

ABSTRACT

Title of Document: UNLIKELY COMPARISON AND THE
TRANSDISCIPLINARITY OF
COMPARATIVE LITERATURE:
THE BOUNDARIES OF GENDER,
TECHNOSCIENCE, LITERATURE AND
VISUAL CULTURE.

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The dissertation argues that current shifts in the humanities provide opportunities to transform comparative literature into a more transdisciplinary field that more fully attends to the agencies of knowledge work. In particular, comparative literature should center the intersections of the humanities and sciences, and feminist technoscience approaches in particular, to theorize and pursue “unlikely comparisons” that shed light on current debates on difference, disciplinarity, narrative, and the changing role of literary studies and the humanities more broadly. To illustrate the role of feminist technoscience in making agency-aware unlikely comparisons, the dissertation considers the resonances between the paintings of Remedios Varo and the philosophy-physics of Karen Barad. It is then shown that cyberfeminist narratives about Ada Lovelace reveal that networks,

time travel, and emergent behaviors are necessary models for understanding the multiple and complex connections between Ada Lovelace and today's digital women, and for understanding the agencies of knowledge work more generally. The dissertation then argues for a more transdisciplinary, comparative, and "polyrhythmic" undergraduate curriculum, providing specific proposals for coursework and pedagogical materials. The sum of these arguments demonstrate that further theorization of "unlikely comparison," directed by the central questions of feminist technoscience, would enable comparative literary studies to more fully engage with the pressures and possibilities of complex and rapidly changing political, ethical, and intellectual connections and responsibilities.

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By

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Chapter 1: Comparative Literature and the Value of Unlikely Comparison

The humanities today are a category of knowledge work, one that is undergoing a set of rapid shifts and transformations in both its boundaries – the question of what is or is not the proper method and subject of humanistic inquiry – and its cultural capital – the question of why the humanities are necessary, and according to whom. These shifts have already been profound enough that it is by now commonplace to say that the humanities are in a state of crisis. Crisis response, however, is a difficult and uncertain task; does one adapt so freely that whatever used to be called “the humanities” no longer goes by that name? Or does one hold more tightly to the humanistic traditions that are most threatened, using them as a shield against the things that would divest them of meaning (globalization, the pervasiveness of the market, technocracy, or other forces, depending on whom one asks)? These questions become even more complicated if one views the humanities not as a bulwark against the onslaught of the Twenty-First Century but as a complex set of knowledge practices, many of which are politically or ethically problematic in their erasures, but some of which have proven valuable or even in some cases have become indispensable.¹

¹ For example, the Western humanistic emphasis on individualism has been deeply problematic in the way that it erases less Eurocentric views of kinship or community, or in the way that it makes cultural constructions less visible, thereby enabling some to argue that oppression is largely the action of individuals acting unjustly rather than a systemic problem. Yet at the same time, this humanistic emphasis has also contributed positively in some cases to rights discourses, such as the development of legal and institutional protections for some human rights. Therefore, with regard to the “crisis” of the humanities, one might desire to simultaneously undermine traditional Western discourses on individualism *and* to resist anything that would devalue or shrink hard-won individual rights.

This dissertation will take the latter perspective; this project is interested in how the humanities in the future – or whatever it is that the humanities will become – will (or will not) attend to gender, difference, identity, and agency. Moreover, the argument here uses these crises – these pressures that demand that the humanities reconfigure – as a way to imagine the exciting possibilities that could arise. In other words, if the humanities must adapt in profound and even unsettling ways, how might this state of flux be taken advantage of?

While this aim could be expressed in many ways, three possible ways of framing this question are put forth here, offered as an introduction to the range of questions about the humanities and about comparative literature in particular that this dissertation will consider. The first way of framing the question is: What would a cyborg humanities look like? Donna Haraway's influential work on cyborg feminism argues that the cyborg should be used as an ironic metaphor for the adaptations and hybridities demanded of feminists and others hoping to act, transform, and thrive under late capitalism. The metaphor is apt for the humanities in that a cyborg may reassemble itself from parts taken in surprising or unlikely combination, and that these new combinations may find use for things that would otherwise be discarded as remnants.² A cyborg humanities will largely leave aside either lamentations or celebrations of the end of Enlightenment certainties and instead seek to take still viable parts of these traditions and reshuffle them into combinations that can thrive among the aforementioned pressures.

² Consider how humanistic inquiry already does this: the term "women" is widely acknowledged in feminist scholarship to be a problematic construct, even one untenable as a description of a fixed category. Nonetheless, although a more hegemonic definition of "women" has been discarded, it is frequently important still to use the category in such formations as "Women's Studies" or "women's shelter." Similarly, consider Gayatri Spivak's term, "strategic essentialism." In these instances, a discarded piece is actually viable as a part in a new theoretical and practical formation.

Another way of asking that question considers: How might the humanities become more orthogonal? The term “orthogonal” here comes from Marcia Bates, who observes that information science has reconfigured itself as a meta-discipline, one that travels “orthogonally” among other disciplinary formations, now addressing broader meta-questions that are distinct from the lenses used in conventional disciplines. In particular, information science is more concerned with the organization and representations of these varied sites. Kari Kraus has observed that humanistic fields such as literary studies are currently undergoing a process similar to the one information science experienced in recent decades.³ A more orthogonal humanities could traverse fully among other disciplinary and extra-academic sites, centering broader questions about narrative, knowledge work, and how we tell stories about knowledge. A directed move toward a more orthogonal relationship with other knowledge worlds might enable the humanities not only to transform disciplinary boundaries, but also to explore how these disciplinary border crossings might be employed in savvy, flexible, and politically and ethically aware ways.

A third way of framing this question is: How might the humanities become more differential? This use of the term “differential” relies upon Chela Sandoval’s work on oppositional consciousness.⁴ This differential mode of consciousness allows resisting

³ Kari Kraus, private conversation.

⁴ Sandoval’s work will be discussed at length in the fourth chapter, but it will suffice here to briefly explain some of her key interventions. Sandoval theorizes that oppositional thinking and power-mapping involves movement among different subject positions and communities, constantly transforming the boundaries and differences that comprise them. Sandoval’s theories draw particularly on the works of feminist theory by women of color, including Gloria Anzaldúa’s work on mestizo consciousness in *Borderlands/La Frontera*, and Donna Haraway’s cyborg feminism, in order to analyze the motion and multiple alliances of feminists also engaged in activism centered on oppressions based on race and ethnicity, class, nationality, sexuality, ability, and others. While such movement was often considered a lack of loyalty or understanding of the ‘true’ nature of oppression, Sandoval argues that U.S. third world feminists wove together innovative

subjects to move among many modes of consciousness – Sandoval compares it to the gear shift of a car – and enables multiple hybrid identities, loyalties, and means of power mapping. Sandoval’s understanding of differential consciousness does not assume that certain modes of resistance are more advanced than others; instead, she emphasizes the differential mode in order to shift the question to how *best to move among* various, and even contradictory, pressures, modes, and subjectivities.

It is in the context of this question of how to take advantage of the crisis of the humanities and these three ways of framing this question that the dissertation considers the uses of comparison – the examination and analysis of similarity and difference – in the field of comparative literature and in the humanities more broadly.

The Uses of Comparison

As early as 1959 Rene Wellek noted that "the world (or rather our world) has been in a state of permanent crisis since, at least, the year 1914. Literary scholarship, in its less violent, muted ways, has been torn by conflicts of methods since about the same

subject positions that were well-suited for the related goals of power-mapping, survival, social change, and love.

In particular, Sandoval’s “modes of consciousness” are different subject positions among which a resisting subject must tactically move in order to survive and thrive under multiple oppressions that are increasingly complex and hard to define under globalization processes. These forms include the “equal rights form,” which is assimilationist in approach, a “revolutionary form,” which advocates for profound cultural changes, the “supremacist form,” which emphasizes the positive attributes of the oppressed group, and the “separatist form,” which seeks to make a space for groups marked as different to exist and interact apart from the dominant group. The key to Sandoval’s theory of oppositional consciousness is the “differential” mode, which allows one to move among these other forms, hybridizing them in innovative and transforming formations to better resist among the layered and shifting agencies that characterize oppression in a postmodern world.

time" (Wellek 162). Wellek's essay,⁵ entitled "The Crisis of Comparative Literature," illustrates a couple of important points: the sense of crisis is not new, nor is the observation that conversations about how to "do" literary studies are deeply connected to broader relationships and crises among cultures and identities. Still, newer crises require newer methods, and this dissertation certainly does not argue that there is no difference between then and now; rather, Wellek's point reminds us that comparative literature as a field of study has often considered the ways in which comparison might be a political act.

Indeed, comparative literature has a very long history of investment in the question of how literary border crossings relate to the politics of national and other boundaries. Its clearest predecessor, the *Weltliteratur* of the German Romantics, was a set of knowledge practices deeply concerned with the political and ethical aspects of comparison; finding similarity in the literatures of peoples who seemed irreconcilably different was thought to be an important step in imagining a common humanity of all (or rather, most European) nations. In this view travelling among literary works of linguistic and cultural difference is an act of peace. In the nineteenth century "comparative literature" itself came about as a scholarly field or approach for similar reasons, and in opposition to the nationalism and isolationism of scholars of the time (Wellek 165).

In the twentieth and twenty-first centuries, under a varied set of processes which are often labeled modernism and postmodernism, attending to difference became a more important goal than proving similarity.⁶ The reasons for this are many and, I would argue, good. The universalisms espoused by this Romantic worldview were now seen, in

⁵ Wellek, of course, wrote a number of influential works defining or describing the field of comparative literature. In addition to the article mentioned above, another example is "Comparative Literature Today."

⁶ Here, I refer to literary studies and in many respects the humanities and social sciences more broadly, not only comparative literature.

light of postcolonial, critical race, and feminist theories, as a way of perpetuating oppression as much as resisting it. The elision of difference and the enforcement of the universal – particularly the Eurocentric, androcentric, colonial understanding of the “universal” human experience – has been a key tool in the oppression of various “others,” and has been at least as violent as it has been patronizing. The “universal” has been shown to be a colonial fantasy, and one that erases peoples and cultures from discourse; the occasional good intentions behind these fantasies is no longer the point. In the commitment to attending to difference, however, there is a similar goal to that of the Weltliteratur of previous periods. There is still (in some locations) the underlying assumption that reading and writing and thinking across borders – if done well – can be an act of political and ethical commitment.⁷

This issue – the politics of comparison -- continues to be a central concern for Comparative Literature.⁸ Recent decades have focused on more current ‘crises’ in Comparative Literature, particularly the field's relationship with multiculturalism, diaspora, Area Studies, translation, Cultural Studies, and cosmopolitanisms.⁹ In light of these complex debates, it is not surprising that there is still no clear definition of what Comparative Literature is and should be, and I would argue that this ambiguity is, in many ways, productive in that it allows for multiple interpretations, ranging from a more belle-lettrist focus to approaches that move the field closer to Cultural Studies. Similarly,

⁷ Bernheimer's anthology, *Comparative Literature in the Age of Multiculturalism*, is a good resource for understanding the kind of debates that reveal the stakes of border crossings, particularly in terms of language, culture, and nation.

⁸ Sue Lanser notes in “Compared to What? Global Feminism, Comparatism, and the Master's Tools,” that comparatists sometimes act as tourists in global cultures, with all the privileges and political erasures a “tourist's” perspective can perpetuate.

⁹ While these debates occurred in a wide variety of sites, a few particularly relevant scholarly works include Charles Bernheimer's collection, *Comparative Literature in the Age of Multiculturalism*, Margaret Higgonet's collection, *Borderwork: Feminist Engagements with Comparative Literature*, Gayatri Spivak's *Death of a Discipline*, and Bruce Robbins' "Comparative Cosmopolitanism."

Comparative Literature grapples with a range of current issues that other literary fields do, including, for example, the role of film and visual culture in the field, the way digital technologies are changing narrative, the appropriateness of various non-literary cultural sites as the object of inquiry, and the question of how (and in some cases whether) to develop less hegemonic, patriarchal, and Eurocentric scholarship and teaching. In addition, these debates are deeply implicated in what is often seen as the broader crisis for literary studies and the entirety of the humanities more generally: what is the place of the humanities in the Academy and in the world?

While not all works of Comparative Literature are literally comparing two or more things, I would argue that the field has, despite the flexibility of both the “comparative” and the “literature,” centered on the borders and boundaries that the term “comparison” implies. In other words, I propose to consider this dissertation as part of a tradition within comparative literature that has, in key moments of turmoil, embraced surprising comparisons as a way to cross disciplinary and other borders for politically and intellectually exciting reasons. In other words, the field has, I would argue at crucial moments, been invested in examining similarity and difference, particularly by crossing borders - national or otherwise - in order to make somewhat illegitimate comparisons, or rather, comparisons that *at first* seem unlikely, nonsensical, or in violation of accepted disciplinary norms. While it is true that no one would claim that the history of comparative literature has been at all times characterized by radically forward thinking, it is nevertheless possible to trace a thread among key transformative moments in the field, from anti-nationalist sentiment to the turns toward theory and multiculturalism, in which certain agencies in comparative literature have actively sought out unlikely and border-

crossing comparisons for the purposes of rethinking how literary studies might relate to the political and ethical complexities of the world.

In other words, I suggest considering a counter-history of comparative literature, one that is multiply intertwined with more widely disseminated histories of the field,¹⁰ but that centers the attempts (whether one believes they were generally misguided or well-founded) to refigure “comparison” as a site and mode of resistance. I offer this counter-history of comparative literature as a way to frame this dissertation’s intervention for two reasons. First, this dissertation theorizes new possible configurations of comparative literary studies in large part by hybridizing the strengths of comparative literature’s long tradition with the kinds of transdisciplinary approaches that will allow the field to be vital in the future. This long history of politically minded unlikely comparison is absolutely a key strength. Secondly, my counter-history centers the ways in which comparative literature has, as a field, produced challenging and even provocative inquiries into its most foundational concept: comparison.

It will be useful to note here that unlikely comparisons are also a vital part of feminist and other scholarship that attends to agencies, difference, and the politics of knowledge work. In order to perform the kind of inquiry that has largely characterized such scholarship, it is usually necessary to make visible key similarities, differences, patterns, connections, borders, or networks that are often rendered invisible. Obviously, it is not the case that all unlikely comparisons are motivated by or achieve all of these goals. Given comparative literature’s traditional investment in unlikely comparison, however, it is an essential part of the field to explore how to utilize unlikely comparisons

¹⁰ Charles Bernheimer’s anthology, *Comparative Literature in the Age of Multiculturalism* provides examples.

in a more conscious and directed way, and in a way that is mindful of one's ethical or political commitments. The very pressures under which the humanities are operating, however – globalization and hybridization process among them – are characterized by multiplicities, complexities, layers of connections, knotty entanglements, disjunctions, gaps, paradoxes, irresolvabilities, change, and alliances and assemblages comprised of elements that were once thought incompatible. In other words, there is a proliferation of sites that are ideal for inciting unlikely or even seemingly “illegitimate” comparison. It is for this reason that comparative literature should engage more fully with its tradition of unlikely comparison, precisely because it is currently the opportune moment for such an exploration. Unlikely comparison is not a goal in and of itself – again, it is not guarantor of reflexivity or of attention to the politics of scholarship – but it is vital to ask how “unlikely comparison,” comparison of that which at first seems incomparable, might be offered as a tool or tactic for addressing the current crises in the humanities in an even more conscious and directed way. In other words, there is a need to more fully explore what it means for a comparison to be unlikely, and when, why, and how unlikely comparison becomes useful; there is a need for a fuller, more specific theorization of “unlikely comparison.”

Therefore I consider this conversation about the “comparative” nature of Comparative Literature in light of two related trends. One is a turn toward border crossings among knowledge worlds – the increased demand for new interdisciplinary formations, many of which are considered in their formative stages to be of questionable intellectual legitimacy. The other is an emerging set of connections between the humanities and sciences. These connections can be seen everywhere from the prevalence

of interdisciplinary projects in university settings¹¹ to the way that fields like information technology and biomedicine have become an increasingly large part of everyday life.¹² In fact, science and technology are no longer easy to separate from any subject matter or ethical commitment that endeavors in the humanities might have.¹³

It is in the context of these larger shifts that I make the primary argument of this dissertation: that the connections between the sciences and the humanities are precisely the means through which “Comparative Literature” should now define itself as a politically engaged transdiscipline. Specifically, by making feminist technoscience a theoretical center, and making the intersections of the sciences and humanities a primary focus of inquiry, Comparative Literature could open up new ground in that most fundamental of questions, the question that is largely responsible for the existence of the field: what makes a comparison meaningful? In other words, what makes it possible for two or more things to be productively compared?

Comparative literature in its various incarnations has long challenged assumptions about what can and should be compared – whether in terms of nation and language or media and culture.¹⁴ This question of what can be meaningfully compared is *the* defining trait of the field, and reveals the common purpose behind the field’s various methods of attending to diverse kinds of boundaries, borders, and categories. Again, comparative

¹¹ Julie Klein, in *Crossing Boundaries: Knowledge, Disciplinarity, and Interdisciplinarity*, enumerates many of these programs and persuasively shows the increase in interest in interdisciplinarity.

¹² Adele Clarke, et al., in “Biomedicalization: Technoscientific Transformations of Health, Illness, and U.S. Biomedicine,” demonstrate the pervasiveness, as well as the political stakes, of the biomedicalization of everyday life.

¹³ Of course I do not argue that “science” and “humanities” are inherently different in fixed ways, but rather that intersections of the humanities and sciences, despite how frequent they are and have always been, still seem to be surprising combinations or connections, due to how these different categories of knowledge work have been conceptualized over time.

¹⁴ Again, it may not have done so at all times, but these challenges have, I argue, proved to be the defining moments of the field.

literature has always centered the kinds of comparison that, at one point, seemed unlikely or even unproductive. The field has always centered comparing (and contrasting) what one is *not supposed* to compare, according to many of the dominant trends of the day. I argue, therefore, that a generative and socially engaged way for comparative literature to continue - and innovate upon - this tradition is to center transdisciplinary inquiry into the boundaries between and among the humanities and sciences.

Clearly, the question of how meaning arises out of comparison is intertwined with the question of why we compare; in other words, the answer to “what can and should be compared?” depends on the political commitments of comparative work. These points will be illustrated in each chapter of this dissertation in order to demonstrate what a feminist technoscience centered Comparative Literature might look like,¹⁵ and to argue for its viability, its feminist potential, its ability to encourage a more agency-aware understanding of literary and other cultural sites, and its necessity in a world with rapidly shifting disciplinary and other borders.

Theoretical Foundations

Feminist technoscience is both the theoretical foundation and object of inquiry of this dissertation. While individual chapters will go more in-depth in examining these theoretical works, particularly that of Karen Barad, Chela Sandoval, and Sadie Plant, it will be useful to briefly outline some of the key theoretical underpinnings of this dissertation that apply equally to all chapters. This is not intended as an overview of the

¹⁵ Clearly, there has been interaction between feminist technoscience and Comparative Literature communities, and so it would not be new to simply include more feminist technoscience; I argue, however, that the field *center* feminist technoscience in order to continue to rework and reformulate the boundaries of transdisciplinary, socially engaged comparative practice.

entirety of feminist technoscience but as an overview of the main theoretical foundations of this dissertation's argument.

The term “feminist technoscience” itself suggests many of the moves that feminist technoscience makes. The term resists the reification of science and technology into separate categories and particularly resists the idea that technoscience is separate from gender and other politics. A key shared commitment of the diverse perspectives of feminist technoscience is that scientific discourse is intertwined with gender, race, class, ability, and other differences in ways that are of great political and ethical importance.¹⁶

The work of Donna Haraway is particularly important to feminist technoscience, especially the questions she raises about how we tell stories about science and knowledge, and how we might tell more “livable stories” (Haraway 148). Stories and metaphors are not “merely” stories and metaphors, and they are not politically “innocent.” Indeed, in this framework, they comprise the relationships that make up what we call “the world.” Haraway (and others in related communities) does not focus on bias as something that *affects* science, but rather demonstrates how culture and politics and histories and countless contingencies are themselves *constitutive* of science. This perspective in no way suggests that feminists should disengage with science and technology. Instead, Haraway's work shows great enthusiasm for and appreciation of science and technology, even as it rigorously interrogates the masculinist fantasies that encourage rapturous romanticizations of science. A notable example is her foundational essay, “A Manifesto for Cyborgs,” in which she draws on Gloria Anzaldúa's theories of

¹⁶ The dissertation, as explained at the beginning of this chapter, seeks to use feminist technoscience to take advantage of current shifts in the humanities, the academy, and the world to make comparative literary studies more agency aware and transdisciplinary. Therefore, this overview of feminist technoscience focuses not on *evaluation* of feminist technoscience but rather on *selection* of relevant, necessary, and exciting possibilities for fruitful interaction between feminist technoscience and comparative literature.

hybridity and argues for the cyborg as an “ironic” metaphor for the hybridizations that characterize both oppressions and possibilities for resistance in a postmodern world. Haraway has also claimed that “nature” and “culture” are not separate categories a priori but that instead these two categories are co-constitutive; they create each other over time in specific locations and ways. Indeed, co-constitution is a key concept in Haraway’s theory, and allows inquiry to go much further than the study of “influence” and to instead interrogate the deep, multiple interdependences of many of the key concepts people use to “know” the world. In a similar vein, Katie King has argued for the benefits of understanding “past” and “present” as co-constitutive categories, which will also be of interest in this dissertation.

Haraway shares with much of feminist technoscience a commitment to recognizing various Others, and to the narrative processes that serve to demarcate others *as* “Other.” For example, Haraway explains the vast violence and other destruction resulting from the desire to objectify and conquer Nature, or to deny the subjectivity of animals. This is also a good example of another common goal of feminist technoscience theorists: undermining the boundary between subject and object, or between the knowledge worker and the “thing” she or he is making knowledge about. As part of this goal, there has been a great deal of attention to non-human subjectivities and agencies, including that of animals and machines. Even more provocatively, feminist technoscience work has explored notions of agency to demonstrate that agency might be better understood as a relationship rather than a property of a subject, and that therefore there might be many possible ways to think about non-human agencies.¹⁷

¹⁷ A much fuller discussion of this will be explored in the chapter on Karen Barad and Remedios Varo.

This dissertation also draws heavily on the kinds of constructivism found in works by theorists such as Donna Haraway or Bruno Latour.¹⁸ Constructedness, in this view, is not based on the assumption that what is constructed is not “real,” but instead insists on the supposition that cultural constructions *become* real, over time, through particular local and historically situated processes. Therefore, these constructions might have been, and still could be, constructed differently (“The Promises of Constructivism”). Science, therefore, is not a language game that is subject *only* to the constraints human agents place on it. Rather, as Karen Barad has noted, human cultures make science, but the universe also kicks back. This perspective respects and attends to the agencies of the animals, machines, institutions, and molecules that do indeed also act – and also acknowledges that there is value to scientists’ attempts to develop narratives that are faithful to observations and to the behavior of matter. In other words, all scientific narratives are constructions, but some constructions are more faithful than others.

Furthermore, feminist technoscience has been notable for its experiments in transdisciplinary methods and subject matters. Although some feminist technoscience work has used traditionally “humanist” frameworks to examine scientific discourse, feminist technoscience has been broader than this in both approach and subject matter. Specifically, feminist technoscience theories have proven to have great relevance to any narratives that draw on constructions of nature, time, observation, self and other, social movements, technologies, and so on. In other words, while feminist technoscience has done much to enhance the understanding of science, its contributions can also illuminate any kind of narrative practice.

¹⁸ The latter’s work is not particularly feminist but is relevant here nonetheless.

Knowledge Work and Disciplinarity: Contexts and Definitions of Terms

With the term, “knowledge work,” this dissertation intends a highly inclusive definition, one that could encompass any work that substantially involves the gathering or use of information, or a variety of social, information, and other technologies, as well as analysis and communication or “artistic expression.” The term originates in the study of business and economics,¹⁹ but has since become a term that travels through many communities and disciplines, taking on varied local meanings.²⁰ The term generally refers to work associated with disciplines, interdisciplines, and professions, including technoscientific work, scholarly work, and a variety of practices that are considered “intellectual” work. Also sometimes included (and certainly included here) are the making of artistic productions and other cultural artifacts, audience responses to artistic productions and cultural artifacts, activist work and other theorizing practices, and informal or “folk” knowledge traditions. In other words, “knowledge work” in this dissertation will not refer only to work that is part of an explicit structure of careers, businesses, and institutions, but rather will refer to myriad acts of knowledge production, both seen and unseen. This “knowledge production” can include knowledge-gathering, analysis, comparison, interpretation, communication or expression, synthesis, and other acts that build, maintain, and transform meanings and boundaries. An extremely abbreviated list of just a few practices that could be considered knowledge work are: developing software, learning to use a new office machine,²¹ ‘watching’ a television

¹⁹ The origin of the term is often attributed to Peter Drucker.

²⁰ In the terms of the category theory described by Geoffrey Bowker and Leigh Star, the term is a “boundary object.”

²¹ See Lucy Suchman’s *Human-Machine Reconfigurations: Plans and Situated Actions*, for example.

show,²² measuring and calculating the area of a room, self-reflection (in a psychological, spiritual, political, or other sense of the term), involvement in formal or informal education as student or teacher or some other role, engaging in religious or spiritual practices, articulating a political (or other) argument or other form of knowledge, participating directly or indirectly in activism,²³ thinking about identity, discovering an unknown correlation in molecular biology, writing a poem, gossiping, copy editing, working on an assembly line,²⁴ conversing about ideas, weaving, sewing, knitting, blogging, creating computer theory, filmmaking, performing music, and strategizing of all sorts.

The purpose of this broad definition of knowledge work is not to erase the boundaries that distinguish its different types, but to resist the erasure of less privileged forms of knowledge work, and, more to the point, to trace these boundaries, to examine what is at stake in the stability or instability of these boundaries, and in some cases to trouble these boundaries. In short, this dissertation uses the term “knowledge work” to examine *how we think about thinking* in selected specific cultural sites, and especially what counts as what *kind* of knowledge. The “boundaries of knowledge work” refers to both the boundaries that demarcate one kind of knowledge work from another –

²² It has now largely been refuted that experiencing a cultural production is a passive act devoid of significant ‘intellectual’ work. One early example is Tania Modleski’s 1982 book *Loving with a Vengeance: Mass Produced Fantasies for Women*.

²³ Feminist and other ethics-centered scholarships have often pointed out the “theorizing” involved in activism, political awareness, and survival more generally; an excellent example is Chela Sandoval’s work on the mapping of power relations and “oppositional consciousness.”

²⁴ “Knowledge work” traditionally is meant to distinguish knowledge-centered work from “manual” work, but here I use the term to foreground those aspects of various kinds of work that require power-mapping, learning, communicating, analysis, observation, troubleshooting, application of skills, and other practices that are widely considered to count as gaining or using knowledge. These knowledge practices, in the above examples of sewing or assembly line work, for example, might sometimes be made invisible by stereotypes or habits of narrating ‘low-status’ work.

disciplinary boundaries, for example – but also to the way that knowledge work establishes, maintains, undermines, or reshapes boundaries surrounding identities, time periods, and other categories.

A “knowledge worker” in this dissertation will then refer not only to those whose job is considered to be knowledge-based, but also anyone who is doing knowledge work in the specific situation or context being discussed. This definition is not intended to ignore the close and varied connections between capital or institutions and knowledge work, but rather to include the great quantity and quality of work that these connections sometimes render invisible.

Another important term is “knowledge worlds.” Katie King has used “knowledge worlds” to discuss the communities and agencies of knowledge work in various settings in a way that attends to the fact that disciplinary identities are only one of many types of communities to engage in knowledge work, and knowledge production is best understood in terms that attend to the relationships and multiplicities of knowledge work (King, *Networked Reenactments*, forthcoming from Duke University Press).²⁵ A knowledge world might be a discipline, but that is only one possibility; knowledge worlds are comprised of interactions and connections that tend to move among both academic and non-academic sites.²⁶

²⁵ While her use of this term performs other tasks as well, for the purposes of this dissertation, it is particularly important to note that “knowledge worlds” is a term that suggests that knowledge work builds connectivities and patterns of motion that are observable and to some extent definable, despite their tendency toward fluctuating borders, and that these knowledge worlds also shape the kinds of storytelling/knowledge work that happens.

²⁶ The use of this term is, of course, only one of the many ways that King’s work has shaped this dissertation. While it would be impossible to enumerate the many ways that her understanding of these concepts has shaped mine, it will be useful here to clarify at least some of the ways in which this work draws on and also differs from hers. King’s approach to transdisciplinary feminist work draws connections among widely different knowledge worlds and looks for broader patterns, and for the potential they reveal. It is this model of transdisciplinarity that is largely modeled here. My own work, however, is more affixed

The term “science” is a complex one. While in U.S. contexts it can sometimes mean the natural and social sciences, the social sciences are often (and problematically) thought to be a field separate from “science.” Although I acknowledge that this segregation is neither accurate nor desirable, there will be many times when I am referring to how the *categories* of the humanities and the sciences are *perceived* or constructed as separate and different, and in these cases I will mean the physical, earth, and life sciences, as well as engineering, computer science, and mathematics. The social sciences have a complex and rich history of interaction with both the humanities and the “harder” sciences, but that is not the reason for choosing to use “science” in this way. Again, this is not to support the exclusion of the social sciences from the term “science,” but rather to interrogate stereotypes of what counts as science and why, and how the perceived differences between the humanities and the physical, technological, and life sciences might be used to generate new transdisciplinary formations.

The dissertation will also consider repeatedly the transdisciplinary directions that comparative literature is taking, and particularly what kinds of disciplinary re-articulations comparative literature might devote more effort to. The turn toward disciplinary border crossings has of course been seen in multiple sites for multiple reasons, and it would be unwise to assume that all shifts toward interdisciplinarity are engaged in some shared feminist or other political-ethical effort. Disciplinary border

to some traditional disciplinary locations such as comparative literature and therefore is somewhat more invested in stylistic analysis. Because of my own interests and background, I approach these questions by first thinking through the intersections of mathematics and literature and then considering their other possible iterations. King’s attention to reflecting on one’s own knowledge work, and the stakes of its inclusions, exclusions, and connections, is also a key influence, as is her consideration of the co-constitution of past and present, and the way that many kinds of knowledge work depends on such constructions (“Pastpresents: Playing Cat’s Cradle with Donna Haraway”). My own work extends this theoretical work by applying it to new disciplinary and other sites, and demonstrates that feminist technoscience is *vital* to thinking through the key questions of fields such as comparative literature and indeed literary studies more broadly, by theorizing the politics and agencies of unlikely comparison.

crossings -- work that reshapes and recombines the boundaries, audiences, methods, or other aspects of communities of knowledge production -- are, however, deeply and repeatedly entangled with politics, ethics, gender, race, and identities. It is rare today to find scholarship which argues that one could purify anything from its political implications, even as there is still need to continue the larger project of tracing these entanglements, and especially for changing knowledge practices to more fully reflect and attend to these entanglements. The pressures, complexities, and contradictions of a world under various globalization and hybridization practices create both opportunities and great need for such disciplinary border crossings, however, and therefore many interdisciplines have pursued these border crossings in order to build knowledge-making sites that are less beholden to hegemonic ways of thinking.²⁷ There is still, however, considerable struggle to piece out what, precisely, makes a disciplinary border crossing an act of resistance, and precisely what difference such acts make. This dissertation makes no claim to answer these questions definitively, but does proceed under the now familiar assumption that there are heavy political stakes to disciplinary boundaries.

While the definitions of “interdisciplinarity” and “transdisciplinarity” used in this dissertation draw somewhat on the works of theorists of interdisciplinarity, especially Julie Klein and Lisa Lattuca, there is not one definition of these terms that is clearly superior to the others. Therefore, I will define these terms in this introduction in the way that I will use them in this dissertation. In other words, I will put forth my own definitions that differ only slightly from others, but these definitions are explained for the sake of clarity and because they are necessary to understand the arguments that will be

²⁷ Just a few examples among many are Women’s Studies, African American Studies, Asian American Studies, American Studies, and STS (Science, Technology, and Society).

made later in the dissertation. I do not intend to argue that these definitions should replace these other good definitions, but rather that they might be put in conversation with other definitions, or be used in addition to them. These are not new definitions but rather adaptations of definitions that will help to streamline later arguments found in this dissertation.

As used in this dissertation, “interdisciplinarity” happens when different disciplinary traditions or methods or subject matters are put into a productive dialogue. This does not imply that the difference between disciplines are “overcome” or erased, but rather that it is the differences and tensions that are productive sources of interesting knowledge work. “Transdisciplinarity” is a specific kind of interdisciplinarity, one in which the boundaries among various knowledge worlds and disciplines are *reconfigured*, especially in a way that makes the agencies of knowledge work more visible. In other words, transdisciplinary inquiry puts different knowledge practices into conversation, *and* does so in a way that more profoundly undermines or reshapes disciplinary boundaries, by revealing the agencies that create or maintain these disciplinary boundaries. The implications of this definition, and how it differs from other definitions, will be explored in later chapters.

Method and Organization

This dissertation is intended for an interdisciplinary audience, and therefore some disciplinary conventions are shifted slightly in order to further the goals of this work. For instance, since the primary purpose of the literary or visual analyses is not to further the study of the particular author but to further develop the theory and method of transdisciplinary comparative literature, there will not be a conventional review of

scholarship for every author discussed, since to do so would shift the focus of the dissertation far from its intent. Instead, since the dissertation is largely about the political and feminist stakes of unlikely comparison, each chapter will make one or more unlikely comparisons. This comparative work will then be used as an example to explain how and why Comparative Literature might center feminist technoscience approaches, and to illustrate the political and intellectual potential for a focus on the intersections among the sciences and humanities. Because this dissertation's aim is also to show how this approach will make the most of Comparative Literature's traditional strengths of analysis of narratives, each chapter will include some close analysis of visual culture or writing. The close analysis, however, will be used in line with the commitments and methodological innovations of feminist technoscience works, which will be delineated in each individual chapter. Furthermore, this emphasis on analysis is not intended to argue for the privileged position of the "literary," but is rather based on the idea that narrative is everywhere; as Haraway says, "stories are not 'merely' anything," because all knowledge is comprised largely of storytelling processes (Haraway 201). Therefore, another benefit of centering feminist technoscience is that it provides a good model for how a close focus on narrative can make a field more, not less, transdisciplinary.

Each chapter of this dissertation will therefore offer comparisons; additionally, each chapter will make a contribution to the theorization of two key concepts for this dissertation, concepts that are vital precisely because of their instability: comparison, and transdisciplinarity.

In the second chapter, I will compare the theoretical work of Karen Barad to the visual art of Remedios Varo; the basis of comparison will be how each narrates the

agencies of knowledge work. I argue that this comparison will show how Comparative Literature might use feminist technoscience's contributions to understandings of agency in order to develop additional methods to productively compare across genre and media, and to do so in a way that centers gender, difference, and ethics. In the third chapter, I will compare several cyberfeminist portrayals of early computer theorist Ada Lovelace and argue that these transdisciplinary works demonstrate new and effective ways of using unlikely comparisons to narrate cyberfeminist intellectual "lineages." These ways resist and transform rather than perpetuate patriarchal understandings of intellectual traditions, and so this chapter will also demonstrate the feminist stakes of centering the intersections of the sciences and humanities. In the fourth chapter, I will discuss how undergraduate curricula might focus on both feminist technoscience and comparative analysis of narratives in order to empower students to use unlikely comparisons to reflect on the agencies of knowledge work, including their own. This chapter's goal is to offer suggestions and theoretical explorations of how to create conversations where socially and theoretically engaged comparisons can flourish. Specifically, I provide concrete suggestions for transdisciplinary undergraduate courses, and propose a term, "polyrhythm," that will be useful in considering the politics of transdisciplinary knowledge work. The conclusions to the dissertation will then summarize the main findings and propose possible new directions that this research could open up. These findings will include conclusions about the particular narratives that were analyzed as well as a synthesis of the theoretical tools developed in each chapter for thinking about transdisciplinarity and the stakes of unlikely comparison. In total, the chapters will demonstrate that centering feminist technoscience will help comparative literature

negotiate the crises and opportunities which define current debates about the role of humanities, and investigate the varied and politically laden boundaries between two of the trickiest co-constitutive categories, “the human” and “the world.” In other words, this dissertation is part of the larger project of reconfiguring what it means to study a human being’s role in the world, at a time when both of those terms are being profoundly destabilized.

Chapter 2: Gender, Science, and Agency in the Works of Remedios Varo and Karen Barad

Introduction and Methods

This chapter examines narratives of gender, knowledge work, and agency in two bodies of work that make an unlikely comparison: the feminist theory and “philosophy-physics” of Karen Barad and the art of Remedios Varo. Putting Varo’s works in dialogue with what Karen Barad calls “agential realism” reveals that both Barad and Varo are engaged in a number of similar projects: making visible the agencies of knowledge work, that is, respecting and acknowledging both human and non-human agencies; blurring the boundaries between science and “not-science” while examining or re-working the way these boundaries gender and are gendered; and suggesting that the act of acquiring knowledge is largely a matter of making visible the complexity and motility of relationships of agency.

This chapter will therefore consider Barad’s and Varo’s work in a series of comparisons of their portrayals of gender and agency together with their creative tactics in expressing these ideas. A discussion of Barad’s “agential realism” is followed by an overview of the portrayal of science in Varo’s work in the visual arts. The chapter is then organized around key theoretical concepts that I argue Barad and Varo share, each illustrated by a brief description of one or more works of visual art by Varo. The method of analysis here makes no claims to be art historical but rather is inspired by feminist technoscience analyses of visual culture and modeled on the scholarship of Donna

Haraway.²⁸ After each interpretative description of an artistic work by Varo, I will argue for its comparability with some aspect of Barad's philosophy-physics. The chapter will thus demonstrate deep and productive resonances between Varo's and Barad's knowledge work that have previously not been explored in the scholarship.

Thus the chapter is something of an experiment, one designed to address two key questions in the theorization of how one goes about making a meaningful comparison. While these questions are not new, their investigation furthers my argument that centering feminist technoscience in comparative literature is a way of strengthening the understanding of what kinds of cultural products can and should be compared. This experimental chapter then also puts forth a *method* of comparing written work and elements of visual culture as a method of making "unlikely" comparisons. Comparing theoretical work to "artistic" or "creative" work allows me to raise questions about what makes such comparisons possible or productive. The chapter goes on to propose that comparatists use and develop such a method, centering similarities in the way cultural products *narrate the agencies of knowledge work*.

Additionally, although there has been some scholarly work on Varo's portrayal of science, there has been no in-depth examination of her work's portrayal of science and agency. Feminist technoscience approaches are precisely those appropriate for considering this artist's interest in gender and science, interests that neither condemn nor romanticize science. And, while Karen Barad's theories have gained influence as new materialist feminist theory, there are few applications of Barad's theories to works of

²⁸ Examples of Haraway's works that take this approach are many; to name only a couple, in *When Species Meet*, she uses a non-art-historical approach that emphasizes the narrative aspects of visual culture, particularly the stories these visual works tell about gender, knowledge, and science. Additionally, Haraway considers the visual art of Lynn Randolph largely for their way of theorizing gender and science in *Modest_Witness@Second_Millennium: FemaleMan_Meets_OncoMouse: Feminism and Technoscience*.

literature or visual art, despite Barad's engagement with these materials. Thus this chapter demonstrates that Barad's theories are a viable and generative theoretical framework for scholars of visual and literary cultures. Finally, the chapter concludes by pointing out shifts in the traditional division between "theory" and the work to which it is "applied," specifying that the "application" of theory should be classified as a specific *kind* of comparison.

Overview of Agential Realism

Karen Barad's development of a theory of "agential realism" has been lauded in feminist technoscience, Science and Technology Studies, and various other scholarly communities interested in the nodes that connect the humanities, social sciences, and sciences. Originally trained in physics and now having departmental and institutional affiliations in Feminist Studies, particle physics, philosophy, and science communication, Barad combines feminist and poststructuralist theory, including Judith Butler's work on performativity and Donna Haraway's work on naturecultures, with theoretical physics, particularly what she calls the "philosophy-physics" of Niels Bohr. Note that this is not the same as saying the "philosophy of physics," but that she hyphenates "philosophy-physics," making it into a single term. Barad examines the resonances among these seemingly incomparable theorists, and the distortions and the "diffraction" patterns they create,²⁹ to develop new ways to talk about the ethics and politics of observing and knowing.

²⁹ The term "diffraction" is used by Barad in a way similar to that of Haraway. Haraway describes diffraction as "a metaphor for another kind of critical consciousness," one that attends to "interaction,

Given these foundations, it will be no surprise that Barad's framework of "agential realism" resists or seeks alternatives to more traditional understandings of knowledge and its relation to the humans that make knowledge. For example, Barad questions the problematic persistence of so-called realisms that insist that there is some one-to-one correspondence between scientific theory and the reality of the universe. Indeed, Barad finds a great deal of fault with the notion that science accurately describes the universe as it is and that cultural practices and any "human" influence on science is irrelevant or unimportant (Barad 41). In response to more traditional realisms that acknowledge the existence of bias, but only as something that is inserted into science or that interferes with "science" proper, Barad argues that cutting off scientific knowledge from the social, political, and cultural factors of which it is a part is an artificial division. As famous experiments in wave-particle duality suggest, the observer is part of the phenomenon that is being observed. To suggest otherwise is a misunderstanding of the nature of observation.

In Barad's view, connectivity is key. To observe a thing – any thing – is to enact a cut, to privilege some of its entanglements over others.³⁰ Because everything is interconnected, the very process of observing requires a filtering of attention, a cut between what is part of what one is observing and what is not. To use an example of Barad's, the wave-like behavior of light might have to be observed by temporarily ignoring its particle-like behavior. Or, in an example from biology, one might observe the behavioral effects of removing a "pleasure gene" from mice, and have to do so by making a series of implicit or explicit cuts, shifting a complex set of boundaries that

interference, difference," noting that unlike reflections, diffraction patterns do not attempt to replicate sameness (*Modest Witness@Second Millennium.FemaleMan Meets OncoMouse* 273).

³⁰ Barad uses the term "entanglement" in a specific way, which will be discussed later in the chapter.

determine what relationships and agencies are included or excluded in the observation. So, in working with genetically modified mice for example, the observer might construct boundaries around what counts as a gene, around what interactions with scientists and the environment are considered to be genetic modification, around what aspects of animal behavior are considered to be noticeable and significant (a boundary notoriously implicated with anthropocentrism), and around what is relevant to the experiment and what is not. Things that might be outside the “cut” – things that might not be considered relevant to these observations – might include the ethics of animal testing or neurochemical aspects of gene expression that are not currently understood well enough to be studied meaningfully.³¹ Similarly, in examining a poem about a plum, for example, one draws a set of boundaries around what does or does not count as part of the poem, part of the act of reading the poem and what an author is. One might determine the scope and nature of the observation by looking at whether the poem is a good example of a literary movement, thus enacting a boundary of inquiry around the relationships between this poem and other works of the literary movement, focusing more on these relationships than others of which the poem might be a part. Or, one might choose to consider the poem an expression of a culture or nation’s identity, or as a telling example of how plant life manipulates human beings into aiding the plants’ survival and reproduction, or as a sexual metaphor which elucidates the role of “appetite” in human psychology, or as an expression of the author’s life experience, or as an inspiration for later poets. In each of

³¹ In other words, in this hypothetical example, one might be able to manipulate the genetic makeup of a mouse, and one might be able to observe the behavioral effects, but there might not be a great deal of established knowledge about the specific pathways and biochemical reactions that happen “between” these two sets of readable information. Therefore, the specifics of the mechanism of this causal relationship might not be part of the study, since the focus might be on phenomena that are possible to observe and communicate.

these cases, the approach to the poem enacts a cut around certain relationships and causalities that become part of the observation while others do not. Any observation, simply by being coherent and finite in its scope, will necessarily include only some of the myriad connections and agential relationships that it could.

