D. (2009). Making psycholinguistics musical: Self-paced reading time evidence for shared processing of linguistic and musical syntax. *Psychonomic Bulletin and Review*, 16, 374-381.

Sloboda, J. (1985). *The Musical Mind.* Oxford, UK: Oxford University Press.

Smail, D. (2008). *On Deep History and the Brain.* Berkeley: Univ. of California Press.

Snowdon, C. and Teie, D. (2009). Affective responses in tamarins elicited by species-specific music. *Biology Letters* (online ahead of print, doi: 10.1098/rsbl.2009.0593).

Spencer, H. (1857). On the origin and function of music. *Fraser's Magazine*, Oct. 1857.

Sperber, D. (1996). *Explaining culture: A Naturalistic Approach.* Oxford: Blackwell.

Steinbeis, N. and Koelsch, S. (2008). Shared neural resources between music and language indicate semantic processing of musical tension-resolution patterns. *Cerebral Cortex*, 18, 1169-1178.

Steinbeis, N., Koelsch, S., and Sloboda, J.A. (2006). The role of harmonic expectancy violations in musical emotions: Evidence from subjective, physiological, and neural responses. *Journal of Cognitive Neuroscience*, 18, 1380–1393.

Stewart, L. (2008). Do musicians have different brains? *Clinical Medicine*, 8, 304-308.

Stewart, L., Henson, R., Kampe, K., et al. (2003). Brain changes after learning to read and play music. *NeuroImage*, 20, 71-83.

Suda, M., Morimoto, K., Obata, A., et al. (2008). Emotional responses to music: Towards scientific perspectives on music therapy. *Neuroreport*, 19, 75-78.

Tallal, P. and Gaab, N. (2006). Dynamic auditory processing, musical experience and language development. *Trends in Neurosciences*, 29, 382–390.

Thomas, D.A. (1995). *Music and the Origins of Language: Theories from the French Enlightenment.* Cambridge: Cambridge University Press.

Thompson, W.F., Schellenberg, E.G., and Husain, G. (2001). Arousal, mood, and the Mozart effect. *Psychological Science*, 12, 248–51.

Tillmann, B., Bharucha, J.J., and Bigand, E. (2000). Implicit learning of tonality: A self-organizing approach. *Psychological Review*,107, 885–913.

Tillmann, B., Janata, P., and Bharucha, J.J. (2003). Activation of the inferior frontal cortex in musical priming. *Cognitive Brain Research*, 16, 145–161.

Titon, J.T. (Ed.). (1996). *Worlds of Music: An Introduction to the Music of the World's Peoples* (3rd ed.). New York: Schirmer.

Tomasello, M. (2008). *Origins of Human Communication.* Cambridge, MA: MIT Press.

Trehub, S.E. (2003). The developmental origins of musicality. *Nature Neuroscience*, 6, 669–673.

Trehub, S.E. and Hannon, E.E. (2006). Infant music perception: Domain-general or domain-specific mechanisms? *Cognition*, 100, 73–99.

Trehub, S.E. and Nakata, T. (2002). Emotion and music in infancy. *Musicae Scientiae* (Special Issue), 37-61.

Vitouch, O. and Ladining, O. (2009). *Music and Evolution. Musicae Scientiae*, (Special Issue) 2009-2010.

Wallin, N.L., Merker, B., and Brown, S. (Eds.). (2000). *The Origins of Music.* Cambridge, MA: MIT Press.

Wiltermuth, S.S. and Heath, C. (2009). Synchrony and cooperation. *Psychological Science*, 20, 1-5.

Wilson, D.S., Van Vugt, M., and O'Gorman, R. (2008). Multilevel selection theory and major evolutionary transitions: Implications for psychological science. *Current Directions in Psychological Science*, 17, 6-9.

Wilson, D.S. and Wilson, E.O. (2007). Rethinking the theoretical foundation of sociobiology. *The Quarterly Review of Biology*, 82, 327-348.

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

Wong, P.C.M., Skoe, E., Russo, N.M., Dees, T., and Kraus, N. (2007). Musical experience shapes human brainstem encoding of linguistic pitch patterns. *Nature Neuroscience*, 10, 420-422.

Wrangham, R.W. (2009). *Catching Fire: How Cooking Made us Human.* New York: Basic Books.

Zarco, W., Merchant, H., Prado, L., and Mendez, J.C. (2009). Subsecond timing in primates: Comparison of interval production between human subjects and rhesus monkeys. *Journal of Neurophysiology*, 102, 3191–3202.

Zentner, M., Grandjean, D., and Scherer, K.R. (2008). Emotions evoked by the sound of music: Characterization, classification, and measurement. *Emotion*, 8, 494–521.

Zimmerman, M.E., Pan, J.W., Hetherington, H.P., et al. (2008). Hippocampal neurochemistry, neuromorphometry, and verbal memory in non-demented older adults. *Neurology*, 70, 1594–1600.

Chapter 9

Making the Cognitive Turn in Art History: A Case Study[1]

In 1172, an Augsburg priest named Wernher wrote, "A poem I begin / in love of holy Mary" [Eines liedes ich beginne / in sente Marien minne" ll. 1-2]. These are the opening lines of his *Maria* or *Driu liet von der maget* (three poems about the maiden), composed in Middle High German verse. Wernher's roughly six thousand lines have the distinction of being the earliest vernacular life of this figure so central to Christianity throughout its history.[2] Apparently motivated by fervent devotion to the Virgin Mary, Wernher freely reshaped and expanded his Latin source, *Pseudo-Matthew*, which he probably consulted in a "legendary"—a collection of saints' lives.[3] As Kurt Gärtner puts it: "Wernher transformed the events related succinctly in *Pseudo-Matthew* into lively and colorful representations of situations; he also knew how to motivate and depict the feelings that moved his characters. . . ."[4] The poem survives today in a richly illustrated manuscript, made about 1220,[5] that further transformed Wernher's text, offering reader-viewers what Nikolaus Henkel calls "an effectively synaesthetic experience-space, in which text and images are each present in their own mode of functioning, but could be experienced together and in relation to one another."[6] This paper explores the reader-viewer's experience in negotiating this illuminated manuscript.[7] Applying the findings of neu-

[1] This content is available online at <http://cnx.org/content/m34254/1.4/>.

[2] For an edition, see *Priester Wernher. Maria. Bruchstücke und Umarbeitungen*, edited by Carl Wesse (Halle, 1927; 2nd edition corrected by Hans Fromm, Tübingen: Max Niemeyer, 1969).

[3] Kurt Gärtner, "Priester Werner," in *Die deutsche Literatur des Mittelalters. Verfasserlexikon.* 2nd edition, Vol. 10 (Berlin: Walter de Gruyter, 1999), cols. 903-15, at 911. The part of *Pseudo-Matthew* that Wernher uses derives largely from a Latin translation of an apocryphal text written in the second century C.E. known as the *Protevangelium of James*. Amplification of a known story characterizes much medieval literature. The editor of *Pseudo-Matthew*, Jan Gijsel, concludes, however, that "Wernher displays a greater originality than at first glance one would attribute to him." Jan Gijsel, "Die Quelle von Priester Wernhers *Driu liet von der maget*," *Archiv für das Studium der neueren Sprachen und Literaturen* 130 (1978): 250-55, at 250. This article also outlines Gijsel's reasons for identifying the version of *Pseudo-Matthew* used by Wernher as a member of the P family. For his discussion of the relationships among the many versions of *Pseudo-Matthew* and his edition of the text, see Jan Gijsel and Rita Beyers, *Libri de Nativitate Mariae*. CCSA 9-10 (Turnhout: Brepols 1997).

[4] Gärtner, "Priester Werner," col. 907.

[5] Kraków, Biblioteka Jagiellónska, Ms. Berol. Germ. Oct. 109; formerly Berlin, Preussische Staatsbibliothek, Ms. Germ. Oct. 109. This manuscript has eighty-five miniatures on its ninety-one leaves, "by far the earliest illustration cycle of the life of Mary in German art," according to Gärtner, col. 912. It contains the version of the text Wesle calls "D." Of the eight surviving manuscripts (most of them fragmentary), only this one, produced in the area of northern Bavaria, probably in the vicinity of Regensburg, around 1220, is illustrated. Black and white illustrations inserted into Hermann Degering's modern German rendition of the text situate the miniatures close to their positions in the manuscript. Hermann Degering, *Des Priesters Wernher Drei Lieder von der Magd; nach der Fassung der Handschrift der Preussischen Staatsbibliothek metrisch übersetzt* (Berlin: Volksverband der Bücherfreunde, Wegweiser Verlag, 1925). Nikolaus Henkel is preparing a facsimile.

[6] Nikolaus Henkel, "Bild und Text: Spruchbänder der ehem. Berliner Handschrift von Priester Wernhers 'Maria'," *Scrinium Berolinense. Tilo Brandis zum 65. Geburtstag*, 2 vols., edited by Peter Jörg Becker et al (Berlin, 2000), 1: 246-75, at 246.

[7] The manuscript opens with two facing full-page illustrations, one of the Tree of Jesse and one of the Judgment of Solomon. The text that follows is made up of three parts that may sometimes have circulated as separate booklets rather than one manuscript, as is the case here. This paper discusses a selection of the ninety-one miniatures inserted at relevant points in the

roscience and cognitive studies[8]—especially in the areas of perception, evocriticism (an approach that sees storytelling as an evolutionary adaptation), functions of mirror neurons, and cognitive blending—enables an understanding of *how* Wernher and the makers of this manuscript convey to reader-viewers the motivations and emotions of their characters.

This paper aims to demonstrate by means of an extended example some of the benefits to art history of making the cognitive turn.[9] Cognitive studies has shown that the mind is "embodied in such a way that our conceptual systems draw largely upon the commonalities of our bodies and of the environments we live in."[10] These commonalities, being biologically based, have evolved and are shared through time. Thus, this inter-discipline of cognitive studies refuses the traditional Western conceptualization of mind and body as distinct and hierarchically ordered entities and speaks instead of the "embodied mind," the "mind/brain," or, as Elizabeth A. Wilson puts it, the "neurological body." This body establishes "a relation between psyche and soma in which there is a mutuality of influence, a mutuality that is interminable and constitutive."[11] As a discipline enmeshed in the material, art history is especially well positioned to benefit from the findings of cognitive studies. For example, one-point perspective (the use of one vanishing point) encourages the notion that a disembodied eye enjoys an ideal, weightless position from which to survey a scene. Cognitive studies enables an understanding of the artifice of this notion by demonstrating that the conditions of embodiment—including, for example, the vertical axis of the body and the placement of the eyes in relation to it—crucially shape "the manner in which sensory information from the outside world is transformed into knowledge of the world."[12] Studies in perception show how the brain and body function together to shape what we think we see. Thus, to accept and apply the findings of empirical research in neuroscience and their interpretation as demonstrated in the range of approaches included in the umbrella term "cognitive studies" would fundamentally change our understanding of the ways humans experience art and would also provide art historians with significant new tools for analyzing response to their objects of study.

---

text of the manuscript.

[8]These findings have stimulated the creation of a growing number of sub-fields, from cognitive psychology to evolutionary literary studies to neuroarthistory. In this paper I will use the general term "cognitive studies" rather than attempting to distinguish among them.

[9]I am far from alone in making this turn; see John Onians, *Neuroarthistory: From Aristotle and Pliny to Baxandall and Zeki* (New Haven: Yale University Press, 2008); Barbara Maria Stafford, *Echo Objects: The Cognitive Work of Images* (Chicago: University of Chicago Press, 2007); and the recent work of David Freedburg, available for download at: http://www.columbia.edu/cu/arthistory/html/dept_faculty_freed.html (<http://www.columbia.edu/cu/arthistory/html/dept_faculty_freed.html>).

[10]George Lakoff and Mark Johnson, *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought* (New York: Basic Books, 1999), 6.

[11]Elizabeth A. Wilson, *Psychosomatic: Feminism and the Neurological Body* (Durham: Duke University Press, 2004), 22.

[12]Nicolae Babuts, *Memory, Metaphors, and Meaning: Reading Literary Texts* (New Brunswick: Transaction Publishers, 2009), p. xiii.

Figure 9.1: 1v. Tree of Jesse

From its first page, the Cracow manuscript of Wernher's *Maria* displays a propensity to convey meaning through and to the embodied mind. The manuscript opens with a full-page miniature visualizing the Tree of Jesse (Fig. 1), an image that derives from a Christian interpretation of Isaiah 11.1: "There shall come forth a shoot from the stump of Jesse, and a branch shall grow out of its roots." In the Latin Bible used in the Middle Ages, the word translated as "shoot" is "virga," often rendered into English as "rod." The Latin is a near-pun for "virgo," meaning "virgin," and was therefore interpreted by Christian exegetes as a reference to the Virgin Mary. By the time the Cracow manuscript was made, Bishop Fulbert of Chartres had written the responsory (or sacred chant), *Stirps Jesse* [the line or lineage of Jesse], which drew on Isaiah's prophecy to create a genealogy for Mary, and Fulbert's liturgical innovation had spread throughout Europe. The miniature in the Cracow manuscript visualizes the claim in Fulbert's punning responsory, "The rod is the virgin mother. . ." [Virga dei genetrix virgo est],[13] meaning Jesse's lineage, visualized as a tree growing from his body, culminated in Mary herself (the rod) and her son Jesus (the branch). The inclusion of Jesse's male descendents in the miniature insists on the participation of male bodies in the Incarnation. In its strong and simple composition, this miniature seems especially to assert that meaning arises from bodies, specifically from the intersecting axes of the horizontal male body of Jesse and the vertical female body of Mary. The bodily concerns of generation, birth, and the safe delivery and subsequent thriving of an infant with a distinguished lineage are introduced here as themes that resonate throughout this manuscript.

[13]"Virga dei genetrix virgo est." Miri Rubin, *Mother of God: A History of the Virgin Mary* (New Haven and London: Yale University Press, 2009), 139, and n74, p. 453, citing Margo Fassler, "Mary's Nativity: Fulbert of Chartres and the *Stirps Jesse*: Liturgical Innovation circa 1000 and its Afterlife," *Speculum* 75 (2000): 389-434.

Figure 9.2: 2r. Judgment of Solomon

The image on the folio facing the Tree of Jesse continues Mary's genealogy by visualizing Solomon, another of her ancestors.[14] This folio again foregrounds bodies (Fig. 2). There is a shift, however, from the very stable and balanced composition of the Tree of Jesse to that of the Judgment of Solomon, which is filled with tension expressed through gesture and exchange of glance and dominated by the strongly unbalancing diagonals of scepter and sword. The story of the Judgment of Solomon found in I Kings 3:16-28 tells of two women who shared a home; each of them had recently given birth. When one mother lay on top of and smothered her child to death in the night, she falsely claimed that the surviving child was her own. The two women took their case to King Solomon, who ruled that, since neither woman would yield to the other, the living child should be bodily divided between them. The miniature visualizes the moment when the deceitful mother addresses the true mother in an endorsement of Solomon's judgment. The words of her speech appear on the banderole rising from her uplifted hands: "It [the child] should be divided, as he [Solomon] says, so that it will be neither yours nor mine" [Man sol ez teilen als er giht. / daz mirs noh dir werde niht]. Typically, the miniatures in this manuscript include speech banderoles touching or held by the hands of speakers. The words thus animate the representations of their speakers, with the double result that speech is embodied and the reader-viewer's sense of hearing is activated.[15] As these words flow across the top of the page, they lead the reader-viewer's eye to the huge sword in the executioner's hand, raised in preparation for enacting the judgment that would inevitably place the living infant beside the dead one in the sarcophagus at Solomon's feet. The atmosphere of anxiety that pervades this image exceeds that of the biblical text. There the actual mother of the living child speaks first, urging Solomon to let the child live and give it to the other woman; she thereby reveals the selfless love that convinces Solomon she is the true mother. Thus, the reader of I Kings anticipates a positive outcome even before learning that the deceitful mother urges the child's slaughter. In the Cracow miniature, however, the true mother is mute, and Solomon, as if to visualize the way its words resound in his ears, appears to ponder the deceitful mother's speech surrounding his head.

Visualization of spoken words moving through space is just one of the ways the engagement with space in this manuscript enhances the impact of the miniatures on reader-viewers. To gain greater access to this aspect of the reader-viewer's experience of this illuminated manuscript, I begin with philosopher and aesthetician Richard Wollheim's concept of "seeing-in," which implies a dual response to a painting.[16] One part of the experience comes from attending to the flat surface itself, and the other involves "seeing an object in the paint,"[17] that is, the "registering of pictorial content."[18] Wollheim identifies "seeing-in" as a "special perceptual skill."[19] Cognitive philosopher Alva Noë's study, *Action in Perception,* analyzes visual perception from the perspective of neuroscience. As Noë observes, far from being precisely focused and expansive, our perceptual field consists of a small, central area of sharp focus called the fovea; the rest of the field becomes progressively blurry towards the edges. The silver (now oxidized to black) and gold frames of the miniatures in this manuscript suggest just such a blurriness, creating a halo of light around the image that may enhance "seeing-in" by mimicking the actual perceptual field of the reader-viewer.

Further, according to what Noë calls the enactive view, perceptual experience depends upon sensorimotor

[14] Henkel ("Bild und Text," n. 38 on p. 269) comments that the relationship to Solomon may be in the genealogy found in Matthew 1:7.

[15] According to Henkel ("Bild und Text," 251), "The inclusion in miniatures of banderoles with text appears to be a singularity of book painting in German-language manuscripts in the first half of the thirteenth century," and this manuscript "represents the earliest known example of it." For the earlier use in Latin manuscripts of banderoles inscribed with words, Henkel cites Susanne Wittekind, "Von Schriftband zum Spruchband. Zum Funktionswandel von Spruchbändern in Illustrationen biblischer Stoffe," in *Frühmittelalterliche Studien* 30 (1996): 343-67 and plates XVIII-XXIII. Throughout this paper, I have relied on Henkel's edition of the texts on the banderoles, as well as their translation into modern German, in his "Bild und Text."

[16] Wollheim laid out this idea, which is "widely regarded as [his] major philosophical contribution," according to Arthur Danto in Wollheim's obituary in *The Guardian* of 5 November 2003, in *Art and Its Objects* (1968; rpt. 1971; 2nd ed. Cambridge: Cambridge University Press, 1981); he returned to this idea in "On Pictorial Representation," *Journal of Aesthetics and Art Criticism* 56.3 (Summer, 1998): 217-226.

[17] Danto, *Guardian.*

[18] Jerrold Levinson, "Wollheim on Pictorial Representation," *Journal of Aesthetics and Art Criticism* 56.3 (Summer, 1998): 227-33, at 228.

[19] Wollheim, "On Pictorial Representation," 221.

knowledge acquired through physical action.[20] "How they (merely) appear to be plus sensorimotor knowledge gives you things as they are."[21] Noë uses the example of seeing objects overlapping in such a way that one occludes part of another; in the miniature of the Judgment of Solomon, for example, the true mother's body occludes part of the deceitful mother's body. But we know that her occluded body is complete because we draw on our experience of having moved our bodies in space to enable multiple points of view. Thus, perception results from appearance plus sensorimotor knowledge, or knowledge acquired through physical action. Perception, in other words, is a bodily experience.

Neuroscience has discovered, Noë reports, that "Perception is not a process of drawing an internal representation, so it seems implausible that pictures depict by producing the sort of representation in us that the depicted scene would produce."[22] He goes on to offer an alternative: "The enactive approach suggests a rather different conception of pictorial representation. Pictures construct partial environments. They actually contain perspectival properties such as apparent shapes and sizes, but they contain them *not* as projections from actual things, but as static elements. Pictures depict because they correspond to a reality of which, as perceivers, we have a sensorimotor grasp. Pictures are a very simple (in some senses of simple) kind of *virtual* space. What a picture and the depicted scene have in common is that they prompt us to draw on a common class of sensorimotor skills."[23]

The preference for physical action in the miniatures in this manuscript especially activates these sensorimotor skills. As reader-viewers "see-in" to the miniatures, they make spaces for moving, gesturing figures and their interactions, and they understand those figures to have weight and three-dimensional substance. Further, the frequently employed device of extending elements of the image beyond the frame pushes the figures forward off the flat surface and into the reader-viewer's space. Although Noë assumes the perspectival depth that most western art constructs, the miniatures in this manuscript ask also for what we might call "seeing-out." This device reinforces the immediacy of the action in part by creating the illusion that the bodies depicted are co-present with the reader-viewer's body. Sensing the overlapping as generative of space, the reader-viewer contemplating the miniature of the Judgment of Solomon experiences the figures of the true mother and child as pushed farthest from the frame and closest to herself. The frailty of an infant and its need for caring and wise mothering thus become concerns that the miniature forcefully communicates to the reader-viewer at the basic level of perception.