Furthermore, the processes by which that cut is made will necessarily impact the knowledge acquired through that observation. Rather than discussing *interactions* of objects or subjects, Barad uses the term “intra-action” to account for the inseparability of objects or subjects from the relationships and connectivities that temporarily and contingently define them (Barad 33). Everything in the cosmos is connected and at the molecular level, everything affects everything else. Therefore, we can only look at separate items by enacting a cut that defines them as separate in the first place. “Interaction” implies that objects have an a priori or inherent separateness, but Barad’s use of the term “intra-action” suggests that the objects in play are not separate objects but instead are discernible parts³² of a common whole (the universe, matter, etc.).

One ramification of Barad’s framework is that the ethics and politics of scientific work – such as the ethical questions raised by the development of a nuclear weapon – are themselves *scientific questions*, worthy of rigorous methodology and debate. The philosophical or political or ethical questions are not “about science”; they *are* science. This move, one of Barad’s most important intellectual interventions, shifts the questions of “what are the political and ethical influences *on* science?” and “what are the political and ethical ramifications *of* science” to the more provocative question of “what processes

³² I.e., they are parts that one can observe or discuss as distinct, not that objects are distinct from one another a priori.

erase politics and ethics from most understandings of science?”³³ Through this theoretical move, Barad creates a possibility of a realism in which politics and ethics are implicated and inextricable from scientific observation, and indeed are *central* rather than peripheral concerns. They are only made to seem separate by particular and rather troubling material-discursive processes.

While Barad has this and other criticisms of traditional realisms, she also questions the viability of certain forms of moral relativism, those that suggest that the entangled connectivities that abound somehow require a disengagement from materialities. In other words, Barad also rejects the kind of moral relativism that suggests that the complex personal and cultural aspects of science make it impossible or undesirable to take a political stance. According to this extreme form of moral relativism, these entanglements suggest an unknowability inherent in the cosmos that renders all ethical or political commitments equivalent – and equally moot. Barad finds the constructivisms that advocate strict moral relativism to be as problematic as traditional realisms in that they both enact a *separation* from the political, and that this separation or relegation of the political obscures the relevant agencies. To use Barad’s example, it is problematic to claim that ethical concerns are entirely separate from the “science” of developing a nuclear weapon, but it is equally problematic to claim that the ethical problems are so thoroughly intertwined and complex and unresolvable that one should abandon any attempt to determine an ethical or political stance on weapon development.³⁴

³³ These questions use my own phrasing, not Barad’s exact words.

³⁴ Barad finds Michael Frayn’s *Copenhagen* guilty of the latter.

Barad also faults this type of moral relativist constructivism for ignoring materiality – in all possible senses of the word, but particularly as literally meaning “matter.” She argues that this brand of relativism assumes that scientific work is naïve and necessarily fruitless since there is no objective and universal truth out there to be found. Again, Barad rejects the logic of these assumptions; in her view, scientific rigor is important, but in no way does it depend on claims to universality or on being able to purify “science” from “not-science.” Therefore, Barad’s agential realism does not render scientific investigation trivial or meaningless because of science’s political entanglements. Instead, Barad rejects as untenable any constructivism that renders scientists’ work meaningless, or that places no value on the crafting of faithful and useful accounts of the behavior of matter.

“Matter matters,” this physicist reminds us, and ignoring the materiality of those intra-actions that are sometimes called “the world” fails to account for the fact that humans are not the only things with agency (Barad 210). It is not the case that human beings are free to impose their social constructs on the rest of matter without any constraints whatsoever; the universe, so to speak, “kicks back” (“Getting Real” 112). Scientific investigation cannot be seen through the rose-colored glasses of a belief in unmediated truth, but this fact does *not* mean that any account of “nature” is as good as any other account. In this sense, Barad’s understanding of observation and agency is similar to Donna Haraway’s use of the term “co-constitution” or to Bruno Latour’s use and critique of constructivism, in which he argues that to acknowledge something is constructed does not mean that it does not exist, but rather that it was built through time under specific circumstances, and that it could have been – and might still be –

constructed differently.³⁵ Also like these other theorists, Barad argues that attending to these materialities and connectivities will foreground the ethical and political accountabilities these connections imply. Barad has argued that this view of agency and observation are not specific to physics, and that it is flexible enough – and “robust” enough, as she calls it throughout her work – to travel to various sites of interest to non-scientists. In other words, “agential realism” is way of understanding knowledge work more broadly, and not just the knowledge work of science.

In defining and explaining her framework of “agential realism,” Barad argues for what she calls a “performative, posthumanist” approach to mattering, in which the apparatuses of observation are “boundary-making practices” that are part of the phenomena they observe (Barad 135). Barad defines “entities” as performances of particular cuts, and in agential realism, any cut must be examined in terms of what relationships of agency are involved in this performance. Through this theory, Barad undermines the traditional boundaries between the observing subject and the object of knowledge, and those between science and not-science. Furthermore, she advocates a definition of agency as “*a matter of intra-acting; it is an enactment, not something that someone or something has*. It cannot be designated as an attribute of subjects or objects (as they do not pre-exist as such). It is not an attribute whatsoever. *Agency is “doing” or “being” in its intra-activity. It is the enactment of iterative changes to particular practices.... Agency is about changing possibilities of change entailed in reconfiguring material-discursive apparatuses of bodily production, including the boundary articulations and exclusions that are marked by those practices....* Particular

³⁵ Haraway uses the term in many works but discusses it very accessibly in *The Companion Species Manifesto*. Latour’s argument here is summarized from his essay, “The Promises of Constructivism.”

possibilities for (intra-) acting exist at every moment, and these changing possibilities entail an ethical obligation to intra-act responsibly in the world's becoming, to contest and rework what matters and what is excluded from mattering.” (Barad 178, emphases in the original). Barad here explains the relational and performative view of agency upon which her framework depends. Note that a ramification is that the observer *always* has a responsibility to consider the ethics of what one includes and excludes.

One of Barad's significant conclusions is that the imagined dichotomy between realism and constructivism is based on problematic assumptions about each. For example, it is not the case that being more mindful of political or other traditionally “non-scientific” matters weakens the objectivity of science. Instead, according to Barad, applying ideas of social construction might benefit, rather than undermine, scientists' goals of increasing the faithfulness of their accounts.³⁶ “Agential realism,” however, also serves to foreground feminist or other ethical commitments, and more importantly, to create and especially to *maintain* a space for these considerations. By making agencies central to realism, one cannot mention ethical or political implications and then move on to the main topic at hand – instead, these commitments are inextricable from the matter that counts as “science.”

Another important task that Barad's theory of agential realism fulfills is to expand the definition of scientific apparatus. In Barad's work, scientific apparatus is a dialogue of the material and the discursive, and it is comprised of physical, conceptual and social interactions. Any understanding of scientific practices would therefore need to include an understanding of agential relations, and especially the relations of the agencies

³⁶ Cf. Latour's understanding of constructivism, *ibid.*, or Harding's strong objectivity, as articulated in *Whose Science? Whose Knowledge: Thinking from Women's Lives*.

involved in observation. Again, it is key that Barad uses “intra-action” rather than “interaction” in order to discuss the “inseparability” of objects and their associated agencies, instead of reifying the dichotomy between language and matter (and the mental and the material) (Barad 33). Barad also suggests that these concepts are useful for breaking down the boundaries between subject and object, and especially the observer and the observed.

Finally, in considering Barad’s theories, it is especially important to note that she does not intend “agential realism” to be a compromise or middle ground between relativism and traditional realisms. Instead, “agential realism” is intended as a new framework that can challenge and radicalize each.

In summary, while Barad develops this theory more fully than is described here, it is sufficient for the purposes of this comparison to reiterate what will be the most relevant features of this theoretical framework. Agential realism:

- Attends to matter and also the discursive-material processes by which “matter” materializes.

- Draws on theorists such as Butler, Haraway, Foucault, and Bohr.

- Attempts to describe knowledge in a way that respects - and is useful to - the work of humanists and activists as well as scientists.

- Rejects the a priori existence of fixed boundaries; instead, boundaries are constantly reconfiguring through “intra-action.”

-Undermines the binaries of observer/observed and subject/object.

-Assumes that politics, philosophy, and ethics are always entangled in observation and other knowledge work. An important conclusion is that scientific theories do not come about despite these factors but *through* them.

Overview of the Portrayal of Science in the Work of Remedios Varo³⁷

Science and scientists are of particular interest to Varo, who often demonstrates a wide and deep knowledge of scientific concepts, which may be why scientific communities have shown such interest in her work (Kaplan 177). The similarities to Barad's work go far beyond a passion for science, however. Originally from Spain, Remedios Varo was part of the surrealist circles in Paris in the 1930s, and with several others in those circles, she migrated to Mexico City in 1941 to avoid the tumult of Europe in WWII. Her work draws extensively on surrealism, but Janet Kaplan, an art historian and author of the definitive book on Varo's life and work, notes that Varo rejects key elements of surrealism and that her work reveals a very broad set of influences; therefore, interpretations of Varo's work should not assume that it falls readily into the category of "surrealist" art. In particular, Varo does not embrace surrealism's rejection of the artist's conscious control (Kaplan 128). Furthermore, while surrealists often reject the political, philosophical, and artistic potential of any realism, Varo's relationship with realisms appears more complicated, as will be explored later.

³⁷ The paintings discussed here are readily available to readers who perform a Google Image Search using the terms "Remedios Varo" and the titles of the paintings.

Varo often combines scientific imagery with other common motifs in her work such as images that evoke myth or mysticism, representations of vehicles or of exploration and migration, and an emphasis on female or androgynous figures. These female and androgynous figures tend to celebrate femininity, albeit sometimes ambiguously, and are possibly influenced by Varo's interest in Jungian ideas about feminine archetypes.³⁸ Deborah Haynes argues that in paintings such as *Harmony* and *Creation of the Birds*, Varo uses the androgyny of these figures to evoke a sense of transformation, and the unity and connectedness of all things (Haynes 29). These figures in Varo's work are frequently portrayed as having "unseen" connections to various other figures, things, or forces. In other words, these connections are revealed via elements that break from realistic depiction, such as in the painting *Sympathy*, in which a tangle of bright angular threads dart through the air, representing the profound connection between a woman and her cat. These female and androgynous figures do not, however, always appear to be empowered by the mystical or spiritual connections Varo ascribes them; their demeanors appear to range from enraptured to alarmed. Some appear excited and intrigued by these connections while others appear heavily burdened, and some look determined to press forward with a quest while others appear stuck and weary with the monotony of the hard (women's) work involved in these connections. This diversity in her portrayals of women and androgynous figures engaged in knowledge work -- viewed in conjunction with Varo's attention to specific, accurate knowledge of scientific or other work -- suggest that according to Varo, there is not *one* way to view the connectivities entailed in knowledge work, but always multiple shifting ways. Indeed, as Luis-Martín

³⁸ In addition to Jungian perspectives on myth, Varo was interested in a wide variety of spiritual and mythical traditions as well, including alchemy, sacred geometry, Sufism, and spiritual movements associated with Gurdjieff and Blavatsky (Kaplan 164).

Lozano notes, Varo's work shows a fascination with the idea of different logics, different sense of time, and multiple understandings of causal networks (Lozano 46-47).

In short, the mythscapes created by Varo are notably quite "narrative," full of figures on journeys and quests, or engaged in creative acts such as music or weaving, or making surprising discoveries. Scientific pursuits, apparatuses, and references abound and appear seamlessly integrated in these fictional worlds that Varo creates. According to Kaplan, Varo "saw scientific inquiry as analogous to spiritual pursuit," and her work suggests that scientists (and society more broadly) should resist using science to control or dominate nature (Kaplan 172); in this way, her work already seems to resonate quite well with feminist inquiry into science and technology. The resonances with Barad's work, however, are far more specific, numerous, and provocative than these general thematic similarities. I would argue, additionally, that Varo's portrayal of this continuity among scientific and mystical-religious discourses does not serve to romanticize science; rather, it makes the continuity the object of specific and directed inquiry into the agencies of knowledge work.

The Universe "Kicks Back"

Varo and Barad both make non-human agencies central to their narratives of knowledge work. Both use these portrayals of non-human agencies to subvert the view that science's natural role is to dominate a passive, feminized Nature. Furthermore, both undermine the assumption that the observer and the observed are separate entities; both, in fact, suggest that this assumption is a fantasy that substantially interferes with the

faithfulness or accuracy of science. This portrayal of scientific work is explored in a witty and evocative way in Varo's *Unsubmissive Plant*.

Description of Varo's *Unsubmissive Plant*

In *Unsubmissive Plant*, Varo shows a scientist whose posture and facial expression gives the appearance of being puzzled or frustrated at the appearance of plants in his/her botanical experiment. The scientist is seated at a laboratory table and staring at a series of plants whose tendrils and stems have grown in the shape of mathematical expressions and equations. The scientist appears quite puzzled and even disturbed, but, like in many of Varo's works, there is a balance between these disturbing elements and a sense of whimsy. The scientist's white lab coat, the symbol of the neat boundaries and controlled environment that scientific authority is supposed to ensure, is fringed and shredded in its lower portion. The effect is not to suggest so much that the lab coat is disintegrating but rather that it is becoming organic at its edges; the hem of the lab coat evokes the dense foliage of a forest, as if the coat were growing or taking on a life of its own. In addition to the coat, there is a clear visual similarity between the frazzle of the plants' stems and leaves and the scientist's hair; his or her hair is wild looking, similar in its off-white color to the plants' tendrils.

Varo describes her painting by noting that the scientist "está perplejo porque hay una planta rebelde. Todas están ya echando sus ramas en forma de figuras y fórmulas matemáticas, menos una que insiste en dar una flor y la única ramita matemática que echó al principio y que cae sobre la mesa era muy débil y mustia y además equivocada pues dice 'dos y dos son casi cuatro.' Cada pelo del científico es una formula

matemática” (Gruen 60). Translated,³⁹ the scientist “is somewhat bewildered because there is an unruly plant. All the plants are growing shoots in the form of mathematical figures and formulas, except for one little branch that insists on producing a flower. And the only mathematical branch it sprouted at the beginning, which drooped onto the table, is very withered and weak and, besides, is incorrect for it says ‘two plus two is almost four.’ Each hair on the scientist’s head is a mathematical equation.”

It is ambiguous whether the hair imitates the plants that the scientist is studying or whether the scientist’s way of caring for the plants has caused them to grow in mimicry of what was already on (in) the scientist’s head, but the effect is to use the stereotypical image of the hair of a “mad scientist” in order to suggest a close parallel between the scientist’s head and the plants. The unsubmitive plant in question is a rose on the table, which the scientist stares at. Again, this flower looks “normal” to viewers because it, unlike all the other plants, is not in the shape of equations. This plant, unlike the equation-growing plants, this is also the plant with the most color and, as a simple pink rose amid a series of white and gray tangles of equations, it is the only plant that fits the general preconception of a beautiful flower. A possible interpretation is that the scientist has sought and, in the case of the rose, failed to grow plants that fit the models that the scientist is using to predict “nature”; in other words, the scientist has found that not everything that happens will fit his or her equations.

Agential Realism and/in *Unsubmitive Plant*

³⁹ For all translations of Varo’s commentary, except where noted, the translations here are based on those found in the *Catálogo Razonado*, with additional translation assistance from Regina Harrison.

The title of this painting, and the scientist's puzzlement at the unsubmissive plant, convey a humorous view of the assumptions of the scientist, and it is not difficult to see that Varo is underscoring a broader irony in scientific work: that scientists are, in the Enlightenment tradition, supposed to be objective observers, and yet they may find it continuously astonishing when the "reality" does not fit the theory. Much of the humor of this painting also comes from the subversion of the assumption that science's role is to dominate Nature. Nature in this painting is not passive; it has its own agency that the scientist must come to terms with. Note that Varo says that the rose "insiste" or "insists."⁴⁰ This insistence causes the scientist to seem quite perplexed and even disturbed, and therefore quite different from the Enlightenment-based stereotype of the calm, authoritative scientist who always has an answer⁴⁰; the implication is that the scientist finds it much more "natural" for nature to be submissive. A further irony is that to the viewer, it is *only* the disturbing, unsubmissive plant which fits our expectations, and the presumably submissive plants look ghostly and strange (as does the scientist). In this way, Varo makes a clear visual distinction between the unsubmissive plant and the submissive plants, and it is only the unsubmissive rose that looks like a thriving, vibrant plant by the viewer's standards. The unsubmissiveness is therefore shown as vibrant and life-affirming.

Varo's narratives often convey complex sets of ideas in seemingly simple and memorable images, and this painting's inquiry into the culture of science is no exception. Notably, the focus on the "unsubmissiveness" of Nature fits well with Barad's claim that any account of socially constructed knowledges must attend to both human and non-

⁴⁰ While it may be argued that scientists have never benefitted from assuming they have all the answers, this statement is about what stereotypes Varo subverts.

human agencies; in Barad's framework, knowledge work is entangled with myriad social and historical forces, but the universe kicks back, and non-human entities have their own agency.

Varo's painting also resonates with Barad's theories in that Varo portrays the inquiring subject and the object of inquiry – the observer and the observed – as being connected at multiple levels. The scientist's clothing is wild and unkempt in back, as is her/his hair, and the hair and clothing visually evoke the plants on the laboratory table, particularly since both the plants and his/her hair are comprised of equations. Varo's suggestion, I would argue, is that the observer and observed are merging characteristics or identities, but not through the intentional action of the subject (scientist). Since the scientist presumably cannot see her/his own hair or the back side of the clothing, the observer and the observed seem to be merging identities through processes of which the observer is *unaware*. Again, it is also possible that the scientist has unwittingly made her/his scientific inquiry into a materialization of her/his subconscious, if one wanted to draw out Varo's (and more generally the surrealists') interest in the subconscious. It is also possible that the scientist is surprised to find that his or her mathematical models could not account for the agencies of the plant life.

In Barad's framework, the scientist seems to have been confounded by an experiment in large part because he or she fails to see herself or himself as part of an intra-action. The scientist is observing the objects of study closely, but has no way of seeing those parts of himself or herself that most reveal the *connections between* the scientist and the science. The scientist literally cannot account for his or her coattails. The surreal elements of Varo's painting all suggest that the scientist is part of the entity

being studied, or at least has some deep connection to it, but the scientist does not have the perspective to see himself or herself in these entangled relationships with these non-human agencies. Again, the title of the painting is key; the fact that the scientist assumes or wants Nature to be submissive may be why he or she cannot see himself or herself as *part of the intra-action*.⁴¹ In this sense, Varo illustrates an important point of Barad's: that awareness of agencies and intra-actions makes for more rigorous science, since traditional realisms make it too difficult to see relevant agential relations.

The painting might also be interpreted as a comment on representation more broadly; such an interpretation is somewhat tangential to the argument at hand, and therefore will not be fully pursued, but it will be useful to briefly suggest how comparison with Barad might provide insight into Varo's complicated relationship with surrealism, and particularly surrealism's relationship with representation. If the equations in the submissive plants are interpreted to be equations that model or attempt to describe plant growth – if they are representations of reality -- then the unsubmissive plant refuses to grow within the bounds of that model of representation. The uncontrolled and unplanned, then, is portrayed an act of rebellion and beauty; in this way, there are clear resonances with broader surrealist philosophies. But the unplanned (the unsubmissive plant) is *not shown as without order*, but rather with a more organic-seeming kind of symmetry. The alarmed appearance of the scientist suggests that the unsubmissive nature of nature, and nature's refusal to be represented by traditional means, can indeed pose a challenge to traditional ways of looking (realism, for example); at the same time,

⁴¹ Lozano notes that even Varo's drawings from her youth demonstrate a deep interest in undermining the traditional boundary between the observing artist and the observed (i.e., the subject and the object), and depicting the act of observation as a relationship; an early work depicts a realistic drawing of a rabbit who is noticeably aware of and anxious about being observed by the artist (Lozano 21).

however, the painting does not adhere to the surrealist rejection of conscious control nor does it juxtapose images which would be maximally jarring to the viewer.⁴² Varo's celebration of the unsubmitive plant's agency is a rose, a symbol of femininity, and is also the object in the painting that would best fit in a "realistic" depiction. Therefore, the unsubmitive plant could symbolize a different way of looking at representation (again, if we take equations to be representations of nature). The plant might symbolize surrealism's relationship to realisms, but since it is the most "realistic" object, the rose could just as easily symbolize those aspects of Varo's work that do *not* fit in with the other surrealist "experiments."⁴³ Varo then may be making a more general comment about "observation," including the kinds of "looking" demanded by avant garde art, which may give us a clue to her complicated relationship with surrealist orthodoxies. By noting the parallels between Barad's and Varo's work, and inspired by Barad's insistence that agential realism is no compromise or watered-down version of realism or relativism, it may be posited that Varo's partial use of surrealist practices was not a more moderate version but an attempt to shape a more agency-aware, relationship-emphasizing use of the myth and dream images that populate the work of this artistic community.

Connectivities

Both Barad and Varo suggest that different perspectives allow for different connections to be visible, and both foreground the *accountabilities* these connections suggest. Furthermore, both portray connection as specific and local; they do not suggest

⁴² The scientist in the painting, however, might be experiencing a disturbing juxtaposition of images.

⁴³ Again, since Varo viewed science and art as similar spiritual-creative quests, it is reasonable to inquire what her portrayals of science are saying about art and creativity more generally.

imagining all connections at once in some overload of transcendent connection that makes differences meaningless, but instead focus on the connections that *shape* agencies and accountabilities. Barad explicitly argues for -- and Varo, I argue, suggests -- that new ways of seeing connections are needed, in order to produce more faithful⁴⁴ narratives of the accountabilities these connections suggest. Varo explores the visibility of connection in many paintings, two of which are discussed here.

Description of Varo's *Sympathy* and *Three Destinies*

Sympathy and *Three Destinies* are two of Varo's paintings that make visible the connections that are generally "invisible." Varo paints lines and threads among various figures to make their relationships visible and to raise questions about how the figures affect one another; in this sense, these paintings might be considered a visual model for agential relations.

In *Sympathy*, Varo portrays a human-like figure and a cat; the human-like figure is seated in a chair and the cat is on a table, and is disproportionately large. The figures are touching – the cat's paw touches one hand while the other hand pats or scratches the cat's back – and the figures are gazing into each other's eyes. There are also several cat's tails poking out from the human figure's dress hem, and both the cat and the human figure are a bright fiery orange. There are also beams of light or energy forming a tangle or mechanism around them, which Varo calls an "artilugio eléctrico muy complicado," an "extremely complicated electrical contraption" (Gruen 52). The beams appear to

⁴⁴ I use "faithful" here in the way that Barad and others theorists do; a positivist might instead say "realistic" or "accurate" or "correct" accounts.

emanate from the two figures, particularly the flame-haired human head and hands and the cat's fur – in other words, the sites of connection between the two figures. The beams create a geometric and complicated set of intersecting lines that fill the room, and they intersect to form tiny concentrated spheres of light as well as the appearance of glowing spoked wheels or gears in the air around them. Here, Varo, who adopted numerous cats in her life and who frequently included cats in her work, portrays the relationship between the person and the cat as one that appears to activate or stimulate each figure's connections not only to each other but also to the broader spiritual or energetic connections between each figure and the world around them.⁴⁵

In *Three Destinies*, three figures, seated in separate buildings, write, paint, and drink, respectively. They are not aware of one another, but Varo draws faint, pale lines that curve like floating threads; the threads are connecting them to one another, to a small glowing sphere in the night sky, and to some kind of machinery or mystical-appearing mechanism consisting of rotating spheres, pulleys, spirals, or wheels. According to Varo's note, the three figures are connected to this "complicated machine from which come pulleys that wind around them and make them move (they think they move freely) ... [but] the destiny of these people... unbeknownst to them, is intertwined and one day their lives will cross"⁴⁶ (qtd. in Kaplan 181).

In both paintings, Varo makes visible "invisible" connections using imagery that evokes both mathematics and mysticism. These connections are specific and do not erase the differences among figures but portray these connections as in the process of becoming, or emergent, and specific to time and place.

⁴⁵ Georgiana Colvile suggests that the cat "connects her to a receding reality" (174).

⁴⁶ Quotations from Varo that use citations from Kaplan's book are using Kaplan's translations.

Connection in Barad and Varo

The paintings discussed above are merely two examples of a common motif in Varo's work, the use of threads or rays of light to show connections among figures and objects, especially those connections that often go unseen. While Varo's interest in various spiritual traditions does much to explain this preoccupation, it is important to reiterate that these portrayals of connection also suggest accountabilities. Varo, an advocate of kindness toward animals and especially cats, portrays in *Sympathy* a relationship between equals that appears to emotionally, spiritually and creatively stimulate both the human and the cat; the bright color and dynamic angles of the beams of light that emanate from the relationship suggest that the seemingly simple act of acknowledging the (animal) Other is intellectually or creatively invigorating. Barad similarly suggests that there is great political *and scientific* invigoration to be found in acknowledging the entanglements of which one is a part.

The threads connecting the figures in *Three Destinies* suggest that the separateness of these figures is only there because they conceive of themselves as separate. The isolation of each figure in a separate tower is not shown to be illusory, exactly, but the separation is shown to be something that is only visible from certain perspectives and not others; the figures cannot see the connections, but the viewers can. In fact, the viewer can *only* see the figures as isolated from one another by enacting a cut and examining certain parts of the painting (the separate buildings) and not others (the connecting machine made of mystical lines and circles). In this way, Varo elucidates Barad's assertion that any consideration of two or more separate phenomena is enacting a

cut that performs said separation; separateness is something that is enacted, not an a priori state. Varo calls into question *the processes* by which people understand what they are separate *from*, and suggests that often, this separateness is an inability to see the entanglements that connect them.

These paintings therefore illustrate the similar understanding of connectivity, agency, and accountability in the works of Varo and Barad. Varo's paintings reveal the stakes of this understanding of connectivity, both with concrete examples (such as human-animal relationships and the way individuals' lives affect one another), and with the spiritual dimension to these relationships that Varo evokes. Barad also illuminates Varo's paintings; using the lens of agential realism to understand Varo's work, which so often makes "invisible" connections visible, reveals that Varo is doing much more than suggesting common bonds among living things. Varo is engaging in a rather sophisticated inquiry into how we visualize connection and separation, and the ethical implications of these visualizations. This is far from a simplification or romanticization of the continuities between science and spirituality. In Varo's work, science and other knowledge work are not always portrayed as a rapturous one-ness with a vaguely defined cosmos. Instead, Varo's explorations of spiritual-scientific continuity suggest highly specific and local accountabilities – in these paintings, attention to agencies reveals profound relationships with the cat on the table, or the unseen neighbor. This conclusion, if extended to consider Varo's treatment of myth and mysticism more broadly, suggests that her repeated use of these elements serves as an inquiry into the ethics of narrating connection.

Agencies, Relationships, and Other Scientific Apparatuses

Both Varo and Barad re-figure “scientific apparatus” in a way that suggests a broader and more liminal, in-motion definition. The scientific apparatus is shown to be in constant transformation, engaging in multiple intra-actions. In this way, Varo and Barad provide similar alternatives to the post-Enlightenment understanding of science, apparatus, experiment, and subject and object. For example, Varo’s *Laboratorio* is not merely a celebration of the mystical or fantastic elements of science, but rather an exploration of the ways that a scientific apparatus, although it is presumably designed to wield control over how the object of study interacts with the environment, defies such controls over its connections and agencies.

Description of Varo’s *Laboratorio*

In *Laboratorio*, Varo comments cleverly on notions of scientific apparatus. The painting depicts a laboratory housing several objects that are recognizable as scientific apparatuses though they are decidedly non-standard, since they take on odd and impractical shapes. The building itself is full of skewed ceiling panels and walls, and the angles at which they meet do not seem to be possible in three-dimensional space; the building is distorted. The central piece of scientific equipment, a distillation set-up, is needlessly complicated and integrated with this skewed building, as the glassware winds around and through architectural features. There are several other glass vessels in the laboratory, which appear to be laboratory equipment as well, but the vessels take on bulbous and asymmetrical shapes, and the largest glass vessel’s shape evokes both a

human body and a branching plant. In the left foreground, a plant is growing in the shape of a person; this person-plant is in the same pose as the small silhouette of the figure wearing a cone-shaped cap that is walking in the door at the back. The painting, therefore, shows this laboratory as a place of skewed boundaries; the roof meets the walls at unlikely angles, the distillation apparatus is literally inextricable from the building, and the glassware and the plants take on shapes that suggest these objects have a life and an agency of their own.

Varo's *Laboratorio* and Barad's Definition of Scientific Apparatus

In *Laboratorio*, Varo raises questions about what counts as scientific apparatus, and what aspects of the scientist, and of the surroundings, shape the apparatus and even *constitute* it. In Varo's painting, there are not clear boundaries dividing the scientist from the scientific apparatus, the object of study, and the location of all these entities; indeed the plants and apparatuses seem to imitate the scientist.⁴⁷ Varo does not suggest these complexities make productive scientific work a mere fantasy; the distillation does appear to be working. But it would be difficult to claim that the laboratory is a neutral place where events are determined by the laws of nature and not by local constraints (the skewed building) or the particularities (and peculiarities) of the apparatuses or the knowledge worker (the glass vessels look like they are growing; the plant appears to mimic the magician-scientist at the back of the room). This laboratory, full of eerie growth and organic shapes and vaguely mythic overtones⁴⁸, is not at all the post-

⁴⁷ Certainly, there are parallels to *Unsubmissive Plant*.

⁴⁸ While Varo's use of combinations of scientific and mythic imagery could possibly be used to promote a view of science as a transcendent experience (the way that some cultural sites have used 'relativity' or other concepts to draw connections with Asian or other non-Western spiritual traditions, for example), this sense

Enlightenment fantasy of a sterile laboratory environment that will not unduly influence experiments. Furthermore, the way that the laboratory is portrayed as in flux, the intextricability of the scientific apparatus from its location, and the refusal for various objects to stay put in their proper shape, all suggest an inquiry into the nature of scientific knowledge-making; specifically, Varo suggests here that the ‘incidentals’ – the characteristics and location of the laboratory and the equipment – are not things which should be overcome or compensated for to produce scientific knowledge; this painting suggests that one must account for these peculiarities and blurred boundaries, and consider them *the means through which knowledge is made*, rather than trying to make them appear insignificant enough that they do not matter.

Barad defines apparatus as “*not mere observing instruments but boundary -- drawing practices – specific material (re)configurings of the world – which come to matter*” (Barad 140, emphases in the original). She further argues that apparatuses are “specific material reconfigurings of the world that ... emerge in time... and reconfigure spacetime as part of the ongoing dynamism of becoming” (Barad 141). Given the sophistication and depth of Varo’s interest in science and other knowledge worlds,⁴⁹ it is again reasonable to conclude that Varo’s interest in the agencies of scientific work make it possible to view *Laboratorio* through the lens of Barad’s theories. The laboratory is portrayed as in the process of becoming something new, which does much to explain the

of joyful transcendence is contradicted by the tone of unease in these paintings, and in the way Varo portrays scientific work as onerous, tedious, and full of unpleasant surprises; see the paintings entitled *Harmony* or *Discovery of a Mutant Geologist*, for example. Varo of course is not alone in seeing a multitude of connections and relations among science and other mythological discourses; one productive way to utilize previous work on these connections might then be to consider myths as part of the agential apparatus of knowledge-making, and to ask whether a myth’s agency differs from that of other stories’.

⁴⁹ Kaplan also discusses the praise Varo has drawn from scientific communities for the conceptual understanding that her works reveal (177).

motley set of images in the painting. Furthermore, Barad's definition that apparatuses "have no intrinsic boundaries but are open-ended practices" that produce the "differences that matter" (Barad 146) resonates well with Varo's portrayal of scientific apparatuses in *Laboratorio*, and indeed reveals that the connectivities evoked by the painting are quite similar to Varo's other paintings about scientific work. Application of Barad's view also suggests an interpretation of this painting in which the laboratory apparatus is growing, which would explain why the distillation set-up travels vine-like up the architectural support, and takes on organic shapes. Furthermore, the smallness and obscurity of the human figure in the painting might thus evoke a lesser agency on the part of the magician-scientist and greater agency on the part of apparatus; again, human agencies are not the only agencies in play. More importantly, there is not a clear boundary or "cut" between the apparatus and "everything else"; the viewer must make that cut, and thus the viewer must pay attention *to the processes* by which that cut is made. Varo, like Barad, thus suggests a more performative understanding of apparatus.

Entangled Knowledge Work

Both Varo and Barad attend to the processes by which knowledge work sifts out relationships and correlations among a plethora of possibilities. Both do so in a way that emphasizes the contingent and performative nature of knowledge work.

Varo's *Harmony*

Because I will argue that *Harmony* most fully conveys Varo's theorization of the agencies of scientific work, it will be useful to describe and contextualize the painting

with more specific detail than the other paintings; this is also necessitated by the fact that *Harmony* contains great detail, and many of these details are specific references to mathematical or scientific discourses. What follows, therefore, will be a description of the painting, a discussion of the painting's use of allusions to mathematical and scientific history, and a suggested interpretation of the painting.

In *Harmony*, a seated figure is trying to place objects on a musical staff, a row of five wire-like lines with a treble clef that presumably appears three-dimensional to the seated androgynous figure; the staff is not on a piece of paper but is more like a sculpture that sits before the figure. It appears that the figure is trying to arrange objects on the staff to discover the desired harmony, and it is ambiguous whether that is the goal in and of itself, or if this harmony will have some broader ramification; according to Varo, this figure is "trying to find the invisible thread that links everything" (Kaplan 178). The objects the figure experiments with are of sundry type, and are on the staff, on the floor, or spilling out of trunks and drawers.

The portrayal of knowledge work is quite prominent in this painting, and the scene contains many objects of symbolic importance; it is therefore appropriate to more extensively comment on this painting, since it provides such a rich set of possibilities for the discussion of agencies in knowledge production. Among the objects are leaves, shells, geometric solids, turnips, and pieces of paper with irrational or complex numbers written on them. In addition, the room seems to be changing and shifting, especially in the floor tiles that are disturbed as plants and swaths of cloth float up from the disrupted floor, and in a bird's nest that is emerging out of a chair. There are also two women or female spiritual figures, emerging ghostlike from the walls, who are taking part in the project,

although it is unclear if the central figure is aware of them. These women appear to be benevolent, and so their supernatural characteristics may suggest that they are Muses in some loose sense, or that they are connected to the true harmony that the figure seeks.

According to Kaplan, the painting draws on the history or legends of the Pythagorean cult, the mathematical-philosophical-religious society, and their idea of the music of the spheres. Some background information on the Pythagoreans (also called the Pythagorean cult) will be helpful here.⁵⁰ They were a group or school of men and women with an enormous influence on ancient Greek (and later European) philosophy, mysticism, and mathematics, and their ideas are still referenced by those interested in mysticism.⁵¹ They *could* be characterized as a spiritual/religious group that used mathematics and other types of knowledge to this end, *except* for the fact that they would not have seen a division between math and mysticism in the first place. To them, mathematics, science, numerology, astronomy, religion, and music were inextricable from one another, since all were ways of understanding and expressing the nature of existence.⁵² For this worldview alone, there are some immediate parallels to Varo's paintworlds⁵³ and *Harmony* in particular.

The spiritual and ritual practices of the Pythagoreans are known only in a loose way, as is common with people who lived thousands of years ago in secretive cults from

⁵⁰ The Pythagoreans were a relatively woman-inclusive religious-philosophical group in the ancient Greek world, according to reputation, in terms of the number of women participating in and leading the group (Wertheim 23-25).

⁵¹ Interestingly enough, the famous Pythagorean Theorem was known to Babylonian mathematicians 1000-1500 years earlier, and in China and India 500 years earlier. Their accomplishments, however, were not limited to this theorem, obviously (Calinger).

⁵² In *Surreal Friends*, Teresa Arcq notes that Varo, like her friend Leonora Carrington, explored diverse spiritual and mystical traditions and integrated some practices into their daily lives. These explorations included Graves' understanding of the divine feminine, as well as numerous divination and alchemical interests.

⁵³ Like many mystical groups, the Pythagoreans attributed special power to the five-pointed star (a common occurrence in Varo's paintings), even possibly using it as a symbol for their group.

which few documents survived. The well-verified information about the Pythagoreans is particularly scant, however. It is common knowledge, however, that their spiritual practices were deeply entwined with making discoveries; the search for understanding of the world was key to their religious practices. They likewise asserted that searching for understanding is the most important work of human beings.⁵⁴ In Varo's works, too, there is the emphasis on the spiritual and revelatory nature of intellectual inquiry, with her many heroes who are on journeys of discovery. In *Harmony*, for instance, the space is full of equipment that seems appropriate for a laboratory experiment. It also seems that the experiment/creation is what illuminates the space and the central character, who is the center of light in a dim room.⁵⁵ This emphasis on the spiritual nature of mathematical and musical discovery is key to showing how and why Varo evokes Pythagoreanism.

The Pythagoreans had a perception of a harmonious order of the world and skies, and the interconnectedness (through number) of all things. Music and mathematics were, to them, part of the same inquiry. They were among the first (known) to show the mathematical relations of string lengths to produce octaves and chords. The imagery they used to describe the order they believed held the key to understanding the nature of both inanimate and animate things was the "harmony of the spheres" (de Vogel); notably, there are actually several spheres present in the room in Varo's *Harmony*. This Pythagorean harmony of the spheres referred to the single notes that a siren on each celestial body would make, working together to form a beautiful music (de Vogel). All

⁵⁴ Although some of the following information about the Pythagoreans may be of suspect historical accuracy, what is more to the point is that Varo, an avid reader about both scientific and spiritual traditions, would likely have been familiar with even the more outlandish of these legends about the Pythagorean cult. Janet Kaplan points out the likely influence of the Pythagoreans, for example, particularly with regard to *Harmony*.

⁵⁵ In Varo's painting, however, there is not necessarily a romanticized view of scientific revelation; the figure in the painting looks to be engaged in a monotonous task, based on the figure's facial expression, for instance.

things are number, and everything is part of the great, cosmic harmony of the spheres; all components of the harmony are numbers, since everything is made of number, and the harmony itself is an expression of a numerical relationship. Human music is a mimesis of this celestial music and therefore has the power to heal sicknesses and help harmonize people's lives. Balance and perfection, in this view, took on the imagery of the perfectly tuned string (Burnet 112).

By bringing this view of harmony and mathematics to the interpretation of Varo's painting, it becomes evident that the arranger may be trying to become in tune with her or his surroundings, or be trying to make the surroundings in tune with some greater celestial order. She or he may also be investigating musical-numerical harmony and, possibly without intention, *causing* the seeming state of flux around her. The helpers in the wall may have some connection to the sirens of the celestial spheres and may be helping the mimetic process: they are Muses of her science. There is no indication, however, that the central figure is aware of them or knows the role they are playing.

Furthermore, in the Pythagorean worldview, numbers had a physical essence, even more so than fire, water, etc. Numbers are the essence and substance and form of all existing things (Maziarz 12-14). Numbers and sounds are not just ways of describing things; they are the things themselves. Similarly, the clef and staff in *Harmony* form a musical instrument that *makes* the reality around the figure (Kaplan 191). The Pythagoreans also had the idea of the world-breath, also called a "boundless breath" (Burnet 108). This breath is inhaled by the world from beyond the heavens, and it divides the limitless into discrete units, thus creating number. This image of the world-breath is particularly striking, given that the arranger is creating her or his own harmony

of spheres (and other objects) and will presumably blow into the trumpet-like clef to give them life.⁵⁶

The objects on the staffs are also reminiscent of Pythagoreanism:⁵⁷ the pieces of paper with number on them, for instance. The scraps of papers have i (the square root of -1) and π (3.1415...) written on them, and are put on the staff with objects like plants or crystals that may seem to have more physical presence. Pi is clearly important; it is what allows for the study of circles, spheres, and curves, and it is interesting that the arranger has only a few digits, which may be why the quest for harmony is still ongoing. The other number is an imaginary number, but it is an important number in much of mathematics since it is the basis for much of modern mathematics.⁵⁸ There is an irony here, which is likely intentional: according to common legend, the Pythagoreans thought whole numbers were true and pure, and this arranger is trying to achieve a Pythagorean harmony using an irrational and an imaginary number.⁵⁹ There are actually several legends suggesting that the possibility of the existence of irrational numbers may have led people to murder Pythagoras. The mathematics of Varo's time, however, would have been quite comfortable using pi and i as some basic numbers that are vital to understanding mathematics. The references to pi and i may therefore suggest something more recent than Pythagorean mathematics, namely that the figure is attempting to create

⁵⁶ This imagery of Pythagorean harmonious connection, however, is used with some degree of seriousness and some degree of parody in Varo's work. The most revered objects are represented as being crumpled or scraggly, and the painting achieves an ambiguous emotional tenor in which the figure seems equally engaged in ritualistic concentration and a sense of bored drudgery.

⁵⁷ Many of the legends about the Pythagoreans I discuss here are from de Vogel or Burnet, except where noted.

⁵⁸ " $e^{\pi i} + 1 = 0$ " is a formula well known to those interested in mathematics, and is thought to have an almost mystical simplicity. Notably, it is thought to be the equation that best symbolized the unity and synthesis of the major branches of modern mathematics.

⁵⁹ An irrational number cannot be expressed as a fraction of two integers. No real number squared is -1 , so i is imaginary (but useful).

a new, non-Euclidean mathematics not limited to rationals or reals (very un-Pythagorean in other words). This new mathematics may poke fun at the inability to conceive of alternate possibilities and alternate worlds/worldviews (in that the Pythagoreans thought that irrational roots were monstrosities), but may also be evoking the slow, processual struggle that comprises knowledge work (which may be as relevant for a surrealism-inspired painter as for a scientist or for a Pythagorean with a staff). Regardless, the figure appears to be looking for a new mathematics – i.e., a new way of conceiving the world.

In the painting, there are also flowers and leaves and shells on the staffs, which Varo elsewhere suggested may have magical powers (Kaplan 179). The spiral shell is also a shape associated with geometry, as are the many crystals and prisms and pyramids (which also have mystical connotations in many traditions).⁶⁰ The nicely made bed is also interesting, since part of Pythagorean moral code was to always straighten one's bedclothes.⁶¹ But it is relevant that the ladder leading up to the orderly bed has little physical integrity/orderly shape where it is closest to the characters and their work; the disorder increases the closer one gets to the central knowledge worker in the painting. The ladder, as well as the floor tiles, show a geometric pattern but are becoming disordered, since the tiles are wandering. Furthermore, there are plants growing from the floor, a nest coming out of a chair, objects spilling seemingly uncontrollably, and, of course, figures of another kind of existence bursting through the walls, breaking through

⁶⁰ The turnips, with their scraggly and uncontrollable roots, may also be a reference to Pythagoreanism, since they were well-known (sometimes primarily known) for vegetarianism. The vegetarianism springs from a belief in the transmigration of souls; souls living in different times as different people or animals. This imagery (again, not exclusive to the Pythagoreans) is found throughout Varo's work, with her animalistic personages, and, of course, the cats. The birds in this picture could be transmigrated souls, as well – could the arranger be the bird tending to the nest or the one escaping?

⁶¹ The bed is also womblike, and may be one of many birth images in this painting; it is certainly one of many (in Octavio Paz's depiction of the Mexican dichotomy) open rather than a closed images; like in *To Be Reborn* and many other paintings of Varo, this openness is access to great power. Kaplan, in her biography, notes the bedclothes' orderliness as well.

the rectangular architecture with the jagged lines of the loose fabric that surrounds them. Euclidean shapes abound in this painting, but they are being burst or distorted or scattered or skewed. In this painting, then, *geometry itself* is undergoing a transformation.

Varo's comments on this painting include that "The person is *trying* to find the invisible thread that links everything and, for this reason, is *skewering* all kinds of things on a staff of metal threads" (Kaplan 178 – my emphases). In this quotation, there is an ambivalence about spiritual/scientific/artistic investigation; investigation is often portrayed in her paintings and is of great importance to her, as demonstrated by her own voracious learning, but Varo suggests that this access to power brings with it a sense of danger. In her description of *Harmony*, there is an unsettling violence to this image of possibly sacred or supernatural objects being "skewered." Also, because the figure is "trying," the project is an attempt, an uncertain journey with many possible hazards that can spring up in the artist-scientist's nearest surroundings. This is reminiscent of some of Varo's writings on magical recipes,⁶² in which she also uses a somewhat humorous depiction of the mildly menacing possibilities of accessing spiritual powers: she jokes that one attempt to harness magic ended with "...my best blouse burned and a big deposit of salt appeared under my bed" (Kaplan 212).

In short, *Harmony* portrays a figure attempting to arrange objects in a way that achieves a harmony. This process may be an attempt to correct the disorder around her or him, or it may be the cause of this disorder if the figure is in fact changing from an old

⁶² Varo is less well-known for her writing than some of her contemporaries, largely because much of it was circulated only among friends (Cf. Emily Dickinson). She did, however, write a satirical work, *HomoRodans*, a mock-scholarly book on a sculpture she made, which depicted an 'ancient' and 'newly discovered' species that was human-like except for its having a wheel instead of legs. Besides this, most of Varo's published work that is widely available is in the form of very brief notes on her own paintings, compiled and published after her death by her late husband in the *Catálogo Razonado*.

geometry (i.e., an old way of ordering of the world) to a new one. In either possibility, knowledge work shapes the world around the figure. The figures in the wall that are helping the central figure, as well as the fact that there are many objects that appear to have some mystical or spiritual power, as well as the evocation of the Pythagorean idea of the power of numbers, all suggest a complex interweaving of agencies, only some of which the central figure is aware of.

Varo's *Harmony* and Barad's Theories of Entangled Knowledge

The process of sifting through information, together with the centrality and complexity of determinations of relevance, is especially interesting in *Harmony* as well. In theories of interdisciplinarity, this might be called a shift from interference to information, or from noise to signal (Klein 84). This process of *sifting* is key, as is the idea that sometimes the considerations that seem most irrelevant may be of vital importance.

For example, the combination of turnips and irrational numbers may appear to be complete absurdity, but it is quite possible in Varo's painting that the seemingly unlikely connections are the most profound. This may be Varo's spin on the surrealists' use of absurd combinations, or it might indicate Varo's belief in the underlying spiritual connectedness of all things. In *Harmony*, the combinations usually include items that are indeed connected in various spiritual/mystical traditions, including Pythagoreanism. I would argue that a more productive interpretation, however, is to note Varo's emphasis on this *sifting* process and on the profound shifts in the world that this kind of knowledge work may induce. For example, is the figure's work altering her surroundings? In other

words, Varo emphasizes sifting or filtering as an act that performs a cut between a signal and the noise that clutters that signal, and suggests that it is not clear or obvious at all what should count or what should not count as relevant. Determining relevance is shown to be a fraught and difficult process, full of surprises and unlikely connections. This portrayal suggests the contingent nature of scientific/mathematical work; it could easily proceed very differently than it has. The possible combinations and arrangements of objects and numbers are nearly infinite, and the knowledge worker makes only one arrangement at a time among these vast possibilities.

Furthermore, knowledge work is shown to be comprised of *specific* interactions and connections that may not be reproducible in the conventional sense. In Varo's work, the seated figure has other options than what he or she selects: a different geometric shape, a different number, and a different plant are present in the scene. The figure's selections seem to be careful and deliberate, based on the level of mental concentration shown by the posture and facial expression, but it is difficult for the viewer to see the logic behind the selection of those particular objects and that particular arrangement. Here, unlike in more "surreal" works, the *arbitrariness* of the juxtapositions of images is not visualized to create a jarring sense of randomness but to suggest that small details that seem to be of no import are actually central, *because they are connected in surprising ways to broader forces*. Furthermore, the multitude of possibilities – the discarded or ignored parts of the musical equation – are not gone but are still present in the room, in continued intra-action with the figures and the apparatus. The "irrelevant" noise is never really out of the picture; it is always there, looming with the possibility of further intra-

action. In *Harmony*, therefore, the sifting process matters, but it does not erase the noise, the interference, the extra, or the discarded; instead, it rearranges them.

This painting perhaps does the most to illustrate Varo's theorization of science; it shows the specificity and multi-layered nature of connection, the centrality of non-human agencies in scientific work, and the inextricability of the scientific apparatus from *everything* else. Furthermore, it suggests that scientific and other creative work is about transforming relationships and surroundings by finding different ways to sift harmonious combinations out of an enormity of possibilities.⁶³

Similarly, as discussed throughout this chapter, Barad's framework centers the processes by which knowledge work enacts a cut that includes some things *and excludes others*; there are a multitude of ways of performing these cuts, and they are not all equivalent, but they are highly contingent on the agencies entangled in producing this knowledge. Barad and Varo each portray science as an enactment or performance of engaging in relationships of agency that sift out some connections and not others. There is discovery, but it is not the discovery of a pre-formed truth that exists separately from the scientist; it is a performative process that is deeply and multiply entangled with countless seen and unseen forces.

Conclusions

Both Varo and Barad foreground the agencies involved in knowledge work; using this portrayal of agencies as a basis of comparison reveals that the resonances between Barad and Varo are multiple, specific, and deep. These include their portrayals of the

⁶³ Note that this view of knowledge work also suggests ways in which "unlikely comparison" might be useful in pointing out these multiplicities and exploring them more fully.

unsubmissiveness of nature, their blurring of the boundaries between the subject and object, their portrayal of connectivity, their shift in the understanding of “scientific apparatus,” and their attention to the processes by which multiply interacting agencies perform the “sifting out” of knowledge from noise.

The aim of this comparison is to show that it is possible and productive to use the portrayal of agencies, and especially the portrayal of the agencies of knowledge work, as a basis of comparison. Particularly, the chapter shows that this basis of comparison is useful in comparing across boundaries; in this case, it is used to compare visual materials to written material, and a “creative” work to a “theoretical” work. This approach emphasizes the narrative aspects of the visual work, and also shows the extent to which creative works are also theoretical and theoretical works are also creative.

Furthermore, the comparison demonstrates that Varo is an important (and relatively early) figure in the body of feminist studies of science that neither reject science nor reproduce its masculinist ideology.⁶⁴ Varo certainly does not suggest that an appropriate response to the patriarchal aspects of science is to reject or disengage with science; Varo, in fact, often portrays scientific work as a site of fascination, creativity, and transformation, even as she reveals that the scientists she paints may be bored or alarmed by their work. Inspired by Varo’s explorations of how scientific creativity is like other kinds of creativity, it may be possible to extend Barad’s theory of agency and posit one possible definition of creative work: work that re-shapes, re-configures, or re-tells relationships of agency. With this definition, it would of course be quite difficult to talk

⁶⁴ This statement is not meant to dismiss even earlier theorists than Varo, such as seventeenth century intellectual Margaret Cavendish, for instance, but rather to point out that Varo approached science in a way that is deeply reminiscent of questions that later became central to such bodies of thought as Science and Technology Studies and feminist technoscience.

about creativity in a way that completely erases political or social aspects, or matters of identity; instead, it encourages the discussion of local and situated knowledge practices. The definition also provides a way to understand many different types of knowledge work as creative, including science and mathematics, and could therefore promote connections and comparisons in unexpected ways, thereby promoting transdisciplinarity. It could also be used to evaluate highly transdisciplinary work; scholars such as Julie Klein have noted the obstacles to open-minded evaluation of such work, and the need for a richer vocabulary to do so.⁶⁵

Again, this resonates well with later feminist technoscience, such as with the enthusiasm for science seen in the work of Donna Haraway. Like Varo, Haraway shows enthusiasm for and appreciation of scientific knowledge, but that excitement for science in no way absolves one of interrogating the ethics and politics of science; quite the opposite, in fact.

Varo also uses scientific work as a way of theorizing creative work *in general*, which also has ramifications for the understanding of Barad. For example, this comparison demonstrates that “agential realism” would be a useful way to examine what relationships of agency are erased in making a cut between the “work of art” and “everything else,” and how these erasures occur. This topic might be of interest for future work in the application of Barad’s theories.

Finally, it is hoped that this comparison may lend support for another claim – that application of theory is best understood as a specific *kind* of comparison. This chapter could have easily been an application of Barad to Varo, or, for that matter, an application of Varo’s theory to the works of Barad. But it is hoped that comparing a “theoretical”

⁶⁵ She discusses many of these difficulties in *Crossing Boundaries and Interdisciplinarity*.

work to a “creative” work, in order to better understand both the creative achievements and the theoretical usefulness of *both*, reveals the fundamentally *comparative* nature of the application of theory. Application of theory is a search for similarities, and for productive resonances, that illuminate both the theory and the item that the theory is applied to. This is precisely what comparison, and especially comparative analysis, should do. For comparative literature, there are several implications for this comparative view of “application of theory”: it sheds light on the fact that comparative literature’s particular interest in theory is not a turn away from tradition so much as it is an especially productive and exciting form of comparative textual analysis. Furthermore, since comparatists might study comparison itself, and since “application” of theory is a form of comparison, comparatists might pursue further study into the processes and assumptions through which theory is applied to a particular situation. In this case, theory should not simply mean cultural and literary and epistemological theory, but instead, any application of “theory,” with examples drawn from a variety of disciplines and other sites, might be the proper subject matter of comparative literature. Further research might thus examine the nature of “application” and how it is similar to and different from other genres of comparative work.

In summary, this chapter demonstrates the usefulness of centering agential relationships in comparative work, and particularly the usefulness in centering feminist technoscience approaches in comparative literature, in order to explore the boundaries of what makes a comparison possible. The chapter also provides one such tactic for making “unlikely” comparisons, and for enabling these comparisons to center politics and ethics: using the portrayal of the agencies of knowledge work as the basis of comparison.

Chapter 3: Ada Lovelace, Cyberfeminism, and Time Travel:

(E)merging Comparisons

Introduction and Argument

Sharon Traweek has observed that a pronounced characteristic of recent epistemic shifts is a preoccupation with naming and defining such shifts (Traweek 30-33). In other words, we live in a time period that is engrossed with questions of how we frame, conceive, and inquire into our world differently than people did in time periods past. It is in the spirit of the times, then, that we can contemplate all the ways “the network” is an emblem and an engine of contemporary experience (or, at least, the discourses that support them). Beyond the changes of Web 2.0 and its successors, to say nothing of the influx of handheld devices with rapidly increasing computing ability,⁶⁶ there are a multitude of globalizing and hybridizing processes that challenge our notions of what counts as human, what counts as technology, and what constructs the ever-blurring boundary between the two.

In this context it is no surprise that computer and information technology more generally is a symbol not only of the hopes and fears associated with “technology,” but also of the hopes and fears – the transformations that are possible, and the dangers real and imagined – associated with new connectivities. This chapter focuses on one particular connection that illustrates the political and ethical implications of how one chooses to narrate the relationship between these two fraught categories, “technology”

⁶⁶ See Howard Rheingold, *Smart Mobs: The Next Social Revolution* for further discussion of the socially transforming nature of handheld devices.

and “culture,” and the relationships of both to gender and other identities. Specifically, the connections between Ada Lovelace, the nineteenth century computer theorist, and today’s digital women, reveal the dynamic instability of the boundaries between past and present. To pursue these questions, this chapter will examine select cyberfeminist narratives about Ada Lovelace in order to show the stakes – and the possibilities – in claiming Ada Lovelace as part of a technocultural matrilineage.

Specifically, I argue that these cyberfeminist narratives, through their innovative articulations of the similarities between Lovelace and women of the Information Age, do two things at the same time: they shift the history of technology in a more woman-centric direction, and they do so in order to narrate the history of women and technology – and, more broadly, the relationship between past and present -- in a way that is not so much a *timeline* as it is a *network that spans different specific points in space and time*. Time travel in this view is the operative form of connection in the history of information technology.

In making this argument, the chapter will also contribute to the dissertation’s explorations and arguments about the feminist stakes of unlikely comparison. The chapter compares select cyberfeminist works, but, in addition, each of these cyberfeminist works is *itself* a comparison of Lovelace and late twentieth century or early twenty-first century women; furthermore, each work makes a number of additional unlikely comparisons with heady political stakes. Through these unlikely (illegitimate) comparisons, these cyberfeminist works provide provocative and useful techniques for comparing across cultures and time periods in ways that are specific, feminist, and agency-aware; the conclusions will discuss the implications for comparative literature.

Cyberfeminism, as will be shown, has considerable overlap with feminist technoscience in both influence and approach, to the extent that for the purposes of this chapter, cyberfeminism will largely be considered a part of feminist technoscience in that the chapter will show what cyberfeminism has to offer those considering the future of comparative literature.

Additionally, the chapter contributes to the broader effort to demonstrate that cyberfeminism continues to have energizing resonances with more recent bodies of thought and should therefore be accorded a more central role in the discussion. In addition to its clear resonances with other feminist engagements with science and technology, cyberfeminism could be thought of as a kind of posthumanism, a set of theories of globalization, and a foundational movement in Digital Humanities, to use just a few examples. Therefore, it is of great benefit to more fully account for and attend to the foundational role of cyberfeminism as a movement that has deep resonances with current scholarly, activist, and technological projects.

This chapter will first provide a very brief overview of relevant background information about cyberfeminism and about Ada Lovelace's contributions to computer theory. The chapter will then analyze the film, *Conceiving Ada*, in order to illustrate the chapter's argument, that cyberfeminist accounts of Ada Lovelace reveal the networked, web-like nature of the strands connecting women, technology, and cyberfeminist ways of telling stories about time. The chapter will then consider the theoretical works of Sadie Plant and Amy Kit-sze Chan to further this argument.

The method here, as in the chapter on Barad and Varo, is to consider creative works as theoretical and theoretical works as creative; the reasons for this approach will

not be repeated here, but they are similar to those of the previous chapter. Here, however, even more attention will be paid to the “literary” features of the theoretical works, since it will be necessary to examine how these theorists’ experiments with form and language enhance their portrayal of time, women, and networks.

Wired Women

Before “wireless” became the keyword, it was important to be “wired,” since to be wired was to be connected. Similarly, the prefix “cyber” has fallen into some degree of disuse in the naming of new products and concepts. The term “cyberfeminist,” however, should not be considered obsolete. It played, and, I suggest, continues to play a vital role in examining the nodes of connection among gender, knowledge, and technology.

Those who identify as cyberfeminists have resisted fixed definitions of what the term “cyberfeminism” means. It is true that the term refers to a loosely bound and multiple set of communities, rather than a movement per se.⁶⁷ “Cyberfeminism” does imply, however, an enthusiasm for the connections between women and technology, which in the cyberfeminist politic is quite different from “women’s use of technology.” As will be shown, cyberfeminists trouble the definition of technology as a tool that a subject with agency uses. It will be useful here to acknowledge the problematic nature of this inquiry. Cyberfeminism is sometimes thought to be quite Eurocentric, and I do not

⁶⁷ The term “cyberfeminist,” like most words with that prefix, has seemingly fallen out of fashion in recent years in North American contexts, although there may be circles where it is still used. Globally, however, the term remains prevalent in many circles concerned with feminist approaches to technology; for example, curator (and artist) Evelin Stermitz has recently curated exhibits in various European countries that explicitly center on the term “cyberfeminist.” See http://evelinstermitz.net/biography/Biography_Evelin_Stermitz.pdf for more information.

suggest that this is a purely unfounded assumption, although this reputation may change if and when being online requires a less privileged set of circumstances than it currently does. Furthermore, as many cyberfeminists are quick to point out, it might be against the spirit of cyberfeminism to think of it as a monolithic community rather than, perhaps, as a set of nodes with varying connections to the term. For example, Donna Haraway does not claim a role in organizing or directly bringing together cyberfeminist formations; it would perhaps be more accurate to suggest that her “Manifesto for Cyborgs” was a boundary object around which cyberfeminist formations emerged. Finally, there is the issue that “cyberfeminism” is not really used as frequently as it used to be, especially in U.S. contexts, now that many more gender-interested communities of discourse are now also interested in technology, and that a somewhat greater number of technology-interested communities are interested in gender (especially in humanistic and social science discourse on technology).

Cyberfeminists generally also attend to the politics and ethics of technology; indeed, in the cyberfeminist aesthetic, the politics and ethics are inseparable from each other, and from spirituality and sexuality. It is notable for this reason that cyberfeminists generally claim to be heavily influenced by the related community of cyborg feminists, credited to theorist Donna Haraway.⁶⁸ Another key figure of cyberfeminism, however, is of course the woman whose name is earliest in most histories of computer science.⁶⁹

⁶⁸ Katie King, “Speaking with Things: an Introduction to Writing Technologies.”

⁶⁹ Most histories of computer science start with the work either of Jacquard or of Babbage and Lovelace (unless Lovelace’s work is erased from the story). Clearly, this convention does not take into account the fact that the history of machines might equally be considered part of the history of computers. There have, however, been efforts to correct these erasures, such as articles on the abacus and other similar handheld devices in the *Annals of the History of Computer Science*.

Ada Lovelace 1.0

Born in 1815, Ada Lovelace⁷⁰ was engaged with British scientific and intellectual circles from her teenage years onward.⁷¹ The projects that she focused on for most of her adult life are her work on the Analytical Engine and a course of study on what we now call neuroscience. Each allowed her to combine a number of fields which at the time (and in some cases, today) were thought to be largely separate fields of inquiry.

Her work on computer theory largely came about through her collaboration with Charles Babbage on the Analytical Engine. They met when Ada was only a teenager, but her support for and understanding of his work on the Difference Engine and especially the Analytical Engine produced a friendship that gradually shifted from mentorship to collegiality. While the Difference Engine was very much like a calculator, the Analytical Engine was a far more ambitious project that, although it was never built, is now recognized by many in the field of computer science as the first computer. The plan was to create an Engine that could handle highly complex operations that could be directed by the user with a series of punched cards, such as those in Jacquard's loom. Ada was fascinated by the plans for the machine and became Babbage's collaborator, and much of the significant work on the Analytical Engine was done in conjunction between Babbage and Lovelace and several other collaborators. Lovelace and Babbage worked on the

⁷⁰ This essay will refer to her as "Ada Lovelace" since most recent texts and films do so; the fuller (and technically correct) name is Ada Byron King, Countess Lovelace.

⁷¹ The biographical information in this introductory section comes from the following sources: Fuegi and Francis, Plant, and Toole for her intellectual contributions, with additional personal information from Moore and Toole. There have been significant debates about Lovelace's abilities and contributions, occasionally over-stating Lovelace's achievements, but frequently going to the opposite extreme and dismissing all of Lovelace's intellectual work. The latter is particularly true in work that draws from Dorothy Stein's 1985 biography, whose claims have been largely refuted by later research and analyses by Doron Swade, and by Jo Francis and John Fuegi. It is not the intent of this essay to rehash these arguments, but rather to examine how and why recent cultural sites find resonance between Lovelace and late Twentieth and early Twenty-First Century cultures. It is appropriate, however, to acknowledge my use of the more recent scholarship, including the more technically rigorous work of Swade, as an influence on how I interpret these cultural sites.

mathematical and technoscientific aspects of this project as well as (less successfully) attempting to garner public interest in and a continuation of government funding for it (a lengthy discussion of the funding issues, and their relation to Babbage's feuds with politicians and engineers among others, are well beyond the scope of this project, as are the numerous manufacturing difficulties).

In 1841, Babbage gave a lecture in Italy on the Engine, and Louís Menabrea published in French a brief description of the content of that lecture. Lovelace translated Menabrea's text into English and appended a series of *Notes*, which ended up being over twice as long as, and far more substantial than, the text being annotated; she signed it with her initials, A.A.L. The *Notes* are often considered a major contribution to computer science for several reasons. These *Notes* are the most thorough account of the design, operation, and future potential for the Analytical Engine. More importantly, it is the first work of computer theory. According to Doron Swade, it was in Ada's *Notes* that the leap is made from a calculating machine to a computer⁷² – because Ada understood and explained that such a machine could do anything that could be reduced to the manipulation of symbols. The *Notes* are also the first published step-by-step explanation of how one might use the Analytical Engine for a specific purpose (in this case, the rapid calculation of the Bernoulli numbers, a sequence of numbers important to the study of number theory), which is why Lovelace is often called the first computer programmer. This choice to demonstrate the Engine's potential for complex mathematical calculations – and precisely the kind of calculations that are time consuming and tedious for human beings without the use of machines to perform -- is itself strong evidence for Lovelace's ability to understand precisely the applicability of this potential new technology.

⁷² Swade explains this point in the documentary film about Lovelace, *To Dream Tomorrow*.

Consider that many early artificial intelligence theorists of the twentieth century believed that it would be far easier to ‘teach’ computers to move and perform physical tasks than it would be to perform complicated mathematical operations (Hoffman 87). Furthermore, her comments seem to have predicted many of the lines of inquiry that computer scientists have been and are now developing. Many early theorists⁷³ were prone to making claims about future leaps in ‘intelligent behavior’ and other capabilities of computers, which often turned out to be far more problematic than assumed. The Notes, although quite imaginative, and although they take as their subject a machine which would not be built until the next century, are remarkable for their precision and restraint in equal parts with their daring and creativity.

What may be even more remarkable is that the *Notes* foresee, long before any such machine was built, a host of issues and possibilities that seem uncannily prescient today. Just a few are: the transformation of the realm of possibilities for scientific and mathematical work with its speed and accuracy; the possibility of many other purposes for computers such as the composition of music; the aforementioned question of artificial intelligence (now referred to as the “Lovelace question,” a phrase coined by Alan Turing, who was influenced by Lovelace and Babbage’s work);⁷⁴ the inseparability of mathematics and metaphysics when discussing thinking machines; and especially the clear and forceful recognition of precisely how innovative this machine would be, precisely what makes it distinct from all previous machines; and the Analytical Engine’s

⁷³ Here, I am using “early” to refer to pre-1960’s computer science.

⁷⁴ In addition to providing this information, John Fuegi and Jo Francis, in the article "Lovelace & Babbage and the creation of the 1843 'Notes'," in *The Annals of the History of Computer Science*, provide a more in-depth look at the direct connections and influences that Ada Lovelace had on Turing and on the development of the twentieth century computer, a connection that has long been denied. I focus, however, on the narrative and political possibilities of looking at a multiplicity of indirect connections.

potential to revolutionize practically all human endeavors. The Analytical Engine was never built, however, due to a variety of political, financial, and engineering constraints, and nothing even like it was built for a century.⁷⁵

Ada's work on neuroscience, like her work on the Analytical Engine, was also quite forward-thinking; it is so prescient, in fact, that it begins to make sense that so many recent narratives portray Ada as jumping to the present or future rather than staying put, so to speak, in the Victorian age.⁷⁶ Lovelace, believing that the methods of her time were ill-suited for the study of the brain and nerves, and wanting to take part in the effort to show precisely *how* the mental is actually material, wrote that she had "hopes and very distinct ones too, of one day getting cerebral phenomena such that I can put them into mathematical equations; in short, a law or laws for the mutual action of the molecules of the brain" (Toole 166), and she called this new field of study a "Calculus of the Nervous System" This is quite a contrast to the mesmerism and phrenology espoused at the time (and in which at times Ada was also interested), but this radical new approach was perhaps even more 'out of synch' with the nineteenth century than her computer theory; the utter dominance of molecular approaches in most areas of biological science in recent decades shows her foresight yet again, and the increased integration of the physics,

⁷⁵ The purpose of this essay is not to enter the debate over the intellectual contributions of Lovelace but to examine how and why these contributions are of interest to feminist communities of the past two decades. Because there is some contention over the issue of Lovelace's work, however, it is worth noting that recent scholarship has largely confirmed Ada's authorship of the *Notes*, her independent theorizing on the Analytical Engine, and her overall contributions to their collaboration. While many histories have questioned Lovelace's skill, knowledge, achievement, or value to the work on the Analytical Engine, most have used Dorothy Stein's 1987 biography as their source. The central claims of this work, that Ada contributed very little of scientific value, and that she had no real understanding of this work, has been called into question (and I think refuted) by recent works by Swade, Toole, and Fuegi and Francis; examination of the correspondence between Lovelace and Babbage, edited by Toole, provides confirmation.

⁷⁶ Of course, an even more famous example of such a narrative (though not cyberfeminist) is a fictionalized version of Ada in Tom Stoppard's *Arcadia*; see also John Crowley's *Lord Byron's Novel: The Evening Land*.

chemistry, and biology is a process that is widely considered to be a *current* priority for the bioscience disciplines; her framing of her new field of study also evokes recent work in mathematical modeling, and physical chemistry approaches to biology. Lovelace hoped that this work might ensure her intellectual legacy, but it was cut short by her illness, generally thought to be cancer, from which she eventually died. During her lifetime, a number of other illnesses (and likely some misguided treatments) as well as family-related distractions impeded her work, but it is also quite possible that her neuroscientific work was, like the Analytical Engine, too far ‘ahead’ of its time – the technologies of observation/measurement required for a molecular approach to the brain have only recently been developed (and some might argue that appropriate technologies *still* have yet to be fully developed).

Throughout her life, Lovelace delved into ideas that seemed better suited for a twentieth century scientist; even as a child, she tried to design a flying machine, and even carefully studied avian anatomy to shape her plans.⁷⁷ As an adult, Lovelace had many interests, and was well-versed in most intellectual fields of her day. In connecting these ideas and approaches, Ada could be, and sometimes has been, thought to fit better in today’s world than in her own. The *Notes*, however, including the computer program written long before computers actually existed, are the primary reason why many narratives of Lovelace, both fictional and biographical, tend to portray her as refusing to stay put in her own century.

⁷⁷ Leonardo Da Vinci famously had similar dreams.

Motherboards and Matrilineage in *Conceiving Ada*

Lovelace is a key character in the 1997 film, *Conceiving Ada*, which was written and directed by Lynn Hershman-Leeson. Hershman-Leeson identifies explicitly with cyberfeminism, and the film considers the relationships between women and information technologies. The film is about a scientist in the present named Emmy who finds a way to connect with people, things, and time periods which were previously assumed to be inaccessible -- in other words, she ventures into all the areas that are off limits. As Emmy develops this technology, she interacts with Ada Lovelace, who is portrayed as her feminist and scientific ancestor as well as a kindred spirit.

The film is fictional, of course, but there are numerous scenes depicting moments in Ada's life, as well as the scenes in which Ada and Emmy are directly conversing with each other. Many of these scenes seem to draw on some common tropes of the biographical accounts of Ada which might be problematic to the film's declared feminist sensibilities: an uncharacteristic humorlessness in Ada, the portrayal of Lady Byron as a relatively simple-minded force of oppression, etc., and there are some inaccuracies in names and dates as well. However, since the film is clearly fictional, I will not note all the biographical inaccuracies, and instead consider the entirety of the film to be an imaginative rather than an historically accurate narrative.

The character of Emmy is actually the focus of the film, but her relationship with Ada takes a central role. Emmy is a computer scientist working on artificial life forms: she is called the "mother of cybergenetics." She feels a special kinship with Ada Lovelace, as part of her intellectual heritage, since she learns that, "[it was] with Ada Lovelace that the history of computing ... and women's liberation were directly woven

together.”⁷⁸ Emmy’s work involves creating simulated life forms, and they eventually take on their own agency (an animated dog, for example, is programmed to repeat words but acts suspiciously like a conscious subject), and she eventually manages to send ‘Charlene,’ a simulation of a robotic bird, into the past to allow Emmy to view various events of other time periods. Eventually, this work enables her to access and communicate with Ada, and even more importantly, Ada can hear her and *respond*. Emmy also seems to be able to see or remember Ada’s life experiences through Ada’s eyes.

Emmy is similar to Ada in a number of ways. They are both portrayed as visionaries who are ‘mothers’ of their fields, which may evoke strength and gynocentrism but also tricky issues with the classification of women’s intellectual work. They both revolutionize the relationship between persons and technology by creating an entirely new theory for new fields of study, and they are both characterized as too far ahead of their respective times. For example, a television interviewer assumes that Emmy’s current work will not actually occur until many years in the future. Their work draws on many disparate knowledge practices, and their accomplishments make them seem not merely more ‘advanced’ but *ill-suited* for their own time periods. This is perhaps *why* Emmy tries time travel: to meet another woman who sticks out like a sore thumb from the dominant narratives of progress.⁷⁹ These dominant narratives of progress suggest a

⁷⁸ Weaving, technology, and women will become central themes later in this chapter.

⁷⁹ A good example of this view of “progress” in science and technology is the metaphor of “standing on the shoulders of giants,” an image made famous by Isaac Newton. The latent masculinism of this metaphor is telling in that it connects towering “greatness” with the notion that it is only through direct and continuous connection and influence with past greats that the “hidden” view is discovered; implicit is the assumption that science is largely about individuals (on their own, and not propped up by the knowledge work of their subordinates) who discover and explore previously unseen territory. Cf. Londa Schiebinger’s argument that the Western colonial-scientific projects in the name of “Discovery” made the colonization of

continuous timeline of direct influence, which in the Modern era is presumed to be largely free of gaps and twists and fragmented curves, with each great technological step forward a direct result of the accomplishments of the directly preceding generation; note that this portrayal depends on the assumption that it is extremely rare for great accomplishments to be ignored in their own time or forgotten by later generations. Furthermore, such views create this sense of a continuous timeline of technological history by portraying each step “forward” as part of one linear path, and each “great mind” is bound or affixed to its time period; all valuable knowledge work, in the model of linear progress, is a push in the same direction, with each person involved inflexibly tied to a time period or era.

In contrast to this model of direct, continuous influence, in *Conceiving Ada*, Ada Lovelace is identified with several aspects of twentieth century feminisms, but it is not merely through the standard means of “influence.” Ada and Emmy’s connections are not mediated by several generations of the mainstream (male-centered) field of information technology – though the connections certainly are mediated, as will be shown. Instead of merely being part of a vast linear historical timeline of technological development, Ada and Emmy have multiple connections and resonances. Ada’s desire to devote herself to her work instead of to the burdens of motherhood resonate with a subplot in which Emmy is surprised by an unwanted pregnancy. The film, however, ends with an apparently free-spirited (i.e., motorbike-riding) Emmy happily sharing her love of computers with a daughter, which may suggest (perhaps problematically) that today’s

(feminized, lower) Nature the guiding mode of Western science (*Nature's Body: Gender in the Making of Modern Science*), and Phillip Davis and Reuben Hersh’s critique of the Western romanticizations of the lone genius with special access to the secrets of the cosmos (*The Mathematical Experience*).

(professional urban British) women can ‘have it all,’ and that the conflicts of responsibility can be satisfactorily tackled with some combination of technology, female strength, and inspiration. This achievement is performed through the old sense of the “inspiration,” in fact, since at the end of the film, Ada literally inhabits Emmy’s daughter, as demonstrated by the denouement’s flash forward scene with Emmy and her computer-loving daughter. Emmy was pregnant at the time of her communion with Ada, and the scene shows that the daughter has ‘inherited’ Ada’s memories, thus making Ada *literally* an ancestor to future digital women.

More provocatively, there are also a number of scenes in which Ada gazes directly into the camera, in an act of resisting the filmic male gaze, to use the terms in the vast body of feminist film theory based on Laura Mulvey’s understanding of the male gaze in *Visual and Other Pleasures*. This technique discomfits the audience with the direct gaze of a woman, who thereby resists the objecthood and the viewer’s voyeuristic pleasure that the filmic apparatus might place on her.⁸⁰

There are clearly a number of important border-crossings in the film. As the ‘mother of cybergeneics,’ Emmy is blurring the biological and the digital in unprecedented ways. Obviously, the communication with Ada is another. Seeing through Ada’s eyes makes Emmy able to blur the boundary between self and other, but in a specific, directed way, in which those aspects of her identity that she finds most important - woman, feminist, scientist - are *enhanced* rather than *elided*. Furthermore, this Ada that she contacts is *simultaneously* the historical Ada and the AI (artificial intelligence) Ada. Ada is thus simultaneously ancestor and daughter, and the sum of

⁸⁰ This technique is common in feminist film and can also be seen famously in Jane Campion’s *The Piano* and Sally Potter’s *Orlando* (which also stars Tilda Swinton).

these liminalities points to this reformulation of the boundaries among past, present, and future. Lines that separate human from animal and biological from machine are likewise blurred or reformulated.

Additionally, these border crossings are illustrated by the film's portrayal of the character of Sims, Emmy's mentor. Sims (played by Timothy Leary) provides crucial advice for Emmy's project by suggesting that the boundaries between self and other, and between one and many, are illusory. His name of course evokes another blurred boundary between 'real' and 'simulated,' as does the fact that he only appears to Emmy on a screen. Not surprisingly, images of liminality abound: Ada is most often pictured, and first accessed, in a hallway full of doors.

The connection between Ada and Emmy is not conventional time travel, however, but a kind of travel among subjectivities and consciousnesses. Moreover, it is precisely the boundary-crossings of various categories of knowledge that allow for this special brand of time travel; one could even interpret the film as showing a situation where boundary crossings of various knowledge practices literally become a kind of time travel: ideas and goals come from computer science, virtual and actual animals, sonograms, philosophy (especially from Sims), and history. In this film, then, unlikely hybrid knowledge practices afford opportunities for transforming not only the knowledge practices themselves but also their implicated subjectivities. In this way, in this film transdisciplinarity becomes time travel and vice versa.

Interestingly, the first communication evokes the question of whether the mutual communication of Ada and Emmy is *really* mutual or if it is something Emmy does *to* Ada. Ada is terrified at first but eventually of her own volition removes her hands from

her face and *gazes back*. The fact that Ada can *speak* back is also key; the object of study is also a subject in her own right, with her own agency. Furthermore, the relationship between the scientist and “the studied” appears to be based on caring and mutual respect.

Another way the film comments on the agencies of these relationships is the fact that Ada’s memories are saved at the end of the film. Neither Ada nor Emmy ‘save’ Ada’s memories, although Emmy makes the offer. But the memories are saved nonetheless. The most likely possibility suggested is that the memories *themselves* are agents in the world. Digitalized information is not stored or downloaded in a completely passive sense but in these processes, *the information itself* is acting. The information itself is shaping its relationships of agency.

The portrayal of agential relations in this film suggests that a brief contrast with Mary Shelley’s *Frankenstein* would be useful here.⁸¹ While *Conceiving Ada* suggests that technology’s capacity to create new life forms will help to solidify the bonds between feminism and technologies, *Frankenstein* is perhaps the most iconic and influential critique of the masculinist horrors of technology’s capacity to create new life forms. Victor Frankenstein of course has no concern for his creation, nor does he even seem to think seriously about what kind of life the monster could have (and he certainly does not predict that the monster will be at least as analytical as Victor about the nature of his existence). Victor’s exaggerated and morbid embrace of dominant ideologies of science and gender appear to lead him to create a birth of a new life form that is more death than birth, and that, not coincidentally, erases women from the life cycle.⁸²

⁸¹ This connection in the film may have been inspired by Ada’s father’s connection to the origin of *Frankenstein*, since he was present for the storytelling game in which Mary Shelley first created the story.

⁸² Margaret Homans has more fully discussed the erasure of women from the birth process in her essay, “Bearing Demons: Frankenstein’s Circumvention of the Maternal.”

Cyberfeminists, and all those attending to the nuanced relationships among genders, knowledge practices, and technologies, have had to grapple with many of the issues that Shelley dramatizes: the erasure of women, for example, or technology being perceived as an eroticized domination of Man over Nature. In order to see other possibilities (actual and possible) for these relationships, it is necessary to resist, reshape, or reconfigure the most masculinist threads woven into the history of technology. Emmy's work is portrayed as a bit risky but largely as the antithesis of the masculinist excesses of Victor Frankenstein. To some, *Frankenstein* would suggest that artificial life forms, or any life forms that cannot be categorized as human subjectivities, no matter how intelligent, are dangerous. In other words only (human masculine rational) subjects should have agency, since the alternative is monstrous. The film suggests an alternative understanding of how living and dead, and past and present, may interact, and that the interaction may be frightening but is ultimately life-affirming. The film even explicitly (and perhaps simplistically) rejects the notion that a feminist AI could be like Frankenstein's monster; Emmy's partner, Nicholas, brings up the comparison, and Emmy retorts that the monster is not Frankenstein's but Mary Shelley's.

The portrayal of emergence is another aspect of the film worth consideration. The intellectual leaps that Emmy makes, including forming new agential relations and subjectivities, occur because she recognizes that individuals and entities and memories are all patterns emerging out of a vast set of connectivities. Each accomplishment of Emmy's may also then be viewed as an emergent pattern that manifests itself to Emmy (with Ada being the ultimate example). The importance of this portrayal of emergence will be discussed near the end of this chapter, since all three examples analyzed here

suggest that emergence is a key concept in understanding the history of technology as a time-travelling matrilineage.

Ada + (Not Ada): Hybrid Subjectivities in *Zeros + Ones*

Sadie Plant's 1997 book *Zeros + Ones: Digital Women + the New Technoculture* is another text that narrates Ada Lovelace's work. Plant does not present a fictionalized version of Lovelace but rather uses her life and work as a frame to create a narrative combining the literary qualities of a historical narrative, a manifesto, and a prose poem about gender and technology amid a wide variety of cultural shifts.

Plant's work is also associated with a broader interest in narrating histories of women, in this case histories of women in science, mathematics, and technology. The attempt to 'excavate' or re-construct histories of women come from a variety of communities and goals but particularly those self-described as feminist, womanist, and/or gynocentric. There is of course a great deal of diversity in these groups but a great deal of interaction as well. The aims of these projects are myriad and often contended, but creating a narrative of women's intellectual contributions through time, especially in science and technology, has long been a strategy for working against the more damaging or absurd aspects of normative gender roles.⁸³ Several more recent debates relate to these depictions, however, and these stakes of course relate to the way Lovelace's intellectual work is narrated.

⁸³ For example, see the reference to female mathematicians of ancient times in the works of Mary Darby Robinson in "Letter to the Women of England," which posits that her readers are the descendants in spirit of remarkable women throughout history, and that despite beliefs to the contrary, there has never been a time when achievements were left only to men.

Many attempts to establish a narrative of women's contributions to technoscience do so by creating interesting or even delightfully monstrous hybrid narratives of technological 'progress' or change and narratives of women's liberation, and I would argue that Plant does so as well. In other words, Plant is drawing upon an older technique of drawing lines of continuity and connection among women in science and technology, connecting those whom the dominant narrative portrays as a series of isolated exceptions to the normal course of events (in the case of women whose names are well known) or who are not usually mentioned at all. There are a number of feminist, historical, ethical, and other reasons for telling a story this way, including of course the long history of erasure of women from dominant narratives of progress. While influence is important to trace in these narratives of continuity, unlike in more androcentric narratives of technological "progress," this continuity does not *depend* on one great (female) mind directly influencing the next generation's great (female) minds. Again, although there are certainly a number of discussions in these texts and others about how women have influenced one another's accomplishments (Mary Somerville's substantial influence on Lovelace is a good example, as are the contributions of Ada's mother, who directed her education), these texts, being part of the larger community of those that bring greater visibility to women's work, use a number of well-proven feminist tactics that are of particular interest to this chapter's argument. Ada is part of a tradition of women in/as technology that is not defined by traditional notions of influence, since defining a tradition by direct influences assigns *value* to knowledge work based on the legitimacy and visibility it receives in Eurocentric masculinisms. Instead, the narrative of continuity (or ancestry, as it can also be called) enacts a vast set of connectivities and interfaces,

which find similarities and kinships in unexpected places but nevertheless attend to differences.

For this reason, the intellectual diversity of Plant's book is particularly notable; it traces several threads of interconnection to illustrate how gender and technology relate to a host of issues and ideas. Only a brief list of topics of which she explains the relevance includes: engineering, mathematics, postcolonial theories, evolutionary biology, ecology, psychoanalysis, weaving, fiber optics, spinning, poststructuralism, science fiction, labor organizations, poetry, Parliamentary politics, sex, drugs, disease, war, control, turbulence, numerical notation, witchcraft, alchemy, hacking, artificial intelligence, commodification, secrecy, hysteria, madness, genius, replication, reproduction, vampires, electricity, texture, touch, speed, agency, hybridity, automata, rhizomes, emergence, encryption, feedback, chromosomes, oceans, fractals, manufacturing, monsters, absence, presence, and many different feminisms. Plant uses a variety of fascinating narrative tactics to bridge these subject matters, creating a coherent yet *decentralized* discussion. Again, there are connections everywhere, but these connections do not create a monolithic view of technology and women. These rapid and seemingly unlikely jumps across subject matter, in sum, portray the political, the feminist, and the technological as being connected in potentially infinite permutations. Furthermore, this decentered, rapidly transporting narrative suggests that knowledge work is best understood as travel in a network; there is no coherent body of systematic knowledge (as distinct from other bodies of knowledge) except for the thread that the reader or writer is currently tracing. All subject matters are hyperconnected in such specific and locally influenced ways that it is impossible to siphon off categories of knowledge, except as a performative,

temporary enactment or motion within a vast network. In Plant's network aesthetic, it is not the case that the strongest or most important connections are to one's neighbors; again, mathematics and engineering are not necessarily more profoundly connected to each other than either is to feminism or to globalization, for example. Similarly, digital women today are not necessarily more connected to recent trends in information technology than they are to Ada Lovelace, for instance, or to ancient weaving technology. In this view of knowledge work, connectivity is not distance-dependent.⁸⁴ In this way, Plant's book (as she argues Ada's work does as well) exemplifies and argues for an aesthetic that values multiplicities and episodic narratives over monolithic and hierarchical narratives about knowledge. Plant's aesthetic values lists, repetitions with variation, and sudden bursts or chains of many disparate-seeming conversations. Plant's use of this network style suggest that these narrative choices are preferable to scholarly conventions that attempt to locate knowledge work in a fixed place in space, time, and intellectual heritage because it is the decentered network style that actually makes the networked, far-jumping nature of knowledge work more transparent.