A cognitive approach to the Cracow manuscript must also take evolution seriously, as literary scholar Brian Boyd does in evocriticism, the approach he develops in *On the Origin of Stories: Evolution, Cognition, and Fiction*. In answering the question of what an evolutionary perspective might offer the student of narrative, Boyd answers that it "can stress the importance of attention itself, so often taken for granted in literary criticism. . . ."[24] Attracting and maintaining attention to their narrative is the "storytellers' first problem." For Boyd, "attention precedes meaning, although an emerging intuition of meaning may also feed back into our interest in the story."[25] Those who designed and made the Cracow manuscript chose to attract the reader-viewer's attention first through images—the facing full-page miniatures I have just discussed—thereby giving priority of place to the visual narrator whose depictions continue to appear throughout the manuscript. As we have seen, the first full-page miniature presents the protagonist of the narrative—Mary, with her child Jesus—as the apex of a centuries-long sequence of generation; it establishes their lineage. The next introduces text, not yet in the author's long rhymed poems but in the deceitful mother's direct speech, which raises anxiety about the survival of a child. Both genealogy and children were of great import to every noble family, aware of and proud of its ancestors and intent on continuing the line through the successful production of offspring. It is virtually certain that such a family commissioned the Cracow manuscript, and that its designers knew what would attract their clients' attention.

[20] "Perception," he claims, "is a way of finding out how things are from an exploration of how they appear." Alva Noë. *Action in Perception* (Cambridge and London: MIT Press, 2004), 165.

[21] Noë, 164.

[22] Noë, 178.

[23] Noë, ibid.

[24] Brian Boyd, *On the Origin of Stories: Evolution, Cognition, and Fiction* (Cambridge, MA: Harvard University Press, 2009), 215.

[25] Boyd, 384.

Figure 9.3: 6r. Jacob's Ladder

Only after these full-page miniatures does the verbal narrator enter, as Wernher's text begins. He opens with praise of Mary and an invocation of her assistance[26] before moving on to a description of his source, which he believed Saint Jerome had written. Then he starts his narrative with the patriarchs Abraham, Isaac, and Jacob, relating the episodes of Jacob's ladder and his wrestling with an angel. This section of text ends with the line directly above the miniature of Jacob's ladder on folio 6r (Fig. 3): "here you may hear a wonder" [hie muget ir wnder horen; l. 260]. The word "horen" seems to refer to his story of Mary's life, which is about to begin. It stimulates the sense of hearing just at the moment when the miniature engages the sense of sight. The gazes of all three angels in the miniature are fixed in the upward direction of their movement on the diagonally placed ladder. This miniature also engages the "special perceptual skill" of seeing-out, as the ladder overlaps the frame and pushes all of the angels—especially the one at the top of the ladder—into the reader-viewer's space. Thus both angelic gazes and seeing-out focus attention on the upper right corner of the page, as if urging that it be turned in order to read-view more of the story.

Boyd makes a case for storytelling as an adaptive quality in evolution.[27] For him, the large category is cognitive play, of which art—including the art of storytelling—is a subset. One of the chief functions of art is "to *refine and retune our minds* in modes central to human cognition—sight, sound, and sociality. . . ."[28] Thus, "*storytelling* appeals to our social intelligence. It arises out of our intense interest in monitoring one another and out of our evolved capacity to understand one another through *theory of mind*."[29] The story that this manuscript tells would not have been new to reader-viewers, so the challenge is to engage their social intelligence by the way the story is interpreted, amplified, and visualized.

A transition at the opening of the next section of the first poem—"From the same kindred [as Jacob]" [Vz demselben chunne; l. 261] a child was born—connects the genealogy of Abraham, Isaac, and Jacob with Mary, for the child is Joachim, who will be her father. The poem continues with the marriage of Mary's parents, Joachim and Anne, leading to the birth of Mary and the story of her life through the Nativity and the return from Egypt after the death of Herod. This narrative is part of the central Christian myth. In ritual as celebrated in the cycle of the liturgical year, that myth is experienced episodically, as a series of key moments. The composition of Wernher's poems appears to have been motivated in part by the introduction of new Marian feasts into the liturgy, for its three parts are organized around them: The Birth of the Virgin (Sept 8); the Annunciation (March 25); and the Nativity through Candlemas (when Mary and Joseph first took Jesus to the temple). But narrative has the option of filling in the gaps between these ritual, canonical moments. In the case of our poem, Wernher, a priest with pastoral responsibilities, explicitly addressed his poem to lay people. And though its stimulus may be liturgical, its concerns are not those of the fulltime religious but of the secular upper class.

One attraction of filling gaps in the biblical narrative through invention of new episodes, expansion of existing episodes, and character development may have been the way such material appeals to and develops what evolutionary psychologists have recognized as "our unique *human* level of theory of mind." As Boyd puts it, "a fully human theory of mind requires a capacity for interpreting others not simply through outer actions and expressions, and even through inner states like goals, intentions, and desires, but uniquely also through *beliefs*."[30] Boyd argues that narrative is an evolutionary adaptation in humans that develops strategic intelligence by providing experience at "infer[ring] what others *know* in order to explain their desires and intentions with real precision."[31] Filling gaps stimulates reader-viewers to engage their theory of mind.

---

[26] Wilhelm Messerer argues that the pair of full-page miniatures that open the visual program correspond to the opening of the text, in that both offer "timeless praise" of Mary; for him, this opening summarizes the entire meaning of the manuscript, which is to praise Mary. He interprets the two miniatures as a juxtaposition of good mother (Mary) and bad mother. Wilhelm Messerer, "Illustrationen zu Wernhers 'Drei Liedern von der Magd,"' in *Deutsche Literatur im Mittelalter. Kontakte und Perspektiven*, edited by Christoph Cormeau (Stuttgart, 1979), 447-72, at 464-65.

[27] "*Adaptations* are complex biological systems, physiological or behavioral, which through the cumulative Darwinian process of *blind variation and selective retention* have developed a *design* that reliably serves some *function*, in other words provides a sufficient solution to some problem a species faces to improve chances of survival and reproduction" (Boyd, 381; the emphases are his).

[28] Ibid.

[29] Boyd, 382.

[30] Boyd, 142. There is a large literature on Theory of Mind (ToM).

[31] Boyd, 145.

Wernher's development of the characters of Anne and Joachim and Mary and Joseph offers opportunities for reader-viewers to employ theory of mind in interpreting the married lives of these two couples, and thus to compare and comprehend more deeply the differences between the human institution of marriage and the unique marriage of Mary and Joseph.[32] Illustrations also engage theory of mind: we learn to "understand social events and the sources of people's knowledge" by "inferring others' attention from reading the direction of their eyes, or their emotions from their expressions, or their knowledge from what they can perceive."[33]

[32] I presented an earlier version of this paper, focused on the topic of marriage in the Cracow manuscript, at the Birkbeck Symposium "Rethinking Medieval Marriage" in May 2008. I wish to thank Isabel Davis for the invitation and the audience for their questions and comments.

[33] Boyd, 144.

Figure 9.4: 8v. A Priest Marries Joachim and Anne

I turn next, then, to the ways the marriage of Joachim and Anne is constructed for reader-viewers. Wernher describes Joachim as a model of a man, "the best man on whom the sun ever shone" [v was der besten eine / den div sunne ie uberschêin; ll. 267-68], emphasizing his mind, sense, innocence, and holiness. He worked assiduously, exercised hard, and fasted. He also enjoyed religious narrative: as a young man, "He gladly sang and read / about his creator / the powerful old stories" [gerner sanch vnd las / von sinem schephaere / div starchen alten m; ll. 296-98]. Visual emphasis falls on his generosity and charity; a miniature shows him as a wealthy man giving away two-thirds of his income. At the age of twenty, he chose to marry, for "he did not want to corrupt himself / with any kind of dissoluteness" [erne wolte sih niht uerbosen / mit deheiner getlose; ll. 339-40]. The miniature on folio 8v (Fig. 4) is inserted into the text passage describing his bride, Anne, whom he chose from the lineage of King David. She is chaste and beautiful, cultivates the giving of alms, and keeps vigils and fasts. The narrator places strong emphasis on their physical qualities. The first poem, in fact, uses the word for "body" twelve times in its 1,230 lines, six of them referencing Anne and three more referencing Joachim. The miniature reinforces the view of marriage as a union of bodies. The priest who is conducting the marriage ceremony holds a banderole out to Joachim, standing opposite him and Anne, containing these words: "Receive this woman for your own, so that you are both one body forever" [Ze diner e enpfahe diz wip. / daz ir iemer beidiv sit ein lip]. Cognitive psychologist David McNeill has shown that words accompanied by gestures are more profoundly retained in memory.[34] In the miniature, gesture enacts the priest's words, rendering them performative. He grasps Anne's right wrist, indicating his power over her—that is, his authority to perform this ritual of marriage. The way his arm obscures the sight of hers virtually reduces her to his puppet. As he manipulates Anne's hand, visually emphasized in silhouette against the blue background, the banderole with the priest's words on it encircles Joachim and elicits his responding gesture of reaching with both hands to enclose Anne's and thus to take possession of his bride.[35] The gesture of enclosure and the phrase "one body forever" together create a normative marriage that will be sexually active, resulting in their daughter Mary. In their construction of Mary's marriage to Joseph, within which, medieval Christians believed, she remained a virgin, the poet and the designer of this manuscript faced the challenge of shaping a relationship that would be understood by the reader-viewer *as* marriage while remaining within the parameters of orthodoxy.

[34]David McNeill, *Gesture and Thought* (Chicago: University of Chicago Press), 147-48.

[35]I wish to thank Alcuin Blamires for his observation that on the iconographic level this is a feudal gesture of receiving homage.

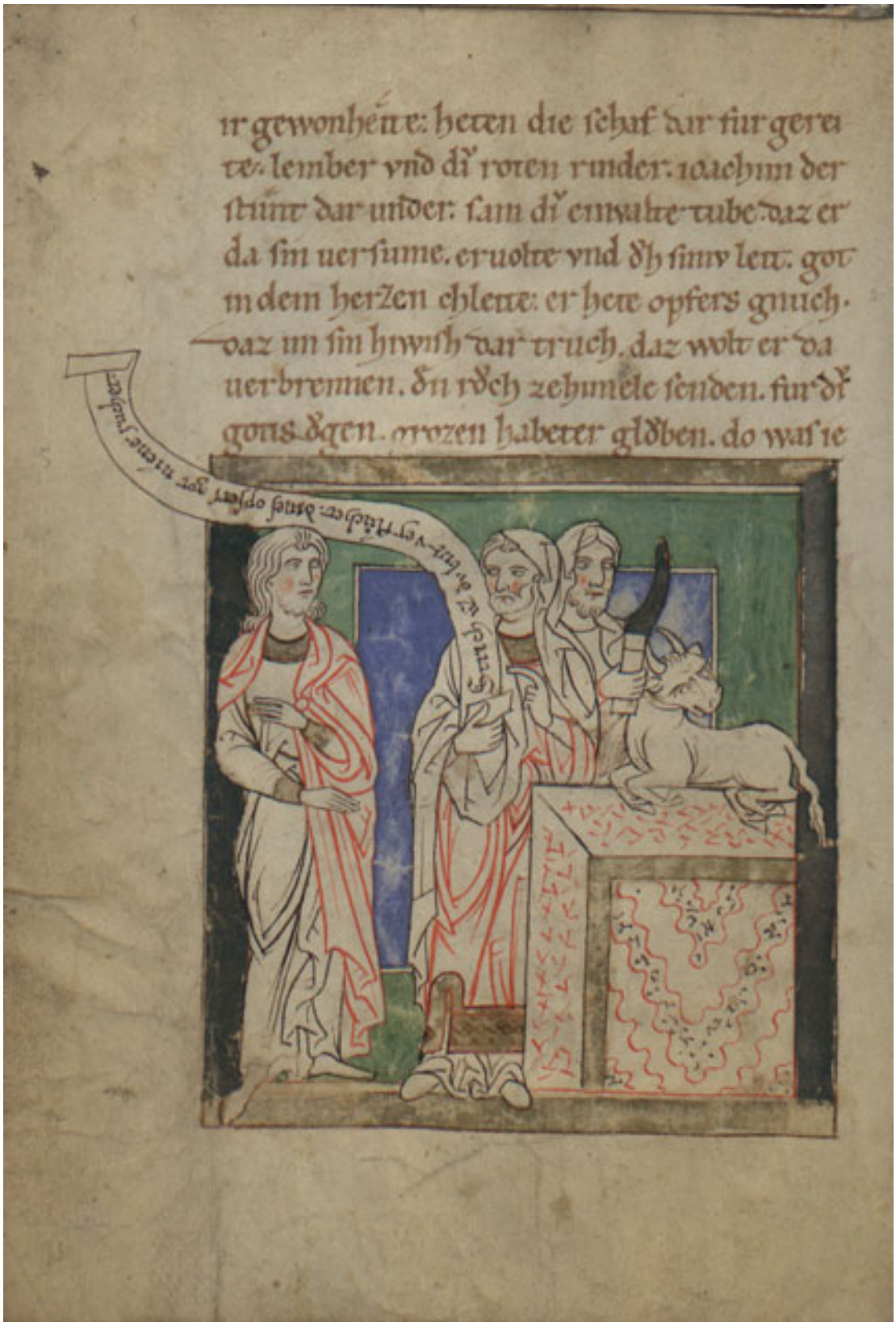

Figure 9.5: 9v. Ruben, Guardian of the Law, Refuses Joachim's Offerings

Following his sources, Wernher's first poem goes on to describe the situation of Anne and Joachim twenty years after the marriage ceremony. They are still childless, a failure that a legal scholar interprets as due to God's curse and therefore justification for sending Joachim away from the Temple (Fig. 5). The miniature emphasizes physical responses that engage theory of mind to understand the emotions of the characters. Joachim recoils physically from the scholar's gesture and glance and, it appears, the words on his banderole: "Go away from here—you are accursed. God does not want your offerings" [Strich uz du bist verfluochet. / dines opfers got nîene ruchet]. The motion of the banderole from right to left seems to push Joachim back; as Messerer notes, "the banderole itself says, 'Out'. . . ."[36] To read the words on the banderole, the reader-viewer must literally turn the book upside down, as if to enact the total disruption of Joachim's life resulting from the rejection of his offering. Such manipulation of the book makes reader-viewers aware of their own bodies even as they engage with the bodily experiences of others; it ensures that the sensorimotor system stays actively involved in perception.

[36] Messerer, 449.

Figure 9.6: 14r. Anne Accuses Her Maid of Neglecting Her

Anne interpreted Joachim's departure as desertion of her and responded bodily: "The beautiful and good Lady Anne became pale and wan. Her bright color disappeared as her joy died" [do muse erbleichen danne / div schone vnd gute froe Anne/ ir liehtiv varwe uerdarp, / al ir frode erstarp; ll. 495-98]. In the miniature on folio 14r (Fig. 6), Anne, who has taken to her bed, accuses her maid of neglecting her. In a clash of banderoles that visualizes their lack of agreement, the woman replies, "It will be just of me to abandon you, for even your own husband spurns you" [Ich sol dih billiche lan. / dih versmahet ioh din selbes man]. Again the book must be turned, the maid's upside-down words physically representing the inversion of the social hierarchy. Wernher's presentation of this marriage offers to the book's most likely owner—a noble laywoman—insights into both a marital relationship and the society within which it functions, as well as into the couple's shame at infertility and joy when angels inform them that she has conceived. The poet and illustrator portray Anne and Joachim as eager to marry, marrying at the expected age in their society, and living in a normative marriage. They are sexually active and expect children, but are childless, for which they are rejected by their society until God intervenes and they have a daughter, Mary, whom they give to the Temple at the age of three. This extended portrait contrasts in significant ways with the next marriage the manuscript presents.

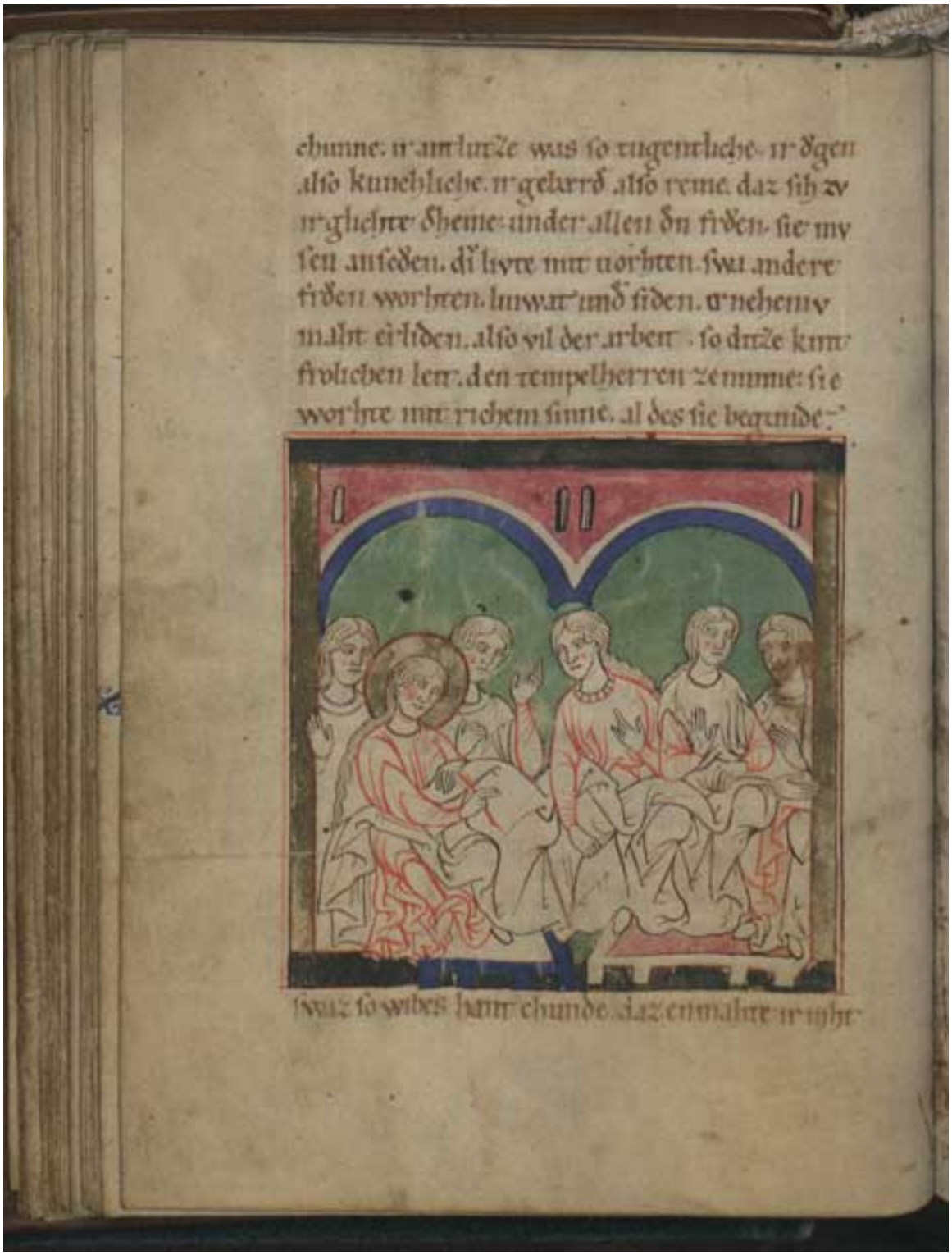

Figure 9.7: 24v. Mary Surpasses the Other Temple Maidens in Doing Needlework for the Men of the Temple

Wernher's second poem begins with a description of Mary's growing reputation in Jerusalem, as judged in physical terms: she "glowed like the sun" [erluhte sam div sunne; l. 1295]; "her face was so virtuous, her eyes so regal, her bearing so pure" [ir antlutze was so tugentliche, / ir ŏgen also kunchliche, ir gebaerde also reine; ll. 1297-99]. This text thus encourages the reader-viewer to actively perceive Mary's large golden halo in the miniatures (Fig. 7) as visible radiant light indicative of the highest virtues, a perception that may be followed by understanding it as a symbol of saintliness. The poet continues to point out Mary's visible bodily radiance throughout the poem, and the miniatures reinforce visually both her "high status" and her "exceptional powers."[37]

[37] Boyd (221) points out that epic poetry focuses on "highly memorable characters," especially those of "high status or exceptional powers or both." Both text and miniatures in the Cracow manuscript develop the character of Mary along these lines.

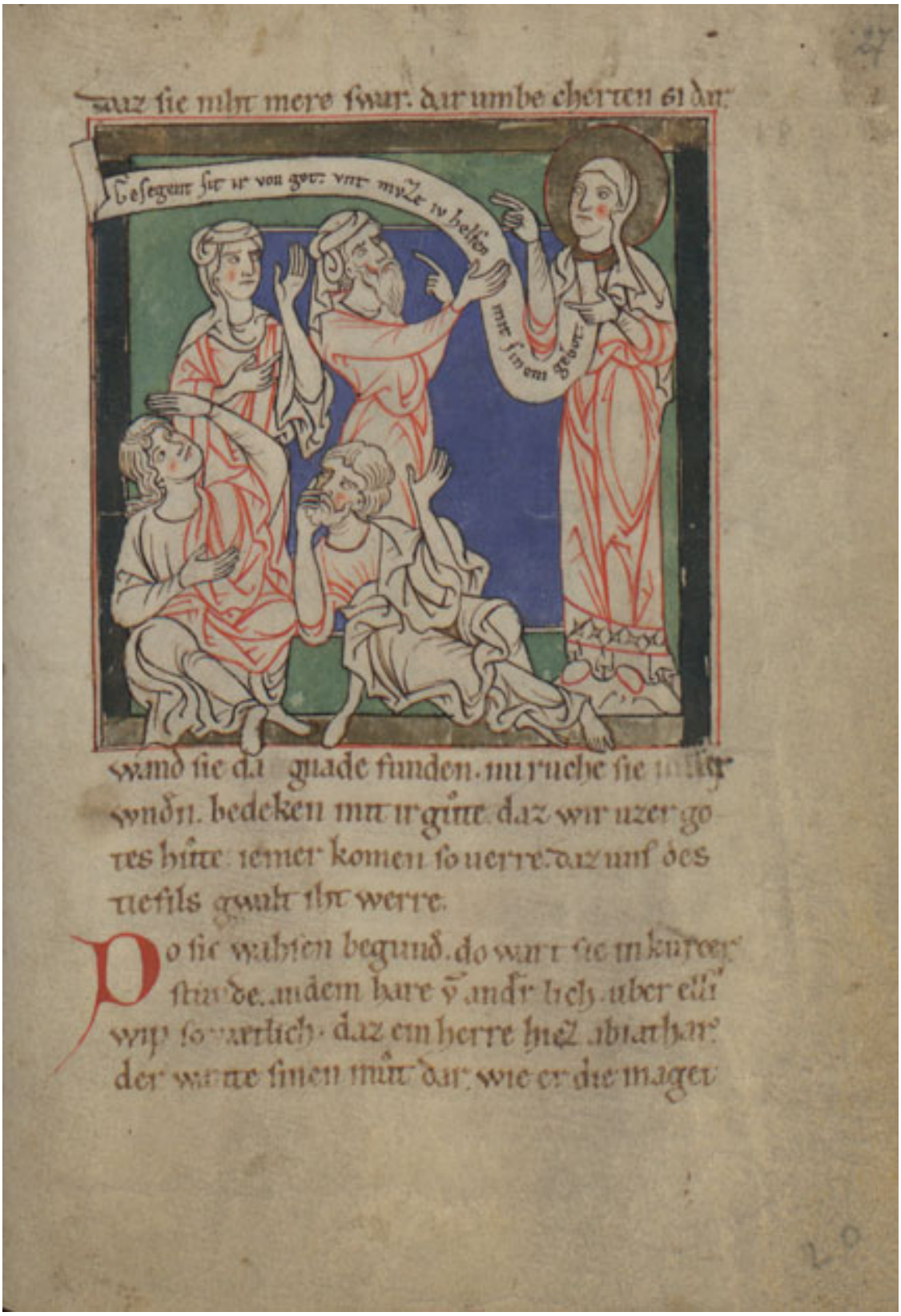

Figure 9.8: 27r. Mary Heals the Sick

The poem also establishes the growing admiration for her actions. Directly below the miniature on folio 24v are the lines: "At whatever kind of women's work it was, none could best her at it" [swaz so wibes hant chunde, / daz enmahte ir niht engân; ll. 1312-13]. She is faster than all the ladies at fine needlework. Daily, the archangel Gabriel brings her heavenly bread; the miniature on folio 25v visualizes the physical substance that Mary actively receives from the hands of the angel. She also, rather unusually, heals the sick, as illustrated in a miniature on folio 27r (Fig. 8).[38] Mary's straight and tall form stands at the right edge of the miniature, where the viewer's eyes rest, even as she visualizes the ultimate goal of those seeking her help. With lively gestures they indicate the parts of their bodies that need healing. Her responding gesture of blessing activates the words on her banderole so that they become performative: "Be blessed by God: he would like to assist you with his power" [Gesegent sit ir von got. / unt muze iu helfen mit sinem gebot]. Here the miniaturist, whose images are generally close visualizations of the text, ignores Wernher's explicit statement that Mary healed the sick by touching them [ll. 1454-57]. The way that the hand of the man facing Mary crosses her banderole suffices to indicate that her words are a conduit of divine power to human bodies. Appealing to her for that purpose, as we shall see, is central to the meaning of this book for its reader-viewer. Neither the text of this part of Wernher's second poem nor the miniatures that visualize some of its passages significantly forward the plot. Rather, they develop Mary's character, enhancing her position as the "redoubtable hero" of the story,[39] whom God has singled out for special attention and to whom he has granted special powers.

[38] According to Jacqueline Lafontaine-Dosogne, the sequence of three miniatures illustrating Mary's life in the Temple in this manuscript is the first in western art to show specific aspects of that life. The claim that she worked miracles of healing is found in *Pseudo-Matthew*, however. *Iconographie de l'Enfance de la Vierge dans l'Empire Byzantin et en Occident.* Réédition anastatique avec compléments. ed. 2 vols., Brussels: Académie royale de Belgique, 1992 (1964), 2.130.

[39] Boyd, 221.

Figure 9.9: 28r. Two Priests Attempt to Persuade Mary to Marry a Knight, the Son of Bishop Abiathar

The next plot development introduces the inevitable conflict between the heroine's goals and the obstacles she faces. Wernher and the miniaturist shape the story to arouse the reader-viewer's empathy for Mary. Having grown more beautiful than other women "in her hair and her body" [an dem hare vnd an der lich; l. 1467], Mary attracted the attention of a suitor, a "magnificent warrior" [der herliche degen; l. 1475] and the son of a very wealthy lord. The reader-viewer has just experienced the sequence of images emphasizing Mary's special relationship to God, but the suitor and his wealthy father can only see her physical attraction. She refused even to listen to him, saying that "she did not want to be touched by a man ever again" [sie sprah, daz sie nien wolte / iemer man geruren; 1482-83]. Wernher constructs the priests of the Temple as venal and therefore susceptible to the bribes of gold and silver offered by the lord; they begin to pressure and threaten Mary. A miniature is inserted into the text just as Mary, "inflamed by God" [Got hete erzundet sie; 1516], gives her firm answer (Fig. 9; fol. 28r): she will never take a husband because she has espoused herself to God. The miniature visualizes the conflict; its composition aligns the young suitor with the seated priests, uniting Mary's opposition and leaving her in isolation. One of the priests speaks to her on the suitor's behalf: "Turn your feelings toward this man, we advise you, noble and perfect lady" [Chere an disen man dinen mut. / daz raten wir dir alle frŏwe gůt]. The reader-viewer who has already read the text describing the bribery may well react to this self-interested advice with moral outrage. But the priest's banderole, rather than enveloping Mary's body in a controlling arc, stops short and folds back on itself as if repulsed by her reply: "I am espoused to God; therefore I will always remain a virgin" [Wan ih mih got entheizen han. / durh daz so wil ih iemer maget bestan]. Because it is written upside down on the banderole, Mary's verbal response forces the reader-viewer to turn the book. The sharp turn of the banderole perhaps visualizes the firmness of her answer. But Mary also responds through the action of turning away from both the priest and the suitor, creating a space between her body and theirs that physicalizes her rejection of a man's touch and communicates her resolve visually.[40] Her turn embodies her meaning; as a parallel to her lengthy speech, it succinctly conveys her intention.

Research in neuroscience on mirror neurons in the primate brain offers ways of predicting the impact of the depiction of Mary's bodily turn on the emotions of the reader-viewer. According to some neuroscientists, mirror neurons enable embodied simulation; that is, when humans perceive the actions, emotions, or sensations of others, mirror neurons throughout their bodies activate those same actions, emotions, or sensations, though not to the same degree. Thus one human internally mirrors another. These responses may remain below the level of consciousness, but they may also generate conscious feelings that result in empathetic engagement.[41] In this reading, Mary's purposeful turning away would stimulate the sensation of turning in the reader-viewer's body, and this in turn would encourage identification with the emotions that motivated her movement—that is, empathy. These "embodied mechanisms of cognition" allow us to ascribe mental states to the actions of others; they facilitate empathy—here our empathy with Mary, whose action creates a space around her body that repels the suitor's touch.[42] Other neuroscientists, however, point to the limited nature of findings based on experiments to date. Christian Keysers, for example, concludes that there is research evidence to show that some neurons involved in performing an action are indeed selectively activated by seeing a similar action—in other words, "mirror neurons do exist somewhere in the human brain."[43] But he is cautious about their link to empathy: "Activations in brain regions involved in executing

[40] As Messerer observes, Mary's "bodily avoidance" is shown only in the miniature (461).

[41] For examples, see Marco Iacoboni, *Mirroring People: The New Science of How We Connect with Others* (New York: Farrar, Straus, and Giroux, 2008), as well as Giacomo Rizzolatti and Corrado Sinigaglia, *Mirrors in the Brain: How Our Minds Share Actions and Emotions* (Oxford: Oxford University Press, 2008; originally published in Italian, 2006). Profiling V.S. Ramachandran, director of the Center for Brain and Cognition at the University of California at San Diego, in the *New Yorker*, John Colapinto writes, "Ramachandran has dubbed mirror neurons 'Gandhi neurons'—because, he said, 'they're dissolving the barrier between you and me.'" John Colapinto, "Brain Games: The Marco Polo of Neuroscience" *The New Yorker*, May 11, 2009: 76-87, at 86.

[42] Naomi Rokotnitz, "It is required / You do awake your faith": Learning to Trust the Body through Performing *The Winter's Tale*" in *Performance and Cognition: Theatre Studies and the Cognitive Turn*, edited by Bruce McConachie and F. Elizabeth Hart (New York: Routledge, 2006), 122-46, at 135. Rokotnitz offers an insightful application of the mirror neuron hypothesis.

[43] Christian Keysers, "Mirror Neurons." *Current Biology* 19, no. 21 (2009): R971-73, at R971. See also Gregory Hickok, "Eight Problems for the Mirror Neuron Theory of Action Understanding in Monkeys and Humans." *Journal of Cognitive Neuroscience* 21.7 (2008): 1229-1243. I am very grateful to Aniruddh Patel for calling this critique to my attention and for sending me copies of these articles. Our ongoing discussion of these and related issues exemplifies well how much emerging disciplines can benefit

actions have been measured while people try to read the minds of others, empathize with them or listen to spoken language. Examining how much of that activity really stems from mirror neurons, and in particular to what extent there is a *causal* link between this activity and these mental functions is a key challenge for future research."[44] Thus, the process in the mind-body by which the reader-viewer might feel empathy for Mary in this miniature has not yet been precisely discovered, but the mirror neuron hypothesis points towards embodied mechanisms of cognition.

Mary's ardent defense of chastity [ll. 1560-98] puts her in direct opposition to the values of her society and angers the elders, who call a council to deal with her. Turning to precedent, the bishop suggests the model of Aaron's rod, which God miraculously made to grow leaves and flowers as a way of communicating his will. To identify a husband for Mary, they will order each unmarried man to bring a branch to the Temple and will leave them all in the sanctuary; the one whose branch flowers will be Mary's husband.

---

from interaction with one another.

[44] Keysers, R972.

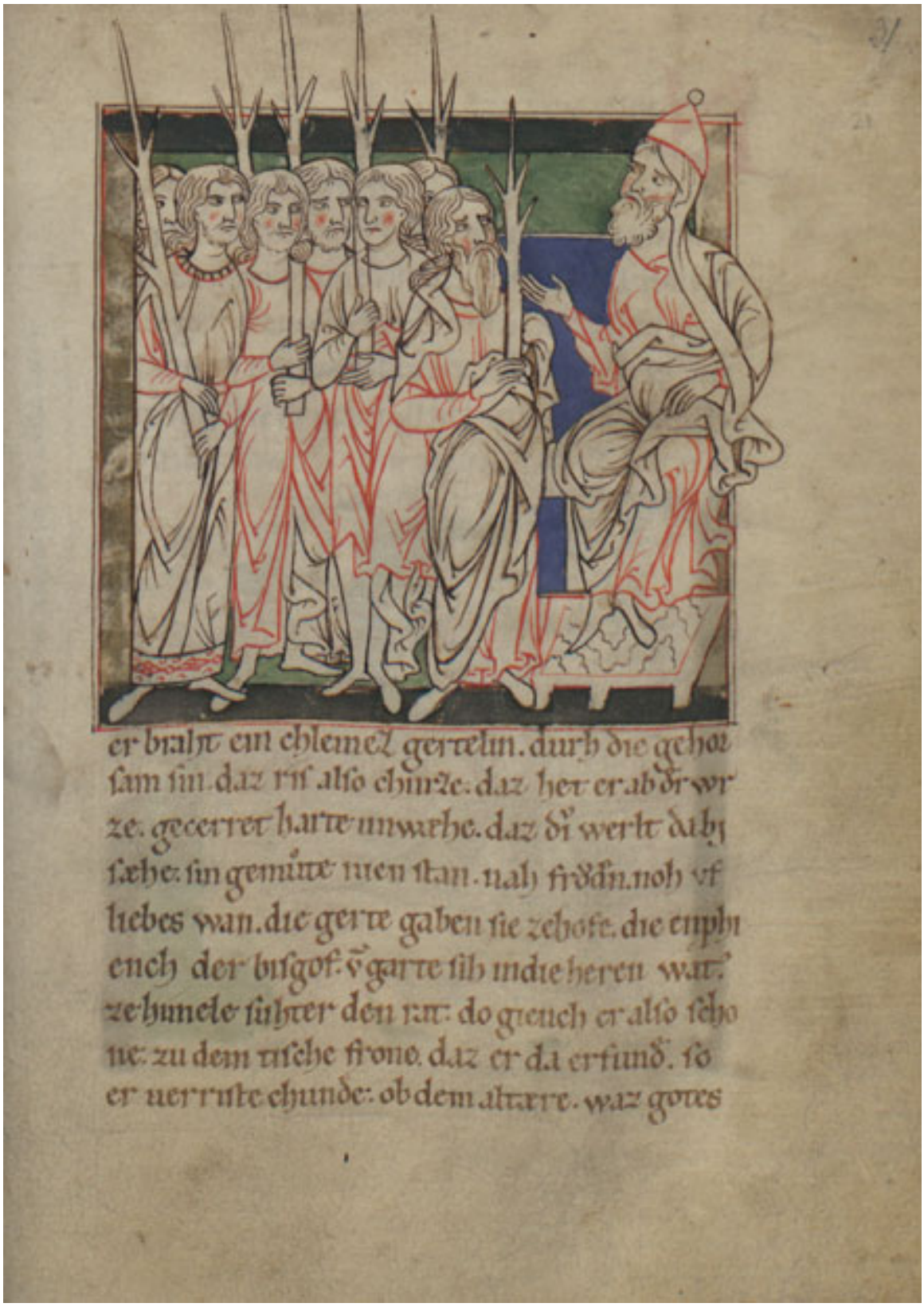

Figure 9.10: 31r. The Old Man Joseph and Six Young Men Bring Branches to the Bishop

Now the plot introduces a further complication that keeps the reader-viewer's interest engaged, an apparently unsuitable and quite unwilling candidate: "On the day, under the same pressure, an old man came there, for he was frightened by the command. Joseph he was called, who is also well known to us, if we want to search in the Bible[45] for his name. He was a widower, old, good, and of good repute, weak in body. He did not desire a wife" [do kom durh die selben not / uf den tach ein grise man; / so harte forhte er den ban. / Joseph was er genant, / der ist uns ouh wol erchant, / so wir an den buchen / sinen namen wellen suchen. / der was ein witewaere, / alter, gut vnd gew, / brode sines libes. / der engerte niht wibes; ll. 1703-12]. The miniature on folio 31r (Fig. 10) portrays Joseph as shorter than the others, bearded to indicate old age, and perhaps fearful. The page design assures that the reader-viewer will attend to the size of Joseph's branch by placing the words of the text, "He brought a little tiny switch" [er braht ein chleinez gertelin; l. 1713], directly below the miniature.[46]

[45]Lines 1706-1707 are only in text version D. Wesle interprets "buchen" as the Bible. This kind of expansion is typical of the D reviser. It distinguishes Joseph from Joachim and Anna, who are not named in the Bible, and places him in the category of a familiar character.

[46]Henkel ("Bild und Text," 258) makes this observation.

Figure 9.11: 34r. The Miracle of Joseph's Branch

The bishop ignores Joseph's branch, but an angel tells him he is wrong to do so: "When Joseph receives it [back], you will see God's wondrous deed with fleshly eyes" [als sie Josep enpfahet, / ir geseht div gotes togen / mit fleisklichen ogen; ll. 1860-62]. Having returned the branches to the suitors, the bishop indeed sees "with fleshly eyes" (Fig. 11; fol. 34r). As he observes the heavenly dove emerging from Joseph's branch, he utters the words on his banderole, "See this proof of what God intends with this man" [Seht diz urchunde an / waz got welle mit disem man]. The composition of the miniature both engages reader-viewers in the discovery and complicates their response. The diagonal placement of the bishop's body, overlapping the left border of the miniature, establishes his bodily presence in the reader-viewer's space and urges movement of the reader-viewer's gaze in the direction of his pointing finger and upraised glance, as well as that of the banderole with his imperative that addresses both the reader-viewer and the group of men facing him: "See this proof. . . ." But this complex interaction of text and image means that seeing the proof of divine will also leads the eye to see Joseph's apparent unsuitability and inappropriate response. At the bottom of the facing page the reader-viewer had read that the bishop handed his branch back to him. The next words continue in the single line above the miniature on the facing page: "His beard was long and gray. He began to weep due to distress" [sîn bart was im lanch vnd gris. / weinen begunde er durh not; 1882-83]. Then he lifts up his branch and a dove flies out of it. His branch crosses the top edge of the miniature to intersect the text, passing between the words meaning "gray" and "to weep." He begs to be allowed to enjoy his old age in peace, claiming that he has neither the youth nor the mental acuity to serve Mary well. Further, he says, he is old and "contrarious" [ungezaeme; l. 1975]. Largely as a result of Franciscan interventions, later writers, among them John Lydgate in his *Life of Our Lady*, attribute Joseph's reluctance to deep and admirable humility, shaping him into the perfect spouse for the humble handmaiden of God. But Wernher's Mary is not especially humble, and Wernher's Joseph takes the clear and unsentimental position that he is physically unfit either to care for or to have a sexual relationship with a young woman; he doesn't want a wife.