Plant likely intends this narrative style as an exploration of the ramifications of digital technology on storytelling practices, and in particular she puts forth this aesthetic as an example of the democratizing potential of narrative in a digital, networked world. For example, as with many other portrayals of Lovelace, the narrative structure of *Zeros + Ones* evokes the hypertext found in the Internet. Again, this depiction may be related to the fact that the Internet is often taken to be the defining symbol of recent cultural change, as Plant also notes as well. Plant also particularly emphasizes that A.A.L.'s *Notes*

⁸⁴ Note that a ramification is that under this framework, a vast majority of comparative knowledge work would be unlikely comparison; comparing things that seem closely related would appear in this framework to be a rather arbitrary way of choosing what comparisons matter.

were themselves a predecessor to hypertext, in that they subvert the hierarchy of the main text over the notes (Plant 10). Although the structure of Plant's book decentralizes its own narrative, Ada Lovelace is the common thread interwoven throughout the book. The first (except for the preamble) and last chapters (except for the notes, bibliography, and acknowledgements) are about Lovelace's work. The book is comprised of many short chapters, each interspersing its main text with one or more quotations in set-apart italicized bold print, and used to jump, often abruptly, to a new topic or a different way of elaborating on the same topic. Other transitions within a chapter often consist merely of a new discussion springing off from the mention of a particular word or phrase, frequently throwing in tangential sentences or quotations. Plant's narrative structure therefore reflects her claim that in the present, and to a surprising extent in the past as well, "[t]here is no center of operations, no organizing core; there are no defining causes, overriding reasons, fundamental bases, no starting points or prime movers; no easy explanations, straightforward narratives, simple accounts, or balanced books. Any attempt to deal with some particular development immediately opens onto them all" (45).

Plant also uses bold-print quotations as headings or transitions throughout the book, sometimes with an obvious connection to the following section, sometimes with a more nebulous one. These bold-print quotations are interjections more than they are descriptions of sections, and they highlight disjunctions at least as often as they provide smooth transitions. These bold-print quotations are, however, the primary means of structuring, and of showing the over-arching threads of, this highly de-centered book. It is notable then that these bold-print quotations are frequently from Ada herself, and many of the chapters illustrate Ada's continued relevance to a great number of issues of interest

to feminists and other socially engaged technologists. A good example is the chapter entitled, “tact” (185-191). It begins by observing that multimedia technologies are becoming simultaneously more visual and more tactile, largely because “[z]eros and ones are utterly indiscriminate, recognizing none of the old boundaries between passages and channels of communication, and spilling out into the emergence of an entirely new sensory environment”(185). Plant observes this trend as a connection point (one of many mentioned in the book) between textiles and fabrics and new media, one used in an extended metaphor to point out the way that “[w]hat was once face-to-face communication [now] runs between the fingertips strung across the world.” This means that the subject is now without the means to keep all ‘others’ outside the boundaries of the ‘self.’ Such acrobatic transdisciplinary leaps continue, from the irony that technology was supposed to keep the others othered, to the idea of a weapon as an extension of hand, to whether the desire to avoid touch caused the human fixation on the ocular, to the un-localized nature of touch versus the centralized location of sight organs, to skin’s and skin alterations’ ability to transmit messages, to touch as a sense that does not rely on the ability to perceive elements as separate things in and of themselves, to the mutuality of touch (“that which is touched always touches back” (188)), to taboos of touching, women’s use of virtual reality as new embodiment rather than de-embodiment, to the absurdity of the mind-body dichotomy, and the “indistinguishib[ility]” of the body from its environment. Notice that all these leaps rearrange where ‘Others’ begin and end.

After all this leaping, a bold print quotation appears, and the source is Ada Lovelace: “I walk about, not in a Snail-Shell, but in a Molecular Laboratory” (189).

While some chapters discuss Ada’s life and work in more detail, this chapter has only this

one quotation from her. Ada (remarkably given her time period) is speaking of her ambitions to originate the serious study of molecular biology and neuroscience and also demonstrating a commitment to ‘living with’ one’s ailments rather than declaring war on them, a view that seems equally as out of Ada’s proper temporal sequence as any other of her ideas. The “Snail-Shell” echoes Plant’s discussion of the wired subject “with no halo of private protection, not even his own body, to protect him anymore” (Jean Baudrillard, qtd. in Plant 186), as well as the nearby statement that bodies may be defined as gatherings of interactions with environments. This is of course only one place of many where Ada is portrayed as a digital woman and as someone who is simultaneously both the ancestor and the future iteration of cyberfeminists, as well as of all those hoping to thrive/survive in a digitized, hyper-networked global village.

The chapter then links to Irigaray and the ‘elsewhere-ness’ of women, which links to the superior tactility of women, which links to the way “digitization” re-unites the artist and tool into a continuous entity, which links to the relationship of screen image to computer program, to the “continuity of product and process at work in the textiles produced on the loom” (189), to digital replication, to the textile/digital lack of authenticity or essence, to the anonymous labor of women who spin and weave, to the fact that female visual artists were among the first to plumb digital creativities, to the “amazing” flexibility of digital machines (which Ada was the first to theorize), and to the computer’s significance beyond object or tool, returning several times to the connection between loom and computer. Sources noted in this chapter include works by Ada Lovelace, of course, but also William Gibson, Marshall McLuhan and Quentin Fiore, Elias Canetti, Luce Irigaray, Sigmund Freud, Brenda Laurel, Gilles Deleuze, and Esther

Parada, among others. The structure of this passage indicates many ideas which will be discussed later – the portrayal of agencies and subjectivities, for example – but also of course illustrates the influence or even the imitation of the narrative forms of hypertext, a key fascination for the 1990s and today. Each point opens up a vast network of topics that are multiply connected at multiple layers.

Plant is also one of several feminist (and other) theorists who use techniques also found in feminist fiction and poetry (although I am certainly making no definitive claims about who arrived at these first). Play with language is frequent: she uses wordplay, notes that “even countesses didn’t count,” for example, and she uses repetition to illustrate the ways some words and concepts are collapsing in on themselves, noting that “[e]ven conceptions of change have changed. Revolution has been revolutionized” (Plant 45). And Plant’s sentence structures are often far more reminiscent of a prose poem. For instance, at various times she may use impressionistic fragments alongside enormous sentences that build up longer and longer as if the words could barely contain their own multiplicities.

Such destabilization of language calls attention to the underlying concepts that create social worlds and the way “reality” is constantly being reformulated. Many of these characteristics – nonlinearity, pastiche, experiments with temporal sequence -- are generally lumped under the rubric of “postmodern literature,” and there are a number of debates concerning the rightful boundaries of this wildly inclusive term which are well beyond the scope of this project. Nevertheless such characteristics reveal the influence of feminist experimentations with narrative structure.

Plant's relation to cyberfeminism may be particularly useful in explaining this point. Plant is a key figure in cyberfeminism, and is one of the first to use that term.⁸⁵ Additionally, many online communities who explicitly identify as cyberfeminist cite Plant, and particularly *Zeros + Ones*, or include information about Ada Lovelace that come from Plant and from this book in particular. Given Plant's influence, and Plant's stake in her own identity as a cyberfeminist, it is useful to more fully enumerate some of the key attributes and commitments that fall under the rubric of cyberfeminism. One of the most important is a resistance to masculinisms in various technocentric communities. Others include an articulation of a series of feminist commitments more tech-savvy and more tech-positive than those of some other feminisms, together with a tenet that information and communication technologies are vital sites of possibility for resisting masculinism more broadly. One common tactic in these endeavors is to naturalize a *special relationship between women and technology* – to make women's contributions to and abilities in computer science something that is assumed rather than something that surprises. Plant instigates this tactic when she narrates a history in which women are central to every notable development in computer history, from spinning wheels, to Lovelace and Babbage, to Enigma and ENIAC (foundational projects in information technology), to ADA (the computer language), to microprocessing manufacturers, and to many other women along the way. Another key cyberfeminist tactic is to critically examine how technology shifts issues of embodiment, which is in direct contrast to a more masculinist science fiction fantasies in which technology offers a means to escape (feminized) bodies and allows for a purity of (masculinized) minds. An example is the

⁸⁵ Carolyn Guertin, in "From Cyborgs to Hacktivists: Postfeminist Disobedience and Virtual Communities," discusses the history of the term in more detail.

claim in the manifesto of the foundational cyberfeminist collective VNS that “the clitoris is a direct connection to the matrix” (VNS Matrix). Plant’s non-linearity – her circularity – helps to put issues of embodiment in dialogue with a host of events in computer history, and also to accomplish the more challenging task of *maintaining* that dialogue.

Cyberfeminist communities tend to shun linear narratives of progress, origin stories, and concepts of knowledge work based on center and margin, and the influence of Haraway’s work could be one reason for this, among others (King, *Networked Reenactments*, forthcoming from Duke University Press). Thus, Plant’s organizing principles are key in creating a book that offers readers many points of access, many threads that interconnect many locations, and without a clear center around which all other points must gather.

Ada and women and technology connect to everything, and that is due to the very *nature* of connection. The book even undermines the common assumption that certain disciplinary locations are more relevant to a given question than others; for example, psychoanalysis is as much a part of computer history as mathematics is part of the history of sexuality.

Another way that the book destabilizes conventional reading processes clearly draws on some vastly differing generic conventions. In these generic experimentations digital technologies have and will continue to encourage shifts and multiplicities in narrative practices, especially by shaping how various kinds of storytelling are considered legitimate or not. These generic experimentations, I argue, reject more traditional ways of telling stories about how the past relates to the present, and therefore it will be useful to begin with a discussion the various generic conventions and traditions that Plant draws upon.

I have already discussed the ways in which the book mirrors a website. Note that although it draws upon interdisciplinary methods and concepts, its theoretical style is sometimes ‘traditional.’ Yet the book also treats fictional accounts of women and technology (such as in science fiction) in precisely the same manner as theoretical or historical works.⁸⁶ What fictional characters do and think is part of theory, and fictional characters, like other patterns of information, are portrayed as having agency. Even more interestingly, plant, machine, animal, and bacterial activity take up places as theory as well. Nor is Ada’s connection to modern digital women, in this framework, bound by conventional narratives of direct influence. A timeline of important scientists, in this understanding, appears a small and arbitrary way of ordering or cutting off vast connections and relationships across time and space. Plant’s boundary-blurring is also key to the way Plant makes connections and comparisons that surprise and jar; in other words, according to the way that Plant defines the conversation, unlikely or illegitimate comparison is the *only* way to faithfully and honestly narrate these multiple layers of connectivity.

And the book’s generic experimentations continue. The book is also an historical narrative; its woman-centric history of technology begins with a preamble set in a distant past (the primordial ooze, presumably) which predates concepts of self, other, past, present or future. This distant past sounds quite a bit like Plant’s description of the present and future, however, since in Plant’s book (Western masculinist) subjectivities are frequently portrayed as temporary or illusory. This alternative history shuns ideas of a monolithic view of progress commonly found in dominant histories of technoscientific change. Instead it narrates a series of specific and historically contingent interactions of

⁸⁶ Compare this to Haraway’s repeated reference to science fiction authors in theoretical discussions.

past, present, and future. And the book also bears elements of the manifesto. It is a declaration of cyberfeminist identity, one consistent in its ethical commitments, emphasizing shifts, fissures, transformations, and malleability. Rejecting the failure of previous understandings of science and technology, it argues that this new understanding of these issues is an absolute necessity.

Not only does the book take science fiction seriously, it is also very much *like* a work of science fiction. Again, keep in mind the observation from Haraway that the present and not merely the distant future is a science fiction world (“A Manifesto for Cyborgs” 8). In Plant’s book, persons and things from different time periods are put in conversation or proximity, as are fictional and historical persons/things. For example, Ada comes in contact with the fictional character Hadaly, who is, in the fictional world of the book *The Future Eve*, an artificial life form: “Hadaly, Ada, wrapped around each other . . . neither something nor nothing, dead nor alive. Missing in action. Absent without leave” (164) [ellipses are in the original]. Examples such as this one suggest how technology and other social changes will reconfigure the boundaries of human and non-human, and alive and dead. Plant vividly draws on the tropes of many science fiction narratives when discussing such ideas. For example, Plant also re-purposes the idea that ‘the machines’ are secretly becoming autonomous and rebellious and may even be planning a takeover to usurp the world from humans (or humanism), by identifying women with the machines.

The book is also remarkably game-like. Like many narratives that experiment with form, the book encourages especially active reader participation.⁸⁷ The sheer number of topics and the rapidity of shifts in subject matter and methodology demand

⁸⁷ Compare the importance of games such as “exquisite corpse” played in surrealist circles (Kaplan 38-40).

that a reader consciously and intentionally *select* which threads to follow. It is also thus much like the games of the digital age in that the rules for the virtual/real reality within this game are myriad, and though they imitate what we (seem to) know about the world's workings, there is the constant potential to discover new and previously hidden treasures, doorways, wormholes⁸⁸, and worlds, each with new limits and possibilities. In a game, for instance, a player might enter a world where one can walk on the ceiling but then is in danger of falling into the sky. This book is game-like in that it depicts many different kinds of reality/simulation co-existing simultaneously, among which readers may have to move.

The book also bears resemblance to a ritual, and particularly to an invocation (although one might suggest that every manifesto inherently does this). The book calls upon powerful forces, praises their power, affirms their longstanding special relationship with her communities, and calls for their involvement in present and future events. It also reiterates that the communities in question must respect and attend to this special relationship. These powerful forces include the new life forms present in cyberspace, new relationships among women and technologies, and a variety of shifts that are laying siege to Enlightenment-style notions of unity, linearity, hierarchy, and order. The communities in question are those who are 'plugged in' to the new networks, computer and other.

⁸⁸ The use of the term "wormholes" here is suggested by Kath Weston's argument that the "wormhole," the sudden travel to another point in spacetime, is a good way to understand how pasts and presents relate to one another in specific, local ways. While Haraway has used the terms as well ("Modest_Witness@Second_Millennium"), Weston develops a theory of wormholes as a way to understand how meaning, difference, and identity are constructed through contrasts and crises of understanding that make these leaps through spacetime. She notes that "[i]n physics, a wormhole describes a fleeting passage that opens at sub-microscopic levels in the quantum foam... but has no definitive structure," and that her metaphorical use of "wormholes" suggests the ways in which such a "temporal, temporary opening connects bodies to memories to time" and allows for travel to "alternate universes" (120-121).

This resemblance to invocation is one way the book shares mythic elements. It also puts into play mythic trickster archetypes – Anna Freud, Eve, Michel Foucault, Alan Turing, the women who worked on Enigma, Arachne, and Beatrix Potter are a few examples of tricksters in this book, but the most important example is Ada. While many narratives of Ada have made much of the imagery of prophet, enchantress, and fairy⁸⁹, *zeros + ones* gives us an Ada who completely disrupts the social order and all that is held dear. Her computer theory ends up causing those startling reversals and blurrings of the distinctions between animal and human, male and female, text and context, virtual and real, and the living and the dead. Ada disrupts, and these acts of destruction are also acts of transformation and creativity. They also allow her to be an intermediary between her own time period and the complex, shifting, and inter-related matrices that were to come.⁹⁰ Secrecy, deception, cleverness, and hiding play an enormous role in Plant’s narrative as well, and these trickster-like characteristics are part of Ada’s character also. Even her revolutionary ideas are placed in a series of Notes instead of the main body, thus making Ada’s choice seem like guerilla cyberfeminism rather than a lack of desire to produce a work of ‘her own.’ She has a special kinship with microscopic (invisible) life forms even before they are widely known about, and the profound influence of her work did not openly “[leave many] trails of the kind which can easily be followed and packaged into

⁸⁹ Babbage called her the “Enchantress of Numbers,” and this sense of magic has accrued to some depictions of her. This has become a widespread moniker in narratives of Lovelace, including Toole’s biographer of Lovelace, and potentially the title of a future feature film about Lovelace. Other sites refer to her as a “prophet” of a computer age or as Babbage’s fairy. This “magical” imagery is problematic in that it makes her into an overly benign stereotype of Victorian femininity. Moreover, the references to magic suggest that Lovelace’s work might be characterized as grand dreams or vague impressionistic comments on the spectacle and wonder of machines, rather than as a specific and rigorously reasoned contribution to computing. Additionally, it suggests she served more as a muse for rather than a collaborator with Babbage.

⁹⁰ Compare Ananse bringing stories to the earth, the origin of the term ‘mercurial,’ or Haraway’s use of the trickster, just to name a few examples.

neat and linear historical accounts” (Plant 21), but instead more *stealthily* became one of the most important intellectual accomplishments of the last two centuries. In this sense, only the artificial life forms (unplanned by humans), which Plant claims already exist in multiple forms in multiple locations, appear as trickster-like as Ada may be. Ada’s liminality is what enables the transformations she brings about and enacts herself. Plant usesf Ada to frame her narrative also helps to portray as a figure of trickster mutability, and Ada’s words as access points into a plethora of issues. The result of these various mythic resonances is a particularly technocentric configuration of feminist politics and spirituality.

Figuring subjectivity is another important way the book reveals its commitments. Plant’s (non)use of capitalization seems relevant here. There are no capital letters in “zeros + ones,” in the author’s name, or in any of the headings or chapter titles. This unusual lack of capitalization is not only a stylistic choice but also a feminist technique for destabilizing the hierarchy that sets apart “proper nouns.” An aim is to rely less on the Eurocentric/phallogocentric hyper-individualism that emphasizes standing apart or standing out. Also note the book’s use of “+” where one might expect “and,” seen in the title and elsewhere. Just as information technology reshapes the communications and interactions that create and maintain subjects. The use of “+” expands on the work of those who argue for language’s role in determining or constituting political ‘realities.’ The language that does this in Plant’s book is clearly alphanumeric. Just as in computer language, there is no clear divide separating letter from number, in Plant’s work, letter and number are likewise part of the same continuum. In other words, knowledge practices that are most *associated* with letter or number are not necessarily separate kinds

of knowledge work, which fits well with Plant's understanding of systems and networks (so that mathematical work can be a kind of philosophy, or that owning a small business is like being a computer theorist).

Hybrid subjectivities are to be found even more explicitly as well. The preamble contains the following comments:

“Those were the days, when we were all at sea.... Species, sex, race, class: in those days none of this meant anything at all. No parents, no children, just ourselves, strings of inseparable sisters, warm and wet, indistinguishable one from the other, gloriously indiscriminate, promiscuous and fused.... We had no definition, no meaning, no way of telling each other apart. We were whatever we were up to at the time.” (Plant 3)

And the discussion of the title numbers, zeroes and ones, is also a comment on subjectivity. Plant notes that the concept of zero constituted a profound threat to the masculine Christian subjects of early modern Europe, and also that computers notate ‘1’ with a hole (absence) and a ‘0’ with presence. The idea of ‘woman’ as the very essence of “lack” in “subjectivity” is turned on its head throughout the book, and numbers’ effect on gendered subjectivities highlights over and over the unstable nature of fixed, unified identities. (Interestingly, in mathematics, the additive identity is zero, while the multiplicative identity is one). Discussions of brain and body also insist that technologies have the potential to radicalize the subject’s relation to materiality, to the very point that “there is no immateriality” (167).

Plant also comments on agencies, and particularly the agencies involved in knowledge work. Agency is portrayed not simply as something possession-like that one has but instead is consistently depicted as a relationship. Furthermore, agency does not

depend on human consciousness or subjectivity. Moreover, similar to Barad's agential realism, Plant's agencies involved in knowledge work *constitute* the knowledge work. Further, Plant claims that the Analytical Engine could not be built in Lovelace's and Babbage's lifetime, but that *the Engine* developed and assembled the parts from which it would eventually create itself (possibly this means that the Engine's plans led to advances in standardization which would eventually help later engineering projects). Even with regard to A.A.L.'s *Notes*' connection to hypertext, Plant writes that, "only when digital networks arranged themselves in threads and links did footnotes begin to walk all over what had once been the bodies of organized texts" (10), and her later discussion makes clear that she is not being fanciful or even metaphorical when she speaks of this agency of networks and footnotes.

The idea of networks that arrange themselves goes directly to another key theme in this book: emergence. Emergence is that which is constantly transforming and transformative, particularly that de-centralized self-organizing nature of everything, found among bacterial colonies, artificial life forms lying low in cyberspace, and even feminist and anti-colonial movements. Plant uses Ada's thoughts on neuroscience to consider a definition of brains as "hives or swarms... [with] no centralized government" instead of "centralized systems of information processing" (167), and then proceeds to suggest resistance movements work the same way. Digital women are onto something good, in Plant's book, because brains, rhizomes, worlds, networks, and social movements are emerging in ways that linear narratives and subjects fail to comprehend.

Ancient Ada/Future Ada

Amy Kit-size Chan, another scholar of technoscience culture and gender, contributes her compelling node among these feminist Ada studies. Of particular interest is her 2003 essay, “When Cyberfeminism Meets Chinese Philosophy: Computer, Weaving, and Women.” While less overtly a form of “creative” expression, due to her adherence to a more traditional view of the genre of scholarly writing, the artistic (and, of course, political) aspects of theoretical and critical writings deserve attention, for their metaphors and underlying stories as well as their explicit arguments.

Although not central, Ada Lovelace plays a vital role in the Chan’s project of tracing the theoretical and other connection points by which the history of information technology puts into dialogue both Western and Chinese traditions, especially cyberfeminist reiterations of each. Lovelace is the crux through which Chan connects women, weaving, and computers: the influence of looms on the development of computer theory is key to showing that old and new kinds of “webs” and “nets” are connected both metaphorically *and* mathematically. The question of “when” these connections were made – which is of course a question first evoked by the article’s title - proves to have multiple answers. Chan reveals that there are multiple wormholes⁹¹ by which women’s connections to technology claim a role that both takes part in, and has the potential to resist, varied globalization processes. Drawing on Plant, Donna Haraway, Chela Sandoval, Gilles Deleuze, and Rosa Braidotti, Chan narrates a “‘herstory’ of technology ... [woven] together by threads of small stories, such as Ada Lovelace’s biography ... the Difference Engine,” and various literary and mythological representations of weaving (Chan 215). In this narrative, Chinese spiritual and intellectual traditions are multiply

⁹¹ Again, I use Weston’s sense of the term “wormholes” (119-121).

intertwined with past, present, and future feminist interventions in the culture of technology.

Chan starts with Ada Lovelace in part because “the computer is often claimed to be man’s invention and therefore a tool of his own” (Chan 216). She emphasizes the importance of the punched cards, transferred from the Jacquard loom and vital to the concept of programmability, which Chan stresses is one of Lovelace’s important foresights. She takes seriously Plant’s claim that “the computer was always a simulation of weaving.... It joins women on and as the interface between man and matter, identity and difference....” (Plant, qtd. in Chan 217). And it is here that Chan notes that the loom is believed to have been invented in China, in order to connect the story of Ada Lovelace (and implicitly, the technoculture of the twenty-first century) to much older Chinese texts that reveal the technological-cultural importance of looms. Chan retells the story of Mulan, the legendary woman who went to war as a man.⁹² She also brings in Greek, Chinese, and Egyptian myths that tell of the goddesses who invent spinning and weaving. After a customary debunking of Freud’s claim that women are disinclined to invention and only do so because of a castration complex, Chan offers instead that women’s and men’s bodies are better understood as multiplicities woven together to potentially make “infinite patterns” (218). Chan also notes several technical similarities between computers and looms, then, drawing on the statements of Ethernet inventor Bob Metcalfe, points to a future of computational fabrics, fibers and yarns that could be used for nanocomputing, and wetware (219).

⁹² She did so using the prosthetic/technology of armor, and so it might be accurate to classify Mulan as an early cyborg/feminist. Many feminists, of course, have retold the Mulan story, in particular in the Asian diaspora. For example, see Maxine Hong Kingston’s *Warrior Woman*.

Chan's cyberfeminist thread traces through time, across cultures, and among the mythic, the historical, and the virtual. The Ada who speaks to Chan (or to Plant or Leeson) embodies a liminal space where today's women inhabit multiple times and places, much like the Internet itself. Later in the essay Chan argues that feminist understandings of virtuality serve to resist linear understandings of causality, and Ada's connections to various time periods, material circumstances, and spiritual traditions are used to reiterate that gender (like technology) is not fixed but transforming and multiple. These connections again emphasize both the *spiritual and tactile* nature of technology, and again, Ada is figured in order to blur the boundaries between human, woman, and machine. In an essay written with co-editor Wong Kin Yuen, Chan and Yuen suggest (after Latour) that "humans 'have never been humans' after all,"⁹³ and continues that "it is only through our memories and their role in our future(s) that we may have a glimpse of our contemporality" (Yuen and Chan 256).

By pointing out the net-like/woven quality of the human body as narrated by early acupunctural manuals, Chan brings up the mathematics of embodiment, a central concern for cyberfeminists because this too, is a connection of bodies, virtualities, and weavings across time and space. Drawing on Chela Sandoval's concept of oppositional consciousness,⁹⁴ Chan offers a parallel between Sandoval's work and the *I-Ching* in its examination of the interplay of differences (and its reliance on dualisms). Sandoval focuses on the mobility and embrace of contradiction necessary to resist multiple

⁹³ Haraway makes the same point in *When Species Meet*.

⁹⁴ Chan also appears to (inaccurately, I believe) critique Sandoval for an un-inclusive description of U.S. Third World feminisms, but Chan's focus is on Sandoval's concept of differential consciousness, the mode of power mapping that shifts among various subjectivities and oppositional methods. Specifically, Sandoval theorizes that U.S. third world feminists move among many different subject positions and "modes" of mapping power, in order to more advantageously resist multiple and interacting forms of oppression.

intersecting oppressions, and Chan suggests the potential for this ancient text to perform similar functions.⁹⁵ While clearly this book and other traditional texts can be used to continue traditional oppressions, Chan seeks to *technologize, and thereby radicalize* these texts. Making these traditional works *part of the history of networked technology* allows feminist iterations to emerge. Chan, like Plant and Hershman, creates a matrilineage of technology characterized by jumps across time and space.⁹⁶ In all of these cases, the emphasis on weaving is telling; in woven material, it is not the closest threads that are connected; connections are not always even visible until a string is pulled.

Additionally, Chan, like Plant, tells stories about zero. Chan even worries that Plant's metaphorical use of zeroes and ones may reinforce the Freudian undertones she seeks to undermine. While I disagree with Chan's view of Plant's use of irony,⁹⁷ Chan contributes to the gender- and boundary-blurring re-articulation of zeroes and ones by bringing in Taoist writings on yin and yang, yet another example in which making connections visible require vast leaps across time and space. She emphasizes not just their complementarity but also the similarity of Tao to Plant's understanding of zero, in that each are spaces of transformation, "virtuality and potentiality" (222), formlessness and namelessness. By weaving together these different threads of the spiritual and

⁹⁵ Chan does not appear to suggest that the I-Ching *has* been used in this way for its entire history but rather demonstrates similarities that suggest feminist *potential* in this spiritual-mathematical text.

⁹⁶ Chan, unlike Hershman, very explicitly attempts to show that this matrilineage is less Western than many might believe.

⁹⁷ Plant's use of these binaries is reminiscent of Haraway's use of the cyborg as an "ironic" metaphor, I believe. While Chan suggests something less than progressive about Plant's embrace of zeros and ones as a metaphor for the gender binary (zeros are women, men are ones, with references to Freudian analyses of the phallus), I argue that Plant's utilization of this metaphor is much more complex. Plant shows that zeroes and ones – the epitome of binary thinking – actually have highly liminal and historically contingent borders, shifting and bleeding into one another, and with complex relations to the concepts of absence/presence and the sexual politics of representation. I suggest, therefore, that Plant's embrace of this binary is not done without consideration of the history of problematic associations this binary has, but instead is done as an ironic appropriation intended to encourage more hybrid and more technologically and politically savvy understandings of gender, technology, and representation.

mathematical, Chan creates a cyberfeminist iteration of the tradition in which “the Tao has reality and evidence, but no action and no form.... Though prior to heaven and earth, it is not ancient. Though older than the most ancient, it is not old” (Zhong Zi, “The Great Master,” qtd. in Chan 223).

Drawing on Deleuze and Guattari, Chan further argues that “Tao is molecular, made up by lines of flight and rhizomes... always producing differences and multiplicities and making new connections” (223). She then argues that this mirrors women’s subjectivities, being fluid and liminal and also rhizomatic. Using this Taoist-Deleuzian-Plantian zero as “the symbol of future feminisms,” she suggests that “it is only through such continuous becomings that feminisms will never cease to exist” (225). She later compares the rhizomatic natures of feminisms and of the Internet. Again, as with Plant’s and Hershman’s work, the blurring of the boundaries of time reveals cyberfeminist roots that transform the understanding of agencies, and that suggest emergence and multiplicity.

Through Ada, and through these various other threads and spaces, Chan argues for a more techno-centric view of global feminisms, as well as for more feminist and more non-Western (or culturally hybrid) spaces in technoscience studies.

Emerging Knowledge

The question of why the concept of emergence should arise so frequently in discussions of Lovelace is a complicated one. It will be useful to discuss the likely

reasons for this commonality, and then to briefly analyze the feminist ramifications for using the idea of emergence to understand knowledge work.

Emergence is a form and process of complex organization that is in stark contrast with conventional wisdom that organization and functionality depend on top-down stable hierarchies. When examining emergent structures, one assumes that relatively simple actors with rules or habits of interaction can give rise to complex structures and arrangements, even to the point that an outside observer might assume that such a complex structure *must* have some centralized, guiding force, even though it does not. As Steven Johnson notes, the ant colony is an excellent example of a complex social organization and physical environment that self-organizes through complex layers of behavior and interaction (31); similarly, a human city, even without urban planners, will self-organize, often using social norms and categories such as wealth (33-43). The emergence of self-organizing systems is also used to theorize key evolutionary changes in biological and ‘artificial’ (machine) life. Some emergent structures, precisely because they are decentralized, sprawling and swarm-like, are able to adapt rapidly and impressively to changing environments (Johnson 20). Johnson also notes that emergent, de-centralized organizations such as that of anti-globalization movements may be more able to resist oppression than older styles of activism, since the transnational corporate economic-political structures they oppose are also hard to pin down and counter due to their increasingly de-centralized nature (226).

Lovelace’s work itself suggests a number of reasons cyberfeminists might associate Lovelace with recent ideas about emergence. Even the tale of her first look at Babbage’s work resonates with the ideas of self-organizing adaptation in emergence.

While others think something seems almost like magic (as was often the case in Victorian spectacles of science), it was possible for the astute Ada to recognize the complex patterns among the moving parts. More significantly, her work on ‘thinking machines’ goes directly to the issue of the way that a thing (a computer or brain for example) might be able to be characterized by its programs or its organization. Is the ‘essence’ of a thing better understood as the ordered patterns that arise among its chaotic multiplicities, for example? Furthermore, while cognitive scientists *today* are setting neurobiology and artificial intelligence studies in dialogue to advance the study of both, it seems that Lovelace started the conversation long before. And since then, the Internet and even the computer itself has become a symbol for various imagined modernities, including a symbol for the overall impact of technology as well as for globalization processes – and emergent behaviors are a valuable metaphor and reality for describing a world in which nation-states and physical borders are not necessarily the totally defining attributes they presumably used to be.

Studies of emergence have also raised questions such as: What is consciousness? How does it come about through the complex neural relations of the brain (and the brain’s interaction with other physiological and sociocultural systems, to be precise)? Not only is this reminiscent of Lovelace’s work on neuroscience but it also speaks to the ‘Lovelace question’ itself. Can a consciousness or some alternate subjectivity arise out of components that seem like inanimate objects – can subjects be created and engineered (in the case of A.I.)? And if so, what does this reveal about how postmodern subjects (such as human beings) have been *engineered*?

Emergence is also related to many notions of how knowledge work may be mapped, and descriptions of the Web and related phenomena are often based on studies of emergent behaviors, for example. The portrayal of emergent behaviors in Ada narratives, however, serves not only to evoke Lovelace's work but also to serve as a metaphor for particular kinds of boundary-jumping knowledge work; furthermore, the metaphor may also indicate a shift in how knowledge work is narrated more generally. It is possible that emergent behaviors are also becoming an increasingly useful metaphor in other sites to describe current knowledge work; Deleuze and Guattari's notion of the rhizome, for example, has been influential (including to Plant), and is linked to the scholarly journals entitled *Rhizome* and *rhizomes*. Deleuze and Guattari use the rhizome, a category of plant life that includes ginger, bamboo, some grassy weeds, and others, as a metaphor or model for knowledge work and systems.⁹⁸ Rhizomatic knowledge, in this framework, differs from knowledge that is structured like trees, which are defined by a clear central trunk, which then branches into several smaller branches of subordinate importance, and then on to twigs and leaves, and so on. Instead, Deleuze and Guattari in *A Thousand Plateaus* suggest that a rhizome is an apt model for a different, potentially more liberatory, kind of knowledge, noting that a rhizome is a plant that grows and shoots off in multiple directions horizontally and has no clear center, starting point, or fixed relation to a source from which all offshoots must come; a rhizome is characterized by a multiplicity of nodes and ways of tracing connections. Rhizomatic organization of knowledge work, and the use of rhizomes to *describe* knowledge work, thus share

⁹⁸ I do not discuss the issue of whether a rhizome is an example of emergent organization in order to avoid a very technical discussion of emergence that is not particularly necessary for this argument.

political and intellectual commitments with similar uses of emergence as a model for – and a method of – cyberfeminist knowledge work.

In short, emergence is an increasingly useful metaphor for current kinds of knowledge work; and, depending on one’s perspective, it may be a literal rather than metaphorical description. With Sharon Traweek, we might recall that one of the chief characteristics of recent epistemic change is the current need or desire to *define* recent epistemic change. One means of doing so is through particular metaphors for knowledge work. According to Michael Cole, “[t]he frequency with which metaphors of weaving, threads, ropes, and the like appear in conjunction with contextual approaches to human thinking is quite striking” (qtd. in Bowker and Star 314). It is likely that these metaphors do a number of important tasks, even in addition to the significant way that centering histories of technology around weaving and textiles decenters dominant Eurocentric and androcentric narratives, and possibly connects technology to particular mythic/spiritual traditions. Some of these tasks are to shift the inquiry from being about things (in and of themselves) toward being about connections and intersections, to trouble most attempts to isolate what should be included as part of knowledge work with what should not, to note that there can be centers and margins but these identities may shift depending on the local perspective, and in observing that there is no separation of page and ink in woven images, to figure, as Plant suggests, those radical potentials that blur boundaries. According to Bowker and Star, recent metaphors of knowledge work evoke several “qualities that are often applied to human interaction: tension, knottiness or smoothness, bundling, proximity, and thickness” (315). Metaphors and realities of emergence begin to have a clear relevance as a dominant symbol of “today” in the

workings of World Wide *Web*, the *Internet*, and various *network*. By focusing on emergent behaviors, narratives of knowledge work follow various threads and nodes, but the partiality of the narration, and its contingency on the narrator, are emphasized rather than erased. Finally, the connotations of ropes and nets include not only complexity and the possibility of discovery but also entrapment or even predation (the same dual connotations of “the ties that bind”).

Emergence, however, is an especially useful idea in that it assumes that theory – and its concomitant categories, naming processes, and investigative methodologies – is not necessarily part of the Enlightenment project of taming the world through knowledge (masculine/mind/reason dominating feminine/body/Nature), but rather a way of engaging with the “world”/“network” and centering ethics and politics and genders, even as it destabilizes them.

For all of these reasons, emergence works well as an especially apt idea of and metaphor for creative work that is characterized by rigorous intellectual breadth and multiple connectivities. Highly transdisciplinary work such as Ada’s, and indeed most innovative work in computer science (which is at the crossroads of science, mathematics, engineering, and philosophy, at the very least), is hard to describe. The ability to pick out particular threads and see patterns of significance where others see unrelated phenomena makes emergence useful while narrations of emergence tend to mesh well with descriptions of knowledge work in nets, threads, and webs.

But is any of this substantially different than the views of knowledge work that so efficiently erased social context from narrations of intellectual work? There is of course a set of stereotypes that suggest scientific and mathematical work are, at heart, the

process of discovering a priori truths that the universe may reveal to the knowledge worker, especially if that knowledge worker is a genius and seduces and/or wrests the secrets from Nature. This assumption may very well underlie various origin stories for technoscientific change, even if these origin stories are competing. Consider, for example, mathematical Platonism,⁹⁹ or various scientific realisms and empiricisms. If knowledge work can be viewed as looking for emergent patterns that arise from the omnipresent vastness of information systems, is this view of knowledge work different (enough) from the Platonisms, etc., noted above? Does the emergence way of thinking about of knowledge work just provide a way for these ideas to sneak back into favor?

Yes and no. There are some key differences, most notably that most narratives of emergence *actively resist* the consolidation of locations and identities associated with the agencies involved in emergent behaviors. To speak of emergence is to look for language other than that of linear relationships, hierarchy, and fixed, essentialized objects.

Of course, another ramification of emergence-based narratives of knowledge work is that this way of describing knowledge work has little or no use for the rhetoric of subject matter; the question of what the subject matter is, or what the object of inquiry is, is no longer assumed to be a clear, straightforward question. In other words, in these emergence-based narratives, the purpose of describing knowledge work is not about answering “What things are we learning about?” but instead responds to the questions, “Through what *connections* does this knowledge reveal itself?” and “What *connections* and relationships does this knowledge work embody or enact?” While cyberfeminist

⁹⁹ Davis and Hersh extensively discuss the legacy of mathematical Platonism and its contribution to Western stereotypes of “genius” in his book, *The Mathematical Experience*. I use the term as they do, not to refer to Plato’s philosophies themselves, but rather to name the longer Western tradition in which Truth is a pre-existing object that geniuses discover by conquering the mysteries of the cosmos.

approaches to Ada Lovelace are the examples used here, this shift is likely seen in other cultural sites as well, since it demonstrates the influence of a number of larger changes in narratives of knowledge work: the shift of attention from things to relations, from authenticity to performativity, and from humanism to various posthumanisms.¹⁰⁰

Conclusions

Ada is a fascinating figure, and the texts discussed here narrate her work and life in a way that show that Ada's work and mind have as much flexibility and wide applicability as ever. A key similarity among these cyberfeminist works' is their often subversive use of the concept of time, of the past, present, and future. The findings of this chapter reveal that the local, specific, embodied, intellectual, technological, spiritual, and other connectivities implicated in knowledge work make time travel a better model for understanding technocultural change than a timeline.

In addition, all of these works suggest that it is not just visionaries but *everyone* in a rapidly changing, digitizing, globalizing world who needs to look to Ada for inspiration or understanding.¹⁰¹ Ada (by many of today's definitions of her) did not fit well in her own time period, not only because of gender roles of the Victorian age but also and especially because of her *worldview*, which fits so much more easily with that of later centuries.

¹⁰⁰ In the future, of course, Lovelace's work may have even greater resonance, as it continues to be viewed as important theory in many areas – feminist, computational, and others. It is likely, then, that these cyberfeminist works are exceptionally prescient in this regard – that Ada Lovelace is still emerging.

¹⁰¹ Compare Lovelace biographer Toole's notion of Ada as a "gateway" to the twenty-first century.

The irony is that Lovelace now appears to be an important *presence* (not a distant historical figure), one that helps us to better fit into our *own* time period. What does this tell us about our time period? It is possible that in the 1990s and 2000s, and likely this decade as well, the ‘present’ is imagined to be full of time anomalies, with pieces of distant science fiction futures popping up unexpectedly; repeatedly, we find confirmation of Haraway’s claim that we are *currently* in a science fiction world. It may even be possible that what *characterizes* this time period is the pervasive sense that one must constantly be in the future – that to be merely in the present is to be left behind.

For these reasons, as well as the many discussed above, Ada Lovelace has become, for many, an inspiration, a fascination, and a symbol of the creative and world-altering possibilities of the relationship between women and technology. The surprise is not that Lovelace is viewed as a cyberfeminist ancestor; the intriguing part is that these narratives incorporate (embody) Ada in a way that makes her, and therefore cyberfeminism, part of a narrative in which women-and/as-technology provide opportunities for ethical acts in globalizing and cosmopolitan worlds. In other words, this connection with Ada is vital to cyberfeminist approaches to the great praxical question: How does one participate in the world (and its processes of change) without reproducing and reinforcing those systems one hopes to resist? Put another way: what does it mean to be part of the network?

It is in the context of these questions that the issue of feminist “ancestry” proves an especially useful metaphor: it suggests profound connection,¹⁰² at once both intangible

¹⁰² I draw on many understandings of the importance of ancestry, under the assumption that many understandings are part of the networks cyberfeminists connect to. While “ancestry” of course has long histories of use in patriarchal and class-based hierarchies, “ancestry” conveys a sense of where one is “from” that conveys profound and spiritual connection in way that terms like “heritage” do not; I don’t

and ingrained in one's body; one that is held in highest respect and that can offer help in times of need; a relationship that is difficult to delineate but one that is quite intimate. In these cyberfeminist narratives, however, there is no clear and fixed boundary line between Ada, the cyberfeminist ancestor,¹⁰³ those who try to know her, and other "objects" of knowledge. This respectful view of Ada the ancestor rejects the view of knowledge work in which one gains knowledge to dominate the object of knowledge; instead, the knowledge worker and the "object" of knowledge are *assumed* to have a kinship relationship.¹⁰⁴ This portrayal of ancestry therefore shows that there are multiple possible networked relationships one can enact or perform, and that the less obvious networks – those made invisible by dominant discourse – may in fact have the most profound connections.

Furthermore, these narratives subvert dominant understandings of ancestry because this technocultural matrilineage is not a top-down affair. Relationships of ancestry are multiply layered and challenge linear time rather than providing a linearity/lineage by which one structures and names distinct separations of time. In this way, these narratives reveal one of the most important aspects of narrating an ancestry of women engaged in knowledge work.¹⁰⁵ Clearly, these are not "mere" encomia to examples of greatness, or to role models, or even necessarily an unquestioning

suggest that there is necessarily a religious nature to cyberfeminist understandings of ancestry, but the spirituality of the term is evoked intentionally. Furthermore, in many traditions, especially non-European ones, ancestry is not dependent on "bloodlines" alone and may have more to do with one's name; furthermore, "ancestry" in many traditions suggests the sense in which ancestors are a presence rather than only of the past; in the Chinese tradition and many others, for example, ancestors can help their descendants.

¹⁰³ I avoid ancestress as an archaism, and use the term in the gender-neutral sense.

¹⁰⁴ This point is yet another example of the ways in which cyberfeminism may be considered very closely aligned with (other) feminist technoscience approaches – as seen in the works of Haraway or Barad, for instance.

¹⁰⁵ While of course these efforts have been especially prominent since the Western feminist and related movements of the 1960's and 1970's, the tradition of these efforts goes back indefinitely. Compare the works of Mary Darby Robinson, Christine de Pisan, etc.

valorization of individualism and androcentric notions of the select and few “great minds” who are sometimes thought to be solely responsible for the progress of the world. Instead, this claiming of feminist ancestry – including Ada Lovelace’s role as cyberfeminist –*radicalizes* notions of connectivity, kinship, and causality.