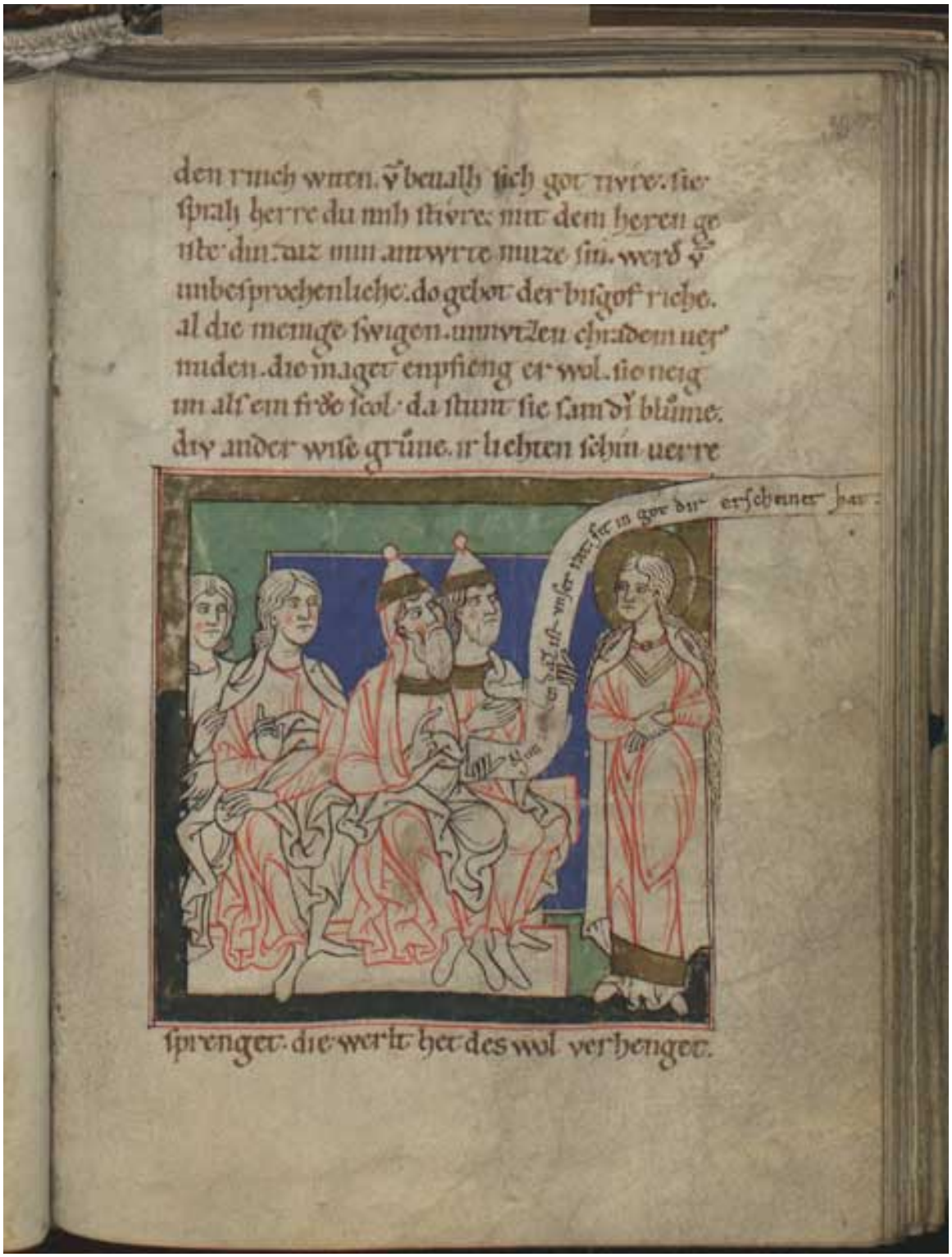

Figure 9.12: 36r. Two Priests Advise Mary to Accept Joseph

Mary is similarly unwilling. The priest sends for her and commands the crowd to be silent when she appears. The language and the miniature encourage the reader-viewer to feel a part of the crowd whose eyes feast on her and to witness the exchange (Fig. 12; fol. 36r). In the text, the priest tells her that the miracle means "she has no respite or postponement and may no longer argue" [daz wil daz du neheine frist / noh dehein ufscub habest / vnd dih niht lenger entsagest; ll. 2048-50]. The direct words on his banderole order her, "Take Joseph, that is our advice, since God showed him to you" [Nim io[se]ben daz ist unser rat. / sit in got dir erscheinet hat]. Standing very straight, she lifts her chin and grasps her left wrist with her right hand. Iconographically the wrist-grasp gesture has a standard meaning; usually enacted by one person upon another, it signals that the grasper has power of some kind, not necessarily physical, over the other. Employed rather unusually to assert autonomy, here Mary's gesture functions as a non-verbal equivalent of her speech. In the text she acknowledges the necessity of yielding to God's will, but nonetheless insists: "My body I give to no one—I remain firm on that" [mins libes ich niemen gan, / da belibe ich staetik an; ll. 2097-98]. Her posture and gesture result from meaningful bodily action that encourages reader-viewers to respond with embodied engagement, that is, to experience in their own bodies, perhaps by means of mirror neurons, her unbending attitude and her determination to retain control over her body.

The sense of witnessing unfolding action in the present, which pervades the visual narrative in this manuscript, seems especially strong in this visual depiction of two forces apparently locked in conflict; it raises a key issue for pictorial narrative, namely the spatialization of time. Art historian Suzanne Lewis offers a brief overview of the problem, pointing out that a traditional view has been that a static picture cannot tell a story, which has to move through time. But more recently, Lewis continues, "the distinction between spatial and temporal arts has become relative, softened and blurred—witness the screen titles in silent films and comic-strip balloons."[47] According to Lewis, art historian E. H. Gombrich also played a crucial role in developing new theories of pictorial narrative: ". . . it was his probing of the spectator's cognitive apparatus that enabled us to link narrative meaning and interpretation within a framework of cognitive psychology and cultural conditioning. Once the viewer entered the equation of narrator, story, and receptor, our theoretical understanding of pictorial narrative could be opened to a wider problematic and range of possibilities."[48] Lewis's note to this passage cites the work of the art historian Karl Clausberg on a medieval German manuscript.[49] Clausberg's work on two manuscripts with banderoles, one of them the illustrated copy of Wernher's poem, is even more relevant here. In describing what makes these manuscripts unusual, he speaks of "the virtually epidemical appearance of banderoles, which mix in everywhere in the representation of communication and discharge of emotion."[50] His analysis of Wernher's *Maria* engages the work of Wilhelm Messerer, who studied the miniatures in the Cracow manuscript from the perspective of word and image interaction, beginning with "the language of the banderoles."[51] Messerer's perceptive readings focus on the banderoles as forms that convey meaning by rising or falling, wrapping around or passing above a figure or crossing or turning back from the frame. After analyses of other visual elements, such as gestures, drapery, and relationship between figure and frame, he concludes that all of these elements, which do not exist in text, "speak 'parallel' to text—admittedly with their own modifications, the way that in polyphonic music a second voice can behave toward the first."[52]

Messerer's analogy to polyphonic music can be further developed as a way to think about the visual narrative in this manuscript by considering the implications of the fact that none of the banderole texts are quotations from Wernher's poem; rather, they seem to have been composed expressly for this manuscript.

[47]Suzanne Lewis, "Narrative," in *A Companion to Medieval Art: Romanesque and Gothic in Northern Europe*, edited by Conrad Rudolph (Malden, MA: Blackwell, 2008), 86-105, at 87. For an engaging analysis of Latino comic book narrative from the perspective of cognitive science, see Frederick Luis Aldama, *Your Brain on Latino Comics. From Gus Arriola to Los Bros Hernandez* (Austin: University of Texas Press, 2009).

[48]Lewis, 87.

[49]Karl Clausberg, "Der Erfurter Codex Aureus, oder: Die Sprache der Bilder," *Städel-Jahrbuch* n.f. 8 (1981), 22-56.

[50]Karl Clausberg, "Spruchbandaussagen zum Stilcharakter—Malende und gemalte Gebärden, direkte und indirekte Rede in den Bildern der Veldeke-Aneide sowie Wernhers Marienliedern," *Städel-Jahrbuch* N.F. 13 (1991), 81-110, at 81.

[51]Messerer, 448.

[52]Ibid., 471. It is important to Messerer that the elements he describes in the miniatures form parts of a "language"; he uses the analogy of translation to justify speaking of "the image as a certain equivalent of text, and thereby as language in the full sense" (447).

As elements of a parallel narrative, the speech banderoles of course need not quote directly from the text any more than the miniature must—or even can—literally visualize every element of the text. The two narratives, the text and the miniatures with banderoles, do not simply repeat one another; they create differences with strikingly important effects. In their form, the banderoles visualize emotions as well as the directional flow of words; they strongly evoke present time. The accompanying text often uses the past tense and indirect quotation to create narrated time. I suggest that in combination, text and miniature create a sense of authenticity, of the inevitable differences between direct and reported speech, eyewitness and carefully constructed written account. The account compiled after reflection is not incorrect; what it lacks in immediacy and, perhaps, precision, it gains in detail and overall structure. The result for the reader-viewer can be a sense of multiple possibilities for authenticity, acceptance of the possibility of responding somewhat differently to each interaction with the manuscript depending on the relative weight placed on visual and verbal narratives. In other words, imagining something somewhat differently each time does not mean that any one reconstruction is wrong. The makers of this manuscript successfully designed it to capture and recapture the attention of its owners.[53] Part of its attraction is that it fosters repeated and imaginative meditation on the events of Christianity's central narrative, an affective devotional practice that was beginning to spread among the laity.[54]

[53] For Boyd, "*Attention capture can explain the* design *features of stories,* as other explanations cannot" (392). He speaks of "choices that successful stories continually make about genre, character, plot, medium, structure, character contrast, irony, and much else" that "can be explained in terms of attention, in terms of offering enticements—especially emotional enticements—to keep audiences distracted from responding to their immediate surrounds as they half-immerst themselves in the far-fetched world of story" (393). I extend that argument here to the design features of the manuscript and specifically to the decision to accompany the verbal narrative with a visual narrative that incorporates speech.

[54] For a recent and important study of this phenomenon, see Sarah McNamer, *Affective Meditation and the Invention of Compassion* (Philadelphia: University of Pennsylvania Press, 2010).

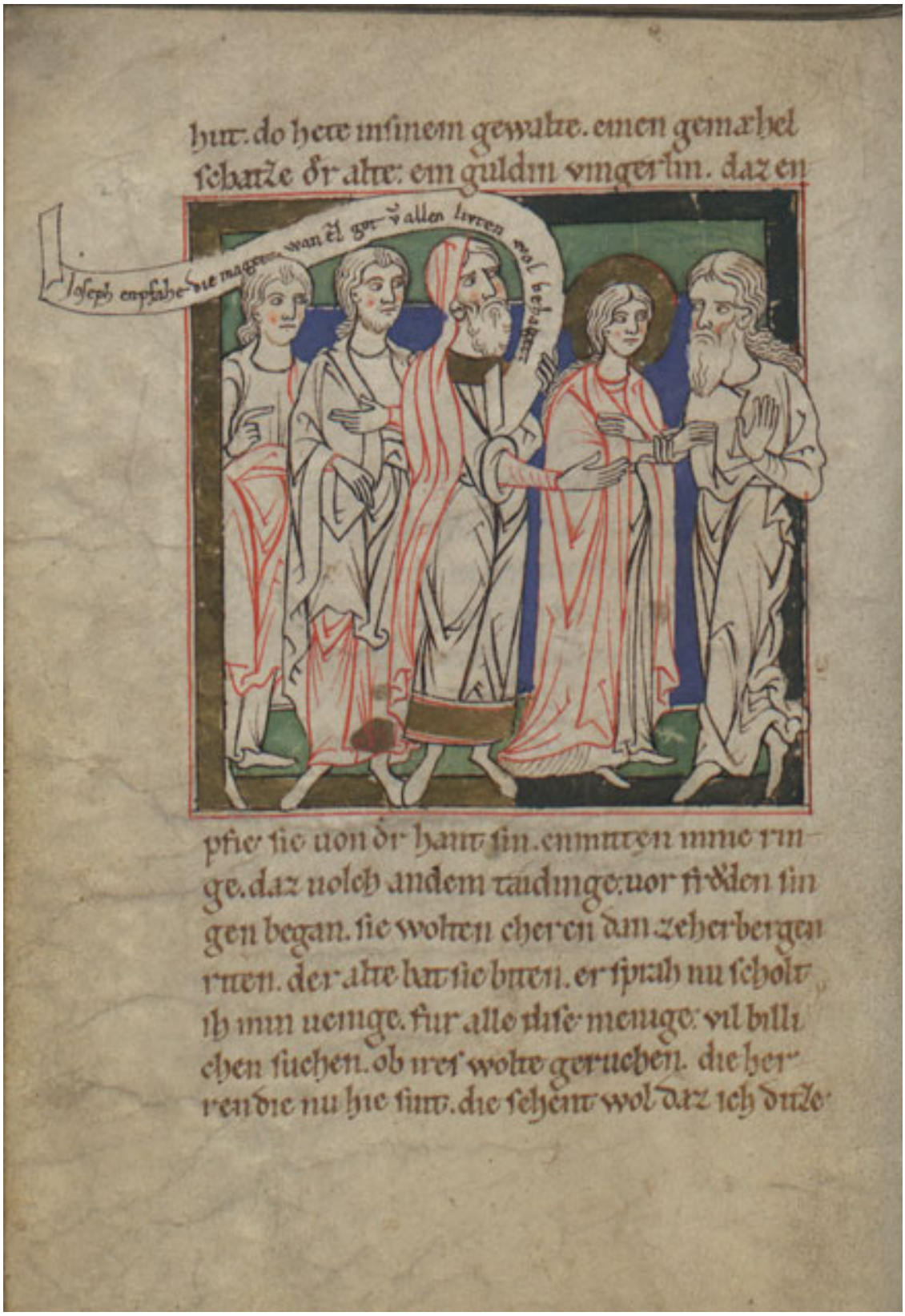

Figure 9.13: 37v. Assisted by Two Other Men, Bishop Abiathar Gives Mary to Joseph in Marriage

Selection of events for illustration, and therefore special emphasis, direct the reader-viewer's attention towards specific subjects. As I suggested earlier, one of these is marriage. As we have seen, in one miniature the priest makes the marriage of Anne and Joachim by controlling the puppet-like Anne with his body and Joachim with his banderole. His words perform their union: "Receive this woman for your own, so that you will both be one body forever." But in the marriage of Mary and Joseph (Fig. 13; fol. 37v), the bishop's gesture is much more tentative, and the visible space between his body and Mary's affords her some autonomy. Further, his banderole quite literally stops short of the couple rather than encircling them, and his words, "Joseph, receive the maiden, for it pleases God and all the people well" [Joseph enpfahe die maget. / wan ez got und allen liuten wol behaget], do not effect a union. Joseph's grasp of Mary's wrist indicates the transfer of Mary's person into his care and control, but she is less passive than Anne and appears to extend her arm herself. Further, she has allowed Joseph to touch her. Her equal height with Joseph communicates equality rather than gendered hierarchy. Separated from the community, Joseph and Mary form a new unit, or rather a unit of a new type. Wernher and the artist have attributed to each partner a strong reluctance to participate, resistance that has been overcome only through demonstration to "fleshly eyes" that this marriage accords with God's will. All of this has been communicated through the medium of the body.

Having resolved the problem of Mary's refusal to marry, Wernher now turns to establishing her place in a domestic sphere. Wernher had followed *Pseudo-Matthew* in describing Joseph as an old man and had focused on his bodily infirmity and age as his motivation for resisting the marriage. After the wedding ceremony, however, Joseph informs the noble families that have gathered, "I must travel around far in my craft" [ia můz ich riten vnd varn / durh mine sache witen, ll. 2124-25], and asks that they allow five of the Temple virgins to accompany Mary home, where they will serve as her companions during his inevitable absences. Subsequently, Joseph is presented as the prosperous head of a household in well-established good order, complete with servants whom he instructs to obey his lady wife when he departs.

Figure 9.14: 41v. An Angel Rebukes the Temple Virgins for Mocking Mary

Meanwhile, in her separate sphere, Mary lives the life of a noblewoman. When she and the five virgins from the Temple who have come to live with her cast lots to determine who will sew the purple and silk for the Temple, and who the rough flax, her companions envy Mary for winning the purple and the silk, and mock her by calling her "queen." Hearing this, the angel who feeds Mary daily decides to frighten them by appearing suddenly, "bright as the day" [lieht als der tak; 2304], and tells them that their derision is actually prophecy, for Mary will be empress of all the world. The miniature (Fig.14; fol. 41v) overflows with bodily action conveying emotion, from the angel's anger, economically expressed by a crossed arm, to the women's fright and repentance. It renders in visible, physical terms the words of the text just above and below: "The ladies were thoroughly frightened when they looked at the angel and recognized his anger. With fright they promised they would change and repent, and threw themselves to the feet of the Good One" [die frŏen harte erschrikten, / do sie den engil an erblikten / vnd sinen zorn ersahen. / Mit uorhten sie iahen, / sie wolten wandeln vnd buzzen, / vnd butten sih der guten ze fuzzen; ll. 2313-18]. Mary's stern demeanor correlates with the imperatives in the words on the banderole that rises from her right hand: "Ladies, stand up and stop your envious behavior; the angel has ended the strife" [Frowen stet uf unt lat den nit. Der engel hat gescheiden dem strit]. The way the banderole rises and gently curves around and beyond the angel seems to make that heavenly being her agent. Further, her physical placement is that of an enthroned empress, complete with footstool, a confirmation of her status as "empress over all this world." Most striking, though, is the decision to make Mary's speech the subject of both miniatures. In Wernher's poem, the only direct speech in the entire scene, from the delivery of the silk and flax through the women's repentance, is that of the angel rebuking the women.

Figure 9.15: 50v. Joseph, as Master Shipbuilder, Addresses His Journeymen

After a lengthy treatment of the Annunciation, Wernher's second poem ends with the Visitation. The first miniature in the third poem shows what Joseph has been doing during his extended absence by presenting him as a master shipwright in accordance with Wernher's text. Directly above the miniature we read: "There [in Capernaum] he taught his journeymen about masterly things [meaning the special knowledge that masters of the craft have]" [da er sîn ivngere lerte / uon meisterlichen sachen], and below the miniature: "How they should make / Strong and firm keels," etc; [wie sie scholten machen / die notuesten chiele; ll. 2952-55]. In the miniature (Fig. 15; fol. 50v), Joseph's body conveys his mastery and authority: he stands very straight and tall and tilts his head up, towering over the men working on the ship. His size and position almost totally obscure the frame, and his banderole crosses the entire top of the miniature. In a visual pun, the man at the upper right "gets the message," as the end of the banderole nears his gesturing hand. A reader-viewer might well expect Joseph's words to be instructions regarding proper shipbuilding techniques, but they actually move the narrative forward: he says he is returning to his home,[55] a narrative ploy that creates dread in reader-viewers who anticipate his reaction to a new development: Mary's pregnancy. This miniature thus functions as a "before" and contrasts sharply with the next image, which shows the "after."

[55]"I must travel home; it is time. May God always command you" [Ih můz heim des ist cit. / got ir iemer bevolhen sit].

Figure 9.16: 51v. When Joseph Returns, He Complains to Mary's Five Companions

At home again, Joseph is bodily transformed back into "the old man with the beard" [Der grise mit dem barte; l. 3009], as the line near the bottom of the page indicates. Exposing his spindly calves and bowing his back so that his head leans forward (Fig. 16; 51v), Joseph accuses Mary's companions of complicity in what he can only see as adultery: "Alas for the worry that I have discovered here; you have behaved very wickedly toward me" [O we der sorgen die ih funden han. / ir habt vil ubel an mir getan]. Beginning at the upper left rather than on end of the banderole that Joseph holds near his mouth, these words literally return to him in a visualization of their ineffectiveness. As the women make very clear, he is not in charge here: "What God has brought about here is the angel's counsel" [Swes hie got verhenget hat. / daz ist des engeles rat]. Alone in his confusion, Joseph is so weighed down with sorrow that he wishes he had died before hearing the people tell lies about him and suffering the loss of his honor. The confidence of the master craftsman is eroded by self-doubt; he knows he will not be able to perform his role as Mary's protector.

Figure 9.17: 53r. Joseph's First Dream

Having reached a decision to abandon Mary, Joseph goes to bed until the moon will rise to light his way; in the miniature (Fig. 17; fol. 53r), his rumpled garments and bedcovers express his "bodily anxiety" [des libes angest" l. 3091], and the text elaborates on his physical condition: "His eyes were dim / From sorrow and the weight of age, / Because in the known region / There was no one older" [sîn ŏgen waren im trube / uon leides vnd des alters swaere, / wand uber die gegende maere / was sîn galter nehein. ll. 3104-7]. Of course, reader-viewers are not to conclude that Joseph abruptly grows older or younger from scene to scene. Rather, both poet and miniaturist manipulate the condition of the body to convey psychological and emotional states. By treating these states as having effects on physical age and wellbeing, the miniatures make them accessible to the body of the reader-viewer, enabling a reaction of empathy.

In his application of evocriticism to similar scenes of deliberation in the *Odyssey*, Boyd identifies the "flexible intelligence" that evolved in humans and "can with effort arrive at novel solutions to novel problems." But allowing flexible intelligence to produce "new responses to difficult situations involves stopping automatic responses and thinking with effort, in a highly conscious way, to solve problems."[56] A modern reader-viewer may project this flexible intelligence onto the sleeping Joseph by deciding that he has given himself time to reconsider, but the biblical narrative invokes supernatural intervention to explain Joseph's awakening with renewed confidence in Mary's chastity. Boyd attributes the human tendency to seek and accept supernatural explanations to "our theory of mind, our most powerful intuitive ontology," which always looks for a deeper explanation, especially "a concealed agential cause." As he observes, "religious myths have provided the standard form of apparently deeper explanation for most humans since we emerged fully into culture."[57]

[56] Boyd, 258-59.
[57] Boyd, 199-202.

Figure 9.18: 54r. Joseph Apologizes to Mary

Here the angel is the supernatural agent who speaks to the sleeping Joseph to remind him of his earlier experience at the Temple: "His goodness chose you. / Now serve her with steady courage, / and hold her in loving protection" [sîn gůte dich erwelt hat / nu dien ir mit staetem mute / vnd habes in lieber hůte; ll. 3138-40]. Joseph immediately seeks Mary out to apologize (Fig. 18; fol. 54r). In a composition that echoes but significantly revises the wedding miniature, Mary extends her hand to forgive Joseph, not to submit to him. He kneels before her, communicating bodily the shift in power. The way Mary leans her body forward and stretches out her hand toward his embodies her empathetic response; their hands will clasp, sealing the affective bond that now characterizes this marriage and overwrites the earlier wrist grasp. This sustained attention to the resolution of a rift within their marriage offers them to the reader-viewer as a model for dealing with tense, emotion-filled conflicts in a marital relationship.

This plot episode also addresses the issue of genealogy raised by the first miniature in the manuscript. The angel addresses Joseph as "son of David" [Josep kind Dauit; l. 3123], identifying him as a descendent of Jesse along with Mary, and goes on to say of Mary, "She is above all women / and must always remain / mother and holy maiden: / God grants her the honor" [sie ist ob allen wiben / vnd můz iemer beliben / muter unde maeit here: / got lihet ir die ere; ll, 3129-32]. The words on his banderole articulate his acceptance of their import: "Gracious lady and pure virgin, my assumption led me into error" [Gnade frowe unt reiniu maget. / min wan hat mir misse saget]. That assumption, according to words assigned to him in the text, was the sin of mistrusting her body because of any earthly man. He now knows that God took her as his spouse [ll. 3164-74]. Mary's acknowledgment of Joseph's apology is followed by a striking passage that does not appear in the version of the *Pseudo-Matthew* that Wernher used as his source and may, therefore, be original to Wernher or a reviser. The verbal narrator reports that those who heard their exchange, presumably Mary's companions, spread the news. As a result, "Then there was never greater joy among a kindred. . . . Thus they were undivided" [grozer froude diu wart nie / under einem gesinde. . . Also waren sie ungescheiden; ll. 3192-93; 3198]. The uniform rejoicing expressed in this line contrasts dramatically with the reaction of "the Jews" who reacted with "hatred" [die iuden viengen ze hazze; l. 3202]. This separation of the house of David from the rest of the Jewish community is, of course, a fiction that functions to protect the lineage of Joseph, Mary, and Jesus from any anti-Jewish sentiment in twelfth- and thirteenth-century Germany.

The issue raised by the second miniature on the Judgment of Solomon of the safe delivery and subsequent thriving of a child reappears in the central subject of Wernher's poems—the Nativity. As Michael Curschmann points out, that subject receives unusual attention in the Cracow manuscript: "The verbal report of the birth of Christ and its circumstances, from the arrival of the couple in the rock cave until the return of the shepherds to their flocks, takes up 310 lines in manuscript D, and incorporated into these 310 lines are no less than eight of these color-washed ink drawings. In no other place is the illustration so dense. Certainly these could have employed the standard iconography, but instead of this the artist has amplified this event in detail, and in such a way that with each turning of the page the reader sees at least one miniature, and twice sees two."[58] Curschmann convincingly links this unusual emphasis to a specific function of this manuscript, a book small enough to be easily clasped in the hand.[59] Wernher's text explains that if an expectant mother is carrying this book in her right hand when she enters her birthing room, Mary herself will ensure that the woman will have a quick labor and an easy recovery (ll. 2853-59).[60] Further, "when the three books are held fast," Mary will see to it that the child is neither crippled nor blind at birth and "will redeem it herself" at death.[61] Wernher's *Maria* in its material form, then, has "special magical

[58] Michael Curschmann, *Das Buch am Anfang und am Ende des Lebens: Wernhers Maria und das Credo Jeans de Joinville* (Trier: Paulinus, 2008), 24. I am grateful to Professor Curschmann for his generous collegiality in helping me with this project in many ways, and especially for giving me a copy of this publication as well as facilitating my access to color reproductions of the entire manuscript.

[59] It measures 16.5 x 11.7 cm, a small format characteristic of all the surviving manuscripts of the poem.

[60] Since it was the custom for upper-class women to take up residence in a room prepared for that purpose sometime before labor began, there would usually be ample time to study or leaf through this book repeatedly.

[61] "Swa diu buchel driv sint behalten, / div maget wil des walten, / daz da nehein kint / werde krumb noh blint, / vnd da niemer werde geborn / daz ewikliche si verlorn, / sine welle es selbe fristen / an dem aller ivngisten, / da diu sele den lip uerlat / vnd ez an den iamer gat"; ll. 2867-76. The reference to "three books" refers to the common practice of creating smaller units, what we might call "booklets," for individual parts, which might circulate separately. Here, it is assumed that each of the three

power as a birth amulet"[62] —it can effect Mary's protective presence. I suggest that the woman in labor would experience that presence through a fundamental process called conceptual blending, or "the process of integrating disparate conceptual content into meaningful wholes."[63] According to cognitive theorists Gilles Fauconnier and Mark Turner, "Human beings are exceptionally adept at integrating two extraordinarily different inputs to create new emergent ways of thinking . . . ."[64]

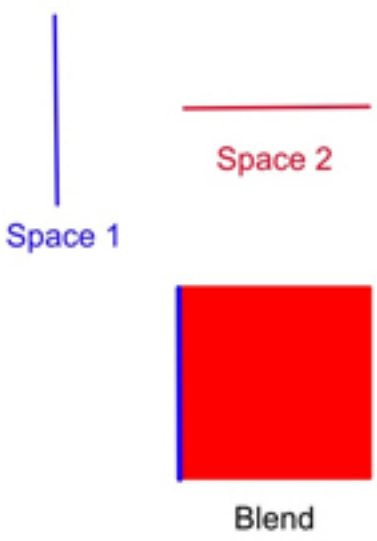

Figure 9.19: Diagram of Cross-Space Mapping

Though different, these inputs exist in mental spaces that are interconnected and share a frame (Fig. 19).[65] A simple analogy may be helpful: In this diagram, each of the lines, the blue vertical one and the red horizontal one, exists in a separate space. Within the frame of the plane, these are "extraordinarily different inputs." Then we attach a red horizontal line to each blue point on the vertical line. This is what Fauconnier and Turner call cross-space mapping. The result is a rectangle that has a property found in neither of the lines: it is two-dimensional. Once the new reality is created, it can be explored, an activity Fauconnier and Turner call "running the blend." In the diagram, that means exploiting the ability to move in any direction, whereas the input spaces allowed movement only in a straight line.

In our example, one input space is Mary's painless birth experience and the other input space is the female book owner's birth experience. In spite of the state of pregnancy they share—the frame—Mary's experience should not have been possible for the book-owner. According to Christian belief, as punishment for succumbing to the devil's temptation, God inflicted pain in childbirth on Eve and all women after her. Mary escaped because she was without sin. Thus, the two spaces of the pregnant reader-viewer and Mary are fundamentally different, separated by the gulf of the Fall. A cross-space mapping links these two spaces.

poems that make up Wernher's *Maria* might be in a separate booklet.

[62]Curschmann, *Das Buch am Anfang*, 13.

[63]Williams, Robert F., "Gesture as a Conceptual Mapping Tool," in Alan Cienki and Cornelia Müller, eds. *Metaphor and Gesture* (Philadelphia: John Benjamins, 2008), 57.

[64]Giles Fauconnier and Mark Turner, *The Way We Think: Conceptual Blending and the Mind's Hidden Complexities* (New York: Basic Books, 2002), 27.

[65]I am grateful to Mark Sheingorn for conceiving this example and preparing the diagram.

However, "composition of elements from the inputs"—that is, the bringing together of these two sets of features—"makes relations available in the blend that do not exist in the separate inputs."[66] Further, "Once the blend is established, we can 'run the blend'—that is, operate cognitively within it, developing new structure and manipulating the various events as an integrated unit."[67] What activates the blend? I suggest it is the material object, the book itself. As its owner moves toward her birthing room, clutching her book makes Mary present to her. Perhaps she remembers the miniature of Mary healing the sick (Fig. 8; fol. 27r) or even imagines herself receiving the blessing that Mary gives in the miniature of her arrival in Bethlehem where Jesus will be born (Fig. 20; fol. 66r).

[66] Fauconnier and Turner, 42.
[67] Fauconnier and Turner, 60.

Figure 9.20: 66r. Mary and Joseph Arrive at the Gate of Bethlehem

This gesture is not described in the text, and in the miniature it takes place just as Mary is crossing a threshold, facilitating the pregnant woman's identification with Mary. In the blend, the participant can make "connections across spaces [that] seem to pop out automatically, yielding a flash of comprehension . . . ."[68] By experiencing rather than merely observing, the reader-viewer comprehends in a different and deeper way that she shares embodiment with Mary and can confidently expect a quick labor, an easy recovery and, above all, a healthy child.

A fuller study would include Curschmann's important use of cultural and historical perspectives to situate the magical, protective function of the Cracow manuscript within a tradition of folk medicine tolerated in pastoral practice. Systematic application of the methods of analysis that the discipline of art history has developed and extended reference to the detailed studies of this manuscript by major scholars, some of which I have cited, would yield more insight into its miniatures. Further, continuing this study to include the unusual emphasis in the manuscript on the Massacre of the Innocents, a threat to the life of the child Jesus that he escaped due to parental vigilance (as well as divine intervention), would strengthen its argument. My goal has been to demonstrate the potential of cognitive studies, which does not replace but rather enhances the approaches and tools employed by art historians. I aim to have shown that, starting from shared embodiment and using tools such as evocriticism, the enactive view, the empathetic potential of mirror neurons, Theory of Mind, and conceptual blending, cognitive studies *can* substantially enhance our access to and our experience of art objects, even those from the distant past.

[68] Fauconnier and Turner, 44.

Chapter 10

An Essay on Neurohistory[1]

10.1 I

Hegemony; false consciousness; propaganda; biopower. These words, and others like them, denote a space where studies of power intersect with studies of the brain. All studies in the humanities have a psychological dimension. Studies of power, in particular, are laced with assumptions about how the brain works. So what would the study of power in human societies look like if we approached it through the latest research on the brain? If we accept the idea that the brain itself is (in part) a cultural construct, instead of a living fossil composed of hard-wired patterns of stimulus and response, would it be possible to write a history of how changing regimes of power over the last several thousand years emerged in tandem with changes in aggregate neurobiological states?

The history sketched in this article begins with the observation that all human societies are marked by an array of mechanisms that affect brain states. These mechanisms include behaviors such as sex, long-distance running, or spousal abuse; cultural practices such as reading or listening to music; and a considerable range of drugs or psychopharmacological substances.[2] These are all psychotropic mechanisms. If experienced continuously by an individual, psychotropic mechanisms can create dependencies or addictions. They can numb or amplify the signals that pass across receptors in the brain and even generate new neural maps. If psychotropic mechanisms are distributed widely enough across a sub-population, they can, in theory, alter or transform the aggregate brain, creating generalized states or conditions in whole groups, not just individuals. The brain states would have the appearance of being hard-wired without being genetic.

Brain states associated with stress are already known to have political consequences in primate societies, and it has been suggested that they also have this effect in human societies. Since the very mechanisms that generate neurobiological states are themselves delivered by political and/or economic systems, we can suppose the existence of feedback mechanisms linking political conditions and neurobiological states. These feedbacks may operate at a level below that of full intentionality on the part of political operatives. Regardless, the effects could be significant, and the possibility deserves a place in our analyses of power.

The argument sketched above is not new. Although recent developments in neuroscience have offered new grounds on which to elaborate the argument, other observers of the human condition have arrived at a similar intuition. The argument was prefigured most notably by Aldous Huxley in his *Brave New World* (1932) and by George Orwell in *Nineteen Eighty-Four* (1949). These two books, published seventeen years apart, offer competing images of the dystopian nightmare that might be human fate. Both authors shared the basic intuition that cultural practices have drug-like effects and that political cultures can therefore be organized around the strategic manipulation of the human nervous system. In this essay, I will offer a preliminary case study illustrating how a more general (and less paranoid) version of this argument might

[1] This content is available online at <http://cnx.org/content/m34243/1.4/>.

[2] Where music and drugs are concerned, see the essays by Aniruddh Patel and Hermann Herlinghaus in this volume.

apply to a specific historical case: that of Europe over the past millennium or so.[3] To introduce the contours of the argument, however, let us look at the Huxley-Orwell model, a strong version of the basic argument that neurobiological states have political implications.

Orwell wrote as a horrified observer of the rise of modern public relations. The field and technique owe much to the figure of Edward Bernays, a nephew of Sigmund Freud who is often called the father of modern advertising. As Bernays explained in his 1928 work *Propaganda,* "We are governed, our minds molded, our tastes formed, our ideas suggested, largely by men we have never heard of. . . It is they who pull the wires which control the public mind, who harness old social forces and contrive new ways to bind and guide the world."[4] From this came Orwell's interest in the way languages and frames can twist and bend our ability to reason. But Orwell's fictional city of Oceania was also a world of constant, never-ending stress visited on the body and the nervous system. In a manner reminiscent of Jeremy Bentham's perfect prison, which he called the Panopticon, all citizens of Oceania are supervised by two-way telescreens and live in constant fear of the thought police. The weekly Hate exercises serve to whip up and channel aggressive sentiments. The total suppression of sexual desire (the torturer O'Brien declares at one point, "we shall abolish the orgasm"[5]) is designed to channel all bodily feelings toward these exercises and simultaneously eliminate one of the many mechanisms that people use to relieve stress.

Huxley's model of totalitarianism worked in an entirely different way. The psychological state generated in the Brave New World was not one of stress, but one of pleasure. Commenting on Orwell's *Nineteen Eighty-Four* a decade after its publication, Huxley wrote: "government through terror works on the whole less well than government through the non-violent manipulation. . .of the thoughts and feelings of individual men, women and children."[6] *Brave New World* explores a nearly insoluble philosophical dilemma: if people are content in their own subjection, is it still subjection? The division of labor in the Brave New World operates by means of child conditioning. From the moment of (artificial) conception, the members of each of the five major castes are genetically manipulated to suit their allotted social condition. Infants destined to be workers are conditioned in Pavlovian ways to resist the allure of flowers, books, and especially mothers. Children are further conditioned through hypnopaedia—constant audio messages played during sleep. As adults, the citizens of the Brave New World are subjected to an additional day-to-day conditioning through free distribution of an opiate called "soma." Soma, we learn, has "all the advantages of Christianity and alcohol; none of their defects."[7] Huxley, here, was alluding to Karl Marx's famous passage: "Religion is the sigh of the oppressed creature, the heart of a heartless world as it is the spirit of a spiritless situation. It is the opium of the people."[8] Religion, in Marx's model, is a cultural opiate, an institution or practice that can have a soothing, opiate-like effect on the body. In *Brave New World*, Huxley turned Marx on his head: the opiate itself has become the religion of the people. A marvelous scene in Chapter Five, a parody of the eucharistic ceremony, plays on a fortuitous pun: *soma* is the Vedic word for a south Asian opiate, but in Greek it also means "body."

The denizens of the Brave New World are addicted to soma. They pop several pills each day and never experience the dopamine withdrawal that makes Ecstasy and other equivalents so dangerous. But they are also both stimulated and subdued by the endless recreations of their consumer paradise: the games, the dances, travel, the sensuous, perfumed showers, the endless rounds of sex, all of them opiates or stimulants, albeit of different kinds. As Richard Posner has pointed out, *Brave New World* was written "in the depths of a world depression that Keynes was teaching had resulted from insufficient consumer demand and could be cured only by aggressive government intervention."[9] The Brave New World was the logical outcome of

[3] I first proposed this idea in *On Deep History and the Brain* (Berkeley: University of California Press, 2008).

[4] Edward Bernays, *Propaganda* (Brooklyn, N.Y.: Ig publishing, 2005), 37-38. See Larry Tye, *The Father of Spin: Edward Bernays and the Birth of Public Relations* (Crown: New York, 1998).

[5] George Orwell, *Nineteen Eighty-Four* (New York: Harcourt Brace Jovanovich, 1983), 220.

[6] Aldous Huxley, *Brave New World and Brave New World Revisited* (London: Chatto and Windus, 1984), 237.

[7] Ibid., 59.

[8] Karl Marx, "A Contribution to the Critique of Hegel's 'Philosophy of Right'," in *Critique of Hegel's 'Philosophy of Right'*, trans. Annette Jolin and Joseph O'Malley (Cambridge: Cambridge University Press, 1970), 131. In the ensuing sentence, he describes religion as an "illusory happiness": "The abolition of religion as the illusory happiness of the people is a demand for their true happiness."

[9] Richard A. Posner, "Orwell Versus Huxley," in *On Nineteen Eighty-Four*, ed. Abbott Gleason, Jack Goldsmith, and Martha

the Keynesian belief that consumption is the antidote to recession.

Chemical opiates on the one hand; cultural stimulants on the other. If the human goal is to pursue pleasure and avoid pain, and if a regime has a total monopoly on the sources of pleasure, then that regime has created a realm of subjection like nothing ever before seen. Working together, the assemblage of opiates and stimulants available in the Brave New World, both cultural and chemical, constitute an order so finely calibrated to the workings of the human nervous system that there can be no escape. The same is true for the assemblage of stressors in Orwell's Oceania. Hence, history itself has come to an end. In describing the end of history's dialectic, both Orwell and Huxley hint at a historical model, a great transformation, in which the native stimulants and stressors of the past yield to a systematically designed array in the new world. Power, they suggest, is always mediated through the nervous system. The end of history comes about when a regime armed with the necessary technological apparatus hits upon the ideal combination of neurological controls.

It is a dazzling and disturbing idea.