Furthermore, machines are part of this ancestry as well. Again, the relationship among human and non-human agencies is reconfigured. Cultural forces, institutions, abstractions, machines, individuals, communities, spiritualities, and sexualities, are all in fact part of this technokinship system. Just as all things can be ‘turned into’ zeroes and ones, all things are connected; but differences are not erased – instead, differences structure the connections. This is not a flattening out of differences, then, but it does have a democratizing potential, as has been often suggested of the Internet.

In addition to arguing for the emergence-modeled understanding of knowledge work, this chapter has illustrated the political stakes in the comparative acts these cyberfeminist works perform. In particular, the chapter reveals the central role comparison plays in subverting notions of linear time, and its narrow understandings of connection, accountability, similarity, and difference. According to these cyberfeminist works, a comparative act can enact relationships with other points in space and time, and can weave together threads that take unlikely travels. In comparative literature, it might therefore be useful to consider how our comparisons weave these threads in light of the works of both Ada Lovelace and cyberfeminism. For example, what if comparisons were *valued* according to how they questioned linear time? What if comparative work were viewed as a way of understanding how the comparatist and other agencies self-organize into readable patterns of connection? How might comparative literature, by using the

nodes of connection between the arts and humanities and the sciences, push at the boundaries of how the present's relation to the past and future is understood?

Additionally, it is arguable that Ada Lovelace herself is a model comparatist, in that her foundational innovation in computer science was an unlikely comparison with important stakes; her biggest contribution was to pick out a wildly imaginative yet astutely precise basis of comparison – the extent to which a process can be expressed as a step-by-step manipulation of symbols – and use that basis to show the similarity among countless endeavors. To take inspiration from Lovelace directly, comparative literature might aspire to become the study of the technology of comparison; comparison is a method, but also a *techne* or skill, after all.¹⁰⁶ Comparative Literature's aim might therefore be to examine and enact the fullness of possibilities of what the act of comparison can do.

For all of these reasons, cyberfeminist interactions with Ada Lovelace - or intra-actions in Barad's framework – demonstrate the political stakes of unlikely comparisons, particularly unlikely transdisciplinary comparisons that reconfigure the connections among the arts, humanities, science, and technology. This chapter has also shown alternative ways of discussing knowledge work – particularly in the metaphor of emergence – that might be more fully embraced to maintain the visibility of political, gender, and agential relations.

¹⁰⁶ Inspiration for this statement is also drawn from feminist technoscience's broadening of the term "technology," particularly Chela Sandoval's understanding of love as a social technology.

Chapter 4: Teaching to Compare: Feminist Technoscience and Transdisciplinarity in the Classroom

Introduction and Argument

Previous chapters have explored the stakes of unlikely comparisons and their usefulness in exploring connections among the sciences and humanities. In particular, unlikely comparisons are vital ways of attending to the agencies and politics of these connections. This chapter applies this theorization of unlikely comparison to the development of transdisciplinary undergraduate curricula. In order to pursue this investigation in a concrete and directed way, the chapter proposes possible ways of addressing the following questions: What might such a transdisciplinary, agency-centered, feminist technoscience-based course look like? What kinds of unlikely comparisons might such courses make?

In addressing these questions, I argue that such courses will need to experiment with multiple transdisciplinary formations, exploring the different results of different kinds of disciplinary border crossings. In particular, such courses should investigate, in a conscious and directed way, what kinds of disciplinary border crossings make the agencies of knowledge work more visible.¹⁰⁷ Transdisciplinary inquiry requires more than the interaction of different disciplinary traditions; it is characterized by motions and patterns that illustrate how disciplinary boundaries themselves are always in process,

¹⁰⁷ Certainly, an aim is to help undergraduate students understand the agencies entangled in their own knowledge work. Note, however, that students of various disciplinary locations are well-equipped to investigate this question. Furthermore, undergraduate students, precisely because they are *in the process* of acquiring the foundational concepts and methods of a discipline, may well have more insight into these questions than instructors.

always in flux. Note that these disciplinary border crossings do not necessarily seek to subsume all methods into one pandiscipline that has pretensions to unmediated access to Truth; indeed, it is the *differences* among various approaches that create productive tensions that can generate new understandings. Whether in bioengineering or digital humanities or in any number of emerging fields, knowledge workers have already sought ways to enact – and more importantly, maintain – generative border crossings across disciplines. Many of these interdisciplinary formations are deeply entangled with the flows of money that characterize new and closer relationships between learning institutions and corporate and other entities.¹⁰⁸ Some, like comparative literature, are facing a number of challenging and fascinating questions about what kind of disciplinary and other border crossing they should enact in an increasingly globalized, digitized world. In the context of these various shifts, therefore, it is vital to consider how to engage in transdisciplinary inquiry in a way that not only addresses but also *centers* the agencies and entangled histories of knowledge work.

Again, a key part of this larger project is to consider how such an understanding might be taught as part of undergraduate curricula. It is particularly difficult to promote transdisciplinary work in the classroom, for a variety of reasons.¹⁰⁹ This chapter, therefore, suggests specific ways that undergraduate curricula might better demonstrate

¹⁰⁸ For example, Sheila Slaughter and Gary Rhoades' *Academic Capitalism and the New Economy: Markets, State, and Higher Education* illustrates the prevalence of these relationships.

¹⁰⁹ These reasons include, among others, lack of resources/precedence in development of such courses (though of course transdisciplinary courses exist, the relatively “set” course material for many disciplinary courses is far more accessible for most instructors), issues of faculty expertise, institutional structures which allow transdisciplinary courses only at the expense (in time and finances) of departments whose stated missions are disciplinary, and requirements that disincentivize students from taking transdisciplinary courses. To use one example, the University of Maryland, in its development of interdisciplinary General Education courses, require that proposed such courses must be “owned” completely by one department or program. While these institutional issues are addressed briefly in this chapter, however, the chapter will primarily consider the intellectual or course design challenges in transdisciplinary undergraduate courses.

and encourage transdisciplinary work for the benefit of students and instructors both. Particularly, this chapter considers how encouraging a feminist technoscience-based transdisciplinarity could reshape the boundaries between the sciences and humanities, and how border-crossings around such boundaries might in turn reshape undergraduate curricula.

To illustrate these points, this chapter describes and provides pedagogical materials for three examples of undergraduate courses that could be integrated for the most part into existing institutional trends. Each course thus furthers several goals of this chapter, by working to define or theorize transdisciplinarity, demonstrating the stakes in building connections between the sciences and the arts and humanities, and providing concrete ways of applying these ideas about transdisciplinarity in the classroom. Each course also demonstrates the ethical and political stakes of a feminist-technoscience-centered approach to unlikely comparison.

There are several underlying assumptions that guide the creation of these materials, and most are well-established principles of feminist pedagogy. For the sake of clarity, I mention two key assumptions here: students come in with a variety of experiences and previous knowledge which should be respected; and, classroom experiences should expose students to materials they are not familiar with, but also allow for new and multiple perspectives of academic or non-academic experiences they are familiar with.

Clearly, one focus of this chapter will be on developing specific ways of maintaining conversations among science and mathematics and the humanities in undergraduate curricula. Thus, the courses proposed are designed to “fit” within existing

structures, either as general education courses or as interdisciplinary seminars or capstones. For practical considerations, the courses are designed to be feasible as humanities courses, perhaps institutionally cross-connected ones. As comparative literature courses or in some other role, they offer examples of the kinds of unlikely comparisons that could help center the ethical and political stakes of transdisciplinary work and knowledge work more generally.

This chapter also demonstrates that centering conversations between the sciences and humanities, when done in a way that is mindful of the theoretical work of feminist technoscience, promotes the study of intersectionality¹¹⁰ -- of the co-constituting processes that build and preserve categories of gender, race, ethnicity, and other identities. Engaging with science is not something that should be “added” to existing curricula but instead used to transform it, just as non-Euro-andro-centric perspectives can reshape knowledge work, and should not simply be superficially added on.¹¹¹ I am of course not implying that the separation of the sciences and humanities means that “science” plays the role of an oppressed group;¹¹² I do, however, argue that fuller engagement between the humanities and sciences – if done in an agency-aware way - will

¹¹⁰ Intersectionality is a term coined by legal scholar Kimberlé Crenshaw, but the theory’s development in its early years relied on work by feminist scholars in many fields. Additionally, Bonnie Thornton Dill provided important foundations in the theory of intersectionality with some of the earliest scholarly theorizations of how feminism must attend to the race and class differences among women. More recently, scholars such as Nira Yuval-Davis have extended theories of intersectionality by attending to global contexts. A fuller description of the development of the theory of intersectionality and some of its key documents may be found in Michele Berger’s *The Intersectional Approach: Transforming the Academy Through Race, Class, and Gender*.

¹¹¹ To use just one example for illustration, the purpose of feminist history is *not* so that history courses might devote one week per year to women and otherwise remain unchanged.

¹¹² Financially, in fact, it is widely acknowledged that the sciences are accorded much higher status than the humanities.

help the *humanities* better attend to oppressed groups.¹¹³ Again, this is another benefit to making feminist technoscience a center of the humanities and comparative literary studies.

The chapter thus argues that implementing these proposed courses would make valuable contributions to transdisciplinary undergraduate education. These courses are even examples of how comparative literature itself might shift if it were to more fully center feminist technoscience. Additionally, I theorize key aspects of transdisciplinarity in order to expand the vocabulary we can use to discuss the political stakes of knowledge work.

Method and Organization

Primarily aimed at theorizing transdisciplinary and agency-aware undergraduate education, this chapter describes and analyzes three specific courses that I argue would be appropriate and beneficial for the above stated goals. For each proposed course, I discuss a set of theoretical justifications, in some cases including my transdisciplinary, anti-colonial, and feminist reasoning. I then describe a specific syllabus and offer an in-depth discussion of at least one sample unit from the course. These sample course syllabi are detailed and intended for actual use (with instructor changes, of course) and come with discussion questions to more precisely and concretely convey the nature of the course. This level of detail is intended to provide a resource for those considering offering such courses. Those who are reading primarily for the overarching argument may not need to all of these course explanations. Since transdisciplinary work will tend to include parts

¹¹³ It is commonplace to argue that fuller engagement with the humanities – especially its discussions of gender, class, race and ability – would make science less complicit in oppressions, but the reverse is not as frequently argued, and so I focus on it here.

that are of interest to different audiences, and since this dissertation is intended for those with different stakes and interests in various parts of the argument, I have labeled sections of the chapter to make it easier for the reader to direct their attention appropriately. It is important to note that these syllabi are intended as model or ideal syllabi, made to convey the overall pedagogical-intellectual goals of the course. The syllabi therefore aim to provide ample material from which instructors may select and adapt. The amount of material for each unit will therefore at times be more than one can cover in a week, but again, it is expected that all syllabi will be adapted to their local environments in terms of the emphases of greatest interest/challenge for instructors and students.

Each course's in-depth analysis of a sample unit is not intended to be comprehensive but rather to provide a general picture of the kinds of questions and comparisons that the course might engage. These analyses work to illustrate the transformative possibilities of fuller engagement with feminist technoscience, including in fields that have not traditionally centered gender *or* science. They also help to theorize the ethical and political stakes of transdisciplinarity. Additionally, the analyses rely heavily on what might be called "textual" or "literary" analysis, which is a traditional strength of comparative literature. These courses could – but do not have to be – comparative literature courses, but the analyses demonstrate the advantage of combining this comparative analytical tradition with the theoretical center of feminist technoscience. Each analysis will offer a brief discussion of why and how the sample unit's comparisons address the underlying questions of the course, and how the course might be used to re-articulate disciplinary boundaries. Again, these analyses are *not* intended to summarize

the argument of the overall course, but rather to provide just one example of what kinds of transdisciplinary work might be involved in the course, and discuss how such work is different from that in other courses offered more generally or widely.¹¹⁴

I am aware that there may be hesitation to attempt teaching a course that is transdisciplinary, and while team teaching is always an ideal option, institutional and economic factors may discourage this practice. Furthermore, I acknowledge that science- and especially math-phobia are serious issues for many, but this is another reason that more transdisciplinary coursework is so important. Therefore, it will be useful to outline a few brief points on why and how a non-mathematically inclined instructor might go about teaching courses such as those proposed here. First of all, a willingness to take risks is vital to meaningful classroom learning and especially to transdisciplinarity. But it is also vital to political, intellectual, creative, and other efforts outside the classroom as well. An instructor willing to engage with material of which s/he has varying levels of expertise is modeling being a lifelong learner, one that helps students understand that ‘not already being an expert’ or just plain ‘not knowing’ is a desirable state for all who seek intellectual challenges. This shifts students away from a mentality that they must avoid being wrong at all costs, and makes the approach to teaching less punitive. It shifts the question of learning away from ‘mastery’ and avoiding the state of ‘not knowing,’ toward creativity, connection, and inquiry. Furthermore, the inclusion of materials that the instructor may not have expertise in provides opportunities for students to take the lead in

¹¹⁴ There is not one standardized or monolithic method for arguing for and providing materials for transdisciplinary pedagogy, nor should there be. The method here, then, is to make each approach with the theoretical questions characterized by feminist technoscience, especially those made by the theorists discussed in previous chapters, as well as to provide materials that will assist in the development of transdisciplinary coursework, along with arguments illuminating how the courses relate to underlying theoretical questions.

discussion of such material and to collaborate in learning difficult concepts. Again, a ramification is that students have the rare privilege of working with someone who acts as though it is ‘natural’ or even positive to be in the position of finding intellectual material difficult.

The first of these three courses is a feminist technoscience adaptation of the kind of General Education course that might traditionally be called “Western Civilization.” I begin its discussion with something of an experiment in telling multiple stories and then proceed to discuss its theoretical foundations, the syllabus and discussion questions, and a sample unit. The second and third proposed courses are examples of transdisciplinary upper-level undergraduate courses, one on the more general topic of “change,” and the other explicitly on transdisciplinarity and unlikely comparison. After the three courses are discussed, the chapter introduces an original theoretical term, “polyrhythm,” used to explore the transdisciplinary nature of these proposed courses and the unlikely comparisons they perform. The conclusions then synthesize the main findings of the chapter.

Teaching Western Cultures

Many courses provide undergraduates with an overview of Western cultures, and there have been increased efforts to make such courses less androcentric and pro-colonizer. These are obviously vital goals, but an additional goal of this first proposed course is to encourage student investigations into the benefits of unlikely comparison. Thus it particularly illustrates what a feminist technoscience series of courses on Western

culture might look like.¹¹⁵ Given the contradictions and multiple purposes of such an effort,¹¹⁶ it will be useful to begin the discussion of this course with something of an experiment in storytelling:

One way to narrate Western culture is to latch on to the term “Western Civilization,” and to fetishize the uniqueness of the West until civilization *itself* is defined in Western terms and values. This story, of the triumph (and in some versions the eventual failures) of Western liberalism from Athenian democracy onward, is a problematic one, but one that appears in too many places, explicitly or implicitly, to ignore. This narrative might be called, if one needed a label, “The Story that Many People Think of When They Argue that Nothing Is More Important than Defending the Core Values of Western Culture,” and a brief summary of this story follows: *In the lands bordering the Mediterranean, between two and three thousand years ago, a series of shifts occurred whose impact is ongoing. These shifts have – by some -- been considered to be an unprecedented and unique blossoming of culture, ideas, and achievements, possibly caused by the uniqueness and unprecedentedness of those people. This uniqueness, however, in no way undermines the objectivity or universality of their experience of the world. Soon, through the foresight and learning of great conquerors, these unprecedented ideas spread far and wide, replacing or changing what was there before – for the better, it is often thought. Particularly, these ideas placed a high value on reason, truth, and inquiry. These values in turn precipitated rapid change by allowing the*

¹¹⁵ For the sake of brevity, this will be referred to as a “course,” even though it would be more practical to make it a series of courses at least one academic year long.

¹¹⁶ As it will be shown, this course is designed to fit administratively into existing curricula and institutional preferences, while shifting the focus and mode of inquiry of survey courses on Western cultures. While it may seem counterintuitive to have a feminist, anti-racist course that is devoted to the West, it will be shown that awareness of “the West,” as a tradition and as a category, is vital to such engagements.

human subject to pursue its full potential; of course, some argue that these rapid changes were not for these reasons, but there is no question that this view of the human subject had an effect. After a series of political, economic, military, and cultural expansions, it is often thought that the effects of these shifts and these ideas culminated in the present state of much of the world, and all its great achievements in government, technology, science, and the arts. It unfortunately follows from this premise that these ideas must also have brought about many of the negative consequences of said great achievements; again, these Western ideas are responsible for the current state of the world. It might be said, however, given this current crisis-prone state of the world, that these shifts, finally, brought about not only the beginning of civilization but also its end. Civilization, knowledge, and human potential are thus made into a sublime Greek tragedy: humanity's greatness and its hubris, hand in hand, rising to unprecedented heights and falling in an unprecedented collapse, as demonstrated by the symptoms of contemporary life: terror, the environment, disease, postmodernism, or e-books, depending on whom one asks. In these twilight years, however, some have begun to question if this "unique and unprecedented" string of achievements are actually just a small part of the story, and if it even makes sense to define civilization according to this narrow tradition; others, of course, have no use for these questions – these questions are yet another sign of the impending end.

Or, there might be another way to tell this story, one that narrates the West through a series of caveats. This narrative keeps the same basic outline as the previous tale but is full of ups and downs, its optimism and faith in Western culture repeatedly countered by reminders that such things really cannot be trusted. In other words, this

story is two stories at once, both trying to use the idea of “the West” to figure out how history happens. This might be called either “There Are Specific Historical Reasons for Your Habits of Thinking and Knowing,” or, possibly, “The Story You Need to Know to Watch the News”: *There was a people long ago – the Greeks – who produced a prodigious set of advances, and who, more or less, invented those things that are held most dear to supporters of Western civilization: Western democracy, Western philosophy, Western science, Western logic, Western politics, Western history, not to mention the gems of Western art and literature (but why did so many Greek thinkers claim that their ideas came from points East?). The Romans came and saw and conquered Greek ideas, spreading them and advancing them – or at least figuring out ingenious new ways of putting these ideas to work (many cultures became few cultures, colonization became synonymous with civilization). In the Middle Ages, advancement of these regions of knowledge were limited by lack of access to and public fascination with these classical contributions, as well as the oppressive influence of a politically and culturally pervasive Church that preferred to keep subjects ignorant. The rebirth of classical ideas in Italy, and then in the rest of the West, signified the beginnings of modern ways of knowing (but where is the proof that the ideas ever really went away? And why is it always the wealthiest states that get to declare themselves modern, thus making the rest of the world something else?); this Rebirth also meant that people were free once more (“freedom” and “people” being relative terms) to pursue the kinds of inquiry that make Western culture what it is (and such a tiny percentage of people were free, and so many of them were actively engaged in destroying the freedom of others). The collective and individual eye was once again set on progress (slavery, genocide, imperialism), i.e., on moving*

forward along the linear axis of human potential. The Enlightenment further undermined the rule of superstition, as reason and evidence became more important than mere tradition or authority or emotion (difference happens because Others lack reason, they are lower on Aristotle's Great Chain of Being¹¹⁷/the evolutionary scale/the phrenological chart). These ideas continued to shape the West, and through the West much of the world, leading to revolutions – political and Industrial -- modern democracy, dominance over other cultures in a variety of military and economic settings, modern arts and literature, modern science and technology, equal rights movements, and eventually, today, a culture that values innovation, individualism, freedom, and tolerance. (While some do not believe this story to be true, it is pervasive enough to make life difficult for those who do not know the story.)

Or, maybe these stories can be combined, together and with another perspective as well, so that the story of the West is a coming of age, a story of a relatively young culture finding its identity and declaring (enforcing) its identity to the world. This might be “The Story of How Western Culture Outgrew a Single Definition” or “The Story of the Story of the West”: *Several hundred years ago, the peoples of what is now called Western Europe began to see themselves as part of a definable unity; they began to collectively believe that they shared something – possibly something essential or inherent -- with one another that the rest of the world did not share. From this particular view of community came enforcements of religious orthodoxy, new formations of the concept of “race,” and a combination of co-operation and rivalry and infighting among European nations that spurred several centuries of global efforts toward imperialism. It is in this*

¹¹⁷ Scott Gilbert has argued that Aristotle's Great Chain of Being has steadily and sometimes stealthily influenced how the West conceives of difference as “lower” on a strictly hierarchical scale (Gilbert 204-208).

context that those in 'the West' wrote their creation myth: the story of the West. Like most adventure tales, this story took on a life of its own. The West's Mediterranean and West Asian heritage were narrowed and in some cases re-routed so that origins were almost entirely from Greece and Rome so that only "classical" cultures were the significant ancestors of the West. Soon, even those on the northernmost edge of Europe claimed to have a culture birthed on Greek beaches (even –or especially – when Greece was the colonized party¹¹⁸); the mosaic of European cultures thus became a monotone monolith (while still leaving enough difference for intra-European fighting to take on global repercussions). The Greek disdain for foreigners, and for the East, became more proof of the natural-ness of the concept of "the West" and the inevitability of hostility toward the non-Western. Rome, the paradigm of Western empire, to which the titles of "czar" and "Kaiser" would later make reference, became an exemplum, a reminder that conquerors were put on earth to, as the Aeneid claimed, bring light to the dark places by subjecting them to imperial rule. The story of the West – synonymous with the story of Western ideas of progress – spanned across time and space, infiltrating, but also influenced by, all the places and spaces it touched. And soon "the West" became a myth, and a powerful one: the West was Icarus, but with better wings, soaring upwards still.¹¹⁹ The West was a warrior, sword gleaming as it sliced through the sinew of the uncivilized world. The West was a phallic shaft of light, always pointing forward, a straight never-

¹¹⁸ For instance, when Britain was engaged in arguably colonial excursions in Greece, the idea that the Greek culture was part of Western and therefore British heritage may have contributed to the plunder of antiquities. It is of course ironic that the English largely ignored or demeaned the Celtic heritage of Britain while claiming a Hellenic one; a denial of one and an embrace of the other furthered colonial aims on both ends. The contradiction not entirely surprising, however, since it is of course true that controlling the outcome of paradox is one of the hallmarks of institutional power.

¹¹⁹ Giordano Bruno's poem, "The Philosophic Flight," for example, celebrates the Early Modern science of his time, comparing the seekers of knowledge to Icarus, and suggesting that they gleefully embrace their fate, if Icarus' dire end is even going to happen to them at all.

ending line of progress piercing through the darkness of the cosmos. And soon, it became clear that there were fundamental differences between the West and others, that in fact all othering processes were iterations of one difference, that the Great Chain of Being placed all things in order according to their distance from the educated Western male aristocratic subject. Women, animals, the lower classes, and non-Westerners shared a lack: they lacked reason, usually, or self-control, or the ability to be moral or true; they were primitive, half-formed, in need of someone to think and speak for them. And as the West expanded, a balloon of violence in the name of civilization, it kept repeating its creation story, rewriting it again and again, giving this story the freedom to adapt and survive. And so the story of the West seemed to change. The story seemed to become the snake that eats its tail, as modern and postmodern narratives critiqued and befuddled and resisted and reinforced but remained, somehow, Western. So in the face of the nuclear, the biopolitical, and a series of “post-”s, in the face of late late capitalism and questions that make even reactionaries wonder if the tradition of the Enlightenment really still has answers, the West tells its story differently: it has adapted, so that there are a multitude of stories, a tournament of stories about what the West was, is, and will be, and someone not paying close attention might think that the story of the West has become much smaller and less powerful. But while the monolithic adventure yarn of “the West” perhaps holds less sway than it once did, the story survives in a multiplicity of sites, viral rather than top-down, but ubiquitous nonetheless. Perhaps the story of the West has decided that the cockroach has a better survival rate than the lion, and it is making itself small enough to escape all its newfound threats. Perhaps the best analogy is not animals but once more is myth: perhaps the wax wings – whatever it was that made

the story of the West soar upward - are hot and tired, or perhaps the sword has started to rust, or maybe the theory of relativity has made the shaft of light seem less unfathomable. But there was once a story, and the story was violently, almost incomprehensibly powerful, and now, that story is looking for something. To be frank, the story seems a bit desperate.

Or there might be yet another way to tell the story, one that focuses on ideas, one that understands the way thinkers in different times are engaged in a great conversation about the most important issues human beings have grappled with. This might be called “The Great Books Story”: *You, the educated reader, are watching Einstein, Socrates, and Shakespeare as they sit at a table in the cafeteria of Great Minds. They are talking, excited, about their work as they sip coffee (hemlock free). They are not so different from one another, it seems, and soon Sigmund and Churchill and Newton come to join them. But then you blink and you realize that there are others there, hundreds of others, most not even from the same continent, and then you blink again and their daughters and wives and employees are all there too. Then suddenly there are millions, and they are not sitting at a table drinking coffee like you thought – their words and works and thoughts are tangled together in complicated knots and groupings, and suddenly it is not clear at all where you should sit.*

Or another way, that we might “The Story of the Birth of Western Culture,” that recalls that half the human species need not necessarily be on the margins of the story: *First, presumably, women were at the center. They were likely majorities on councils of elders, and the center of religion as well, and contributed to food acquisition and cultural achievement and war; division of labor, after all, was likely based on age and not gender.*

At some later point, class hierarchy and patriarchy followed, The old stories of mythic women were turned into fairy tales or fables, and in these versions, powerful women (Pandora, or Bluebeard's wife) were too curious, and they suffered for knowing too much. But despite this façade of the masculine grip on knowledge, women continued their traditions of political wisdom, medicine, storytelling, science, textile and other technologies, lived mathematics, and networks of female connection. And while most of this was as silent and lost-to-posterity as the work of Shakespeare's sister¹²⁰, women still achieved an astounding proportion of human accomplishment, good and bad, from Enheduanna to Sappho to Lise Meitner to Rosalind Franklin to Ellen Johnson Sirleaf. And at a time when crisis besets crisis, when the cultural and other institutions that upheld patriarchal subjectivities are so loose and delicate, it is starting to seem that in the long course of human history, a few thousand years might not be such an interminable amount of time after all; this liminal world of today offers both threats and possibilities for groups that have long been oppressed.

Or, one might want a story that considers the foundations of Western cultures without such blatant geographical bias. Of the many such possible stories, this one also tells at least two stories, and might be called "The Story of the West and How It Started in the East," or, perhaps, "The Story of Nature and Culture": *It started between two rivers. Communities between the Tigris and Euphrates built cities, and then they built walls around these cities, and then other kinds of walls to change the floods and establish the kinds of long-term uni-location agriculture that allowed them to have bread and beer (and division of labor and a class system). And then, because there was a permanent*

¹²⁰ The reference here is to Virginia Woolf's famous discussion of Shakespeare's hypothetical female counterpart in *A Room of One's Own*.

city, “people” and “place” became bound together in a way that they never had before. And from this unity, this forced and tumultuous meeting of people and place, came writing, and a variety of other things that we now take for granted, but which must have been, at one point, astounding in their novelty. Here, Gilgamesh (or those who wrote his epic) realized that people do not live forever but perhaps cultures do; Enheduanna wrote about religion and politics and sex in a way that confounded later peoples who put these into separate categories; accountants were mathematician-artist-linguists who established new ways of ordering things and society¹²¹; the forest or mountain became the place of exotic things, scary or appealing. And so nature became the thing beyond the walls, the place where people come from but no longer live. And because nature (in other words, the world) is always with the past – because the individual is always leaving it behind – she (or he) is always walking with both pull and loss, always knowing that the world she knows, the world she is of – i.e., culture – is a motion away from the world that is real. Thousands of years later, in the time of climate change and resource shortage and globalization, where people still refer to Man and Nature as if they are separate categories, the problem that was there at the start is still here, still making it seem like culture is a motion “from.”

These stories are just a few of many that could be told, each showing just a few of the stakes and contradictions enacted by any attempt to ask what “the West” is, and how it has shaped the current state of the world. What it means to study Western culture is a fraught topic, to say the least. Telling these stories was intended as an experiment in multiplicity. There are other possible stories, certainly, and many of these stories that

¹²¹ Denise Besserat-Schmandt has explained this process in the development of Mesopotamian writing in her book, *When Writing Met Art: From Symbol to Story*.

were included above are politically problematic and even full of falsehoods. But even the most problematic stories about “the West” – or, in fact, *especially* the most problematic stories – are vital for students to know about in order to understand how the idea of “the West” continues to influence the world they live in. In a time when definitions of the West are undergoing rapid change, students need to consider who tells these stories and why, and to do so, they need to know what stories have been told.

The purpose of the above experiment is not simply to point out that multiple stories exist. Indeed, the question of greatest interest might not be “How does one know which story to tell?” or even “How does one tell students they must know a story even as you tell them they must know why the story is untrue?” Rather, the most pressing question is “How does one learn to tell – and listen to – all these stories at once?”¹²² Students need many perspectives on “the West,” but they also need the skills to navigate *among* these stories. It is this question – of how we might move among multiple stories about the West in a more agency aware way – that motivates the following course design for teaching courses on Western cultures to undergraduates.

Course 1: “A History of Difference in Western Cultures: The Uses of the Past”

The first proposed course (or series of courses) is entitled, “A History of Difference in Western Cultures: The Uses of the Past.” While no course so titled could be completely comprehensive, it is intended to be appropriate for lower-level

¹²² The shift embodied by this question is largely inspired by Chela Sandoval’s work on oppositional modes of consciousness, which will be discussed later in the chapter. In brief, Sandoval critiques the desire to demonstrate that one kind of oppositional mode is superior or more advanced than others and argues that a more relevant question is how to move among these modes.

undergraduates. As such, it might serve some of the same purposes a more traditionally-minded survey-style “Western Civilization” sequence would, in that it would provide a useful breadth of knowledge about Western cultural productions and intellectual contexts. But unlike those courses, this one follows the larger trend of studying Western culture(s) by studying how the West came to construct itself as such. While considering Western culture through a feminist and anti-racist lens is not new, nevertheless these efforts are far from over and achieved.

Much attention in this course is directed to scientific discourses, since they are inextricable from the other cultural and knowledge traditions discussed. While any course that tries to fit Western Civilization into a year is bound to omit very important material, the course here works with its very omissions. While it is true that important figures such as Kant, Castiglione, Petrarch, and innumerable other worthy texts have been left out, and that large swaths of omitted canonical material are necessary for any course spanning thousands of years,¹²³ what is included works to direct attention to the central and framing questions listed in the Course Description below.

Course Description and Explanation:

This course provides an introduction to Western cultures that integrates the cultural, social, and historical studies of mathematics, science, technology, philosophy, economics, literature, art, religion, and more. The course aims to provide a history of Western cultures and ideas from feminist technoscience perspectives and therefore centers the following questions:

¹²³ The course centers on European cultural production but is not completely exclusive (nor could it reasonably be). The course design is also a response to Kath Weston’s call for an attention to ‘spacetime’ and the multiple relations among differences in identity and in space and temporality (Weston 12-18).

1) How is the past imagined? How is the present's relationship with the past imagined and to whose benefit? Where and how do multiple understandings of the past proliferate and why?¹²⁴ Note that this question – what do we use the past *for*? – is key to teaching Western culture in a way that encourages us all to think critically about *why* Western culture is studied.

2) How are technoscientific and other kinds of knowledge implicated in historical, material, and agential relations?¹²⁵

3) How have nature and culture co-constituted each other as categories? How do these categories relate to other dualisms?¹²⁶

4) How are narratives of difference and various Other-ings related to Western culture, including conceptions of “the West”? How and why are narratives of continuity/discontinuity with the past used to define “the West”?¹²⁷

Syllabus/Course Outline:

¹²⁴ These questions are inspired by Katie King's work on the co-constitution of pasts and presents in “Pastpresents: Playing Cat's Cradle with Donna Haraway” and Sharon Traweek's observation in “Faultlines” that a proliferation in different ways of defining a time period may itself be a defining characteristic of a time period.

¹²⁵ This question is inspired by Karen Barad's agential realism as expressed in *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* and Bruno Latour's *Laboratory Life: The Social Construction of Scientific Facts*.

¹²⁶ Donna Haraway address this question throughout her work; a good foundation in her work on naturecultures is “Otherworldly Conversations; Terran Topics; Local Terms.”

¹²⁷ These questions are inspired by Edward Said's *Orientalism* and Londa Schiebinger's “Feminist History of Colonial Science”

Unit 1: **Science and Culture**

Readings: Denise Schmandt- Besserat, *From Counting to Cuneiform*.

Enheduanna, *Inanna, Lady of Largest Heart: Poems of the Sumerian High Priestess*, Ed.

Betty de Shong Meador

Eleanor Robson, “The Uses of Mathematics in Ancient Iraq,” in D’Ambrosio and Selin, eds., *Mathematics Across Cultures*.

Discussion Questions: How is technoscientific work involved with religion, writing, agriculture, wealth distribution and trade, divisions of labor?

What is social about technology? What is a social technology?

Unit 2: **Genders and Natures in Egyptian, Biblical, and Greek Narratives**

Readings: Tom Hare, Excerpts from *ReMembering Osiris: Number, Gender, and the Word in Ancient Egyptian Representational Systems*

Ronald Calinger, Excerpts on Pythagoreans in *A Contextual History of Mathematics*.

Hesiod, *Theogony*

Sappho, Poems.

Bible: Genesis, Song of Solomon, Luke

Discussion Questions: What can religious, technoscientific, and other discourses reveal about a culture’s (diverse) views on the world and on the relationships among people, communities, and non-human (or liminally human) agents in the world? How do these

discourses relate to conceptions of past and present? How and why do narratives of social changes or turmoil come to be gendered?

Unit 3: Math, Reason, and Power: Accounting, Architecture, Textiles, Religions, Calendars, Graphic Design

Readings:

Ronald Calinger, Excerpts on ancient Greece in *A Contextual History of Mathematics*.

James Ritter, “Egyptian Mathematics,” in D’Ambrosio and Selin, eds., *Mathematics Across Cultures*.

Marija Gimbutas, Excerpts from *Language of the Goddess*.

Homer, *The Odyssey*. Excerpts on Penelope weaving.

Plato, Excerpts on “the Cave” from *The Republic*.

Aristotle, *History of Animals*

Discussion Questions:

How are mathematical practices implicated in social hierarchies, rituals, labor practices, and community, ethnic, or city-state membership? How can mathematical practices mark insider or outsider status? What kinds of knowledge practices are entailed in cross-cultural comparison, and how does subject matter affect the nature of comparisons?

Unit 4: Culture, Change, and Identity

Readings:

Aeschylus, *Oresteia*.

Froma Zeitlin, "The Dynamics of Misogyny: Myth and Mythmaking in Aeschylus' *Oresteia*,"

Bible: Judges.

Susan Ackerman, *Warrior, Dancer, Seductress, Queen: Women in Judges and Biblical Israel*.

Discussion Questions:

What various contributions could Greek mathematicians make to discussions of comparison or of similarity and difference (geometric similarity, equality, equivalence, proportionality, etc.)? What contributes to the (more limited?) possibilities for discussion of differences related to gender or Greek-ness? How are the binaries listed in Zeitlin's article relevant to later periods in Western culture, including contemporary cultures?

Unit 5: **Rome and Empire**

Readings:

Ronald Calinger, Excerpts on Rome and Late Antiquity in *A Contextual History of Mathematics*.

Valerie French, "Midwives and Maternity Care in the Roman World."

Vergil, *The Aeneid*

Ovid, Excerpts from *Metamorphoses*

Discussion Questions: How did various Roman cultural sites conceive of the Roman empire's relation to other cultures, including Greek and Hellenistic cultures? How did Roman identity develop in relation to empire and various Others? What role did

mathematics and engineering play in imperialism, trade and cultural exchange, and city life?

Unit 6: **Medieval**

Readings:

Video: Hildegard von Bingen, *Ordo Virtutum*

Táin Bó Cúailnge

Ronald Calinger, “Mathematics in the Service of Religion” and “Recovery and Expansion in Old Europe, 1000-1500,” in *A Contextual History of Mathematics*.

Jacques Sesiano, “Islamic Mathematics” in D’Ambrosio and Selin, eds., *Mathematics Across Cultures*.

Excerpts on the introduction of ‘Zero’ to the West in Plant’s *Zeros + Ones* and Weston’s *Gender in Real Time*.

Discussion Questions: In what ways was the ‘medieval’ period a time of great change? How did gender, religion, and science interconnect in different situations and environments? How are women’s and men’s bodies represented by various groups for various purposes? What cultural exchanges and other changes helped shape the idea of “Christendom”?

Unit 7: **Early Modern I: Seeing/the human**

Readings:

Ronald Calinger, Chapter on the Early Scientific Revolution in *A Contextual History of Mathematics*.

Leonardo da Vinci, Excerpts from *Notebooks*.

Margaret Hodgen, Chapter on “The Sixteenth and Seventeenth Centuries, or the Cabinet of Curios” in *Early Anthropology in the Sixteenth and Seventeenth Centuries*.

Mary Wroth, *Love’s Victory*

Discussion Questions: How do these texts narrate the relationship between the individual and public life? How are various differences distinguished or elided? How does difference relate to methods and technologies of observation? What are the uses of the idea of “the new” in Early Modern culture? What are the uses of “the ancient” in Early Modern culture? How does unequal access to classical texts inform the various travels of humanisms? What changes in “perspective” are important here, literally and metaphorically? How did mathematics relate to shifts toward urban life and capitalism?

Unit 8: **Early Modern II: Science and Society**

Readings:

Margaret Cavendish, *The Blazing World*

Francis Bacon, *Novum Organum*.

Genevieve Lloyd. “Reason, Science, and the Domination of Matter” in Keller and Longino, ed.

Mary Terrall, “Heroic Narratives of Quest and Discovery.”

Discussion Questions: How are discovery, exploration, and con/quest connected in various cultural sites? What “Others” are becoming more or less visible, and in what situations? What are the various understandings in various sites of the relationships between “Man” and “Nature”? How were the appeals, dangers, and rewards of “New” World(s) understood? How did this understanding relate (or not) to labor practices, slave trades, empire, and conquest?

Unit 9: **Baroque/Enlightenment**

Readings:

Sor Juana Inés de la Cruz, *Poems, Protest, and a Dream: Selected Writings*

Audio: Bach, excerpts from *Art of Fugue*: performed by Riemer, Gould, Nikolayeva

Thomas Hobbes, *Leviathan*

Shapin and Schaffer, Excerpts from *Leviathan and the Air Pump: Hobbes, Boyle, and the Experimental Life*

Donna Haraway, “Modest_Witness@Second_Millennium”

Londa Schiebinger, “Feminist History of Colonial Science”

Discussion Questions:

How are artistic and technoscientific discourses of the past three weeks related to shifting relations of public and private? To print culture? To theatre and theatricality? What do the terms “Enlightenment” and “Illumination” reveal about attitudes toward reason, and toward visual observation? What various intersection points between religion, mathematics, and science were significant and to whom?

Unit 10: **Enlightenment/Revolution**

Readings:

John Jackson and Nadine Weidman, “The Origins of Racial Science: Antiquity-1800” in *Race, Racism, and Science*

Ronald Calinger, Excerpts on Scientific Revolution in *A Contextual History of Mathematics*.

Voltaire, *Candide*

Londa Schiebinger. “Why Mammals Are Called Mammals: Gender Politics in Eighteenth-Century Natural History” in Keller and Longino, ed.

Mary Wollstonecraft, *A Vindication of the Rights of Men* and *A Vindication of the Rights of Woman*.

Discussion Questions: How and why do categories travel to different locations in space and time? How are the categories of ‘science’ and ‘not-science’ relevant to other trends of the time period? In what ways did rights discourses signal a discontinuity with past understandings of the self and society? In what ways did these discourses rely on previous understandings of these concepts? What were the implications of the ideas of the rational man/modest witness?

Unit 11: **Romanticism**

Readings:

Mary Shelley, Frankenstein.

Anne Fausto-Sterling. "Gender, Race, and Nation: The Comparative Anatomy of 'Hottentot' Women in Europe, 1815-1817."

Percy Shelley, "Ozymandias."

Brothers Grimm, *Fairy Tales*

Clara Schumann, "Am Strande," Perf. Grimaud and Von Otter

Discussion Questions: How is "the past" being used? How are "ruins" and narratives of ancient cultures used? How do urbanization and industrialization practices relate to representations of the rural, the folk, emotion, Nature, ruins, and entropy? How are representations of the human (or monstrous) body, of passion, and of birth and other creativities, related to negotiations about religion, gender, race, class, government, and education? In what ways can these materials be thought of as a continuation of Enlightenment discourses? In what ways can these materials be thought of as counter-Enlightenment?

Unit 12: **Nineteenth Century/Early Twentieth Century**

Readings:

John Jackson and Nadine Weidman, "The Establishment of Racial Typology" and "Race and Evolution" in *Race, Racism, and Science*

Julie Klein, "Forming Humanities" in *Humanities, Culture, and Interdisciplinarity*

Charlotte Bronte, *Jane Eyre*

Lennard J. Davis. "Constructing Normalcy: The Bell Curve, the Novel, and the Invention of the Disabled Body in the Nineteenth Century."

Githa Sowerby, *Rutherford and Son*.

Discussion Questions: How might technoscientific work bolster, resist, or be shaped by bureaucratic, family, and institutional control? How does the 'disciplining' of the disciplines affect knowledge practices? What other institutions become important in these times? Which social movements become important in these times? What is the significance of shifts in concepts such as madness, hysteria, criminality, and the primitive? How do narratives of difference relate to narratives of the past? How did technologies and understandings of "the human" influence each other?

Unit 13: **Early/Mid-Twentieth Century**

Readings:

Alfred North Whitehead and Bertrand Russell, Excerpts from *Principia Mathematica*

Virginia Woolf, *To the Lighthouse*.

Leonora Carrington, *The Hearing Trumpet*.

Karen Barad, "Niels Bohr's Philosophy-Physics: Quantum Physics and the Nature of Knowledge and Reality" in *Meeting the Universe Halfway*

Marcia Bartusiak, "The Woman Behind the Bomb."

Discussion Questions: How do these materials conceive of their respective time periods; in what ways do these materials view the early Twentieth Century as continuous or discontinuous with various "pasts"? What aspects of the past are "rejected" and why? In

what sites do military, mathematical, ethical, and epistemological debates become closely intertwined? What shifts and tensions are evident in various portrayals of foundations, formalizations, and axiomaticizations? What shifts are evident in attitudes toward representation?

Unit 14: **Contemporary Narratives of Western Cultures**

Readings/Viewings:

Section on “Heroines” in *Orpheus and Company: Contemporary Poems on Greek Mythology*

Dacia Maraini, *Veronica Franco*

Tom Stoppard, *Arcadia*.

Shelley Jackson, *Patchwork Girl*

Bruno Latour, “We Have Never Been Modern.”

Film, *Orlando*. Dir. Potter

Discussion Questions: What are the uses of the past? How does a narrative about a “time period,” “era,” or “Age of ...” relate to more recent conversations? What narrative tactics are used to idealize the past (in this week’s *and* previous materials)? What tactics are used to resist idealizing or romanticizing the past? Where and how do multiple understandings of the past proliferate and why?