We can set aside the intuition shared by Huxley and Orwell that transformations of this type are guided by the hand of totalitarian regimes, for although their model actually does describe with some accuracy the *modus operandi* of twentieth-century totalitarian regimes, it is probably less capable of describing past societies. Some of the most interesting trends in history, moreover, are those that emerge as the unforeseen and unintended consequences of shifts in practice or thought. When their model is purged of this totalitarian and voluntarist vision, however, it offers a startling new way to think about the transformations of the past. In the case study offered below, I would like to offer a glimpse at what such a history could look like. I shall begin with a brief review of relevant findings of neuroscience and related fields like cognitive archaeology before turning to a preliminary case study using evidence drawn from medieval and early modern Europe.

Why Europe? My own limited expertise, rather than any belief in Western European exceptionalism, is the chief reason. But Western European history does have several features that make it an interesting subject for a neurohistorical approach. As various observers have noted, medieval Latin Christendom was a region generally poor in psychopharmacological substances. There were plenty of cultural practices, however, that impinged on the nervous system. These were the components of a distinctive assemblage of traits that emerged in stages along with the rise of Latin Christendom. Then, across the long eighteenth century (from about 1688 to 1815), a distinctly different assemblage of traits came together.

First, the exchange of psychopharmacological substances like caffeine and opium accelerated all over the world. David Courtwright has called this "the psychoactive revolution."[10] Patterns of use changed. To take but one example, coffee—hitherto a medicine—became a luxury, an adjunct to entertainment, and eventually a staple. Expanding production led to a growing density of psychoactive substances in all global societies.

Second, there were transformations in the basic profile of available cultural practices that impinged on the nervous system, as evidenced by the luxury debates, the mania for collecting, the passions aroused by theater, and especially the anxieties surrounding what was known as "reading mania" or "reading fever." It was a century, remarkably, in which contemporary observers were aware of the changing forms of addiction. A neurohistory is, necessarily, a deep and global history, but the full spectrum will emerge only after we have begun to piece together the local histories.[11]

10.2 II

In the past few decades, enormous strides have been made in the fields of biological anthropology and paleohistorical archaeology. Genomic studies have enriched our understanding of behavioral traits and patterns of migration in the Paleolithic era (the old Stone Age). New dating techniques have supplied the chronological scaffolding that was missing or thin in many areas of deep human history.[12] The emergence of the field

C. Nussbaum, 183-211 (Princeton, 2005), 193.

[10] David T. Courtwright, *Forces of Habit: Drugs and the Making of the Modern World* (Cambridge, Mass.: Harvard University Press, 2001).

[11] E.g., through the work of Hermann Herlinghaus in this collection.

[12] See my contribution, "On the Possibilities for a Deep History of Humankind," in this volume.

of cognitive archaeology, a distant cousin of the better-known field of evolutionary psychology, has offered important new insights on both brain and behavior.[13] All of this is leading to a robust new understanding of early human history.

One of the most significant questions of the emerging field of paleohistory is also the one that has been around the longest: what instigated the growth of the human brain? The size and shape of the brain case is easily graphed, and what that graph illustrates is a pattern of punctuated growth from the australopithecine brain (ca. 3.2 million years ago) to the modern brain. The brain is expensive tissue, and the large skulls needed to protect it are dangerous for both mothers and neonates. So what was the evolutionary benefit that offset the considerable costs of the large brain? One of the most vigorous arguments lately is the social intelligence hypothesis,[14] which builds off the idea that humans have lived in cooperative groups for nearly two million years and are dependent on altruism like no other species. The brain, accordingly, grew to keep track of credits and debits, social alliances, and social standing. This new social context placed a premium on the ability to accurately read and act on social signals. In his studies on autism, Simon Baron-Cohen calls this "mind-reading."[15] Social intelligence created what evolutionary theorists have called a "cognitive arms race" in which the most important selection pressure was not the changing environment or the use of tools, but the need to keep up with everyone else's mind-reading ability.

The changing use of the brain pushed the evolution of practices or mechanisms that interact with the dopamine reward and the stress response systems. These are ancient systems found in all reasonably complex animal species, for animals need to receive pleasure for doing good things and pain for doing bad things. The dopamine reward system works by generating dopamine in synapses; this excites the neurons and produces a feeling of pleasure or satisfaction. The stress response system generates discomfort through the reduction of dopamine and serotonin in synapses and through the release of stress hormones. In social species, the two systems are harnessed to the demands of cooperative life. Pro-social activity generates a reward. Stress mounts if the animal is at odds with or isolated from the group. The sensory-deprivation experiments first conducted on human subjects at McGill University in the 1950s vividly illustrate this point. Subjects who were isolated from sensory input—with frosted goggles, gloves, solitary rooms, white noise—would begin to hallucinate within a day or two. Every one of them was forced to abandon the experiment within a week. Horrifying studies conducted in the 1970s showed that newborn rhesus macaque monkeys went psychotic and suffered permanent neurological damage after being isolated for several months in the aptly named "Pit of Despair."

Key to this psychological process is the need felt by most primates for daily contact. As the psychologist and primatologist Robin Dunbar has argued, grooming is not just about parasites; it is crucial for building and maintaining social relations.[16] Grooming generates a pleasant dose of dopamine and serotonin, along with oxytocin, the peace-and-bonding neurotransmitter. Language, according to Dunbar, allows for gossip, a kind of verbal grooming. Using gossip, humans can extend the reach of chemical bonding across a much larger network. In practice, this means that humans can live in groups of unlimited size, unlike other primates. Dunbar's insight is key to answering one of the great questions we ask today: how did large, imagined communities come to be?

In both birds and mammals, the sensitivity of this neurochemical system makes it susceptible to psychoactive substances. But the system is also open to things you do to yourself and especially open to things that other people do to you. Although Edward Bernays built an industry on the understanding that clever marketing could induce consumers to make purchases they didn't really intend to make, he was not the first person to make this observation. Writing in the mid-sixteenth century, the French essayist Etienne de la Boétie observed, "theatres, games, plays, spectacles, marvellous beasts, medals, *tableaux*, and other such drugs [*droguerie*] were for the people of Antiquity the allurements of serfdom, the price for their freedom,

[13] Most recently, see Sophie A. de Beaune, Frederick L. Coolidge, and Thomas Wynn, eds., *Cognitive Archaeology and Human Evolution* (New York: Cambridge University Press, 2009).

[14] Richard W. Byrne and Andrew Whiten (<http://www.kli.ac.at/theorylab/AuthPage/W/WhitenA.html>), eds., *Machiavellian Intelligence: Social Expertise and the Evolution of Intellect in Monkeys, Apes, and Humans* (New York: Oxford University Press, 1988).

[15] Simon Baron-Cohen, *Mindblindness: An Essay on Autism and Theory of Mind* (Cambridge, Mass.: MIT Press, 1995).

[16] Robin Dunbar, *Grooming, Gossip, and the Evolution of Language* (Cambridge, Mass.: Harvard University Press, 1996).

the tools of tyranny."[17] To be enticed by what the Roman poet Juvenal had called "bread and circus" was to submit to voluntary servitude. La Boétie's idea of voluntary servitude was an early contribution to a long intellectual thread leading through Marx and Gramsci to Huxley and beyond, to the cultural critique of late capitalism found in Neil Postman's 1985 work, *Amusing Ourselves to Death.*[18]

Primatologists have described a daily dialectic between the stress-response system and the dopamine reward system. Dominant males and females visit stress on subordinates the better to maintain their own high rank. Pleasurable grooming and same-sex sexuality among primates helps to build and repair social bonds and alliances. Among humans, the daily dialectic between the dopamine reward system and the stress response system is also a kind of historical dialectic. The neuroscientist Robert Sapolsky has offered the most vivid point of departure for this argument.[19] Stress, he argues, is distributed unequally across the social spectrum. The poorer you are, the more stress you endure. The transitions that have taken place in recent human history—that is to say, the last ten thousand years—have created hierarchies of wealth and power that have institutionalized forms of stress. What we need to add to Sapolsky's observation is the possibility that institutional stress can be balanced by practices that relieve stress and provide diversions. These can be cultural, as La Boétie divined, but they can also be psychopharmacological. To take a modern example, Frank Dikötter and his coauthors have argued that the consumption of opium in the Chinese countryside in the nineteenth century tended to increase in times of malnutrition. Foreign observers passing through the so-called opium villages would confuse cause and effect, blaming the starvation of the people on their consumption of opium.[20] The institutionalized forms of stress that emerged in agrarian and post-agrarian societies prompted a growing human investment in opiates and pleasurable stimulants of all kinds, chemical and cultural. A whole economy came to be harnessed to this task.

This model proposes that human history has been shaped by a continuous dialectic between the dopamine reward system and the stress response system. The dialectic was initiated in Africa several million years ago with the emergence of hominins and cooperative living. It has been fed by the cognitive arms race and especially by changing human population densities. Significant steps were taken after modern humans colonized the globe, starting around 85,000 years ago. Agriculture, cities, and whole civilizations added new wrinkles. To return to the works discussed earlier, Huxley, following La Boétie, imagined that this dialectic could come to an end with the victory of pleasure. Orwell, like Sapolsky, favored stress.

The language of neuroscience is not strictly necessary when it comes to talking about changing patterns of reward and stress in human society. The point has been obvious enough to authors and essayists. But the neurobiology is helpful, for it confirms on a chemical level that there is no meaningful distinction between cultural practices and psychoactive chemicals. Both kinds of input are translated into the language of the nervous system. That language consists of synapses, neurochemicals, and a hideously complex grammar. At the level of the synapse, the effect of cultural traits and practices is similar to the effect of psychoactive substances. Culture, in this sense, is like a drug. But drugs themselves are part of culture, delivered by commerce and bound up in ritual forms. Patterns of use can and do change significantly from one historical society to another.

This insight allows us to fashion a category of analysis that embraces cultural stimulants along with their psychoactive counterparts. These are the "psychotropic mechanisms" mentioned earlier in this essay—the spectrum of devices, practices, or substances available in any culture that alter the nervous system to greater or lesser degrees and perform political or social work. Every political society has a characteristic assemblage of psychotropic mechanisms. The history outlined below is a history of transformation in psychotropic assemblages.

---

[17] Etienne de la Boétie, "Discours sur la servitude volontaire," ed. François Hincker, *La Boétie. Oeuvres politiques* (Paris: Éditions Sociales, 1971), 65.

[18] Neil Postman, *Amusing Ourselves to Death: Public Discourse in the Age of Show Business* (New York: Viking, 1985).

[19] Robert M. Sapolsky, *Why Zebras Don't Get Ulcers*, 3rd ed. (New York: Times Books, 2004), 364-83.

[20] Frank Dikötter, Lars Laamann, and Zhou Xun, *Narcotic Culture: A History of Drugs in China* (London: Hurst, 2004).

10.3 III

Medieval Latin Christendom, toward the end of the first millennium, was a world tucked away in the northwest corner of the Old World, at a remove from the vibrant civilizations and trade networks that stretched from Al-Andalus to Song Dynasty China. Gone were the psychotropic mechanisms of the ancient world: the theatres, games, and spectacles described by La Boétie, to which he could have added an eroticism worthy of the Brave New World. Europe at this time was a world in which the luxury items of the age, such as gold and ivory, and the spices, the fine silken fabrics of the great Islamic and Chinese civilizations, were all imported, mostly in exchange for slaves, and did not circulate much outside the great secular and ecclesiastical courts. It was a world largely bereft of psychoactive substances. Other Old World societies had their tea, coffee, hashish and marijuana, opium, and even the soma of the Vedas. New World societies had long since discovered coca, tobacco, peyote, and hallucinogens. None of these products was native to the European backwater.

The major exception was alcohol. Richard Unger has argued that northern Europeans consumed at least a quart of ale or "small beer" every day, matched in southern latitudes by wine.[21] It is hard to avoid the impression of a continuously intoxicated society. Wolfgang Schivelbusch, indeed, has described a great transformation from what he called the "alcoholic stupor" of the middle ages to the common sense and industry of the caffeinated middle-class culture of early modern Europe.[22] But this is an egregious misreading of the medieval evidence. Medieval wines, ales, and beers had lower alcohol content than their modern counterparts. Wine was a thin and vinegary substance, with an alcoholic content of no more than 5 percent and typically mixed with water at that. Ales and beers made from the first wort were not necessarily weaker than modern beer, but brewsters drew second and even third worts off the grain, resulting in what is called "small beer" with very little alcohol. Alcoholic beverages were consumed primarily for health and dietary reasons, not recreation. As Unger has put it bluntly, "the society did not know about alcoholism."[23]

Medieval Latin Christendom, in short, was a world in which the range of psychotropic mechanisms was largely restricted to the things people could do rather than the things people could ingest. How do we find evidence for these things? How do we describe the psychotropic assemblage of medieval Europe when we are necessarily limited to indirect evidence and inferential arguments? It is true that swings in body states among people in past societies cannot be studied through brain imaging technology. Even so, some alterations will express themselves on the outside of the body in the form of emotional displays or somatic gestures such as blushing, pallor, fainting, sighs, tears, and so on. We can, therefore, approach swings in body states indirectly, through observations drawn by contemporary observers. Happily, medieval Europe, although psychopharmacologically poor, is rich in surviving texts, and it is through written and illustrated evidence that we can begin to develop a partial understanding of medieval Europe's psychotropic assemblage.

As it happens, scholars in literature and art history interested in the semiotics of nonverbal communication have long been aware of the somatic gestures in medieval sources. As Moshe Barasch has observed, the painter Giotto portrayed involuntary gestures with the same care and attention he gave to voluntary or purposive gestures.[24] Yet medievalists have typically dismissed the study of somatic gestures, arguing that because they fail to carry what St. Augustine called a *voluntas significandi* (a desire to communicate), they cannot be the worthy subjects of historical inquiry.[25] This is the "cognitive fallacy," the mistaken belief that the only form of communication worth considering is voluntary communication. The autonomic nervous system is constantly engaged in communicating with other autonomic nervous systems. The substance of this communication is critically important for sub-cortical negotiations involving politics, social rank, forms of obligation, prosocial behavior, antisocial behavior—everything that is central to the work of history.

Medieval observers, who had a keen eye for somatic gestures, were in this respect more thoroughly aware

[21] Richard W. Unger, *Beer in the Middle Ages and the Renaissance* (Philadelphia: University of Pennsylvania Press, 2004).

[22] Wolfgang Schivelbusch, *Tastes of Paradise: A Social History of Spices, Stimulants, and Intoxicants*, trans. David Jacobson (New York: Pantheon, 1992), 34.

[23] Unger, *Beer in the Middle Ages*, 2. See also Judith M. Bennett, *Ale, Beer and Brewsters in England: Women's Work in a Changing World, 1300-1600* (New York: Oxford University Press, 1996).

[24] Moshe Barasch, *Giotto and the Language of Gesture* (Cambridge: Cambridge University Press, 1987), 2-4, 13.

[25] E.g. J.A. Burrow, *Gestures and Looks in Medieval Narrative* (Cambridge: Cambridge University Press, 2002), 3-4.

than modern historians and literary scholars of the need to track all forms of nonverbal communication. In *Le Grand Coutumier de France*, for example, the late medieval French jurist Jacques d'Ableiges counseled judges to pay close attention to sworn witnesses who grow pale, blush, shift, tremble, or speak obscurely or unclearly.[26] Gratian's Decretum (a collection of canon law compiled in the twelfth century), as William Courtenay and Karl Shoemaker have recently discussed, has dozens of references to tears, key components of what we can call the canon law of weeping.[27] For a more extended example, consider the marvelous description found in Raymond of Capua's *Life of St. Catherine of Siena*, written around 1380.[28] In addition to everything else she did, Catherine was a peacemaker. One day, Raymond sought her help in pacifying the troublesome Nanni di Ser Vanni. Catherine's entreaties seemed to be going nowhere. With great ill-grace, however, Nanni finally agreed to let her try to resolve one of them. This is how Raymond describes the climactic scene:

> *"I have four feuds [said Nanni]; as to one of them. . ., you can do what you like about it." Having said this he got up and made to go, but as he did so he exclaimed, "My God, how contented I feel in my soul from having said I shall make peace!" And he went on, "Lord God, what power is this that draws and holds me? I cannot go away and I cannot say no. Who has taken my liberty from me? What is it stopping me?" And with this he burst into tears. "I own myself beaten," he said, "I cannot breathe." He fell on his knees and said, weeping, "Most holy virgin, I will do as you say."*

In addition to offering somatic gestures like tears and constriction of the chest, medieval observers sometimes describe interesting body states without using somatic terminology. When Catherine first arrived, for example, Raymond described himself as being filled with joy.

Sifting through a range of medieval texts like this one, we find many bodies that are moved by joy or happiness. We find descriptions of compulsive behaviors. We find things that soothe as well as things that excite and agitate. Descriptions like these are scattered thinly but meaningfully across a variety of genres. Though rare in legal contracts and court records, they are not uncommon in narratives, such as chronicles, epics, and romances, as well as moral treatises and letters. So what happens when we take a census of these observations and explore the contexts in which they are found? It is true that literary descriptions are often stylized and conventional. But even if we cannot know whether St. Dominic wept copiously during his prayers, or whether El Cid's eyes filled with tears as he groveled before his sovereign Alfonso, his mouth full of grass, we can perhaps draw legitimate inferences from the fact that tears are conventionally found in circumstances involving religious devotion and public self-humiliation.

Let me offer some highlights of a very preliminary census. Attributions of joy and ecstasy, along with tears and great exhalations, show up in many contexts. Not surprisingly, the evidence is skewed to religious experiences like sermons. Medieval observers of sermons were sensitive to the psychology of crowds. In their accounts, we find rare but interesting descriptions of collective tears, sighs, and groans in response to sermons. Medieval authorities on the art of preaching, as Beverly Kienzle has observed, advised preachers to go carefully: if the audience is weeping too heavily, wrote Alain of Lille, "hold back a little, but not too much."[29] A remarkable thing about the sermons of the great mendicant preachers is that they were held outdoors, where the audible range of a sermon, or indeed any speech, is very restricted.[30] Yet the descriptions of audiences at medieval sermons suggest crowds sometimes numbering in the thousands. Most of them could not have heard the content of the sermon. The messages conveyed during a sermon were therefore as much visceral as they were intellectual. Experts on sermons agree that listeners experienced sermons as a form of theater, complete with joys and sorrows and great swings in mood.

---

[26] *Le Grand Coutumier de France*, ed. Édouard Laboulaye and R. Dareste (Paris, 1868), 600.

[27] William J. Courtenay and Karl B. Shoemaker, "The Tears of Nicholas: Simony and Perjury by a Parisian Master of Theology in the Fourteenth Century," *Speculum* 83 (2008): 603-28.

[28] *The Life of St. Catherine of Siena*, trans. George Lamb (New York: P. J. Kennedy and Sons, 1960), 212-15.

[29] Beverly Mayne Kienzle, "Medieval Sermons and Their Performance: Theory and Record," in *Preacher, Sermon and Audience in the Middle Ages*, ed. Carolyn Muessig, 89-124 (Leiden: Brill, 2002), 99.

[30] I owe this to Rowan Dorin, who has explored the issue in an unpublished seminar paper, "When the Expected Becomes the Miraculous: Some Tensions in Accounts of Medieval Preaching."

Surveying this evidence, it is clear that the cultural stimulants of medieval Europe were marked by the context of publicity. Geoffrey Koziol describes scenes of begging pardon and favor where audiences were moved to tears and exhalations as the supplicant prostrated himself in public, arms outstretched in the form of a cross.[31] This is not to say that men and women in the middle ages were never moved in solitary ways, as in the endless lonely tears of the fourteenth-century English mystic, Margery Kempe.[32] Nonetheless, solitary pleasures are not nearly as marked in medieval sources as they come to be in the eighteenth century. Medieval sources describe people who were moved in the context of interpersonal relations, especially in situations laced with power, competition, and coercion, such as the enormous burden of expectation that Catherine laid upon Nanni di Ser Vanni. A close study of the somatic gestures in the Old French epic *Raoul de Cambrai* confirms the point.[33] There are about one hundred somatic phrases in the poem, and almost all occur in contexts that a primatologist like Frans de Waal would instantly recognize as contests over rank-order.[34] Perhaps above all, here and throughout the sampling of sources explored for this essay, we find descriptions of people being moved in situations involving relationships between people, and not between people and commodities. There are major exceptions to this: the joys derived from plundering in warfare or the ecstasy reported during the bonfire of the vanities in Savanarola's Florence. Even so, this was not a world marked by what psychotherapy is now calling "compulsive shopping disorder," a compulsion that we now know is driven by the dopamine reward system. Medieval Europe had its compulsions, but by and large they were not solitary compulsions, and they were not commodity-centered compulsions.