Brief Explanation of Course Design

This course proceeds in a loosely chronological fashion – in other words, it starts with the ancient and ends with the modern, but the cultures and texts are not arranged in

strict chronological order, and there is a fair amount of “jumping around” in the time periods of the texts, even within a single unit. The course is designed to approximate the periodizations of Western history into Ancient, Medieval, Early Modern, Baroque, Enlightenment, Romantic, Modern and Postmodern, but the goal is to ask students to think about the ramifications of choosing these periodizations as a way of making meaning of the past, and to examine what these periodizations reveal about the *uses* of past. In other words, the course studies how these divisions and categories of time make visible – or make invisible – some people, groups, practices, continuities, and discontinuities, and not others. The reading materials and names of weekly units therefore are not strictly chronological, and instead are designed for these goals, and also of course to facilitate exploration of discussion questions. Furthermore, the attention to periods provides a similarity to -- and shared community with -- many traditions of humanities pedagogy, and could therefore be more readily integrated into existing institutional practices. In this way, the course aims to take advantage of the strengths of instructors in fields where periodization is a significant category for scholarly specialization (many literature and language departments or art history, for example).

Each weekly set of materials aims to integrate course material at several levels in a way that fulfills traditional goals of General Education courses but in a way that is more responsive to difference, ethics, and the complexities of the world today’s undergraduates face. Each weekly unit is designed to integrate the study of science and the study of traditionally humanist material, and to do so in a way that foregrounds self-reflexive analysis of both disciplinary and cultural differences. The course design assumes that putting various disciplines into dialogue with one another, and thereby attending to

gender and other differences with a breadth of interacting disciplinary perspectives, is vital to ethical, flexible, agency-aware, self-reflective, and intellectually rigorous knowledge work.¹²⁸ This is precisely the kind of critical thinking that undergraduate General Education courses should enable. Another goal that General Education courses might share is the production of knowledgeable and critical global citizens; again, this transdisciplinary perspective is helpful, since scientific, historical, mathematical, political, cultural, and statistical literacy have become increasingly necessary for active and informed participation within (or in opposition to) civic society. Admittedly, most of the readings in this course focus on European cultures,¹²⁹ with ample “canon” material, but this choice is not done only to “cover” this material, but also, more importantly, to interrogate the agencies involved in the canonization of texts.

There are several ways this course might fit into existing institutional structures at colleges and universities. As mentioned, this course could of course be used as a survey of Western culture(s), and much of the reading material, as well as organization by period, would make it an appropriate fit. The reasons for doing so are stated prior to the course description, but one additional benefit of the course is that science and non-science majors can benefit *both* in using the broader historical-intellectual context to be

¹²⁸ Again, this assumption stems from the longstanding assertion that disciplinary border crossings are key to creating more politically viable knowledge and teaching, and can be seen in the foundational claims of interdisciplines such as Women’s Studies, Diasporic Studies, and other fields.

¹²⁹ The course uses both primary and secondary sources; while many survey courses are exclusively dedicated to primary sources, often for good reasons, the inclusion of secondary sources accomplishes several goals: the summary and explication of large amounts of material, attendance to many of the questions that lie at the center of inquiry for the course as a whole, and, since the secondary sources of course are also cultural artifacts (usually of more recent times), the frequent reminder of how and why various persons in the present interpret and use artifacts of ‘the past.’ In other words, the secondary sources will also be used as primary sources. While some of the secondary material may be difficult for some lower-level undergraduates, it is worth noting that one of the more ‘traditional’ justifications of Western culture surveys is the exposure of students to difficult primary material, and I would posit that theoretically-minded secondary materials are difficult in a different *way*, but not necessarily *more* difficult to *all* students of all backgrounds than primary sources.

more (self-)critical about their own knowledge practices and also to gain exposure to many areas of study and to consider the multiple specific (and contingent) ways these areas intersect. In other words, General Education courses should help students put their own disciplinary field in the broader context of the politics, histories, and agencies that produce that field. This course, through its emphasis on questions centered by feminist technoscience, aims to do so.¹³⁰

For those interested, although it is not strictly necessary in order to understand the purpose of the course, it may be useful to know the specific justifications for the various units in the course, since I argue for a somewhat unusual approach to commonly taught material. The course begins with Sumerian and Babylonian cultures, for reasons of chronology. The unit encompasses several aspects of these cultures in order to provide an introduction to the situatedness of technoscientific and other knowledge. Specifically, it introduces the topics of early writing, accounting, measurement, calendars, and architectural practices as social, political, and often religious activity in the context of urban life, social hierarchy, and empire. On a different note, another benefit of a

¹³⁰ Note that there are many possible institutional locations for this course. Obviously, the course would work as a general integrated humanities course or as a science-aware comparative literature course. The course might also slightly shift focus to work as a course located in a science department; the course would be appropriate for ‘non-majors’ but the attention to knowledge practices could shift to center methodological questions of science (which would also avoid the stereotype that non-major science courses - sometimes mockingly called “Physics for Poets” - have little material that would be useful to science majors. Therefore, since science and engineering majors would also benefit from the course, the course resists the tendency for science general education requirements in science to separate science and non-science majors (which is to the intellectual detriment of both groups in terms of missing out on productive dialogue, but could also possibly affect the proportion of underrepresented groups in the sciences and engineering). In other words, this course would allow for science and non-science majors to share General Education science coursework in a way that will help both equally. With modifications, this course might also be a useful interdisciplinary “Area Studies” course in European studies, or a course in Women’s Studies, English, or Critical Studies of Race and Ethnicity. With fewer readings and more written assignments, this could be used as a template for development of a math-centered feminist technoscience course that serves as the freshman writing course that is required at most colleges and universities; the course would examine examples of context, audience, definition, argument, evidence, and warrant, and would also involve close analysis of several readings, and therefore would be appropriate for both literary and rhetorical approaches to teaching college composition.

science/mathematics-heavy course is that it makes it even more difficult to ignore the long and abundant intellectual exchange between the “West” and the “Near East” (though of course many Western culture surveys already consider this). The histories of “Western” and “Middle Eastern” mathematics, for example, are quite tricky to consider as separate histories, despite the apparent tapering (not absence) of exchange for the brief few hundred years before the emergence of the Internet.

The following two weeks consider cross-cultural comparisons from the perspectives of two different ways of looking at ‘science and culture,’ one that considers myth alongside the technologies associated with life, death, and reproduction, and one that considers the politics of mathematics. This double comparison occurs early in the semester to allow students to frame the semester in a way that emphasizes the following: the agencies involved in *selecting* the basis or focus of cross-cultural comparison, the trickiness of using a text as a ‘window to the past’ that may be used to define cultures in broad strokes, the diversity of knowledge practices within a culture, and the idea of interdisciplinary inquiry as a dialogue among specific knowledge traditions rather than all-encompassing studies of ‘everything.’ On the issue of reading choices, (which will primarily be explained only when they depart from canonical texts, where there might be uncertainty as to the reasons for such a choice, or if I believe that a particular reading is vital to the unit), Calinger’s history of mathematics is selected because it contains a great deal of specific information about the history of mathematics with fairly clear explanations of some difficult mathematical material; it also attempts to place mathematical work in Europe in a broader social and intellectual context, often with (a bit brief) descriptions of philosophical, technological, scientific, political, religious, and

artistic changes and movements. While the book does rely on narratives of genius, a fair degree of mathematical Platonism (see Davis and Hersh on the implications of this), and a somewhat Euro- and andro-centric view of mathematical work, it is nevertheless in these regards still better than most histories of mathematics that have such comprehensive coverage of Western mathematics over such a large time span; furthermore, the contextual approach and clear explanations make this a suitable choice (though certainly not the only one, and the use of more primary mathematical texts is an excellent option though necessarily less able to ‘cover’ wide swaths of mathematical material). The Biblical readings other than *Genesis* and *Song of Solomon* may appear to be of less cultural import or cross-cultural resonance than some other books of the Bible might be, but each has implications for gender and sexuality. For examples, *Judges* has a number of female figures involved as both purveyors and victims of violence and power, during a time of great turmoil and religious and ethnic disunity, and *Luke* of course is central to the establishment of the Marian tradition in Western Christianity (and, coincidentally, is thought to be written by a physician).

Week 4 is devoted to the practices of naming and defining, and the previous discussion of ancient Greek materials will provide useful context as well. The attention to difference, with a centering of mathematical notions of difference, attends to identities and difference with less reification of categories of identity. Additionally, the richness of mathematical language on difference puts into stark relief the comparatively shallow discourses on differences of Greek-ness, gender, and ability, which is a prime example of the perspectives offered by some interdisciplinary approaches. Week 5 employs a similar tactic for Roman culture, and again attends to difference and the uses of particular

ideas about pasts and Others, as well as emphasizing the co-constitution of engineering and processes of urbanization, colonization, and globalization.

Cultural encounter is again central to the medieval unit; also important are the technoscientific contributions of Hildegard von Bingen, Fibonacci, growing networks of merchants, and others. The discussion questions should also help problematize the periodization of the “medieval,” and the term itself. The Early Modern units are largely centered on the interconnections among humanism, observation, and subjectivity, and their relations to their co-constitutive dominations and dehumanizations. The two units are not meant to be interpreted as a chronology (i.e., they are not intended as a division into categories like early Renaissance and late Renaissance), but instead as two different approaches to similar sets of questions. The same should be said for the two units on the Enlightenment. In the materials for the Enlightenment units, it is worth mentioning that Bach, like Hildegard von Bingen, provides a good example of how mathematics relates to music; the multiple recordings are meant to expand on the theme of variation present in the music, but also to evoke how contemporary audiences “use” the baroque (the performers are diverse, particularly in their attitudes toward ‘authenticity’ of performance style). It would also be important to emphasize the technoscientific work of Sor Juana, and Schiebinger’s essay on colonial science is particularly useful in describing the contributions of Maria Sybilla Merian to science and culture.

Romanticism as a category or a way of defining a period could certainly be questioned, and has been, which is the focus of that particular unit; students can ponder what it means to ascribe certain traits to a time and place. Fairy tales are also a good opportunity to talk about male appropriation of women’s cultural production (in

conjunction with Victor Frankenstein's erasure of women from the birth process), and also of course to consider broader trends such as the relationship between oral and written knowledge traditions, and perceptions of nation and class (as well as the romanticization of rural poverty, in which the exoticized, timeless, unchanging Other becomes a symbol of nationalism). In the nineteenth century unit (again, not strictly a chronological term, since it overlaps with the dates of the Romantic materials), the readings on "Race and Evolution" also provide an accessible overview of Darwin's work as well as many of ways it was used to naturalize oppressions, and regardless of the materials used to discuss evolution, it would be important to emphasize a couple of points that are occasionally overlooked – that craniology and other racist science was not pseudo-science but was science ("science" of course not being the same as "truth"), and that evolution depends on diversification through mutation and sexual reproduction (at the very least) as well as on selective pressure . Both the nineteenth and twentieth century materials deal with responses to growing bureaucracies, militaries, and imperialisms, as well as to abolition, suffrage, anti-colonial and other movements, and Lovelace, Whitehead, Russell, and Bohr attest to the inseparability of technoscientific and epistemological discourses during times when multiple materialization processes were in flux or in crisis. For Week 14, instead of a more standard 'postmodern' unit (although of course many of these materials would be considered excellent examples of postmodernism), I have designed the 'contemporary' unit to also serve as a 'Summary and Review' unit, in which the materials and discussion topics of previous units should be looked at through a different lens. To that end, the reading/viewing materials for this unit represent time periods of the past in diverse and fascinating ways. Not all time periods are represented, and for

reasons of practicality, I have chosen only a few of the multitude of possibilities (for instance, other good options include Judy Grahn’s poetry on Inanna, Michael Frayn’s *Copenhagen*, or Angela Carter’s fiction) . The sample of readings chosen here include several poems (on women in Greek myth), two plays (Maraini’s is about Early Modern Venice, and Stoppard’s jumps between the Nineteenth and Twentieth Centuries), an essay (covering a wide swath of narratives about the past), a work of digital literature (Jackson, referring particularly to Shelley’s *Frankenstein*), and two films. *Brotherhood of the Wolf* might seem like an unexpected choice, given the number of excellent French films set in this time period, but this particular film demonstrates the resilience and persistence of some of the more troubling Otherings in Western history, particularly with its portrayal of ethnicity, gender, and disability. *Orlando* is based on Woolf’s novel and is particularly interesting in light of the theme of this unit since it centers on a character who lives through several centuries of Western culture. Again, these materials for each unit, and particularly for the ‘Summary Unit’ in Week 14, are a loose guide and can be tailored to instructor, institutional, or student strengths and interests.

Key Concepts and Arguments of “A History of Difference in Western Cultures: The Uses of the Past”

The primary focus of this approach is intersectional, examining differences, such as gender and race and nation and time period, not as separate areas of inquiry but as mutually dependent categories – these categories are co-constitutive, to use Haraway’s words. This course is intended as a history of the intersections of the dualisms and other categories that have defined Western culture, including “old” and “new,” “nature” and

“culture,” and “past” and “present.”¹³¹ Certainly, work in the direction of this intersectional¹³² approach has defined much feminist and other inquiry for the past two decades, and has particularly been led by US third world feminisms.¹³³ The efforts have changed approaches to Western culture¹³⁴ but of course there is still more work to be done in changing the Eurocentrism and androcentrism of undergraduate pedagogy. A good measure of the kinds of changes that are most widespread in a field such as literary studies is to look at recent editions of often-used anthologies such as Norton or Longman anthologies of Western literature. In these anthologies, inclusions of authors who are “new” to the canon are more frequent, as are “theme units” on topics such as “Medieval Women,” or “Exploration,” which are, as a whole, very positive changes. Intersections of *various kinds* of differences and identities are still largely an afterthought, however.

¹³¹ Again, Katie King has argued that the term “pastpresents” be used to explore the co-constitution of past and present, in much the same way “naturecultures” does.

¹³² Intersectionality theory explains the mutual construction of gender, race, class and other categories, and emphasizes the necessity for feminisms to attend to differences among women. Foundational works in the development of intersectional theory include Bonnie Thornton Dill’s “Race, Class, and Gender: Prospects for an All-Inclusive Sisterhood” and Kimberlé Crenshaw’s “Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory and Antiracist Politics.”

¹³³ I use the term as scholars such as Chela Sandoval have, as a coalitional and innovative formation of resistant subject positions, largely founded by the alliances among feminists of color in the 1960s and 1970s (Sandoval 191). “US third world feminism” is a term that foregrounds the intersections of gender, race and ethnicity, economic inequality, culture, geography, and nation. These multiple oppressions are interactive and not just additive, and therefore a US woman of color experiences specific iterations of oppressions that cannot be characterized as a sum of the experiences of the gender oppression of white women and the racial oppression of men of color. US third world feminists develop and describe tactics for resisting these intersecting oppressions, often, as Sandoval points out, drawing on hybrid or moving subject positions. A foundational object in U.S. third world feminism was the influential 1981 anthology, *This Bridge Called My Back: Writings by Radical Women of Color*. This foundational collection brought together scholarly and other forms of theoretical writing such as poetry and cross-genre and cross-media work, by US women of different ethnicities, sexualities, class statuses, and relationships to academia. There are many other works that contribute to U.S. third world feminisms, of course, and Sandoval provides extensive notes and bibliography (191-192, 217-223). Just a few possible sources (some not mentioned in Sandoval) for those interested in reading more are Trinh T. Minh-Ha’s *Woman, Native, Other, This Bridge We Call Home*, the anthology edited by Gloria Anzaldúa and Analouise Keating, Ana Castillo’s *The Mixquihuala Letters*, Audre Lorde’s *Sister Outsider*, Deboleena Roy’s “Should Feminists Clone?”, Shante Smalls’ “Wade in the Water,” Wendy Chun’s *Control and Freedom*, the dramatic works of the Spiderwoman Theater, Gloria Anzaldúa’s *Borderlands/La Frontera*, and June Jordan’s *Technical Difficulties*.

¹³⁴ Barnard University’s Western Literature course is just one example.

This continued marginalization of intersectionality is an important reason why these changes, while appreciated, may come off as “Western culture with a twist,” or, a narrative that re-inscribes oppressions while inoculating¹³⁵ against claims of ‘bias.’ In other words, these inclusions of “diverse” perspectives, in their superficiality and especially their isolation from other discussions of other *kinds* of “difference,” help to continue hiding or erasing the highly political nature of narratives of Western culture. While the purpose of this chapter is not to offer a comprehensive critique of andro-, Euro-, and other centrisms,¹³⁶ since that task is far beyond the scope here, it is important to consider the course proposed here in light of the fact that in many pedagogical and scholarly sites still, narratives are often more *inclusive* but not necessarily more intersectional. This context is vital for conveying the importance of the organizing trope, “the uses of the past.” The assumption of the course – the starting point – is that various Western cultures in various time periods have narrated their past(s), and that these narratives are always *being used for something*.¹³⁷

Using this central question of the uses of the past, the course examines the ways in which the boundaries that demarcate the differences between past and present are Othering processes, and how they are closely related to many other Othering processes. Consider, for example, European colonizers’ claims that Native American peoples were exceedingly like the peoples of ancient Greece. Thus, an argument of this course is that constructing a history of “the West” (as opposed to the rest) is largely a process of

¹³⁵ The term is borrowed from Roland Barthes’ discussion of “inoculation” in *Mythologies*.

¹³⁶ There is not necessarily any good reason that a Western Civilization course must necessarily be Eurocentric in approach, despite its subject matter.

¹³⁷ Later, an analysis based on a sample unit will illustrate the importance of this claim.

forming, maintaining, or troubling categories that bear heavily on the present.¹³⁸ The necessary extension of this argument is to ask how we, as teachers and students, ‘Other’ our others with our own narratives of the past.

Thus, the course’s purpose is not to merely tweak dominant narratives of Western progress (and triumph) but instead to use every time period as a way to self-reflectively analyze the politics of periodization, and its multiple entanglements with genders, colonialisms, ability, political economy, or naturecultures.

Comparative Analysis: Unit 4: Comparing Greek and Biblical Literature

An important part of this course is to help students generate different ways of comparing, and multiple ways of understanding difference, similarity, and connection. Keeping in mind the goals of the course – to center the uses of the past, the intersection of various differences, and feminist technoscience approaches -- this sample unit is chosen to provide an example of what characterizes this course by performing one of the most common tasks in survey-style courses in Western culture: a comparison of Greek and Biblical materials. This comparative analysis, however, differs in that it demonstrates the course’s key tactic: using seemingly unlikely comparisons to interrogate the politics of the comparative act.

In particular, this analysis will compare how *Judges* in the Bible and Aeschylus’ *Oresteia* narrate cultural change, and how cultural change becomes gendered in each. This comparison will also show how the comparisons encouraged by this course differ from Biblical-Greek comparisons found in more traditional Western culture courses. The

¹³⁸ Kath Weston’s use of “time claims” is apt here as well. Weston, in *Gender in Real Time: Power and Transience in a Visual Age*, examines how the local and current pressures entangle with claims to define the ways in which the present is different from (and particularly more advanced than) the past.

reasons for selecting this comparison are many. First, one of the most common cross-cultural comparisons in Western civilization courses are between Greek/Roman and Biblical works of literature; these two traditions are sometimes thought to be the two prongs that together shape and define the West as a whole. This analysis will suggest that comparative work might embrace alternative bases of comparing these traditions, since different bases of comparison have widely varying political and feminist implications. Second, *Judges* and the *Oresteia* are selected because they are *not* explicitly about science. Though this may seem counterintuitive, this choice demonstrates that feminist technoscience approaches do indeed have the broad applicability that I argue for. In order for feminist technoscience to be demonstrated to be viable for understanding what Comparative Literature can be, it must be shown that feminist technoscience approaches are able to shed light on texts that at first look do *not* seem to have anything to do with science. Finally, because these narratives were presumably written during or about times of great cultural change, it is difficult for students to use the comparison to essentialize the two cultures (which is one of the easiest pitfalls for students inexperienced with cross-cultural comparison); neither text is easily readable as a good example of what a culture or people “was like,” and since both cultures are in the process of change, it is more difficult to assume that the particular texts represent *permanent* attributes of the cultures that produced them.

The materials selected for this Unit and the Discussion questions ask students to work up to these questions: how do cultural changes become gendered? What rhetorical

moves, assumptions, categories, and bundles¹³⁹ of meaning are in play when this happens?

Note that this question requires students to consider a broad range of concepts, which might be discussed before these comparative questions are addressed in depth, including: the possibility that there are *multiple* viable ways of narrating cultural change; the fact that these narratives are non-neutral and are implicated or entangled with politics and history and categories of identity; and the idea that narratives and concepts might be gendered – i.e., that gender roles and norms are imbued and intertwined with other categories, and that these intertwinements might be *produced over time* rather than being a priori and permanent.

Aeschylus' trilogy, the *Oresteia*, is a particularly good text to consider in the investigation of these questions, particularly in conjunction with Froma Zeitlin's landmark article, "The Dynamics of Misogyny: Myth and Mythmaking in the *Oresteia*." The trilogy, which is authored by the founder of Western drama and is arguably as influential as any dramatic works in the Western tradition, depicts the culmination of a long and bloody cycle of violent revenge among the family members of the House of Atreus. To briefly rehearse a few of the events, Agamemnon sacrifices his daughter, Iphigenia, to ensure his troops' passage. In retaliation, Iphigenia's mother, Clytemnestra, kills Agamemnon.¹⁴⁰ Clytemnestra's son, Orestes, then kills Clytemnestra, and since

¹³⁹ The term "bundles" of meaning is used here as a remnant of structuralist analyses of myths, although clearly the analysis here is not limited to structuralist techniques.

¹⁴⁰ While it is somewhat beyond the scope of this discussion, it is useful to note that Greek ideas of pollution are in play here at several levels, including the fact that the curse on the entire House of Atreus is one of the main factors in the course of these events. The end of the trilogy, in which the stain is lifted not by further death but by a trial followed by reconciliation, furthers Aeschylus' portrayal of the triumph of the new ways over the old ways, as will be discussed below.

there is no one left to avenge her, the Furies demand retribution on Orestes on behalf of Clytemnestra.¹⁴¹ Aeschylus, in the third play, shows Orestes on trial before a jury, but instead of a continuation of the cycle of revenge, there are arguments based on reason, a fair trial presided over by Apollo and Athena, and the acquittal of Orestes. This acquittal is based partly on an idea that is quite astounding to modern audiences: that Orestes is not truly related to his mother, since the mother is merely the earth that the seed is planted in.¹⁴² The Furies agree not to pursue vengeance on Orestes, to take on a less powerful role, and to reside under Athens as helpful spirits, thereby becoming “the Eumenides.” The end of this trilogy thus depicts a resolution not based on the cathartic killing of yet another character but on the acquittal and the peace agreement that follows. The new way thus triumphs over the old way, reason trumps superstition, and peace overcomes violence.

Froma Zeitlin’s article, “The Dynamics of Misogyny: Myth and Mythmaking in the *Oresteia*,” famously explicates the trilogy’s establishment of several related binaries – and their implied hierarchies of value – and argues that these binaries became foundational to Western culture more broadly. Zeitlin reveals the binary oppositions at play in this foundational Western drama and argues that the trilogy connects these various binary categories in a way that values the masculine over the feminine, the mind over the body, the sky over the earth, the new over the old, and reason over passion. Furthermore, all these categories *are connected with one another*; to give a brief

¹⁴¹ The onus was on the surviving family members to avenge the death of a murder victim; this vengeance was considered an obligation and not just a right, and so it is evident how cycles of violence could grow longer through time under this system. The *Oresteia* is often thought to depict the transition from a vengeance-based society to a justice-based society.

¹⁴² To ancient Greek culture, the killing of a family member was a far greater misdeed than the killing of a non-relative; the stain of pollution was much greater for the one who committed an intra-family murder.

sampling of the discussion that Zeitlin provides, the feminine is associated with nature, the earth, death, the past, the body, unreason, foreign-ness, animality, chaos, and darkness; the masculine is associated with culture, the sky, life, the present, the mind, reason, Greek-ness, human-ness, order, and light. Furthermore, these other binaries are all connected to -- bundled with -- the others, and the “masculine” characteristics are shown to be positive, while the feminine characteristics are shown to be negative. Zeitlin argues that with the *Oresteia*, Aeschylus bundles these binaries together in a way that influences the entire Western understanding of these concepts.¹⁴³

While this discussion will not review all of Zeitlin’s many good arguments in support of this claim, it is important to note one of Zeitlin’s key claims, that the move from a vengeance system to a justice system¹⁴⁴ is portrayed as *a move from the feminine to the masculine*. This cultural change, in other words, is highly gendered. This gendering is achieved through various literary elements -- the portrayal of the beastly characteristics of the Furies, for instance, who cling to ritual and tradition and are always on the side of “the mother.” In contrast, well-reasoned Athena, a benevolent goddess here, says that she is always on the side of men, since she was born out of a man’s skull and not from a womb (this is one of her reasons for voting for Orestes’ acquittal). The old way, the animal way, is feminine, and the new way, the way of reason, is on the side of

¹⁴³ Zeitlin’s list is especially excellent to use with lower-level undergraduate students – they can easily come up with examples from Aeschylus to support the connections among these binaries. The article is also good as a way of showing continuity among various Western texts; students can readily see the prevalence of interconnected binaries in the works of Euripides, for example, or come up with modern examples that show similar intersections of binaries – nature with the feminine, for example.

¹⁴⁴ This move to a court system in these plays famously reflects some degree of similar changes in Athenian attitudes toward justice, though there is not consensus on what, if any, commentary Aeschylus was trying to make with regard to controversies over the power of the court system.

men.¹⁴⁵ Students might then discuss modern conceptions of progress and reason, and how gender or nature/culture binaries inform them today.

Attending to the gendered narration of cultural change in the *Oresteia* is therefore a specific, feminist, and politically engaged way to focus a discussion on Aeschylus in the classroom. It addresses the questions that guide the course as a whole, it allows for an appreciation of the artistic achievement of Aeschylus without eliding the trilogy's politics, and it encourages students and instructors to think critically about how we – like Aeschylus - narrate our imagined separation from a past in particular and historically contingent ways. In other words, there are many ways to narrate our continuity or discontinuity with an imagined past, and for us as well as for Aeschylus, these narratives are not politically neutral.

More importantly for the argument of this chapter, approaching the *Oresteia* in this way provides a basis to compare works in the Greek tradition to those in other traditions in a way that *raises the question* of what makes two or more texts comparable.

To illustrate this point, it will be useful to briefly outline the resonances between the *Oresteia* and the book of Judges from the Old Testament. Judges is a particularly good text to compare to Aeschylus' plays because it has an abundance of fascinating female characters, both perpetrators of and victims of violence. Productive resonances include similarities in characters, some similar elements of plot structure, and similar

¹⁴⁵ Students can also readily come up with other examples of how Aeschylus melds these binaries noting Clytemnestra's association with animals, for instance.

thematic concerns. Most importantly, however, is the portrayal of women, power, and violence in the context of cultural change.¹⁴⁶

Judges portrays a time period when there was great uncertainty, instability, and fragmentation among the twelve tribes of Israel. Judges also includes many fascinating female figures, including, among others: Deborah, a judge and military leader whose strength evokes Clytemnestra at her best and whose foresight suggests a Cassandra without the curse; Jael, who became a hero to her people after an invading general came to her tent for hospitality (she “gave him milk,” and then while he slept she drove a stake through his head); Jephthah’s daughter, a young girl who, like Iphigeneia, was sacrificed by her father; Delilah, who has become shorthand for the traitorous nature of women; and the unnamed woman of Judges 19, who, after being raped by a group of attackers, was cut into twelve pieces by her common-law husband and sent to the twelve tribes of Israel,¹⁴⁷ presumably to elicit enough outrage to unite them.

Biblical scholar Susan Ackerman, in *Warrior, Dancer, Seductress, Queen: Women in Judges and Biblical Israel*, argues that the prevalence of so many female characters, and the extremes of their power and powerlessness, serve to reinforce the nation’s descent into chaos. In other words, the lack of fixed gender roles is depicted as one of the primary symptoms of a broken unity, a lack of justice, and, finally, a proliferation of excessive violence. This focus, on the use of women’s bodies to

¹⁴⁶ Mieke Bal has performed a narratological and psychoanalytic comparison of Clytemnestra and women in Judges, and while it is quite fascinating in its own right, it will not be discussed here since it is largely outside the purview of this chapter’s argument about narrating change.

¹⁴⁷ Biblical scholar Phyllis Trible has, in the long tradition of using Old Testament figures as precedents for the New Testament story of Jesus of Nazareth, argued that the unnamed woman is martyred for the people in way that evokes the Christian Gospels; her body is broken for the people’s sake to bring a new order, and she is also a scapegoat since the attackers originally wanted to sexually assault her common-law husband and she was thrown out of their host’s home so that she would suffer the violence intended for him (Trible 65-92).

symbolize the order or chaos of an entire people, makes Judges resonate in fascinating ways with the *Oresteia*.

In particular, both texts narrate a society's transition among various stages of order and chaos in a *highly gendered way*. Both portray gender roles as highly unstable but also portray that instability as a sign of some broader problem or pollution.

Furthermore, both texts use violence against women's bodies as a way of marking *a separation of the present from the past*. Orestes' murder of his mother was the final killing necessary to bring the curse of the cycle of revenge to a close; it also brought about a justice system based on reason and order and intellect rather than superstitions of the past. The killing of the woman in Judges 19 provided the climactic act of moral decline in Judges,¹⁴⁸ which instigated the war that closes the time period depicted in this book. In each case, therefore, a new order – and thus the “othering” of the past and all the chaos associated with the time-that-is-now-marked-as-past – comes with a violent rejection of the feminine. In particular, this cut between the past and present comes via violence against a woman who does not meet the stereotypes of a good mother or wife,¹⁴⁹ and who both, in different ways, take the place or ‘role’ of their husbands. The destruction of a woman who represents *an instability of gender roles* thus allows the society to go back to its fixed or stable state; the chaotic instability of women is rejected in favor of a masculine stability.

¹⁴⁸ The attackers in Judges 19 are reminiscent of the would-be attackers of Lot in Sodom, and in the gender and sexuality politics of the Biblical tradition, the attempted rape of a man is often portrayed as symbolic of particularly abhorrent moral decline.

¹⁴⁹ In Clytemnestra's case, she takes the role of her husband in that she attempts to usurp him. In other Greek works, she is clearly juxtaposed to faithful wives like Penelope, as seen in Odysseus' conversation with Agamemnon in the Underworld in *The Odyssey*. The woman of Judges 19 takes the “place” of her common-law husband when she is thrown from her host's home even though the attackers are calling for him.

While only a few key similarities have been discussed here, these resonances show the ways in which narratives of cultural change can be gendered, and they elucidate the connection between misogyny and ideas about the past and present and about order and chaos, in ways that have importance throughout the Western tradition. Obviously, these connections are revealed because of *the basis of comparison* that was selected, which was in turn based on the course's use of feminist technoscience approaches to the questions of what the past is used for, and how gender relates to other Othering processes.

Thus, the benefits of using gendered cultural change as the basis of comparison are many. Women are centered in this analysis and this sample unit of the course, as are the instability of gender roles; students are asked to think reflexively about the politics of how one goes about narrating change; and categories such as “culture” and “nature” and “order” and “chaos” are shown to be non-innocent.

Further benefits include the discussions that might arise from this comparison. For instance, students might discuss whether reason and emotion are gendered similarly or differently in the two texts, which in turn points the way to understanding how “reason” is constructed and perhaps to imagine how “reason” might be constructed differently.¹⁵⁰ The differences and similarities provide a generative tension between students' readings of each text, as any good comparison should do, but this comparison centers the intersecting ways gender, time, and various “otherings” are narrated.

This comparison is also a good example of how a somewhat unusual choice of focus *within* a very canonical text can shift the discussion to less-discussed parts of

¹⁵⁰ This question draws on Latour's claim in “The Promises of Constructivism” that to assert something is constructed means that one can ask how it might be better constructed.

canonical texts; attending to gendered cultural change encourages the study of Judges instead of a Biblical selection that might be more commonly included. The roles of women in Judges are astoundingly diverse and provocative, and characters such as Deborah and the woman of Judges 19 are rarely discussed as central narratives of Western culture, despite their fascinating stories and what they reveal in terms of both cultural history and theology/philosophy. The basis of this comparison centers these women who might otherwise be considered figures of minor importance to the Western tradition.

Furthermore, it is clear that the selection of the basis of comparison affects not only which parts of a text will be emphasized but also which conclusions are likely to be drawn, in politically non-innocent ways. For this reason, it pays to examine *the process* of deciding what makes a comparison meaningful or productive. For example, if one were to focus the study of Aeschylus on the triumph of reason and order and law as a marker of a free society, the most ready Biblical comparison would be to the establishment of Mosaic law. If one were to focus on the portrayal of women but with an emphasis on how women are represented as “untrustworthy” deceivers who lure men into terrible situations, one might investigate the similarities between Clytemnestra and that other woman with too close a connection to knowledge and a snake, Eve. With a feminist technoscience approach, one might be more inclined to center how categories like chaos/order, past/present/ and nature/culture are gendered, and therefore might see a great deal of resonance between the *Oresteia* and Judges. All of these are fine comparisons to make, and well worth discussion, but they are not the same, and none are politically neutral.

Examining and reflecting on how one decides to *find* similarities among different works, particularly works from different cultures, is especially important in light of the elisions that can occur in these comparisons. For example, from my own teaching experience, the first and readiest way students compare religious or mythical texts across cultures is by invoking the hero archetype, usually with some greater or lesser degree of familiarity with Campbellian analysis, or even with Jungian or other precedents. While the politics - sexist and otherwise – of these archetypes have been often critiqued, and it is outside the scope of this argument to review the entire debate, it is useful to bring up some of the most apparent problems with using archetypes as the *primary* means of cross-cultural comparison of ancient material. Clearly, the emphasis on the archetypal male hero, who often achieves a position of privilege through laudable acts of violence, might be of concern to feminists and others interested in how violence is naturalized. Furthermore, archetypal analysis tends to focus on universalisms; the universalism of the archetype is what makes comparison possible, and the goal of the act of comparison is to reveal the universal truths or stories that were there all along, lurking under the ‘superficial’ set dressings of culture.¹⁵¹ By pointing out these problems, I am in no way suggesting that there is no place for a consideration of archetypes in the study of these works; rather, I argue that it is the responsibility of instructors to provide opportunities to pursue other kinds of cross-cultural comparison, and to encourage students to evaluate the stakes in these various comparative acts.¹⁵²

¹⁵¹ In fairness to Joseph Campbell, he does emphasize that sociopolitical control is one of the four main functions of myth in *Occidental Mythology* and later works.

¹⁵² One might speculate more generally that the apparent ease in comparing characters, as opposed to other kinds of comparisons of literary works, also reflects a desire to use comparative literary analysis as a quest for universalisms. In comparing two films from different nations or cultures, for example, one might find that for students, the “easiest” argument to make is to explain why two characters are similar, and perhaps even to attribute differences in characterization to broader (essentialized) cultural difference. It is for this

Again, by comparing portrayals of cultural change and how they intersect with the construction of gender roles and other categories, it is difficult to make assumptions about the universality of these narratives. On the other hand, it is likewise difficult to make sweeping, essentializing claims about cultural difference; it is hard, via this comparison, to overgeneralize entire cultures and what characterizes them as fundamentally different in some a priori way. This comparison, based on feminist technoscience approaches, is clearly not designed to allow students to make over-arching statements about the cultures that produced either text. It is a challenge, after all, to essentialize a culture's fixed characteristics when centering the discussion on cultural shifts and changes.

Most importantly, however, this comparison stands in stark contrast with the readier or "easier" Greek-Biblical comparisons, such as comparisons of hero-kings or lawgivers. The point is not to use this basis of comparison to the exclusion of all others, but to open up a discussion of *the sheer diversity* of bases for comparison that students might delve into. In other words, the purpose of this portion of the course, in addition to the usual reasons that many universities teach Western cultural traditions, is to invite students and instructors to think critically about how and why we find similarity among texts, and how such comparisons depend on particular ways of understanding cultural difference and change. The comparison discussed here is intended to reiterate that it –the comparison - is based on one of many possible interpretations,¹⁵³ and that the basis for comparison is therefore only one among myriad possibilities. The discussion

reason that it might be worth discussing the politics of comparison with all students, in order to convey that character comparison, and not merely archetypal criticism, is politically non-innocent and actually quite tricky to deal with.

¹⁵³ One might even ask if this comparison is more accurately described as a comparison of Zeitlin and Ackerman.

surrounding this comparison should emphasize that picking out threads of similarities between different texts is a fraught process, and that it is vitally important to be aware that one's threads of similarity are precisely that: just a couple of threads in a long and complicated history of a "West" that is largely shaped by the resonances and tensions between the Biblical and classical traditions. In short, this comparison is not intended to stand alone as "the" way of comparing these traditions, but to emphasize the multiplicity of resonances and similarities and differences between these traditions.

This comparison, therefore, is presented here as a way of illustrating an approach to achieving the main goals of the course: it examines past cultures in a way that asks students to critically examine how they imagine the past; it foregrounds the construction of difference and its multiple intersections with what "the past" is used *for*.

Changing Discourses: How to Be a Shapeshifter: Interdisciplinary Approaches to the Study of Change.

The next course proposed in this chapter is an upper-level undergraduate course entitled, "**How to Be a Shapeshifter: Interdisciplinary Approaches to the Study of Change.**"

Course Description: 'Change' encompasses the study of similarity and difference as well as the study of time. For this reason, the course will examine a variety of artistic, technoscientific, and other discourses in order to consider the following questions:

- 1) How is change narrated? By whom? In what situations?

- 2) What are the stakes of how we tell stories about change?
- 3) How might we develop a more self-reflexive and/or richer vocabulary for talking about change?
- 4) In what situations are there shifts or fissures in subjectivities? In what situations do these shifts multiply or intensify? Why might these shifts be effective tactics – and for what purposes?

Explanation of Course Design/Course Outline:

This course is designed as an upper-level undergraduate seminar that provides opportunities for students of various majors to converse, to consider new and familiar materials in transdisciplinary contexts, and to allow them to share their knowledge in their own majors with other students. Each week is a unit on a given topic, and the weekly units are grouped together into four sections.¹⁵⁴

The course begins with materials that frame the course and its focus on how we narrate change, and the importance of multiple and flexible subjectivities in thinking about and acting among complexly layered changes. In this sense, the course may be an example of a pedagogical response to Chela Sandoval's understanding of the

¹⁵⁴ This course could be used for many upper-level undergraduate requirements that are usually small seminar-style classes. It could be used as an interdisciplinary capstone for a variety of majors, or as an interdisciplinary course that could be cross-listed with departments such as Comparative Literature, Cultural Studies, Women's Studies, English, American Studies, History of Science, and Science Studies programs, and many other fields. It is particularly appropriate as an example of how Comparative Literature courses might attend to "literary analysis" as a way of more fully engaging with science, technology, and politics.

democratization of oppression, the process by which many more people now need the power-mapping skills, the flexibility in subject-position, and multiple memberships that have historically characterized the knowledge practices of U.S. Third World women. The course is thus designed to help students understand how people and groups tell stories about change; in turn, students will practice more flexible and multi-valent ways of thinking about knowledge work that narrates change.

This course's method is to actively embrace less well-studied intersection points among mathematics, sciences, and the humanities. Each unit is designed to be transdisciplinary, without necessary or obvious ways to elide or ignore the methodological or narrative differences. In other words, each unit on an aspect of "change" is specifically designed to encourage unlikely comparisons. Thus, there is not *one* clearly designated way to connect the materials for any given moment – each student may have extremely different ideas about what connects the materials in a unit, thereby highlighting a multiplicity of comparative practices. This course therefore expands on the tactics used in the previous course on Western cultures in that it also encourages students to view their own comparative work as entangled with politics and histories and disciplinary identities. This course on "change," however, also asks students to more fully contribute in the creation of multiple bases of comparison. The general, abstract, and multiple unit titles and discussion questions are intended to encourage vastly different responses from different participants, in the hopes that discussion of these differences can lead to greater self-reflection/reflexivity.

In addition, the course materials for this course are more flexible and student-driven, since an ongoing assignment is a Collaborative Bibliography, in which students

are asked to find and share materials with the class related to the Unit topic. This Collaborative Bibliography is an important part of the course, since it encourages students to actively develop course materials, and because it provides opportunities for students to understand how their own disciplinary and other locations shape how they approach their knowledge work.

As shown by the syllabus that follows, one assumption of this course is that literature, film, music, and other performance do significant and sophisticated theoretical work about change. As explained in earlier chapters, essays and articles should also be considered ‘creative’ works that use metaphors, narrative, and artistry in articulating various changes. This course is characterized by a disciplinary diversity in reading/viewing materials as well as in the discussion questions and organization. The units also try to include terms that could be applicable to or resonant with a very wide range of student majors, such as the sciences (social or ‘natural’), the humanities, Women’s Studies and other interdisciplines, business, engineering, etc (“evolution,” for example, has different resonances to these various disciplinary locations).

The course is also designed to have the sense of a ‘toolkit’: students can gain a large breadth of ways of talking about change, both in vocabulary and in broader storytelling practices, and can practice asking questions about the agencies and ethics of stories about change. The need for this practice is clear when examining how pervasive narratives about change are, and how often such narratives cling to linear and erasure-filled descriptions of progress or decline. The course is thus designed to help students think about how they might adopt various tactics for doing knowledge work (of all kinds) among the moving and multiple discursive-material-economic-technoscientific-identity-

community intersection points that they engage in – in other words, how to live and love in a time when panic, silence, and reactionarism seem like more probable responses to looming and irreducible changes.

Course Outline for Course 2:

How to Be a Shapeshifter: Interdisciplinary Approaches to the Study of Change.

Similarity and Difference/Space and Time

Week 1: Faultlines/Fissures

Readings:

Sharon Traweek, “Faultlines”

Bowker and Star, Excerpts from *Sorting Things Out: Classification and Its*

Consequences. Pages 1-50, 283-326.

Chela Sandoval, "U.S. Third World Feminism: The Theory and Method of Oppositional
Consciousness in the Postmodern World"

Discussion Questions: What makes change noticeable and significant? To Whom? What is subjectivity? What are storytelling practices? According to Traweek, this time period is occupied by questions of epistemic change; why might this be the case? What is the significance of these materials’ vocabulary of change?

Week 2: Stability, Malleability, Volatility

Readings:

“Reason” in *New Keywords*

Jacquelyn Zita, “The Pre-Menstrual Syndrome: Dis-easing the Female Cycle” in *Feminism and Science*.

Jonathan Shay, Excerpts from *Achilles in Vietnam*. Pages 23-38, 77-102, 165-210.

Judith Butler, “Imitation and Gender Insubordination.”

Collaborative Bibliography: 1 item of students’ choice that narrates ‘personal’ or individual growth

Discussion Questions: How does defining change help to define the subject and vice versa? How do the concepts of stability, habit, predictability, and liminality/multiple memberships inform subjectivities? How do definitions of health depend on gendered definitions of health and other categories? How and why are corporate and other economic entities narrated as subjects?

Week 3: Critical mass/critical practices

Readings:

Dreams, Dir. Akira Kurosawa

Carol Cohn, “Nuclear Language and How We Learned to Pat the Bomb.”

Malcolm Gladwell, Chapters 1 and 4 in *The Tipping Point*, and any 2 book reviews

Rene Girard, “Sacrifice” and “The Sacrificial Crisis” from *Violence and the Sacred*.

Susan Sontag, “Against Interpretation”

Collaborative Bibliography: This week's found item must argue (or discuss an argument that) something has 'gone too far' or that it is now 'too late' for some result to occur.

Discussion Questions: How does the language of critical mass, tipping points, and points of no return shape debates? In controversial debates, what examples are used to show that things have 'gone too far'? How does scapegoating inform discussions of complex causalities and vice versa? What do the readings and bibliographic examples reveal about the stakes of various debates?

Progress/Progression: The Ends, the Means, and the Justifications

Week 4: Evolution I: Progress/Development

Readings/Viewings:

Evelyn Fox Keller, "Language and Ideology in Evolutionary Theory: Reading Cultural Norms into Natural Law" in *Feminism and Science*.

"Orientalism," "Other," "Development," and "Evolution" in *New Keywords*

Sembene Ousmane, *Faat Kine* (Film)

The Story of Six and Nine (Film)

Michael Pollan, "Introduction" and "Apple" in *The Botany of Desire*

Donna Haraway, "Adrienne Zihlman" and "Sarah Hrdy" in *Primate Visions*

Assignment, in lieu of the Collaborative Bibliography: Find 2 narratives of the history of a social movement that differ from one another in a significant way. Write a brief

analysis of how these differences relate to ideas of progress or change and to specific changes (global, national, or local).

Discussion Questions: How and why do narratives of cultural or national change use the metaphor of individual/personal ‘development’? How are these narratives gendered and why? How do shifts in subjectivities affect these metaphorical uses and vice versa? Why do some informal (and some formal) narratives of change rely on (disproven) notions of the status quo as ‘meant to be,’ the end goal, or the fittest; what accounts for the persistence of these notions? What are livable stories?

Week 5: Evolution II: Proliferation

Readings:

Caryl Churchill, *A Number*

Kathleen Biddick, “Bede’s Blush.”

“Globalization” in *New Keywords*

Wendy Doniger, “The Mythological Clone.”

Discussion Questions: By what processes do cultures make meaning out of changes in quantity? What does it mean for something to ‘suddenly be everywhere’? What implications are there in discourses that emphasize how many there are of something, or how rapidly something is growing in number? How does proliferation relate to processes of diversification, fluctuation, or measurement? What assumptions about fluctuation, difference, and ‘many’ or ‘multi-’ are in play? When do proliferation or diversification

processes require an explanation, justification, or assignment of cause/blame? When is a proliferation seen as a threat to the subject-hood of individuals or groups and why?

Week 6: Motion/Stillness

Readings:

Herbert Mehrtens, “Mathematical Models”

Luisa Valenzuela, “Up Among the Eagles”

Mary S. Morgan and Marcel Boumans, “Secrets Hidden by Two-Dimensionality: The Economy as a Hydraulic Machine”

Katherine Solomon, “Galatea” in *Orpheus and Company*.

Jeri Theriault, “Galatea Walking” in *Orpheus and Company*.

Emily Short, *Galatea* (Interactive Fiction)

Discussion Questions: How do these materials narrate the relationship between motion and visual observation or gaze? How is motion or stillness measured relative to context or surroundings? How do these and other narratives of motion and stillness relate to demarcations of Self and Other?

Week 7: Histories of Disciplines

Readings:

Richard Mankiewicz, *The Story of Mathematics*

“Forward,” “Introduction” and “An Example of Traditional Women’s Work as a

Mathematics Resource” in *Ethnomathematics*, Ed. Powell and Frankenstein

Discussion Questions:

How do narrations of disciplinary history shape disciplines, and in what spaces and times? What or who is considered most responsible for the current state of (student-chosen discipline)? By whom and why? What intra- and interdisciplinary influences are affecting these narratives? What technologies of observation or communication are having an impact? What knowledge traditions have been consolidated or separated out in the development of the discipline? What are the overarching goals of the discipline and how are they changing? Why are they changing? How do we/they know?

Revolutions and Other Circular Motions

Week 8: Revolutions/Liberations

Readings:

“Radical” and “Reform and Revolution” in *New Keywords*

Kath Weston, “Liberation When?: The First Paradox” in *Gender in Real Time*.

Deborah Kennedy, Chapter 2 in *Helen Maria Williams and the Age of Revolution*.

Ngugi wa Thiong’o, “The Quest for Relevance” in *Decolonising the Mind*

Audio: Aram Khachaturian, Excerpts from *Spartacus*; Vusi Mahlasela, “When You Come Back”; Shante Smalls, “Wade in the Water”; Gossip, “(Take Back) the Revolution”

Discussion Questions: What constructions of “revolution” and “liberation” are evident here? What assumptions about rights, subjectivity, nature and culture, and social organization are revealed in these narratives? How does the language of “revolution” or “liberation” or “decolonization” affect the processes they try to describe? How do these narratives characterize liminal states, including the threshold spaces between ‘liberated’ and ‘pre-liberated’?

Week 9: Revolutionizing Perception

Readings:

Film: *Who’s Counting?: Marilyn Waring on Sex, Lies, and Global Economics*

George Lakoff and Turner, Chapters 1 and 2 in *More Than Cool Reason*

Barry Mazur, *Imagining Number*

The Guerilla Girls’ Bedside Companion to the History of Western Art

Discussion Questions: How do these materials narrate changes in processes such as “seeing,” “representing,” “framing,” “imagining,” and “counting”? How do these materials portray the relationship between perception and liberation or revelation? How do these different narratives of change and perception connect to their varying assumptions about the relationship between theory and praxis?

Week 10: Centralizations/Decentralizations/Incorporations

Readings:

Steven Johnson, Introduction to *Emergence*

Trinh T. Minh-ha, “The Other Censorship”

D. A. Leslie, “Global Scan: The Globalization of Advertising Agencies, Concepts, and Campaigns”

Massimiano Bucchi, “Is Mathematics Socially Shaped?” in *Science and Society*

Barbara Page, “Women Writers and the Restive Text”

Discussion Questions: What definitions are being negotiated by these materials? How are these definitions important to narrations of centralization, decentralization, or incorporation? What assumptions about “adaptation” are explicit or implicit in these materials? How do boundary objects influence centralization or de-centering processes? When and why are narratives of centralization or decentralization attached to narratives of progress, liberation, or reason?

Transformations/Fluctuations

Week 11: Materialize/Embody/Hardening/Softening

Readings/Viewings:

Karen Barad, “Getting Real: Technoscientific Practices and the Materialization of Reality”

William Mitchell, “How to Do Things With Pictures”

Christoph Meinel, “Molecules and Croquet Balls”

Rebecca Belmore, Video of performances: “Vigil,” “Bury My Heart,” “Tent City”

Discussion Questions: What materialization processes do these readings/viewings consider? In what ways are these readings/viewings enacting materialization processes? What is fixed or in flux? In what various ways are fixity and flux constructed, and how might these constructions be changing? How else could they change?

Week 12: Repetition/Iteration

Readings:

Ron Eglash, *African Fractals*.

Albert B. Lord, Part I in *The Singer of Tales*

Sadie Plant, Excerpts on feedback in *Zeros + Ones: Digital Women and the New Technoculture*.

Charlotte Perkins Gilman, "The Yellow Wall-paper."

Angélica Gorodischer, "Under the Yubeas in Bloom."

Discussion Questions: How do these materials discuss repetitions and iterations in other cultural sites? How do these materials use repetition and iteration as a narrative tactic and for what purposes? What assumptions about similarity and difference are in play? What assumptions about possibility/impossibility are in play? How does repetition or iteration relate to understandings of traditions and individuals/communities? In what situations is 'repetition' associated with liberations or captivities, and why?

Week 13: Continuity/Discontinuity

Readings:

Mary Darby Robinson, "A Letter to the Women of England"

"Daara J" and Audio samples at worldmusic.nationalgeographic.com/worldmusic/view/page.basic/artist/content.artist/daara_j

Larissa Lai, first chapter in *Salt Fish Girl*

Sadie Plant, *Finish Zeros + Ones: Digital Women and the New Technoculture*.

Jamaica Kincaid, *A Small Place*

Revisit the assignment for Week 4. How do these discussions of social change narrate continuity and discontinuity?

Discussion Questions: What metaphors and other storytelling practices are used in discussions of continuity and discontinuity, and what are they good for? How do globalization processes affect these narratives? What are some productive ways of talking about multiple aspects of diasporas? How is the category of 'women' used and why?

Week 14: Hybridizations/Purifications

Readings:

Kath Weston, "The Global Economy Next Time: When Genders Are Not Enough" in

Gender in Real Time

Tomson Highway, "Comparing Mythologies"

Philip J. Davis and Reuben Hersh. *The Mathematical Experience*

Bruno Latour, "The Promises of Constructivism"

Discussion Questions: What hybridizations do these materials discuss and enact? Where are separations and distinctions of great stake? How might these materials, and the topic of hybridization/purification, relate to the materials of previous weeks – Sandoval, Bowker and Star, or Mazur, for example? How are narratives of hybridization and purification used to map power relations? How might narratives of hybridization and purification be useful in telling or practicing more livable stories?¹⁵⁵

Key Concepts and Arguments for Course 2:

The main argument of the course is that discussions of changes – whether biochemical, historical, or other – are many times *also discourses on changes in subjectivity, identity and connection*. For this reason, among others, it is clear that narratives of change are never politically innocent.

For example, narratives of change often use the language of subjects; narrative turns those undergoing change into characters, and thereby inscribes the change-maker's agency. For example, the sperm as the conquering hero in reproduction is a notorious example, and has been critiqued by Emily Martin, Scott Gilbert, and others (Gilbert 202-204). In short, it is impossible to adequately discuss narratives of change without considering how and why these narratives are co-constitutive with understandings of individuality, subjecthood, and connections. It is for this reason that the course title focuses on the potential for more flexible subjectivities implied by the term “shapeshifting.” This troubling term, which suggests untrustworthiness to some, may

¹⁵⁵ The opposition of hybridization and purification is borrowed from Latour. “Livable stories” is a term from Donna Haraway's work, and would be a useful term to consider throughout the course.

serve as an apt metaphor to consider the power-mapping advantages to engaging with many sides of many kinds of narratives of change.¹⁵⁶

It will be useful to use one unit to briefly illustrate the political stakes of narrating change. In the unit on “Critical Mass/Critical Practices,” for instance, the term, “critical mass,” and its chilling connotations in nuclear physics, is used to examine how and why various narratives suggest that things have gone “too far.” Kurosawa’s film *Dreams* includes a disturbingly prescient piece on nuclear catastrophe; Carol Cohn’s essay discusses the bomb but also how language and gesture help normalize weaponry until the unthinkable becomes the everyday; Gladwell’s work ‘popularizes’ and synthesizes research and opinion on the social and policy importance of a relatively basic mathematical concept,¹⁵⁷ and Sontag’s essay argues that “interpretation” can gut meaning rather than add layers of meaning, since interpretation is often taken too far. Girard examines the need for ritual sacrifice to purify excess; Girard’s work is also useful in looking at the ways that narratives of “going too far” tend to be acts of scapegoating. As explained above, these materials are intentionally disparate in approach, and, without a very broad understanding of the unit title, would seem largely unrelated to one another. The aim of this design is to provide opportunities for students to make unlikely comparisons, and in sharing them, to experiment with and observe what kinds of disciplinary and political entanglements they enact in their comparative work. Therefore,

¹⁵⁶ See Chela Sandoval’s *Methodology of the Oppressed* for a specific discussion of power-mapping from liminal spaces. As Sandoval notes, this view of the costs and benefits of liminal spaces have characterized U.S. Third World feminisms for several decades.

¹⁵⁷ Gladwell reports, for example, that cleaning graffiti has been shown to improve safety, since there is a disproportionate shift in public attitude toward safety and legality when graffiti is present; largely absent is a discussion of what is revealed about attitudes toward property, the public sphere, public art, the socioeconomic connotations of graffiti art, etc. The form of vandalism with the closest ties to art markets, hip hop culture, and the archetypal mythos of rebellious American individualism, is a threat to public safety in this narrative.

a key goal of classroom discussion would be to examine *whose* voices determine how far is too far, how different narratives envision futures in which it will be “too late” to solve a problem, and how these narratives of going “too far” relate to underlying debates about progress or decline.

Furthermore, in each of the course materials for this unit, the point of no return is directly related to fixing (or blurring) a boundary between self and other. It is Othering processes that allow the nuclear to become naturalized in Kurosawa and Cohn, Gladwell depends on normative views on society to indicate the point at which the non-normative becomes the rule, Girard’s consideration of scapegoating certainly points out the way the one who is sacrificed is symbolically made to represent some aspect of the self that must be Othered, and Sontag’s work tries to draw a line between a work of art and the external forces that would graft an interpretation onto the art. In defining boundaries of what constitutes a critical mass, these materials all engage in a number of other boundary-marking acts, and thereby show how many boundaries are actually entangled with narratives of change.

Again, one of the purposes of the course is to develop a rich and context-sensitive vocabulary for talking about change. By vocabulary, I mean not just terminology but the practice and habit of questioning *how* change is characterized and how it might be characterized differently. It is hoped that by the end of the course, progress and decline are not necessarily the easiest terms to think with (though they may of course remain useful in some contexts). The other main purpose – the argument of the course – is to show the diverse processes by which narratives about changes in the “world” become narratives about changes in subjectivity, identity, and connection.

Comparative Analysis Based on a Sample Unit: “Proliferation”

The unit on “Proliferation” provides a good way to illustrate the approach, method, and transdisciplinarity the course entails. By focusing on one kind of change, and *leaving tacit* any delineation of *what* is undergoing this change, each unit in this course has numerous ways for different disciplinary traditions to become important to the conversation.¹⁵⁸ This omission is not intended to make each unit ambiguous but rather to center the question of *how* one determines what is undergoing change, and what changes are worth studying.

As mentioned above, students are expected to find and contribute course materials to each unit as well as examining the materials listed on the syllabus. Because this course has this focus on the discussion of individual student research, the following analysis will focus less on literary analysis of the readings and more on how to direct student research and how to inquire into the *resonances* between student research and the course readings. In terms of organization, this analysis will therefore consist largely of a direction or structure for key questions rather than for particular arguments, with the exception of the discussion of a literary work whose importance to the unit’s theme of “Proliferation” will be explained below. Thus, the listed materials of this Unit are there to provide multiple points of comparison with the materials from the Collaborative Bibliography. In other

¹⁵⁸ Additionally, the research-oriented approach to this course, particularly in relying on the Collaborative Bibliography assignment explained in an above footnote, to generate additional course material, encourages students to engage in transdisciplinary border crossings. Student contributions to this Collaborative Bibliography should occur every Unit, except where noted on the syllabus.

words, the readings for this unit are designed to be used *in conjunction* with student research on some other aspect of “proliferation” that students choose.¹⁵⁹

For this unit, it should also be noted that the term “proliferation” has negative connotations; the term often signifies an increase in quantity or even rapid reproduction that is to be regarded with caution or suspicion at the very least. This negative connotation is an opportunity to discuss how the very basic question of “how many?” may take on politically troubling dimensions; specifically, the class might discuss the fact that in order to assert that something is proliferating, one must start with certain *assumptions* about its proper number or rate of increase, and then find that one’s assumptions have been challenged.

In this context, it might be considered that proliferation is more than mere increase; it is *surprising or alarming* increase. It is a change that is disruptive, to our categories if not also our world. It may even suggest excessive increase, pushing its way into being pervasive or possibly even invasive. Therefore, when someone notices a proliferation, what usually follows is a demand to know why *that thing* is proliferating. Even when something “good” proliferates, the sudden surprise in quantity still demands an explanation.

In a classroom setting, one might start with something simple, such as this question: have you ever suddenly realized that something that used to be rare is suddenly *everywhere*?

¹⁵⁹ Ideally, in terms of course scheduling, the members of the course will have the chance to discuss the unit topic in a general way, and then before the following class meeting, students and instructors will perform research on a “proliferation”-related topic of the individual’s (or group’s) choosing. These findings will then be discussed in conjunction with the class readings for this Unit in order to explore what it means to claim that something is proliferating, who makes such claims and why, and what the stakes are in claims or observations of proliferation.

This question is a good one for students to brainstorm off of, because it can easily lead to that important question of “why” the proliferation is happening. While nuclear proliferation and the proliferation of a disease may be the readiest examples of “proliferation,” this broader question about “things that are suddenly everywhere” may help jog additional examples of proliferation. Simply as examples, some things that might be included are: politicians behaving scandalously, whatever insect species the news media currently is covering, recently trendy fashion items, disingenuous comparisons of public figures to Hitler, products manufactured in particular countries of origin, certain words that suddenly seem to be everywhere, a newly popular model of handheld device, tourists, particular genres of youtube videos, commercially popular T-shirts, songs that receive a great deal of radio play, etc. Students might then speculate as to the causes of these proliferations.

After students share their ideas, it would be worthwhile to ponder related questions:

-When one notices a proliferation, is it because there are indeed more of this item or phenomenon? Or has the observer simply become more aware or able to see how many there are? Or did these things used to be somewhere else and are now nearby? Did they used to be scattered and now they are centralized and thus visible? Does this thing ‘spread,’ so that an increase now is likely to lead to an exponentially greater increase later, (i.e., is this thing contagious, metaphorically or otherwise)? Is the increase in number due to reproduction, infection, conversion, inspiration, or division into parts? Is the increase because of a change in categorization practices whereby what was once “one” has now become “many”?

- How does one go about *deciding* the causes of a proliferation? What assumptions and stakes are in play in this decision-making process?
- What defines the significance of proliferation: an increase in number, or the speed of growth, or the change in visibility, or some other factors?
- When something proliferates, how does that affect its value? Does its ubiquity lessen or ‘water down’ its meaning or impact?¹⁶⁰
- How are claims of proliferation necessary in identifying trends and other broader changes? Is it possible to talk about trends without reference to proliferations, i.e., the sense of sudden pervasiveness?
- How does one’s subject position and cultural location determine which proliferations one notices?

After discussing these questions, it would be useful to broaden the discussion to include more time periods. In particular, the following two sets of questions should be considered:

- What are some well-known claims about proliferations that have turned out to be politically motivated? What are some well-known claims about proliferations that have turned out to be false?
- What are the most important proliferations of this time period? What other time periods have had similar proliferations?

¹⁶⁰ Obviously, this question owes much to Walter Benjamin’s essay, “The Work of Art in the Age of Mechanical Reproduction.”

These questions then in turn suggest some areas students might choose to research. Although of course students should determine the course of these discussions, some relevant research topics they might pursue include:

-Narratives about the proliferation of certain identity groups: for example, who talks about the “exploding population” of immigrants and why?

-Sudden increases in politically charged images: why did public images of “welfare queens” proliferate in the 1980s, for instance?

-Historical multiculturalisms: in what time periods have people suddenly found it necessary to be familiar with more cultures and languages than they previously needed to?

-“Technology and society”: what defines a technology as “widely used”? What subject positions and assumptions are in play in such claims?

-Fear and “the enemy within”: what are the political stakes in narratives about increasing “threats,”¹⁶¹ whether these so-called threats are crime waves, the spread of infectious diseases, the rising number of single-parent homes, etc.?

Again the specific topics students will research will vary, but it is important that, before this research is completed, the class talks about the often problematic stakes of claims about proliferation. After completing their individual research, students should have a chance to share their research in order to discuss whether they find common threads in their findings (or if not, why not).¹⁶²

¹⁶¹ Obviously, the question here is about things that are *portrayed* as threats, and I am making no claim, for example, that single-parent families are either increasing in number or harmful.

¹⁶² If the course meets three times a week, a good organization might be to have one class for a brainstorming session, one class to share research and develop some working theories about narratives of proliferation, and one class to consider whether student research can be productively discussed in conjunction with the unit’s assigned class readings.

The readings for this unit can then be considered in this context that student research and discussion has established. The value in this structure is that the students are *creating* a theoretical framework in order to discuss a particular kind of change, and the assigned course readings will be considered in *this student-created framework*. Students' investigations are thus the *center* of the course material, and the course readings are more accurately described as test cases for the student-developed framework.¹⁶³ Furthermore, this unit can be viewed through the overarching thread of the course, the relationship between narratives about change in "the world" and changing subjectivities.

It is in light of this overarching thread that the readings for the "Proliferation" unit are chosen; they all deal, to some degree, with proliferations of *selves*. What follows is a brief analysis of how the Unit's assigned readings might be used to develop likely themes of the course. Churchill's play will be given particular attention, since it most overtly ties to the theme of "Proliferation," and the relevance of the play to the course as a whole is largely based on an original argument about the play, which will require a fuller explanation than that given to the other readings for the "Proliferation" unit.

The readings for this Unit include a brief description of globalization from *New Keywords*, a book used throughout the course because of its transdisciplinary explorations of key terms, and an excerpt from Kathleen Biddick's 1998 book, *The Shock of Medievalism*. This excerpt is an experimental section of Biddick's scholarly work, a fictional dialogue between the medieval author Bede and a late Twentieth Century U.S. Third World feminist. They have differences, Biddick notes, but share an understanding

¹⁶³ Previous discussions from other units may prove valuable here as well; for example, students may use their understanding of narratives of instability, critical mass, or progress to analyze "proliferation."

of what it is to live in a time of rapid change, multiple languages and cultures that are transforming one another, and the pressures to inhabit multiple subject positions. These readings illustrate how globalization processes are entangled with changes in subjectivity and proliferations of selves.

The other readings for this unit deal with cloning. Doniger's essay shows that recent narratives about cloning are often retreads of older myths about doubles and multiple selves, and the threats to identity these multiples evoke. Doniger particularly attends to the assumptions about masculine selfhood, and its unity and uniqueness, that underlie these narratives about the horrors of having multiple selves.

The last reading for this unit, Caryl Churchill's 2002 play, *A Number*, superficially appears to reproduce many of the tropes that Doniger enumerates. Closer examination, however, reveals that Churchill actually subverts many of these tropes. The play is about a man named Bernard who discovers he has an indeterminate number of clones, and then later discovers that he himself is a clone; his father, Salter, neglected the "original" Bernard as a child, and when he realized that "Bernard 1" was a sociopath, he abandoned the child and cloned him in order to start fresh.¹⁶⁴ Bernard 2, the Bernard the audience is originally introduced to, has a few momentary questions about what this cloning means for his identity, for his soul, and for his uniqueness, but these questions are quickly put aside so that he can pursue the more important questions of what his father did, what other dangers are in store, and what else his father might be lying about.

¹⁶⁴ While it is not necessary to outline all the tropes Churchill countervails, to briefly explain how Churchill differs from most cloning narratives described by Doniger: there are an indeterminate number of clones, not just the doubles, and the audience meets a third 'version', so there is no way to view the clones as two sides of a mirror/binary opposites; the *original* Bernard is the 'evil twin' who suddenly appears to wreak havoc in *the copy's* life; and, the 'inevitability' of one copy destroying another is not inevitable because they are genetically identical but because of specific mistakes that were made by Salter.

There are also other ways in which Churchill portrays the classic ethical questions surrounding cloning as mere distractions from the questions of greater ethical importance. The clones were made as part of an experiment to study “nature vs. nurture,” and much critical attention to Churchill’s play has focused on this issue, but Churchill’s play suggests that this supposedly key question is largely trivial or irrelevant; according to the play, the experiment is now neglected, and the scientist who performed the experiment is long dead and is never mentioned by name. The play does emphasize the importance of “nurture” but it is portrayed as a rather obvious factor that reveals little about what makes this act of cloning (this act of proliferation of subjects) so challenging or fraught. While Churchill indeed shows genetically identical individuals behaving quite differently, the extremity of their different upbringing makes this unsurprising: Bernard 1 is full of self-centered violent rage, Bernard 2 is full of self-centered anxiety and uncertainty, and the clone raised by an adoptive family is well-adjusted and engaged with the world. The importance of “nurture” seems obvious, but Salter, the guilty father, keeps *looking for* reasons to believe that his sons turned out the way they did because of some inherent genetic trait, especially after he discovers that Bernard 1 has murdered Bernard 2. In other words, the only character who insists on making these events about “nature vs. nurture” is the one trying to distract or deny his own accountability.

Salter, the father, looks for the easy comfort of the “nature vs. nurture” question particularly in the last scene of the play, in which Salter meets a third ‘version’ of his son, Michael Black, who was not raised by Salter. Michael is much better off than the sons Salter raised, and finds it delightful that he is a clone, and that he is only one of many. Salter is distressed to find that this clone is happy whereas the two he raised were

miserable. In this conversation, Churchill also alludes to Michael's perspective on war, and his discomfort with the way the language of "good guys" and "bad guys" is employed to justify violence. Here, Churchill invites audiences to make a direct comparison between purveyors of the rhetoric of "good guys" and "bad guys" to Salter, who consistently claims that he did the best he could and that his actions were justified.

The play, given its plot and characters, actually deals very little with the ethical aspects of cloning, the metaphysical implications of having multiple 'selves,' or the debate over nature and nurture. The only times these issues are brought up are when Salter is trying to deny his responsibility for what he has created. The explicit political discussion in the last scene, along with Churchill's longstanding interest in the worldbuilding properties of language, reveal that the play is not about cloning at all; it is an allegory for the destruction that comes from denying what one has created, and from the fantasy that one can wipe the past clean and start over (as Salter tried and tragically failed to do). The expected anxieties about the proliferation of 'selves' is revealed to be a distraction, an attempt *to deny* responsibility or connection.

It is for several reasons that this play is an ideal choice to examine "proliferation." One is that the play suggests that the existence of multiple 'selves' is neither universally disastrous nor universally beneficial. For this reason, it is a good way to introduce the question of how the self is defined, and what it means for another (an Other) to be another *self*, not just in the case of cloning but in any process of recognizing the deep connections between Self and Other. Additionally, the play points out the psychological and ethical complexities of discovering that there are actually an indeterminate "number" of beings when it was previously assumed that there was only

one, possibly suggesting that in general, narratives about individual uniqueness are disingenuous and are told for the benefit of maintaining a status quo. Finally, the play shows that sometimes, as in Salter's case, outrage about a proliferation is often a distraction, a way of *obscuring* the agencies and histories in play. In short, the play is particularly good at bringing up the following question: when we ask "Why so many?", what are we really asking? How might narratives of proliferation deny or distract from responsibilities or connections to the "many" that are proliferating? What do these stories of proliferations *erase*?

The assigned readings, as a whole, are thus designed to raise questions about narratives of proliferations in general. In conjunction with the students' research on narratives of proliferation, the discussion may also address how proliferations of selves are similar to or different from other proliferations, and what erasures these narratives about proliferation enact.

After a discussion of the assigned readings, the concluding questions to this unit might be:

- How does one survive a proliferation of selves?
- How does one catalyze a proliferation of selves?

These questions will once more connect the assigned readings to the student research projects, and connect the unit to the course's overall goal of exploring how narratives about change "in the world" relate to changes in subjectivity.

As can be seen, this unit demonstrates the approach of the course, which is to examine a kind of change from multiple angles, to assume that narratives of change should be examined for what they leave out or erase, and to make visible the assumptions

that undergird particular narratives of change. Ideally, students will gain insight into the importance of how we tell stories about change, and how these stories in turn affect *what kinds of changes* can occur.

Additionally, if the course is adopted as a comparative literature course, it serves as another example of what a more transdisciplinary, feminist technoscience-centered comparative literature curriculum might look like. Comparative literature should attend to narrative in a way that is mindful of the pervasiveness of narrative in any cultural site, and of Donna Haraway's considerations of the non-innocence of storytelling practices. The focus on change centers boundary-crossings of many kinds, including cross-cultural and transdisciplinary perspectives. Student expertise in a particular discipline may be useful – it may be relevant to discuss the marketing strategies behind the proliferation of certain products, or the historical influences on the explosion of visual styles in Twentieth Century Western art, for example – but while expertise is useful, no one area of expertise can be the *center* of investigation. The function of expertise in the classroom is therefore not to keep the discussion centered on one monolithic trajectory of understanding. Instead, various kinds of expertise instead serve to poke and curve the discussion in *multiple* directions. For instance, there is room for close literary analyses, but there is room for these analyses to be in conversation with many other approaches as well. Most importantly, the course asks students to reshape the boundaries of *what constitutes* a meaningful comparison by enacting transdisciplinary, self-reflective, agency-aware intellectual border crossings. In this way, students learn to think more critically about how change is narrated, and how they might narrate change differently.

Teaching Transdisciplinarity: Making Knowledge/Unmaking Knowledge: Transdisciplinary Experiments in Unlikely Comparison

The final course discussed in this chapter asks how undergraduates might contribute to making higher education practices more transdisciplinary, and how they might study and contribute to theories of transdisciplinarity. The course is entitled, **“Making Knowledge/Unmaking Knowledge: Transdisciplinary Experiments in Unlikely Comparison.”**

Course 3: Description and Explanation

This course is intended as a comparative study of transdisciplinarity. Each unit will put together a diverse set of course materials specifically to explore the question of what makes certain discourses comparable to others. Each unit will focus, therefore, on a keyword or key phrase that encourages students to look at materials from different traditions and disciplines and investigate whether these materials are engaged with similar or different knowledge-making processes.¹⁶⁵

This course also continues and expands on the tactics used in the courses explained in earlier parts of this chapter. Like the previous courses, it uses “unlikely” comparisons to explore the process and stakes of comparative work. This course, however, asks students to center their contributions to the course on explicitly theorizing about the nature of comparison and how it relates to disciplinary and extradisciplinary boundaries. In other words, comparison itself is explicitly the subject matter.

¹⁶⁵ The following course outline is intended to be diverse in discipline and otherwise, and to be highly flexible according to the interests and strengths of all participants; changes based on local situations are expected.

The use of keywords¹⁶⁶ as a means of organizing and connecting different discourses draws inspiration from Raymond Williams' landmark book, *Keywords*, and expands on its tactics. This keyword-based focus serves, as with Williams, to provide ways to weave together discourses from various disciplinary sites without a clear disciplinary center; the keywords are both general and specific, in that they both broaden the focus (in terms of disciplinary location) and make the focus more specific (in terms of narrowing the focus to that which can reasonably be connected to the keyword itself). Furthermore, Williams' book suggests a move away from comprehensiveness as the goal of inquiry; a keyword may never be "covered" completely, but the associations of the keyword may be explored, and the keyword may be shown to relate to a surprisingly diverse set of concerns.

This use of keywords as focal points differs, of course, from Williams' in several respects. The Units in this course do not seek so much *to define* the current nature of these keywords but instead to *explore unexpected threads* that the keywords may help to pursue; each unit is designed to choose course materials that do not "obviously" match the unit keyword, but instead *pose a question as to whether and how* the course materials might be put into dialogue with the unit keyword. Each unit is therefore designed with the specific intent of discovering how well (or poorly) the keyword might be used to perform or enact transdisciplinary inquiries. To use the well-rehearsed metaphor of the journey, the course is best explained this way: each unit takes a keyword not as a map or compass or destination but instead as a supply bag, a source of sustenance, that one uses

¹⁶⁶ Of course, the keywords are not always single words but may be phrases as well; "keyword" is used here for simplicity's sake, whether referring to a keyword or a key phrase.

to meander on the hidden paths, under the assumption that getting lost is an important part of knowledge work.¹⁶⁷

Furthermore, the keywords chosen are not selected based on the amount of debate these words inspire (which Williams arguably uses as a criterion). Instead, the keywords are chosen for their ability to encourage border-crossings of various types, but especially across knowledge worlds. In this way, these keywords are inspired by the kind of intellectual work that goes into choosing a theme for an interdisciplinary conference or journal issue;¹⁶⁸ the keywords are chosen specifically for their potential to destabilize disciplinary boundaries.

As the title of the course suggests, each unit is also an experiment in comparability and the challenges of unlikely comparison, since each unit *calls into question* which materials can one sensibly view in conjunction and why. In other words, students' central inquiry is into the question of what makes a comparison possible and desirable. Again, the course has been designed so that it is possible but *not* immediately obvious to see how course materials relate to the Unit keyword. Thus, each Unit is designed to explore this question of comparability and how it relates to disciplinary locations. The subject matter is not one particular "area," but instead the question -- of *what and how and why* one compares -- is itself the common thread that unites the various units.

For all of these reasons, this course is ideal as a senior capstone for undergraduates in order to help them review and re-examine the disciplinary and other

¹⁶⁷ "Getting Lost" is a term borrowed from Patti Lather's book of that title, in which she argues for the epistemological and feminist need for a model of knowledge work that centers "getting lost."

¹⁶⁸ Some excellent examples of keywords that encourage disciplinary border crossings are recent conference themes for the Society of Literature, Science, and the Arts, which have included, "Emergence," "Evolution," and "Iteration," which were also inspiration for some of the units in the course on "Change."

knowledge practices they have engaged in, and to consider the underlying agencies and politics of these knowledge practices.

Course Outline:

Week 1: **Combination**

Readings:

Julie Klein, *Crossing Boundaries: Knowledge, Disciplinarity, and Interdisciplinarity*

Stuart Hall, “The Local and the Global: Globalization and Ethnicity”

Weisstein, Eric W. “Combination,” “Permutation,” and “Event” From *MathWorld* at

<http://mathworld.wolfram.com>

Jonah Lehrer, “The Future of Science...Is Art?”

Discussion Questions: How is multiplicity narrated? What metaphors are useful for describing coming together and combinations? Where do you see ‘strange bedfellows’? In what ways is a knowledge tradition or discipline like a ‘culture’? What narrative tactics have been or might be used to respond to concerns that meaningful knowledge work may be stymied by the existence of ‘too much’ information, too much complexity, and too many interconnections across too many fields? How does subjectivity relate to narratives of knowledge work?

Week 2: **Permission**

Reading/Viewing Materials:

“Human Rights” and “Freedom” in *New Keywords*.

Lawrence Lessig, “Introduction,” “Conclusion,” and “Afterword” in *Free Culture*

“Exploring Emergence,” Interactive essay at <http://ilk.media.mit.edu/projects/emergence>

Donna Haraway, “A Manifesto for Cyborgs”

“A Guide to Understanding Informed Consent” on National Cancer Institute website

Discussion Questions: How do rights discourses frame contentious debates? How do ideas about emergence, information, and flow relate to “control,” “permission,” and “centralization”? How do centralization processes relate to subjectivities and individualisms in debates over rights and property? In what ways are we living already in a science fiction worlds (in Haraway’s terms), and where else do we see the shift to metaphors of information and control? What considerations of agency are visible or invisible in these narratives of “permission”?

Week 3: **Fast and Loose**

Reading/Viewing Materials:

Sindiwe Magona, “House-Hunting Unlike Soweto.”

INtransit V.2: Fast Women. Video.¹⁶⁹

Howard Rheingold, “From the Screen to the Streets”

Norimitsu Onishi, “Thumbs Race As Japan’s Best Sellers Go Cellular”

Nadine Gordimer, “The Ultimate Safari”

Christa Wolf, “Associations in Blue.”

¹⁶⁹ The unit title is particularly inspired by this art video’s use of various definitions of “fast,” and particularly its use of “fast” as a way of talking about technologically engaged women.

Poramate Manoonpong, et. al. “Adaptive, Fast Walking in a Biped Robot under Neuronal Control and Learning.” (“Introduction” and “Results/Discussion”).

Discussion Questions: How do these narratives relate speed and mobility to blurring boundaries of insider and outsider? How do more dominant narratives about marginalized groups affect mobility? What shifts are occurring in the relationship between space and community? In what circumstances does forgetting have a vital purpose? How and why might definitions of “diaspora” be used in new contexts? How does speed relate to various ways of talking about the future?

Week 4: **Inform**

Reading/Viewing Materials:

Sara Ahmed, Excerpts on surveillance culture in *Strange Encounters*

Matthew Fuller, “Break the Law of Information: Notes on Search Engines and Natural Selection” in *Behind the Blip*

Jerry Portwood, “Can Architecture Shape Science?”

Antjie Krog, “Defence of Poetry.”

Discussion Questions: What are specific ways of talking about different kinds of information? What work does the broadness/generality of the term “information” do? What does it mean to say that knowledge work is “informed” by something? How might a surveillance society be defined – and can it include a wider set of knowledge practices

than literal surveillance? What other trends in knowledge work play into the politics of surveillance?

Week 5: **Deviation**

Reading/Viewing Materials:

Donald Savran, *Taking It Like a Man*

Nawal El-Saadawi, *Twelve Women in a Cell*

Robert Niles, “Standard Deviation” at <http://www.robertniles.com/stats/stdev.shtml>

Lucy Parsons, “The Principles of Anarchism”

“World Atlas of Biodiversity” at [http://stort.unep-](http://stort.unep-wcmc.org/imaps/gb2002/book/viewer.htm)

[wcmc.org/imaps/gb2002/book/viewer.htm](http://stort.unep-wcmc.org/imaps/gb2002/book/viewer.htm)

Discussion Questions: How are deviations from norms measured and narrated? Who narrates them and why? How is difference coded as oppositional and for what purposes? When and why are homogenization or conformity portrayed as life-affirming? As destructive? How do narratives of authenticity, rebellion, and resistance help constitute narratives of deviation? How do narratives of norms, averages, and deviation help constitute narratives of diversity, freedom, action and reaction?

Week 6: **Inherit**

Reading Materials:

Leslie A. Pray, “Epigenetics: Genome, Meet Your Environment.”

Brona McVittie, “European Tour of Epigenetics.”

Sophocles, *Antigone*

José Watanabe and Teresa Ralli, Excerpts from *Antígona*

Discussion Questions: What shifts are the concepts of “inherit” and “ancestry” undergoing and why? Does attendance to women’s contributions tend to parallel attendance to environment/context and to interactions/intersections – and if so, when and why? What does it mean to call someone (or a mythological character) a proto-feminist or an early example of civil disobedience or a resistance fighter? How might “ancestry” be used in narrating social movements and why? Is it possible to speak meaningfully of archetypes without relying on universalisms? How does the language of “heritage” and “inherit” inform subjectivities? How does kinship relate to time?

Week 7: **I / We**

Mid-term Student Presentations on Subjectivity: Research a few technoscientific and other sociohistorical factors that you think have had a significant influence on how you view yourself and your role in the world (and in your communities of practice); you might consider individualisms, histories, or other narratives. Prepare an oral presentation on what your findings may reveal about subjectivities.

Week 8: **Proof**

Reading/Viewing Materials:

Jane Taylor with William Kittredge and the Handspring Puppet Company, *Ubu and the Truth Commission*

Bonnie Shulman, “What If We Change Our Axioms? A Feminist Inquiry into the Foundations of Mathematics”

Proof of Equivalence of Well-Ordering Principle and Induction, at

<http://www.libraryofmath.com/well-ordering-principle.html>

M. Nourbese Philip, *She Tries Her Tongue, Her Silence Softly Breaks*

Discussion Questions: What does truth have to do with reconciliation, in the various senses of these words? How do legal discourses and informal discourses elide – and where and why? What is the relationship between proof and absurdity (satire as argument, absurdist play of language as a questioning of the stability of truth, reductio ad absurdum proofs)? How do these narratives narrate “foundations” and “starting points” or the lack thereof? In what ways is “proof” a technology of communication and connection?

Week 9: **Clean:**

Reading/Viewing Materials:

Art Spiegelman, *MAUS*

Alan Kraut, “ ‘Proper Precautions’ ” and “ ‘Viruses and Bacteria Don’t Ask for a Green Card’ ” in *Silent Travelers: Germs, Genes, and the Immigrant Menace*.

Yes, Dir. Sally Potter

Peter Shaffer, *Equus*

“Stop Semiotic Pollution.” Video at www.subfuse.net/local/stopsemioticpollution/

Discussion Questions: Where is there a perceived need to clean, literally and metaphorically? Who cleans and why? How do definitions of “reason” allow for “clean” to become elided with “familiar”? How does “clean” relate to human/non-human boundaries? When is knowledge work narrated as “messy” and why? How do scale, number, location, and shape relate to narratives about “clean”?

Week 10: **Incomplete**

Reading/Viewing Materials:

Raymond Smullyan, section on the Incompleteness Theorem in *The Lady or the Tiger?*

Trinh T. Minh-ha, *Woman, Native, Other*

Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective"

Browse “Wikipatterns” at www.wikipatterns.com/display/wikipatterns/Wikipatterns

Discussion Questions: What are some narrative tactics for suggesting that incompleteness is a source of opportunity, power, creativity, or transformation? How

does “incompleteness” affect narratives of knowledge work and their perspectives on time and temporality? When is “liminality” useful in discussing incompleteness and when is it not? What is the relationship among incompleteness, materiality, and embodiment? When and why do multiple definitions of “part” and “whole” proliferate?

Week 11: **Break**

Reading/Viewing Materials:

Karen Barad, “Agential Realism” and “Getting Real” in *Meeting the Universe Halfway*

Haruki Murakami, *The Elephant Vanishes*.

Marcel O’Gorman, “Detroit Digital: On Tourists in the Apocalypse”

Michael Marder and Jay Fineburg, “How Things Break” at

http://chaos.ph.utexas.edu/~marder/fracture/phystoday/how_things_break/how_things_break.html

Discussion Questions: How do breaks reveal implicit and explicit categories at work? How are generational differences narrated and why? How do technoscientific change, cosmopolitanism, and other globalization processes affect the meaning of “ruins”? How do breaks and broken things relate to narratives of psychological or economic stability in Murakami and O’Gorman, and masculinist subjectivities in Barad? How does the suddenness of breaking contrast with more gradual forms of change in these and other narratives – for example, does conceiving of a change as a break instead of a process lead to different ways of investigating causality? When and where do critiques of dualism proliferate?

Week 12: **Playthings:**

Reading/Viewing Materials:

Elena Dorfman, *Still Lovers*

Merlinda Bobis, “The Long Siesta as a Language Primer.”

Donna Haraway, *Companion Species Manifesto*

Nina Katchadourian, Maps

View several robotics demonstrations on YouTube and read comments.

Discussion Questions: When and why do attitudes toward language and representation change? What is the appeal of gadgets? What narrative tactics are used to ascribe agency to those beings or things that are often assumed to lack agency – ‘Real’ dolls in Dorfman’s photography, child prostitutes in Bobis’ short story, pets in Haraway, landmasses in the maps, and robots? Under what circumstances does ascribing agency to them encourage greater or less examination of ethical issues? How does ‘the exotic,’ ‘the authentic,’ and ‘Otherness’ relate to a sense to play? How might ‘play’ relate to subjects and objects of knowledge?

Week 13: **Noise/Signal**

Readings/Viewing Materials:

Chela Sandoval, *Methodology of the Oppressed*

Anna Deavere Smith, Introduction to *Fires in the Mirror* and Video of *Fires in the Mirror* and *Twilight: Los Angeles 1992*.

Marilyn Frankenstein, *Relearning Mathematics: A Different Third R – Radical Math(s)*

Discussion Questions:

Where in these texts (and others throughout the semester) can we see Sandoval's oppositional consciousness? How do these materials relate to Klein's position that interdisciplinary work is characterized by attendance to the processes by which information is sifted out from interference? What do these and previous materials reveal about the relations among interdisciplinarity, social engagement, and various other diversities? How is hope narrated by these materials, and how does hope relate to knowledge practices, and to the way knowledge work is narrated?