In his essay comparing Huxley and Orwell, Richard Posner has noted that Orwell's joyless Oceania was modeled on medieval Christendom.[35] The two-way telescreens, the thought-police disguising itself as the Ministry of Love, the exercises in hate, the suppression of sexual desire: these, Posner tells us, are barely concealed allusions to the disciplinary regime of confession, the regime of inquisitorial terror functioning under the banner of Christian Love, the frenzied sentiments directed against witches and heretics, and the joyless sexual puritanism fostered by the medieval ascetic tradition. But if this preliminary census has any merit, it shows that the world of medieval Europe was nothing like the world of Oceania. Medieval European society, surely, was a high-stress society, not unlike Oceania in that regard. But the stress that circulated in this society was visited upon people by other people, in much the same way that stress was decentralized and interpersonal among the military aristocrats described in the poem *Raoul de Cambrai*. This was not Orwell's world, in which the mechanisms for delivering stress have been gathered in the hands of a totalitarian order.

The other thing we learn from this brief survey of the medieval psychotropic assemblage is that Marx was wrong about religion, at least in the middle ages. This was not a world in which religion operated as a cultural opiate. To the extent that it can be separated from other forms of theater and ritual, religion shows up far more often as a stimulant and even a stressor. Religion may have had an opiate-like function in Marx's day, and perhaps it serves that function today, but that was not how it worked for most of the laity in medieval Europe.

10.4 IV

Let us now turn to some observations about the significant expansion in the range of non-indigenous psychoactive substances that entered the European market in the post-medieval era. These products include coffee, sugar, chocolate, and tobacco, and later opium, hashish, morphine, and coca. All of these products have mood-altering properties to greater or lesser degrees, and they are products that first began circulating broadly in Europe in the seventeenth and eighteenth centuries. In their indigenous environments, the use of psychoactive substances is often bound or limited by religious or cultural rituals, where the ritual itself is a

[31] Geoffrey Koziol, *Begging Pardon and Favor: Ritual and Political Order in Early Medieval France* (Ithaca: Cornell University Press, 1992).

[32] Margery Kempe, *The Book of Margery Kempe*, trans. B.A. Windeatt (London: Penguin, 1994).

[33] See my "Emotions and Somatic Gestures in Medieval Narratives: The Case of Raoul de Cambrai," *Zeitschrift für Literaturwissenschaft und Linguistik* 138 (2005): 34-47.

[34] Frans B. M. de Waal, *Chimpanzee Politics: Power and Sex among Apes*, 25th anniversary ed. (Baltimore: Johns Hopkins University Press, 2007).

[35] Posner, "Orwell Versus Huxley."

form of recreation, and recreation is ritual. Shipped across the seas, however, the substances were stripped of their cultural constraints and sold on a market strictly for diversion. In addition to imported substances, the recreational consumption of alcoholic drinks, notably in the form of fortified wines and spirits, accelerated dramatically in the long eighteenth century. The effect of this psychoactive revolution, as Courtwright calls it, was not lost on contemporaries.[36] Peter Burke cites a passage from the German historian August Ludwig Schlözer (d. 1809), who asserted, "the discovery of spirits, the arrival of tobacco, sugar, coffee and tea in Europe have brought about revolutions just as great as, if not greater than, the defeat of the Invincible Armada, the wars of the Spanish Succession, the Paris Peace, etc."[37]

The modern science of neurobiology has been built on the human subjects available for experiment and observation, that is to say on brains and nervous systems that postdate the psychoactive revolution. We don't actually know what happens to a human population when it is introduced over the space of a few decades to a much greater array of psychoactive substances than hitherto available. In this respect, the long eighteenth century in Europe offers a particularly interesting natural experiment, which leads to two possible hypotheses. First, the growing consumption of psychoactive substances across the social spectrum altered the number or sensitivity of brain receptors in the aggregate population. Recent experiments, for example, suggest that people who experience dopamine highs with greater regularity require even more stimulants as receptors grow numb. The second hypothesis is that phasic firing patterns, that is to say patterns that depart from the normal or tonic firing pattern—think of them as waves with larger amplitudes—became more common in the aggregate in a population that indulged in psychoactive substances. This is something we would describe as more intense mood swings. From these hypotheses follows a corollary: the growing availability of psychoactive substances in the long eighteenth century pushed the development of new *cultural* stimulants or amplified the effects of existing ones. Put differently, psychoactive substances primed the pump for a growing and changing array of addictions and compulsions that were cultural in nature. This argument is not unfamiliar; it maps neatly onto historical trends in the United States over the past few decades: namely, the way in which the growing presence of drugs and alcohol in high schools may have created a susceptibility to other forms of addiction, such as internet addiction disorder, Facebook addiction, and the fairly new "Addiction-to-Text-Messaging Syndrome." These new addictions, in turn, push drug use in a feedback loop.

What is interesting about the long eighteenth century, in other words, is not just the increasing availability of psychoactive substances but also the evidence it provides of the simultaneous emergence of cultural patterns and practices described by contemporaries as compulsive or addictive. Again, we infer these from descriptions. The best evidence comes from various forms of leisure reading. As Roger Chartier has argued, "travel accounts and descriptions of everyday life stressed the new universality of reading, present in all social circles under a variety of circumstances. A veritable 'reading mania,' also described as a 'reading fever' and a 'reading fury' (German texts refer to *Lesesucht, Lesefieber,* and *Lesewut*) took hold of the population."[38] Observers described this mania as a disease or epidemic, associating it with physical exhaustion, the rejection of reality, and bodily immobility. An imagination excited by reading, it was argued, was readily drawn to other solitary practices, including masturbation. In England, observers thought that reading matter had a "remarkable power over body and mind alike."[39]

Novels stand out in particular for their drug-like qualities. Observers commented on their addictive, page-turning quality and their ability to transform their readers. According to Robert Darnton, readers of Rousseau's *La Nouvelle Héloïse* "wept, they suffocated, they raved, they looked deep into their lives and resolved to live better, then they poured their hearts out in more tears."[40] As William Warner reports, novels "were thought especially dangerous for young women, their minds unshielded by a classical education, who

[36] Courtwright, *Forces of Habit*.

[37] Peter Burke, "Ranke the Reactionary," in *Leopold von Ranke and the Shaping of the Historical Discipline*, ed. George G. Iggers and James M. Powell, 36-44 (Syracuse: Syracuse University Press, 1990).

[38] Roger Chartier, "Reading and Reading Practices," in *Encyclopedia of the Enlightenment*, ed. Alan Charles Kors, vol. 3 (New York: Oxford University Press, 2003), 399.

[39] Adrian Johns, "The Physiology of Reading in Restoration England," in *The Practice and Representation of Reading in England*, ed. James Raven, Helen Small, and Naomi Tadmor, 138-61 (Cambridge: Cambridge University Press, 1996), 140.

[40] Robert Darnton, *The Great Cat Massacre and Other Episodes in French Cultural History* (New York: Basic Books, 1984), 242.

would grow addicted to the pleasures induced by novels, turn against serious reading, have their passions awakened, and form false expectations about life." Young female readers were warned not to meddle with romances, novels, and chocolate, all of which were seen as likely to inflame the passions.[41]

Other kinds of literature proved to be equally captivating. The avid taste for following politics in newspapers was described by observers as a mania, a hot fever, or a malady comparable to tuberculosis. Finally, in many regions of Western Europe, there was a huge profusion of erotic literature in the eighteenth century. Contemporary fears about reading, and reading erotica in particular, are strikingly similar to today's concerns about the Internet. Erotica epitomized the potential of reading to control the mind. Fears regarding the specter of this sort of mind-control crop up frequently in the remarks of alarmed contemporaries.

There are other described manias and crazes that we can pass over here: these include the compulsions for collecting, the manias for tulips and vases, the economic speculative bubbles, theater mania, and music. This profusion of diverse manias points to a century of interlocking addictions. More accurately, it was a century of the awareness of addiction. The word "addiction" first developed its modern range of meanings in the late seventeenth century. Earlier, the word had implied the state of being bound or indebted to a person. By 1675, it was possible to say that someone had an addiction to books. Alcohol and tobacco were soon added to the list of addictive substances, with others not far behind. As Roy and Dorothy Porter have observed about Britain in the eighteenth century, it was a century "seminal for both the perception, and the actuality, of addiction."[42]

10.5 V

The increasing use of psychoactive substances fed back into patterns of chemical dependence in a never-ending spiral. But if the arguments of this essay have any merit, the availability of psychoactive substances in eighteenth-century Europe may have primed the pump for new cultural stimulants that fed the dopamine reward system. In a sense, the dopamine reward system in the aggregate population was becoming increasingly insistent. Compared to medieval Europe, a distinctive feature of the emerging psychotropic assemblage of the long eighteenth century was the way in which compulsions became available in the marketplace. Strikingly, some compulsions (like reading) were solitary recreations, a category not nearly so visible in the medieval European sources. These joined the continuing thirst for such public spectacles as pay-as-you-go theater and music performances, not to mention the state-sponsored spectacles and pageants that remained free to all comers.

What are implications for the nature of power? This is the question that captivated La Boétie, Huxley, and Orwell. When we contemplate law courts in late medieval European society, one of the most striking features is the way in which stress was visited upon enemies in the form of lawsuits, procedures for debt recovery, public insults, and fights.[43] This was one of the most visible ways in which power was exercised in this society, and it operated on a person-to-person basis. In post-medieval Europe, stress was becoming increasingly institutionalized, worked in hidden ways into the fabric of society much like the disciplinary regime described by Foucault. But an equally diffuse kind of power operates through the marketing of goods and products that ease stress and provide recreations and distractions. This is true in the most literal of ways, as Courtwright has argued, for "mercantile and imperial elites. . . quickly discovered that they could use drugs to control manual laborers and exploit indigenes."[44] But if the effects of cultural stimulants are indistinguishable from the effects of psychoactive substances at the level of the synapse, then they must also figure into this equation. And as Aldous Huxley saw, hedonistic consumption is a recipe for total if unwitting subjection. I doubt that there can ever be an end to history, as Huxley imagined, but I don't doubt, in

[41] William Warner, *Licensing Entertainment: The Elevation of Novel Reading in Britain, 1684-1750* (Berkeley: University of California Press, 1998), 105, 137.

[42] Roy Porter and Dorothy Porter, *In Sickness and in Health: The British Experience, 1650-1850* (London: Fourth Estate, 1988), 217.

[43] See my *The Consumption of Justice: Emotions, Publicity, and Legal Culture in Marseille, 1264-1423* (Ithaca: Cornell University Press, 2003).

[44] Courtwright, *Forces of Habit*, 4. In a different vein, he calculates that in 1885, close to half of the British government's gross income was derived from taxes on alcohol, tobacco, and tea.

this world created by Edward Bernays, that forms of power feed off the capacity of the human nervous system to be subverted. Since this has always been the case and since power has always emerged from the capacity to deliver both stress and reward, what we have in this outline for a history of the transformation of psychotropic assemblages is a new way both to connect our local studies with our global studies and to bind our recent history to our deep history.

Chapter 11

Discussion of Patel, Sheingorn, and Smail Papers[1]

Audience: In the Middle Ages, it took remarkably little to put someone into a state in which they talked to the Virgin Mary, for example. Within a liturgical context, such things could often happen without elaborate ritual preparation or even music.

Smail: The Middle Ages had an abundance of practices that were described as compulsive. We wonder if descriptions of how easily tears flowed, for example, are a trope or a reality. I suspect that whatever the psychotropic assemblage is, it's at least in part a learned phenomenon. If I went to a medieval service, I doubt I'd have the same reaction as what medieval observers have described, because my body has not been tuned to that psychotropic assemblage. This notion of tuning your body provides a way out of the epistemological difficulty of explaining why each culture reacts differently. I've introduced psychoactive stimulants as a way to explain the difference between cultures, but drugs are not the only way to bring about changes in psychotropic assemblages.

Audience: Was there a psychoactive or political consequence of the dominance of the four-part harmony and trance-like nature of Gregorian chant in medieval Europe?

Smail: Some studies suggest that practices such as confession can be addictive, and I suspect that a lot of practices in the medieval monastic world would be. Other practices, such as the prohibition against speaking in the Cluniac monastic system after the eleventh century, would be stress-inducing, at least in modern bodies. In light of the "pit of despair" experiments at McGill University, we know that wide-spread monastic practices such as fasting and remaining in isolation induce stress. Those stress-inducing practices were likely balanced by stress-alleviating practices, such as Gregorian chant or prayer.

Audience: There have been studies on nuns and anorexia in the medieval ascetic tradition.

Smail: If you deprive yourself of calories, you change neurological states (see Richard Wrangham's book on this). Caroline Bynum and others have written about women's fasting in the ascetic tradition and the other practices of food deprivation that women adopted as a form of control. The question of changing neurological states also comes up with Marjorie Kempe's tears.

Patel: The book *Deep Listeners* by the musicologist Judith Becker discusses music and trancing, particularly the interface of music, ritual, and biology. Becker takes a cross-cultural approach and looks at commonalities in the ways that music and trance regulate physiological states among Sufi mystics, Pentecostal Christians in the U.S., and Balinese trancers.

Sheingorn: We now know that people have a group response, a kind of entrainment, and move with a performer's body in the recitation of lines. If it can happen in an audience at a play, I would think that the groups of performers in medieval theater, which was frequently in verse, would experience it even more strongly.

[1] This content is available online at <http://cnx.org/content/m34247/1.2/>.

Audience: It appears that in pre-Reformation England, there were many more processions than after the Reformation. Religious life was central and people held processions on all the saints' days. Perhaps procession was another form of stress relief for that society.

Patel: Barbara Ehrenreich's book, *Dancing in the Streets*, is about the role of group rituals throughout human history, how they were more common in the past and why they became suppressed. Those kinds of processions would often involve music and dancing, and people would feel in a different state than they normally would have.

Sheingorn: Processions might also induce or heighten stress. I've written about conflicts regarding which churches controlled which properties that manifest during processions. Some groups could process in a place where another group wanted to be, creating conflict. Urban processions were also strictly arranged according to hierarchy. You had to be positioned just so, behind the right person and in front of the right person. That was not a mechanism for reducing stress, but rather a way to display the structure of the community. Processions performed many different functions.

Poovey: The historical coincidence of perspeculative manias and the advent of addictive substances in England is remarkable. The first modern perspeculative mania was the 1720 South Sea bubble. Prior to that was the 1689 Tulipmania in Holland. They perfectly map onto Dan's accounts of the early eighteenth century.

Neuro-economics is a growing area. Some economists have turned to the tools of neuroscience to see what happens in the brain as people take economic risks. One scholar measures cortisol during decision-making on the trade floor and looks at the states people get into when they make bad decisions following a high that they got from a big win.

Audience: How does the tradition of three-dimensional perspective – in particular, Panofsky's conception of the symbolic form perspective – enter into the connection between observation of an action and simulation of the action?

Sheingorn: The findings of neuroscience don't undo what art historians have done; they give us a different perspective and provide a starting point in the common human condition. Think about the difference between empathy and sympathy. Empathy is a response we can't control because our mirror neurons are doing certain things, but we're not controlled by these physical responses. We can interpret that response and feel sympathy, or we can reject it and feel hatred or some other emotion. With perspective, things like action and perception make sense: I know the rest of your body is there even though I can't see it, because I've seen many bodies from three directions. Studies show that with just a simple line, we immediately start to assume light and shade, something behind and something in front. This is built into our biology.

Audience: Can your studies on mnemonic function of tonality, Dr. Patel, help reshape our knowledge of epic poetry?

Patel: People do find it easier to remember tonal sequences than atonal ones. Perhaps it's just due to exposure, but the difference is extreme. Some of my colleagues are showing that patients with fairly advanced Alzheimer's disease who can't recognize their families can sing along with tunes and recognize subtle errors that experimenters introduce into the tunes. They remember fine-grain details of musical sequences long after many other types of memories are gone. Tonality probably plays a role in the remarkable mnemonic power of music, but so do rhythm, entrainment, and probably a whole host of other factors.

Chapter 12

Roundtable Discussion[1]

Levander: The synergy that has been produced by bringing these research projects together, if only for a day, has led to a remarkable level of energy and fruitful discussion during the question and answer periods. This is especially encouraging at a moment that is often described as a "crisis" for the humanities. During this closing discussion, Chuck Henry and I would be interested in hearing the speakers address the new methodologies that their emerging fields engage, intellectual opportunities and challenges requisite to the emerging field, and strategies the speakers may have developed for sustaining new research models. How have university structures facilitated or impeded research in your emerging disciplines and, in turn, how have these emerging disciplines put pressure on existing university structures? Finally, what new relationships between infrastructure and research is your work uncovering and what kinds of preservation needs and sustainability issues are arising as a result of your work?

Poovey: For the past decade or more, there has been much discussion of "the humanities in crisis." Rahm Emanuel said, though in the context of the Obama campaign, "Never waste a crisis." It may be the case that the financial downturn's impact on universities, and on the humanities disproportionately, will finally provoke those of us in the humanities to articulate the kind of program that we want to positively pursue, so that we do not remain on the defensive. This symposium has touched on articulations of a positive program for the humanities.

Presner: These calls about crisis, dying and downsizing, and the humanities' irrelevance and inability to make money put us as humanists on the defensive. But we're engaging with the terms of the debate set by administrators who have introduced particular rubrics and metrics to measure success and impact. It's incumbent upon humanists not only to articulate what the problems are, but also to look beyond this crisis model. That, for me, is a humanities without apology.

Levander: "Emerging Disciplines" is a kind of thought experiment in new strands of developing knowledge in the humanities. Might you suggest useful collaborative tissues that have emerged? What strikes you as the most useful strands to continue to think about?

Herlinghaus: I would like to address the issue of mirror neurons that came from Pamela and connected to Ani's and Dan's talks. We have looked into such different experiences as music, pictographic versions of empathy, and affect in certain medieval contexts. The motivation to work with neurons is quite different in each case, because the effect that engaging with and mimicking music has on the brain might well be different from the one Pamela described when a viewer sees an image or holds the book she discussed when entering a birthing room. People from the twentieth century might not feel the same empathetic affects as people from medieval times, and it may also vary by gender.

Ani, you have been describing music's effect on the neocortex, the limbic system and the brain stem. Does tonality not affect different regions of the brain? This line of inquiry is of interest to cultural studies, including the issue of rituality in history and culture, as Dan discussed. Several studies on rituality and neuroscience have shown that the effects of rituals (especially those that have become regular social practices in contrast

[1] This content is available online at <http://cnx.org/content/m34257/1.2/>.

to processes like reading a book) on the wiring of the brain, specifically the re-constitution or intensification of the synaptic systems, are quite intense. Walter Benjamin touches on this issue in his text on the mimetic faculty, in which he refers to non-modern practices of reading what was never written, but with which we connect as if it were written, such as non-textual yet narrative patterns in culture.

Patel: One point of contact between my work and Dan's is the notion that over historical time, and perhaps across cultures, there are differences in aggregate brain states. Through research on neuroplasticity and the effects of environment on brain structure, we know that within the lifetime of an individual the brain changes extensively with different experiences. I never thought about the effects of historical circumstances or cultural practices on the possible ranges of brain states of whole populations. These experiences and differences in environment—not genetics—would mean that on average, the brain chemistry of one population might be somewhat different from the brain chemistry of another. Experiences and environments would affect the behaviors of the population, which would then feed back on the brain. Perhaps a culture tunes its chemistry and anatomy in ways that change its responses.

Smail: In one example of this, a neuroscientist conducted a study at the University of Michigan that compared students who registered for the university from a home state in "The North" with students who registered from a home state in "The South." The study put the students through tests of their honor and measured testosterone levels in their saliva afterwards. There were distinct differences that could not have been genetic. This neuroscientific test revealed a contemporary phenomenon that can be transposed onto historical knowledge.

Patel: Apparently, paleoanthropologists have been able to learn a lot from bone, which is a very dynamic structure. By studying an animal's bones, you can see what kind of stresses it had endured. I wonder if there's any trace in bone or fossil data of the amount of physiological stress, measured by hormones, that an animal had experienced in its life. In terms of human archaeology, I wonder whether it's possible to assess whether people in the Middle Ages lived in a more stressed-out state with higher baseline levels of stress hormones.

Smail: I don't know whether stress would lead to a signature on the bone, but I can think of two useful paleolithic examples. Studies of nutritional indicators and evidence of much poorer nutrition can point to servitude or slavery. This is an important finding, because servitude and slavery are generally understood to be products of agricultural civilizations. Such studies challenge our understanding of the effects of agriculture in lots of ways.

The other example is from a site in Russia, 22- to 25,000 years ago. Two women's neck bones show severe signs of compression, which suggests load-bearing on the heads. This indicates a distinct division of labor and its differential effects on women's bodies at this particular site. The paleoanthropological evidence confirms they were a foraging, hunter-gatherer population with a strong division of labor.

Audience: Mary referred to how we crave collaborations. This runs upstream from what institutions reward us for doing. I'm curious to know what other people have to say about this, perhaps Ani in particular, because the scientific world doesn't have the same individual, proprietary view of texts.

Patel: Science is very much a collaborative enterprise. We almost always work with a team, but not typically a team that spans the kinds of boundaries that are represented here at "Emerging Disciplines." Teams are typically comprised of other specialists more or less within a discipline. Are there research questions that would draw people from our group today to work together? Problems are typically intransigent and often cross disciplinary boundaries. Not only do we need to find a problem that will excite people from diverse backgrounds and make them feel that they have something to contribute, we also need to create structures and reward systems that allow that to happen. There are definitely incentive systems for staying in your lane. Events like this reward people from diverse fields for getting out of their lanes.

Audience: Many collaborations in the humanities don't result in anything on a graduate student's CV other than acknowledgements in the beginnings of our books. A recent essay in PMLA suggested web publication as a way for graduate students to collaborate, but it is important to recognize that social and institutional circumstances matter. A graduate student's on-line work is not going to get as much commentary and collaborative interaction as Caroline Levander's would. We have to teach the ethics of collaboration as well. Many of your comments about one another's work have suggested that this is very

much on your minds. What does it mean to do scientific work in history, or to think about the visual humanities in relation to literary studies, against which it stands in ambiguous relation?

Sheingorn: I find collaborative work to be the most stimulating. I have always worked with someone who shares an interest in a question and brings something to it that I can't bring. In my case, we're not two art historians looking at a manuscript, but an art historian and someone from French, English, or history. I find that process synergizing from the moment you bring up the question on through the writing, which is also collaborative. But many of my collaborations are not rewarded within certain institutional structures. I tell my students not to think of such collaborations until they have tenure, but I will have them do a collaborative project, hoping that the experience will plant a seed that will pop up when they get tenure. We shouldn't give up on collaborative work because book prizes go to single-author books or because getting two grants the same year to work on a project is hard.

Presner: Institutional structures that reward single, isolated achievements continue to reign. Nevertheless, there are often clear rubrics in place for dissecting who did what on a project. In a way, this process can be odd, because often projects are synergistic, and the design of the interface, for example, cannot be dissociated from the content. Yet if it can be reduced to something scalable and numerical, collaboration can be adequately rewarded in promotion. It's key to figure out how to open up spaces for unanticipated or unexpected participation, whether it concerns the ways in which new communities are engaged in contributing, producing, or gathering knowledge, or how this information becomes respected by the scholarly community, perhaps in a way that it hadn't been before.

In my paper I gave an example of a student who had produced a photo-documentary of his block in Los Angeles's historic Filipinotown. By itself, it might not be that interesting, but it is within the framework of a scholarly apparatus and alongside many other such participatory projects. HyperCities provides different lenses to examine the ways in which the history of a place might be articulated. It's not a collaboration by design, but a way to open up possibilities for participation that sometimes result in unexpected gains and sometimes, of course, unexpected failures.

Herlinghaus: Whether people do or don't engage with digital humanities from a variety of disciplines might not be a question of insight, but one of repression. I am less interested in why more people from older generations or from certain fields are not engaged in digital humanities, than I am in their neurophysiological and neurosympathetic reasons for not doing so. Their resistance is emotional and affective. Let me go back to Caroline's expression of energy and synergy. Intellectual survival is dependent on more or less regular communication with colleagues from other fields. The synergy and energy that emerge out of this communication are especially important because they produce something different. On a rational level, it's probably not so difficult to envision the constitution of such work or the planning of interdisciplinary centers for the humanities. But how could we facilitate the synergetic/energetic level, which is tremendously important for creativity and drawing transversal connections? How could we address the tendencies towards depression that are, to an extent, reproduced within academic structures?

Smail: A geneticist colleague of mine said that although he is ultimately interested in history and wants to find out about migration patterns in the past, he has to spend 90 percent of his time doing things that are related to therapies. He feels that he has to fund his historical interests—what you might call his humanist interests—by virtue of giving the medical community what it wants from his lab. I was curious to know whether this is a fairly widespread phenomenon. An interest in music can be an interest in Alzheimer therapy, but it can also be an entirely different humanities-oriented inquiry.

Patel: There has been a change for the better in the past decade. It used to be that if you wanted to study music and the brain, you didn't use the word "music." Instead, you said, "I'm a neuroscientist, and I'm interested in complex sound processing." If you wrote the word "music" in your grant, you were out of the competition. Now you can write grants about studying music and the brain, and I think that trend will increase because we're seeing the effects of music on therapy, biology, and the feedback systems. I've been fortunate to have started my career at a time when it's okay to talk about what you're doing openly, without having to code it.

Smail: So, because the sciences are open to the idea that music can be part of therapy, then music can be an object of inquiry? According to this logic, then reading or other "addictions" could be subjects of

scientific inquiry as well.

Patel: I shouldn't be overoptimistic. Some neuroscientists still think music is not to be taken seriously as a topic of neuroscientific investigation. The more work we do and the more papers we publish, the more that type of attitude will fade. The world of neuroscience is opening up, with neuro-economics, neuro-aesthetics, neuro-everything. The trend is to try to understand phenomena that were once considered too complex and too subjective from the standpoint of the brain. This is an exciting move in neuroscience, but it requires dialogue between neuroscientists and people who are actually working in the other fields, such as economics, so they don't over-simplify things.

Poovey: Through these discussions, I've been thinking about what I see as a generational challenge in humanities collaborations. My undergraduates are perfectly happy to collaborate, and my tenured colleagues are often open to collaboration. The problem is with graduate students and untenured assistant professors. That's the period in their lives in which they are absolutely dominated by fear, and they know perfectly well that the reward system recognizes individualistic achievement. One of the things that I've been doing systematically in my graduate courses is building in a requirement for a collaborative project, just to get over that fear factor.

The one part of humanistic activity that seems to be intractably individualistic is reading. You might understand how writing or painting could be collaborative, but how can you read together, unless you read the book aloud? There's a free website called bookglutton.com, in which you can set up a group of colleagues or students. Everyone puts the same book on their bookshelves, such as Jane Austen's *Emma*. Then you ask the students to read, say, the first five chapters of *Emma*. As they're reading it, they annotate different passages, and they can read what the others are annotating. It would take too long to read the whole book together in this way, but this exercise introduces a collaborative, interactive reading process that opens up the experience of immersive, individualistic reading to a completely different dimension. My students have found it startling to discuss other people's reactions to the same text in real time. I encourage you to think of similar exercises that challenge this individualistic model of scholarly activity.

Levander: The irony of making concluding remarks at a conference devoted to "emerging disciplines" is not lost upon me. The very rubric resists closure, easy condensation, or summation, particularly in light of the fact that today's symposium is the first of three held at Rice, to explore new forms of humanistic research that variously ignore, defy, or operate at the peripheries and blind spots of institutional frameworks such as departments, colleges, and schools. Rather than concluding today's discussion, then, the following very brief comments are offered by way of opening up rather than shutting down conversation: of generating continuity and forging connective links between today's symposium and those soon to follow.

Paul Courant and Michael Keller,[2] among others, have recently called for a "big humanities" that reproduces the "big science" approach (some would say "tactic") of our colleagues in the science and engineering fields. Such a "big humanities" would identify large-scale research questions across humanities disciplines, generate a clear research agenda for funding agencies, and have the benefit of articulating, for once and for all, the importance of humanities research to administrators and to an increasingly skeptical public. Today's panels have, among other things, reminded us that wholesale importation of scientific rubrics, institutional structures, and models of collaboration does not, necessarily, best facilitate new forms of humanistic knowledge production. The questions that are being asked in such unorthodox hybrid academic languages as cultural economy, digital humanities, and neuro-history, to name only a few, require not simply adding new conversation partners or laying claim to alternate disciplinary rubrics, no matter how effective at the ground level. More fundamentally, these questions, as we have seen today, challenge our speakers, among other things, to develop new models for collaboration itself.

Rather than accepting the disciplinary assumptions of the disparate fields they traverse, the scholars we have heard speak today are generating research questions, methods of analysis, objects of study, and research tools that challenge us to revisit the basic premises governing our disciplines. While it is certainly true that scientists and humanists have much to learn from each other by strategically joining forces, as we have seen today, new questions and possibilities for scholarly inquiry become visible when we revisit our long-standing assumptions about the sanctity of disciplinary coherence itself. Rather than adding the perspective of a seemingly outlying discipline (cognitive science, for example) to a familiar conversation in art history, the

speakers today, in other words, have suggested the new hybrid languages and modes of inquiry that can emerge when we let go of the disciplinary apparatus as the default model for research production. We have heard the utterings of some of these new languages today, but there are, of course, others as well grumbling for attention: global health, new health media, neuro-aesthetics, and biopolitics, to name only a few. We will take these up, as well as continue to consider the inter-fields that we have begun to explore today, at the next Emerging Disciplines conference. I look forward to the continuing conversation and all the new modes of utterance it is creating as it unfolds.

Chapter 13

Participant Biographies[1]

Charles J. Henry is President of the Council on Library and Information Resources (CLIR), an independent, nonprofit organization dedicated to improving the management of information for research, teaching, and learning. He is also publisher of the Rice University Press, which was recently reborn as the nation's first all-digital university press. He serves on the advisory board of Stanford University Libraries and on the boards of NITLE and the Center for Research Libraries, and is currently a director/trustee of Tan Tao University in Vietnam. Previously, Dr. Henry was vice provost and university librarian at Rice University. He has a Ph.D. in comparative literature from Columbia University.

Hermann Herlinghaus is Professor of Latin American Literatures and Cultural Studies at the University of Pittsburgh. He is the author of *Violence Without Guilt: Ethical Narratives from the Global South* (Palgrave Macmillan, 2009), *Renarración y Descentramiento: Mapas Alternativos de la Imaginación en América Latina* (Iberoamericana–Vervuert, 2004), *Narraciones Anacrónicas de la Modernidad: Melodrama e Intermedialidad en América Latina* (Editorial Cuarto Propio, 2002), *Modernidad Heterogénea* (Universidad Central de Venezuela, 2000) and *Alejo Carpentier* (Text+Kritik, 1991). He is currently completing a book project called *A Global Aesthetics of Sobriety*.

Caroline Levander is the Carlson Professor of Humanities, Professor of English, and Director of the Humanities Research Center at Rice University. She is currently writing *Laying Claim: Imagining Empire on the U.S. Mexico Border* (under contract, Oxford University Press) and *Where Is American Literature?* (for Wiley-Blackwell's Manifesto Series), and co-editing *Teaching and Studying the Americas* (Palgrave Macmillan) and *A Companion to American Literary Studies* (Blackwell). She is author of *Cradle of Liberty: Race, the Child and National Belonging from Thomas Jefferson to W.E.B. Du Bois* (Duke University Press, 2006) and *Voices of the Nation: Women and Public Speech in Nineteenth-Century American Culture and Literature* (Cambridge University Press 1998, paperback reprint 2009), as well as co-editor of *Hemispheric American Studies* (Rutgers University Press, 2008) and *The American Child: A Cultural Studies Reader* (Rutgers University Press, 2003).

Aniruddh D. Patel received a bachelor's degree in biology from the University of Virginia and a Ph.D. in organismic and evolutionary biology from Harvard University. He joined The Neurosciences Institute in 1997, where he is now the Esther J. Burnham Senior Fellow. His research focuses on how the brain processes music and language, a topic he has pursued with a variety of techniques, including neuroimaging, theoretical analyses, acoustic research, and comparative studies of nonhuman animals. He has published over forty research articles and a scholarly book, *Music, Language, and the Brain* (Oxford Univ. Press, 2008), which won the 2008 ASCAP Deems-Taylor Award. In 2009 he was awarded the Music Has Power award from the Institute for Music and Neurologic Function in New York City. He is president of the Society for Music Perception and Cognition (2009-2011), and is interested in promoting student involvement in the field of music cognition.

Mary Poovey is Samuel Rudin University Professor of Humanities and Professor of English at New York

[1] This content is available online at <http://cnx.org/content/m34245/1.2/>.

University. She has published on topics as diverse as the history of medicine, feminist theory, nineteenth-century British government reform, and the history of accounting. Her two most recent books, *A History of the Modern Fact* and *Genres of the Credit Economy*, form the first two parts of a trilogy of investigations into the origins of contemporary ways of understanding the economy. With Kevin Brine, she is currently working on the third volume, which is tentatively entitled *The Present Value of the Future: A History of American Finance Capitalism*.

Todd Presner is Associate Professor of Germanic Languages and Comparative Literature at the University of California, Los Angeles. His research focuses on European intellectual history, visual culture, and digital humanities. He is the author of two books: *Mobile Modernity: Germans, Jews, Trains* (Columbia University Press, 2007) and *Muscular Judaism: The Jewish Body and the Politics of Regeneration* (Routledge, 2007). He is also the director of "HyperCities" (http://www.hypercities.com), a collaborative mapping project, which was awarded one of the first "digital media and learning" prizes from the MacArthur Foundation/HASTAC in 2008.

Pamela Sheingorn received her Ph.D. in art history from the University of Wisconsin, Madison, in 1974 and is Professor Emerita of History at Baruch College, City University of New York and of History, Theatre, and Medieval Studies at The Graduate Center, CUNY. She has been a Fellow of the Medieval Academy of America since 2002. She is co-author of *Myth, Montage, and Visuality in Late Medieval Manuscript Culture: Christine de Pizan's Epistre Othea* (2003), as well as co-editor of *Same-Sex Love and Desire among Women in the Middle Ages* (2001), and a former co-editor of the annual *Studies in Iconography*. With Robert L.A. Clark, she has published a series of articles that center on the performative reading of illustrated French manuscripts. Her current project, which has produced several articles and will eventuate in a book, is a cultural biography of Joseph of Nazareth.

Daniel Lord Smail is a Professor of History at Harvard University with special interests in medieval European history and the natural history of humankind. Much of his past research has concentrated on the social and cultural history of the city of Marseille in the later middle ages, on subjects ranging from women, Jews, and demography to law, violence, and space. His book, *On Deep History and the Brain* (Berkeley: University of California Press, 2008), tackled some of the philosophical or methodological issues associated with the writing of deep history. He is finishing up a collaborative project with Andrew Shryock (University of Michigan), tentatively entitled *Before the Beginning: Human History and Deep Time*.

Index of Keywords and Terms

Keywords are listed by the section with that keyword (page numbers are in parentheses). Keywords do not necessarily appear in the text of the page. They are merely associated with that section. *Ex.* apples, § 1.1 (1) **Terms** are referenced by the page they appear on. *Ex.* apples, 1

Attributions

Collection: *Emerging Disciplines: Shaping New Fields of Scholarly Inquiry in and beyond the Humanities*
Edited by: Melissa Bailar
URL: http://cnx.org/content/col11201/1.1/
License: http://creativecommons.org/licenses/by/3.0/

Module: "Introduction"
By: Caroline Levander
URL: http://cnx.org/content/m34253/1.5/
Pages: 1-2
Copyright: Caroline Levander
License: http://creativecommons.org/licenses/by/3.0/

Module: "On the Possibilities for a Deep History of Humankind"
By: Daniel L Smail
URL: http://cnx.org/content/m34256/1.4/
Pages: 3-9
Copyright: Daniel L Smail
License: http://creativecommons.org/licenses/by/3.0/

Module: "From Transatlantic Histories of "Intoxication" to a Hemispheric "War on Affect": Paradoxes Unbound"
By: hermann herlinghaus
URL: http://cnx.org/content/m34250/1.4/
Pages: 11-18
Copyright: hermann herlinghaus
License: http://creativecommons.org/licenses/by/3.0/

Module: "Discussion of Smail and Herlinghaus Papers"
By: Melissa Bailar
URL: http://cnx.org/content/m34249/1.2/
Pages: 19-20
Copyright: Melissa Bailar
License: http://creativecommons.org/licenses/by/3.0/

Module: "What Is Cultural Economy?"
By: Mary Poovey
URL: http://cnx.org/content/m34260/1.4/
Pages: 21-26
Copyright: Mary Poovey
License: http://creativecommons.org/licenses/by/3.0/

Module: "Digital Humanities 2.0: A Report on Knowledge"
By: Todd Presner
URL: http://cnx.org/content/m34246/1.6/
Pages: 27-38
Copyright: Todd Presner
License: http://creativecommons.org/licenses/by/3.0/

Module: "Discussion of Poovey and Presner Papers"
By: Melissa Bailar
URL: http://cnx.org/content/m34248/1.2/
Pages: 39-40
Copyright: Melissa Bailar
License: http://creativecommons.org/licenses/by/3.0/

Module: "Music, Biological Evolution, and the Brain"
By: Aniruddh Patel
URL: http://cnx.org/content/m34255/1.7/
Pages: 41-64
Copyright: Aniruddh Patel
License: http://creativecommons.org/licenses/by/3.0/

Module: "Making the Cognitive Turn in Art History: A Case Study"
By: Pamela Sheingorn
URL: http://cnx.org/content/m34254/1.4/
Pages: 65-110
Copyright: Pamela Sheingorn
License: http://creativecommons.org/licenses/by/3.0/

Module: "An Essay on Neurohistory"
By: Daniel L Smail
URL: http://cnx.org/content/m34243/1.4/
Pages: 111-121
Copyright: Daniel L Smail
License: http://creativecommons.org/licenses/by/3.0/

Module: "Discussion of Patel, Sheingorn, and Smail Papers"
By: Melissa Bailar
URL: http://cnx.org/content/m34247/1.2/
Pages: 123-124
Copyright: Melissa Bailar
License: http://creativecommons.org/licenses/by/3.0/

Module: "Roundtable Discussion"
By: Melissa Bailar
URL: http://cnx.org/content/m34257/1.2/
Pages: 125-129
Copyright: Melissa Bailar
License: http://creativecommons.org/licenses/by/3.0/

Module: "Participant Biographies"
By: Melissa Bailar
URL: http://cnx.org/content/m34245/1.2/
Pages: 131-132
Copyright: Melissa Bailar
License: http://creativecommons.org/licenses/by/3.0/

About Connexions

Since 1999, Connexions has been pioneering a global system where anyone can create course materials and make them fully accessible and easily reusable free of charge. We are a Web-based authoring, teaching and learning environment open to anyone interested in education, including students, teachers, professors and lifelong learners. We connect ideas and facilitate educational communities.

Connexions's modular, interactive courses are in use worldwide by universities, community colleges, K-12 schools, distance learners, and lifelong learners. Connexions materials are in many languages, including English, Spanish, Chinese, Japanese, Italian, Vietnamese, French, Portuguese, and Thai. Connexions is part of an exciting new information distribution system that allows for **Print on Demand Books**. Connexions has partnered with innovative on-demand publisher QOOP to accelerate the delivery of printed course materials and textbooks into classrooms worldwide at lower prices than traditional academic publishers.