Week 14: **Student Presentations** on their choice of "unlikely comparison"

Key Concepts and Arguments:

The purpose of each unit in this course is to put disparate materials into conversation in a way that asks students to inquire into what makes a comparison meaningful or not. Each unit includes several materials that can be used for this purpose, but it should be emphasized that there are *many, many* such combinations of course materials that could have just as readily been used. This course design is based on this underlying view of knowledge work, which should be discussed explicitly in the classroom: that inquiry is a process of gathering and following particular threads among

many, many viable possibilities, and the way that these threads are gathered have political stakes.

The course is intended to resist, or provide alternatives to, the following problematic assumption about knowledge work: that knowledge work is largely about “connecting the dots” and finding the single line or mono-narrative that can stand alone and make sense out of a complex situation, and that the method of connecting the dots is very little influenced by culture or politics or political erasures.¹⁷⁰ Instead, the course will suggest that knowledge work, instead of marking a clear line through a tangle of unwieldy dots (building a trail through the wild, etc.), is rather an iterative process, a series of variations and reconfigurations, a series of stories or pictures, some blurrier than others, each revealing something different.

Additionally, the course is intended to provide students opportunities to draw on their own diverse knowledge worlds, disciplinary and otherwise, to explore the question of *how* one inquires into what various cultural sites do or do not have in common. The course design is therefore intended to invite students to consider the multiplicity of ways that they might reconfigure disciplinary boundaries, and the various purposes of doing so. Although a fuller discussion of a sample unit will be discussed below, it will be useful to very briefly use an example from the course to explain this point. The unit entitled, “Inherit,” has two works centered on epigenetics, the study of changes in gene expression that are *not* caused by changes in DNA, and two plays about Antigone. The materials on epigenetics may or may not impact how students conceive of what it means to “inherit,” and whether environmental factors can be said to be “inherited,” and so on. The point is

¹⁷⁰ Even those who might explicitly reject these assumptions may find that they work under these assumptions at some level nonetheless; the standards of scholarly discourse are, to some extent, based on these assumptions.

that students will need to decide what (if anything) makes these materials resonant with the keyword, and, crucially, *what processes they use to make such a determination*. For example, some students may have prior knowledge of epigenetics and find it a promising field, whereas other students may have never heard of epigenetics and may even find it threatening to their understanding of the primary role of DNA. The unit on “Inherit” also includes Sophocles’ ancient Greek play, *Antigone*, and a Twentieth Century version of the same mythic character, *Antígona*, by Peruvian playwright José Watanabe and actor--playwright Teresa Ralli, that deals with the disappearances of political protesters in Peru. Again, students may inquire into or debate what these materials have to do with the keyword, since there are several possible ways to connect these plays to the keyword “Inherit”: Sophocles’ play portrays a family living with a pollution or a curse that the younger generations “inherit” in a sense; both plays ask what it means, spiritually and ethically, to live with the past, and with the losses suffered by one’s family or community – in other words, the plays ask what actions are possible when one cannot disinherit the past; the influence of Sophocles may pose the question of what it means for various cultures to inherit *Antigone* as part of a Western or a “world” literary tradition; the differences between the plays may suggest that Watanabe’s and Ralli’s inheritance from Sophocles is not so direct as the titles suggest. These are just a few of the ways that the course materials may relate to the keyword; students may determine what, if any, connections are to be found, and then can discuss which aspects of their own locations in various knowledge worlds encouraged the methods they used to make these connections.

Taken together, the materials for this Unit, “Inherit,” pose many different questions about how and why various sites narrate inheritances of many kinds. This

discussion can only occur, however, if students explore and analyze their own understandings of the keyword and the course materials; it is self-reflexive examination that allows students to consider *how* they connect the course materials to the keyword “inherit.” In order to render the course unit or the unit keyword readable, they have to engage in unlikely comparison, and then, in class, engage with the diverse unlikely comparisons that other students perform. It is for this reason that the keyword and the course materials are designed to have *several* possible connection points, and while the basic goal of each unit is to explore those connection points, the overarching goal of the course as a whole is to ask students to think about *how and why* these connections get made. In short, it is *intended* to be a challenge, though hopefully a generative one, to connect the course materials to one another and to the Unit keyword. In the case of “Inherit,” for instance, students may have prior experience in how they are expected to think about plays or about scientific articles based on their exposure to literature, theater, or science, and so they may have different understandings of what processes they are expected to use to evaluate, understand, and form opinions about these materials. It is unlikely, however, that students will ever have been asked to compare articles on epigenetics to dramatic versions of the Antigone myth. By asking students to engage in a transdisciplinary inquiry for which they have *no ready basis* of comparison, and for which they have the opportunity *to figure out* how to cobble together different methods of interpretation, the course asks students to think about *how* they think, how they bring different disciplinary knowledges together, and how their thinking reflects the kinds of knowledge work they have previously done.¹⁷¹

¹⁷¹ Again, note the value in this process for a senior capstone course; students are expected to synthesize diverse knowledge practices but also to examine the politics and agencies entailed in them.

Another key concept that the course develops is the issue of “context.” The line between text and context is one that is blurred and problematic, and implied in this dichotomy is a privileging of “text” and a relegation of all else as mere background. However, it is useful at times to center a discussion on a particular “text” and to consider the fact that a text might have *many* different contexts. The keyword-based approach in this course provides an alternative sense of what an appropriate “context” might be, under the assumption that the *methods* for determining context are important markers of disciplinary location, and transdisciplinary work will therefore need to re-evaluate the processes by which the categories of “text” and “context” is determined.

Again, while a fuller discussion of a sample unit will be discussed below, it will be useful to very briefly draw on a few units here to explain how and why the course asks students to consider multiple contexts. In Unit 5, for example, the keyword is “Deviation,” which is taken to mean both a way of measuring difference or variation in a population, as well as deviation from social norms. This unit enacts a “context” for studying deviation; some materials suggests that social norms are a way of measuring and inscribing difference, and some suggest that differences are to be expected and are even necessary. The course materials for this unit include Donald Savran’s work on American masculinity and related fantasies of rebellion from dominant norms, Lucy Parsons’ foundational work on early feminist anarchism, Nawal El-Saadawi’s play about women of diverse backgrounds who meet in prison, a mathematical definition of standard deviation, and a representation of biodiversity. The first three materials all explore the ramifications of deviating from the norm, and to do so, they suggest that societies construct freedom, deviation, and social deviance in ways that are highly dependent on

gender roles. Viewing these materials in the context of this comparison brings out the way that social “deviance” can be gendered, but also, since this context and comparison appears unlikely, it allows one to see the stakes and results of particular ways of dividing text from context.

This discussion of context might, of course, emphasize some course materials over others; if the work of Lucy Parsons became a focus of class discussion, to use one example, students might think about the contexts in which her work might be studied: as part of late Nineteenth and early Twentieth Century political writing; as part of feminist literature; as part of African American literature; as part of the history of women’s rhetoric; as part of the history of revolutionary ideas; as part of the history of anarchism; as part of the history of anti-segregation protest; as part of the history of U.S. multi-ethnic women; or, as part of the history of labor movements. All of these are worthwhile and important contexts to consider, and since students may have more knowledge of some of these contexts and less knowledge of others, it would be appropriate to discuss these contexts in class. The course, however, also provides a very different context, one in which Parson’s writing is viewed in the context of discourses on “deviation”; in this unit, Parsons’ work is in the context of a relatively recent Egyptian feminist play about women imprisoned (largely unjustly) for various crimes, a current scholar who argues that U.S. masculinities purport to rebel against societal norms while actually reinforcing them, an explanation of biodiversity, and a mathematical definition that illustrates an important way the study of deviation can be made more precise, the kinds of distributions of difference one might expect and why, and the kinds of measurements it takes to study deviation in this way. Because the course design asks students to view Parsons’ work in

the larger context of works we might use to think about deviating and norms, students may discuss Parsons' context in terms of her nation and time period, for example, but they *cannot* easily limit their understanding of "context" to these aspects; there are many ways of considering the context, many of them challenging or unexpected. Context here, therefore, is not a community of mutual influence for the *producers* of the work being studied – in this case, Parsons - but rather a selection or category of inquiry *enacted or performed* by the knowledge worker (the student) who is examining the text and context (and determining the line between the two). Context is not the space in which the text is found; "context" is a performance enacted by specific acts of knowledge production and boundary drawing.¹⁷²

Furthermore, it is clear that there are many other contexts that might be considered/drawn. To again use Parsons' "The Principles of Anarchism" as an example, students might discuss what *other* alternative contexts might be enacted, besides the unit theme of "Deviation." For instance, her work could be considered as part of the history of narratives about the creative or life-affirming aspects of chaos; the context might then include works on chaos theory, creation myths that narrate the cosmos beginning with chaos, and so on. The point of bringing up the agencies and choices involved in determining context is to convey that context is something that students enact when doing knowledge work, and that they should be aware of the multitude of vastly differing

¹⁷² Cf. Barad's sense that to observe is to make a cut between what is part of the intra-action you are observing and what is not. Likewise, context is shown to be a boundary that one draws around certain entanglements and not others. Also compare this view of context to the cyberfeminist portrayal of networks and time travel as ways of modeling intellectual lineage; naming the context of knowledge work is a politically laden act of tracking of particular threads among many.

contexts that they *might* enact.¹⁷³ In other words, the course asks students to engage in a more agency-aware view of context. The intended result is that students may be more aware of the stakes in assigning a text a certain “context.”

One might be inclined to use the mathematical formula as the model or basis for the entire unit – to use it as the ideal way of understanding “deviation” because it is the most precise. This inclination, however, runs counter to the purpose and role of mathematics used in these courses. There should be an effort to maintain a sense that all disciplinary and other knowledge worlds are the source of material that might well be useful in examining other materials from other knowledge worlds. Because of the tendency to give privileged status to that which is widely considered “difficult” – which might very well be mathematics in many locations – it will be useful to think of multiple ways of putting the materials into conversation that do *not* assume a hierarchy. For example, the mathematical definition of standard deviation in this unit should not be the main standard by which other consideration of deviation are understood, simply because the mathematical definition is highly precise and draws on particular kinds of (privileged) methods of collecting and recording data. Instead, a good question to ask might be “In what situations is it advantageous to use such precise measures of deviation? In what situations might it be advantageous to use imprecise measures? When is imprecision an asset?” Another question that might be useful is use the mathematical definition of standard deviation to discuss the definition of “outliers.” Possible questions could include whether the concept of outliers developed in part because of Western ideas about boundaries and normativities, whether “outliers” is an intuitive concept and for whom,

¹⁷³ This sense of context is largely based on Karen Barad’s argument that observation requires the observer to make a cut between what is included in the observation and what is not, and that these cuts are not politically or ethically neutral.

whether there might be a better way of talking about “outliers,” how the term “outlier” takes on different meanings than the ‘standard’ mathematical one in various sites, and whether one tends to think that the very existence of outliers pushes observers into asking why the outliers exist (in other words, whether outliers are expected to justify their existence, and why).

Another goal of the course is to encourage students to think analytically about transdisciplinarity. To this end, most units have one or more course materials that could themselves be considered transdisciplinary; for instance, Chela Sandoval’s or Karen Barad’s work enacts transdisciplinary border crossings by the definitions used in this dissertation. The course thereby provides an opportunity for students to ask what makes something transdisciplinary, and how they might characterize *similarities and differences* among various kinds of transdisciplinary work. The sample unit below is a good example.

Comparative Analysis Based on a Sample Unit: “Noise/Signal”

Since an important goal of the course is to encourage students and instructors to re-examine what may count as a coherent problem or topic to investigate, it will be useful here to examine one unit as an example of the aims of this course. The unit on “Noise/Signal” is one that perhaps is unexpected in the unlikely comparison it enacts. It is not about digital filters for search engines or sound recordings (though it well could be). The reading and viewing materials, as with all these units, are not an intuitive match for one another, or, in this case, for the keywords of the unit, “Noise” and “Signal.” This comparison, however, is a good example of the primary approach to the course, in that

each unit is an experiment in bringing together different conversations from rather disparate knowledge worlds. Furthermore, each object of inquiry in this particular unit is itself quite transdisciplinary, in that each tries to create a broader framework which will create and *maintain* conversations that cross boundaries of academic discipline as well as boundaries between “academic” and “non-academic” discourse, in a way that reconfigures these boundaries themselves.¹⁷⁴ To make these transdisciplinary moves, the course materials in this unit question what counts as “theory,” what counts as “art,” what counts as an “event,” and what counts as “mathematics.” The materials for this unit, Chela Sandoval’s *Methodology of the Oppressed*, Marilyn Frankenstein’s *Relearning Mathematics: A Different Third ‘R’ – Radical Math(s)*, and Anna Deavere Smith’s *Twilight and Fires in the Mirror*, will therefore be considered as *examples* of transdisciplinary work, even as students engage in enacting a transdisciplinary inquiry by putting these materials in dialogue with one another and with the keywords or title of the unit.

The keywords of this unit, “Noise/Signal,” are inspired by Julie Klein’s observation that interdisciplinary inquiry tends to highlight the processes by which boundaries are drawn between information and interference, or between signal and noise (Klein 84). The three works discussed here, Marilyn Frankenstein’s work on radical mathematics education, Anna Deavere Smith’s use of documentary theatre to depict American negotiations of identities, and Chela Sandoval’s feminist theory, particularly her work on oppositional consciousness, have several things in common: all combine various disciplinary traditions in a way that creates specific intersections of often-

¹⁷⁴ Katie King in “Queer Transdisciplinarity” defines transdisciplinarity in part by movement among academic and extra-academic knowledge worlds.

separated audiences; all work from the intersections of anti-racist and feminist practices and commitments; all blur genre in ways that are central to supporting their implied or overt claims; and, most directly relevant to the keyword of the unit, all are examples of works that foreground to the processes by which noise is filtered from signal.

To illustrate one possible way of putting these three works into dialogue, it will be useful to discuss this last point in greater detail. The following analysis and comparison will therefore serve as an example of the approach of the course as a whole, and will discuss the relevance of selected works of Chela Sandoval, Anna Deavere Smith, and Marilyn Frankenstein to the unit keywords, Noise/Signal. Specifically, this comparison will show that these three projects achieve their transdisciplinary border crossings through similar means, especially their foregrounding of the processes by which signal is filtered from noise. For the sake of clarity, each example's relationship to the unit theme will be discussed in its own section, and after the three brief analyses, there will be a more integrative discussion of the three.

Noise/Signal and Oppositional Consciousness

Chela Sandoval, a theorist and scholar-activist, has done much in the way of examining issues of theory and praxis. She develops her concept of “oppositional consciousness” in many sites, but I will refer particularly to her influential 2000 book, *Methodology of the Oppressed*. Sandoval's theory of oppositional consciousness addresses the issue of how it has been – and, most significantly – how it is *still* possible to meaningfully resist in an age of postmodern globalization. She identifies several modes of consciousness that, taken together, provide a “topography of consciousness in

opposition... [that] delineates a set of critical points within which individuals and groups seeking to transform dominant and oppressive powers can constitute themselves as resistant and oppositional citizen-subjects” (Sandoval 54). This delineation comes from her analysis particularly of U.S. Third World feminisms, and their attention to hybridity, especially the challenges and possibilities in resisting the *intersection* of multiple oppressions. Sandoval’s “modes of consciousness” are different subject positions that are “legitimate” in the dominant discourse but are “self-consciously” transformed through oppositional consciousness into “effective sites of resistance” (Sandoval 55). These different forms of oppositional consciousness include the “equal rights form” – a mode of consciousness in which one advocates that differences are only on the surface, masking an essential sameness, or the essential oneness of different groups; the “revolutionary form” – which “legitimizes, claims, and intensifies... differences” (Sandoval 56), and calls for a fundamental restructuring of society; the provocatively named “supremacist form,” in which the oppressed “assert that their differences have provided them access to a higher evolutionary level than that attained by those who hold social power” (Sandoval 57); and the “separatist form,” which seeks a separate space from the dominant order to protect and preserve difference. In short, these are four very commonly used ways of understanding difference and identity in ways that resist oppression that Sandoval identifies and categorizes.

The key to oppositional consciousness, however, as Sandoval explains, is the “differential form.” This form is actually a movement, a performative “weaving” (Sandoval 58), among the other forms. Sandoval compares the differential form to the gear shift on a car; the differential form is that which allows you to shift from one

resisting subject position to another, and from one way of mapping power to another. Sandoval further explains that this differential form – this movement among these various ways of resisting oppression – describes what U.S. Third World feminists have always done, moving from one mode of resistance to another, moving from anti-racist activist groups to anti-sexist activist groups to groups resisting various kinds of oppression (Sandoval 58). While this mobility, and these multiple responses to multiple oppressions, were often considered to be proof of disloyalty, or a lack of commitment or understanding, Sandoval draws on the tradition of U.S. Third World feminists to show that this movement among forms of resistance is *not* a problem or a lack of dedication; on the contrary, this mobility *is vital* to resisting oppressions.

Therefore, one of the fascinating things about Sandoval's formulation of oppositional consciousness is that it shifts the debate away from which form – which way of understanding difference – is most correct, most advanced, or shows the most progress. Instead, there is the implied assumption that most oppressed groups and most social movements use *all* of these forms. Thus the question shifts from asking which view of difference is “best” to the question of what tactics are most effective in order to *move among these forms*.

An important ramification is that these forms of resistance may manifest in various sites, including activist groups as traditionally defined, scholarship and theory of vastly diverse disciplines and approaches, works of art, and any other sites where power mapping is important. All of these may be included as part of the difficult and often

contradiction-filled work of resistance.¹⁷⁵ Furthermore, Sandoval's framework makes it clear that activist positions are very clearly participating in very sophisticated theorizing.¹⁷⁶ Theory includes much more than works that are published by scholars; theory is power mapping with a purpose. Sandoval's work therefore examines – and is an example of – transdisciplinary work, or work that moves among different knowledge worlds, reshaping key boundaries that separate or connect different categories of knowledge work.

Sandoval's work makes several important interventions, but it will be useful to briefly explain which interventions relate most clearly to the theme of "Noise/Signal" and the related concepts of "interference" and "information." For one thing, Sandoval rejects the notion that multiple activist commitments interfere with or lessen devotion to social movements; for example, she counters the assumption that engagement with anti-racism work takes something away from one's devotion to feminism, regardless if one thinks patriarchy is the underlying cause of racism or not. Furthermore, she illustrates the possibility – and mutual *necessity* – of the various modes of consciousness; to use gender as an example once more, feminists may need to *both* argue that women and men are fundamentally the same (or that such categories are poorly constructed) *and* that women are in some ways superior and that those characteristics traditionally associated with women should be valued – and in Sandoval's framework, one position is not more advanced than the other, but to an extent both positions *rely* on each other. In Sandoval's understanding of social movements and identity, therefore, it is a mistake to look for the

¹⁷⁵ Sandoval does not imply that all such acts are politically or morally equivalent; rather, I note that her emphasis on modes of subjectivity and power-mapping provides a specific way of talking about the political stakes of many kinds of knowledge work.

¹⁷⁶ Sandoval is not the first to make this clear, but it is important to note as a ramification of her framework.

one “signal” – the *one* social movement that addresses *the* underlying issue, or the *one* way of understanding the differences that mark an oppressed group -- and dismiss everything else as interference or noise that must be cleared away. Sandoval shows that the “noise” of these multiple modes of consciousness are in fact all necessary for the “signal,” i.e., resistance under globalization. Furthermore, by naming and making “differential consciousness” the centerpiece of her framework, Sandoval demonstrates that hybridities and multiple perspectives are not interference or noise that obscure the signal, but *are* the signal. The differential mode of consciousness – the tactically effective motion among modes of consciousnesses – foregrounds the fact that it is neither obvious nor politically innocent to determine what counts as “noise” and what counts as “signal”; instead, Sandoval portrays the sifting out of “signal” from “noise” as a *process* deserving of attention and visibility in its own right, and also suggests that this process can and should be different in different cultural sites.

Noise/Signal “On the Road”

Anna Deavere Smith, in her works of documentary theater, performs a collage of re-enactments of excerpts from interviews surrounding an issue or event. These performances comprise her “On the Road” series, which examines negotiations of identity in American life, and it is on this body of work, particularly *Twilight* and *Fires in the Mirror*, that this analysis will focus. In both of these works, Smith performs a one-woman show that portrays an entire community as it responds to an event that is largely perceived as one of racial or ethnic identities in conflict.

Fires in the Mirror portrays the relationships and discourses among and about the Hasidic and African American communities in Crown Heights, Brooklyn, surrounding the killing of Gavin Cato and Yankel Rosenbaum in August 1991. *Twilight* portrays the events in Los Angeles in 1992, before and after the infamous beating of Rodney King and the “Not Guilty” verdict for his attackers. In these performances, Smith imitates or impersonates persons of varied ages, genders, ethnicities, and opinions, transitioning from one character to another at telling points in their monologues. To call them “characters” is difficult, however, since they are all real people whom Smith interviewed.

Taken together, Smith and her performance embody a community full of voices and gestures. While the works are too complex to summarize in full, with dozens of interviewees portrayed, one necessary point is the stark contrast between Smith’s portrayal of these communities and events and the simpler – some might even suggest simplistic – portrayals of most of those in the news media. Smith attends to the *long-term tensions*, the events before the event, and the broader meaning of race, ethnicity, religion, and other identities in these communities.

As Smith describes her process, she performs the exact words of her interviewees as closely as possible to their original manner of delivery. The vocal inflections and gestures of her interviewees are closely imitated, including pauses, facial expressions, and gestures (Deavere Smith xxvi). This process, according to Smith, rejects the idea that acting is about finding the character in one’s *own* core of experiences (in the vein of Stanislavski’s method of acting, for instance). Instead, she attends to the negotiations between self and society that are evident in syntax, pauses, dialects, and gestures. In this way, Smith reverses the perspective of more mainstream acting approaches, particularly

their view of what counts as signal and what counts as noise. To Smith, acting is about finding the other, not finding what is deep “within” one’s self, and voice and gesture do not come from an “inner” understanding of character, but instead the details of speech and body language *are* character. Additionally, onstage, Smith transitions between one character and the next without leaving the stage, and in this way she highlights not only the performativity of identities more broadly,¹⁷⁷ but also her own authorship as the actor/interviewer/playwright. This method of constantly calling attention to her authorship encourages the audiences to ask how and why she included certain people and certain portions of interviews *and left out others*; in other words, the performance makes the audience think about the *processes* by which a signal is filtered out from a mass of information.

Furthermore, Smith attends to the aspects of the “event” which are often ignored. Smith’s narratives often consider an “event” whose scope is hard to narrow, but whose portrayal has tended to be reductive, divisive, and full of deeply problematic erasures. In Smith’s performance, the “signal” is not the same message of most media coverage (snippets of which Smith often includes in her performances), which portrays these complex communities and tensions as literally a matter of black and white. Smith rejects these reductions of American identity, and attends to what might superficially seem irrelevant to the event that garnered headlines. For instance, she often juxtaposes tragic and attention-garnering events with seemingly mundane stories of cross-cultural interaction, thereby encouraging audiences to inquire into how both relate to larger issues of difference and identity. For example, she portrays the seemingly mundane story of a Hasidic woman in Crown Heights who asked an African American child to turn off her

¹⁷⁷ Cf. the performativity of gender as explained in Judith Butler’s *Gender Trouble*, among other works.

radio since she could not do so on the Sabbath, and uses this seemingly irrelevant anecdote early in the performance, and as the first performance of a member of the Hasidic community, thus framing the community's intercultural relations in a way that would likely be far from the minds of audiences beginning to watch a performance on this subject matter. In this way, Smith's performances question what interactions *count* as central the issues of racism and the relations among groups within a city. She asks why some interactions are seen as defining a community's relationships, and other interactions are largely unseen. In other words, Smith calls attention to the *processes* by which certain interactions *and not others* are filtered out, sifted from the "noise" of a complex community, in favor of more simplistic, less challenging messages or "signals" about identity in the United States.

In *Twilight*, similarly, Smith includes people who act with kindness despite their fear among the more "newsworthy" perpetrators of violence. She also gives extensive time to the inexplicably ignored stories of Latinas/os and Asian Americans affected by these events, including extended monologues from a Korean woman whose family was victimized, and her struggles with why the police did not protect Korean-American stores. Smith also portrays a juror on the Rodney King trial who was sickened to discover the "Not Guilty" verdict made them a hero to white supremacists; she portrays activists engaged in the long process of peace-brokering within the city, whose work came long before and had to continue long after 1992; and she portrays wealthy citizens of Los Angeles who were safely tucked away, thinking that they were not connected to these events, even though Smith's inclusion of them suggests that their privilege of being

removed and protected and safeguarded does indeed have something to do with the dynamics that led to these events.

In *Fires in the Mirror*, Smith likewise includes the perspectives of those in the community who were not connected with the events but who were part of the broader web of relationships that define the community, and she again uses the voices of those outside the communities looking in, both to resonate with and to contrast the voices from the community. In *Fires in the Mirror*, Smith also includes many women's voices, particularly Hasidic women's, who were often ignored by mass media portrayals and who had significantly different experiences with cross-cultural interaction than men did, but their experiences were not considered central to the cultural relations and particularly not to the violent conflicts, especially since so many narratives defined the cultural relations by the conflicts. As Cornel West has noted, in doing so, Smith is "*de-patriarchalizing* our conversation" about relations among different communities (West xix, emphases in the original). These inclusions, and the sum of the disparate subject positions taken together, raise questions about what counts as relevant or irrelevant to the issues of difference, ethnicity, community, and conflict that are brought to national attention by tragic events.

Smith also blurs the boundaries of what counts as part of an "event," raising questions about how we can answer, or even begin to answer, questions like how these events started, who is part of the story and who is not, and why some parts of the story are given attention to the exclusion of all others – in other words, how we draw border lines around which actions or persons are part of an event and which are not. In short, the collage-like structure of the performance, Smith's foregrounding of the performativity of identity with her own onstage transitions of character, and the inclusion of narratives that

push at the boundaries of *what counts* as part of the story of an event, all shift aspects of “background noise” into signal. Furthermore, her work invites the audience to question how and why she filters relevant threads from the mass of possible narratives, and thereby draws *attention to* the problematic nature of how the line between signal and noise is defined.

Noise/Signal in Radical Mathematics

Marilyn Frankenstein is a key figure in “radical math,” a movement of math educators and other activists and math-involved communities committed to social justice. Her contributions include the textbook-cum-manifesto, *Relearning Mathematics: A Different Third R – Radical Math(s)*. The book is intended to help adult learners gain facility with “basic” math skills and concepts; it is also a political and epistemological tract and an important intervention in the understanding of the generic conventions of mathematics textbooks. In this book, Frankenstein calls attention to the processes by which “real life” and “mathematics” are made *to appear* to be separate spheres, and the textbook implicitly argues that it is politically oppressive to treat social inequalities as something that “interferes” with mathematics education, rather than being a primary reason for mathematics education. Additionally, Frankenstein suggests that it is deeply problematic to teach mathematics in a way that obscures the way math can be used to perpetuate or resist inequalities. In the terms of “Noise/Signal,” Frankenstein encourages students and instructors to think more critically about the processes – in and out of the classroom – that turn student’s extra-classroom ways of knowing into “noise” that must be filtered out to clarify the “signal” of legitimate mathematical knowledge.

Frankenstein draws on scholars who argue against the political neutrality of mathematical knowledge and teaching,¹⁷⁸ and it should be noted that there is much resistance to this approach, since it is usually thought that mathematics is utterly universal. Frankenstein's textbook also serves as a counter-argument to the claim of the universality of mathematical knowledge; again, this relates to the theme of the unit, in that it is the "universal" nature of mathematics that allows for student experiences and "difficulties" to be dismissed as noise that interferes with the signal that mathematics educators are trying to impart.

This critique of the presumption of mathematics' universality is part of the broader way that Frankenstein's work challenges dominant definitions of what counts as mathematics, what counts as intellectual work, and what counts as learning. For example, Frankenstein's textbook emphasizes mathematics that are not usually acknowledged as math, or even as intellectual work at all – those mathematical activities involved in sewing or making geometric patterns or designs, for example, or in the informally taught algorithms used to calculate a grocery bill - and she particularly focuses on those mathematical activities that are usually considered "women's work" rather than intellectual work. She also draws on the mathematics of cultures whose contributions are often left out of Eurocentric narratives of what counts as mathematics.

The focus of the mathematical textbook, however, is helping students learn the mathematical material that will help them survive in globalizing capitalist economies, but without naturalizing these economies. To this end, in Frankenstein's textbook, "practice" problems are not just for practice, but tend to focus on distribution of wealth, health care,

¹⁷⁸ An interesting parallel between Frankenstein and Sandoval are that both are greatly influenced by the pedagogical work of Paolo Friere.

and other issues. One question asks readers to write a brief essay describing their history of experiences with mathematics, and asks them to analyze the social and economic forces that have shaped their relationship with mathematics. What is notable about Frankenstein's move here is that this question is listed comfortably amid more traditional math problems; in Frankenstein's book, this essay topic is a *mathematical* issue, as much as it would be to write an essay on what constitutes a valid proof, because it speaks directly to the embodied epistemology of mathematical knowledge, and implicitly asks readers to evaluate the erasures enacted by dominant mathematical discourses.¹⁷⁹ In Marilyn Frankenstein's book, the problem of what draws the borders around "mathematics" is, in every sense, *a math problem*.

Another "practice" problem asks readers to accurately calculate the population of their city or town, with no directions as to which techniques would be most appropriate. While superficially a simple problem, readers are invited to examine how statistics, estimation, and even counting in general might relate to issues of visibility and privilege; this problem requires consideration of homeless populations, immigration and its relation to record-keeping institutions, and the variable and often class-based differences in population distribution in cities. Furthermore, this is a good example of Frankenstein's tendency to select examples that have many possible means of calculation, whereas most mathematics textbooks try to include problems that have one or few possible solutions (to prevent the noise of alternate methods from obscuring the signal of the assigned goals of that one particular chapter).

Transdisciplinary Approaches to Noise/Signal

¹⁷⁹ Cf. Barad's claim that ethical questions *are* scientific questions.

Taken together, these works from Chela Sandoval, Anna Deavere Smith, and Marilyn Frankenstein show a surprising number of similarities despite their obvious differences in subject matter, approach, and disciplinary identity. Viewed in conjunction with one another, and with the unit keyword of “Noise/Signal,” it can even be seen that they are all engaged, in a sense, in a much larger shared project, or at the very least in projects with very similar political and ethical commitments. In exploring these commitments, the unit’s unlikely comparison of these materials inquires into the connections and entanglements among race, gender, mathematics, performance, motion, and the processes by which knowledge work is categorized. The unit does so, however, in a directed and specific way, and so students can see then that there are political stakes in enacting particular comparisons.

Because the course is also intended to encourage examination of multiple interpretive modes, it will be useful to also enumerate some of the different bases of comparison that might be used to draw out the similarities among these cultural sites in this Unit on “Noise/Signal,” and the way this unlikely comparison elucidates the political stakes and the creative tactics of each.

One clear similarity is that all three include (and center) that which is often excluded from dominant discourses. Particularly, all three are concerned with making visible the exclusions based on race, ethnicity, class, and gender. Pursuing a comparison based on the materials’ similar commitment to inclusiveness may show a particular way in which all three are engaged in a similar project: all three materials demonstrate that including often-marginalized perspectives does not merely add to the conversation but *transforms it*. Another similarity that might be further addressed in the classroom is the

way that the unit materials center intersectionality, the way different categories of identity depend on one another.

Additionally, all three blur genre and/or discipline in a way that makes them nearly impossible to categorize in conventional terms, a fact which students might use to consider the politics of generic conventions. Related to genre and discipline is the question of audience; all three are seeking multiple audiences that are not usually grouped together as an audience. How do they do this? For one, these three works actively resist easy categorizations, and the easy readings that would go along with that. Sandoval is doing feminist theory, critical race theory, a history of social movements, an ethnography of scholar-activists, and a philosophy that considers love as the most important social technology. The work is political, spiritual, intellectual, and also highly transdisciplinary. Smith's theatre is even harder to categorize – are these impersonations or interpretations? Is this collage? What genre is this? Is this tragedy? Is this mimesis? Is this what we normally think of as political theater? Is this really how it (the event, or the interview) happened or is this just a call to look into the processes by which we sift out what that “it” exactly is? Marilyn Frankenstein's work on radical math combines a math textbook with a political manifesto and a handbook for resistance, and is a book for teachers as much as for students. It defies expectations of what kinds of math we can learn from a book. In all three sets of materials, these experiments in genre are vital to the interventions these three sets of materials make; by inviting us to ask, “what kind of book/play/work is this?”, we also learn to ask how and why we have become comfortable with certain kinds of knowledge exchange and not others.

These, however, are only a few ways of making this unlikely comparison. There are many other ways as well. For example, each of the three sets of materials in this unit explores tactics for engaging with dominant discourses, and living in a world structured by these discourses, *without naturalizing them*. Furthermore, each of the three focuses on communities rather than individual subjects, despite the traditional focus on individualism in theater (the protagonist), epistemology (the mind), and mathematics education (the individual student's mastery of objective truths). All three are concerned with the politics of listening, and all three call attention to the entanglements of power with ways of knowing. And, as discussed in the analyses above, all three call attention to the way that 'relevance' is determined, the way 'information' is filtered from 'interference,' and the related questions of who decides what *counts* and how. Again, in doing so, these materials raise the question of why some signals are so easy to dismiss as noise, while for others these signals are impossible to filter out or ignore.

Clearly, there are a number of ways to compare these materials, and a class might explore several of them based on class interest, but it is particularly of interest that although the comparison is quite unlikely, there are many, many possible bases of comparison. It will thus be helpful here to briefly summarize what this comparison shows about what students are expected to contribute to and gain from this course.

First of all, students of different disciplinary locations and political commitments are likely to notice and engage with different parts of the materials; in this way, class discussion also serves as an experiment or investigation into *how* one finds a basis of comparison. The materials have a number of things in common, but are still quite different, and students will need to generate their own methods of interpretation and

analysis, possibly bringing together different disciplinary practices into a specific, directed transdisciplinary inquiry. It is *intended* to be a challenge to think about how these materials relate to one another and the keyword, and this challenge is aimed at inciting students to be creative in *reconfiguring* familiar methods of comparison and analysis. It is precisely because these units ask them to perform unlikely comparisons that the course opens up a space for students to experiment with reconfiguring the boundaries of knowledge worlds.

Additionally, part of these explorations should ask students to consider what kinds of disciplinary boundaries are blurred or reshaped in these materials. Smith, Sandoval, and Frankenstein each cross or blur many boundaries; students may thus ask whether these materials are engaged in similar or different *kinds* of interdisciplinarity or transdisciplinarity. In this way, students can examine both the material, and their own methods of comparative knowledge work, as examples by which they might theorize or describe specific transdisciplinarity, and discuss what *kinds* of transdisciplinary inquiry are best suited for the kinds of resistance that Smith or Sandoval or Frankenstein might advocate.

In summary, the course is designed to provide challenging opportunities for students to experiment with unlikely comparisons in order to explore the agencies and political and ethical entanglements of these comparative and transdisciplinary formations and of their own broader set of knowledge practices as well.

Polyrhythm: A Key Characteristic of Agency-Aware Transdisciplinarity

A vital part of how transdisciplinary work attends to the agencies of knowledge work is the manner in which it deals with multiple narratives. For this reason, I argue that a good way to describe and evaluate transdisciplinary work is by how fully sense-making processes depend on attending to multiple narratives at once. Therefore, I propose that the term “polyrhythmic” should be used to describe knowledge work that expects or demands knowledge workers to attend to multiple narratives at the same time (or very close to simultaneously, at least). In simple terms, with knowledge work that is highly polyrhythmic, things make *more* sense when multiple stories are simultaneously considered, but it is difficult to “get” the picture, to render the work readable, or to make the object of analysis make sense, *without* considering multiple stories.¹⁸⁰ It is therefore beneficial to consider to what extent specific knowledge work is “polyrhythmic.”

One reason to examine “polyrhythmic” transdisciplinary work is to consider how one might *evaluate* or otherwise characterize the transdisciplinarity of a cultural site. The issue of how interdisciplinarity or transdisciplinarity might be evaluated – what specifically makes something more or less transdisciplinary than something else -- is a challenging one. While theorist of interdisciplinarity Julie Klein has suggested *integration* as the key to evaluating interdisciplinarity, theorist Lisa Lattuca has suggested a broader set of criteria based on specific context and purpose.¹⁸¹ It may not, however, be

¹⁸⁰ The metaphor is clearly drawn from music, which is often thought (perhaps not coincidentally) to be both the most mathematical and the most viscerally affecting of the arts. The metaphor (comparison, model) should not be taken too literally since, of course, even multiple narratives considered simultaneously do not provide the “full picture.” The irony of using a term with Greek roots that largely describes non-Western music is noted.

¹⁸¹ Julie Klein argues in *Crossing Boundaries: Knowledge, Disciplinarity, and Interdisciplinarity* that integration is the key characteristic and goal of meaningful interdisciplinarity. Lisa Lattuca, however, in *Creating Interdisciplinarity: Interdisciplinary Research and Teaching among College and University*

most useful to explicitly seek to measure *how* “transdisciplinary” something is. Rather, what is needed is to generate a broader vocabulary to talk about what *kind* of transdisciplinary work characterizes a particular cultural site. To explain by way of an analogy: if one were considering postmodern literature, one might ask how to determine *how* postmodern a work of literature is. Alternately, one might try a second, different method, and focus on a few *characteristics* of postmodernism. Therefore, as a partial means of examination of postmodernism, one might develop more specific ways of discussing the extent to which a cultural site uses pastiche (to use one example), and thereby develop more indirect but perhaps more precise and productive ways of discussing how fully a work expresses postmodern characteristics. In other words, the second way picks one facet of some postmodern works instead of measuring postmodernism as if it were a quantifiable measure that certain objects hold. This second way lends itself to more specific critiques and analyses, and it is less readily adaptable to reductive discussions which assume that the more postmodern a work is, the better it is (or the worse).

Similarly, to discuss a cultural site’s transdisciplinarity, there are benefits to selecting a specific aspect of transdisciplinarity and examining it in various contexts. Polyrhythm is chosen here for the following reasons: it is relevant to but not identical with transdisciplinarity; it especially characterizes (but is not *only* found in) the kinds of transdisciplinary work that crosses disciplinary borders in order to resist the politics of those borders; and its emphasis on multiple narratives decenters intellectual authority and resists attempts to fix clear boundaries around what is or is not relevant to particular

Faculty, argues that integration is only one possibility in a broader typology of means for interdisciplinary inquiry, but suggests that it is an important one nonetheless.

knowledge work. Polyhythmic knowledge work doesn't just include multiple perspectives; it depends on *maintaining* the interactions of multiple perspectives. More perspectives are thus *included*, but more importantly, polyhythmic work *shows faith* that people can turn difference and multiplicity and complex entanglements into something generative.

Polyrhythm, as mentioned above, is implicated with the question of whether, when, and how transdisciplinarity aids -- or is necessary to -- politically aware knowledge work. It is for this reason that I emphasize the "sense-making" aspects of polyrhythm. Of course, one of the chief markers of a disciplinary framework is how its users "make sense" of the information they are processing; disciplinary knowledge work might even be thought to be largely about using available constrictions (data, theory, etc.) to create a seemingly consistent narrative -- a story about the information that can be told, understood, and potentially verified by those who share a close enough disciplinary framework.¹⁸² Therefore a good measure of transdisciplinarity is to examine how it creates possibilities or even the *demand* for knowledge workers to craft polyhythmic narratives. In other words, highly transdisciplinary work challenges people to tell stories that are actually multiple stories at once, stories that *only* make sense when viewed as such.

There are many reasons why polyrhythm might be a positive trait-- in other words, a criterion (among others, certainly) to use for evaluating potential benefits of transdisciplinarity. Any mono-narrative is problematic in its politics; it can be

¹⁸² It is possible, however, that the creation of multiple, sometimes contradictory narratives, is not rare but rather characteristic of much disciplinary work, which would suggest that the singularity of the narrative is built through careful and multi-site processes, such as those demonstrated in Bruno Latour's study of the construction of scientific fact in *Laboratory Life*.

exclusionary, or fail to acknowledge its own partiality or historical contingency, or in some cases simply erase whole groups and categories of human beings and agencies. Science studies, feminist technoscience, and other scholarly and activist communities have demonstrated the ethical and epistemological stakes in understanding knowledge work as a process of forming *partial perspectives*, and in drawing attention to the contingencies and connections that create these partialities.¹⁸³ The all-seeing human eye is an impossible goal, and to many, a dangerous fantasy. Multiple partial perspectives, considered with the knowledge that even such a combination of perspectives does not and could not create a totalizing narrative, is not just a goal but also a *value* of these ethically and politically minded communities of scholarship.

In this context, “polyrhythm” is a term that is intended to center and respect difference, relationality, and resistance to politically reprehensible erasures. In other words, “polyrhythm,” as a term of analysis, is helpful in examining the political stakes of transdisciplinary border-crossings. None of this implies that polyrhythmic knowledge work is inherently feminist or anti-racist or anti-colonial simply by virtue of being polyrhythmic. It is, however, argued that polyrhythm does *help*. To clarify this point, the inspiration for this view of “polyrhythm,” is heavily reliant on Anzaldúa’s work on borderlands, Haraway’s work on cyborg feminism, and Sandoval’s work on oppositional consciousness. In this theoretical tradition, it is clear: not *all* kinds of liminality are necessarily the source of liberating worldviews, but some kind of engagement with these hybridities *is* vital to forming new and livable narratives that can threaten the status quo.

¹⁸³ I use “partial perspectives” in Donna Haraway’s sense of a non-innocent partial perspective that is aware of its connections to specific histories, as articulated in Haraway’s *Situated Knowledges: The Science Question in Feminism and the Privilege of the Partial Perspective*.

My use of “polyrhythm,” through its metaphor of music, conveys the passage of time and is also intended to emphasize the *continued* and iterative clashes and meldings of different frameworks for a productive and creative purpose. I emphasize that polyrhythmic music depends on contradictions, conflicts and multiplicity. These are not there to be resolved but are what *makes* the music.¹⁸⁴ However, the multiple contrasting rhythms of the musical term evoke musicality of storytelling and poetry, the visual progression of patterns, and even the embodied beat of dance movements. I also use “polyrhythm” to emphasize the intersections of the mathematics and sciences with the arts and humanities, since polyrhythm in music is *mathematically* challenging and interesting to play, compose, and understand. “Polyrhythm” thus provides cross-sensory and cross-disciplinary connotations.

With regard to the arguments of this chapter, it will be useful to consider the overall goals of the courses proposed here in light of this desire for polyrhythmic knowledge work. Throughout the chapter, the proposed courses have been designed to create a more polyrhythmic learning experience. The use of unlikely comparison emphasizes the need for multiple narratives and multiple engagements across disciplinary and other borders to make such a comparison readable. The course design in each case assumes that multiple perspectives will be needed to form a coherent picture of the central questions of these courses, and so the selection of course materials, the course organization and unit titles, the discussion questions, and the emphasis on students’

¹⁸⁴ Douglas Hofstadter, in *Metamagical Themas*, points out that Chopin’s waltz, Opus 42 in A flat minor, uses polyrhythms (183). Ethnomusicologist David Locke has documented the extensive use of polyrhythms in Ewe music, and it has been argued that polyrhythms largely characterize non-Saharan African music. There are numerous other examples of polyrhythmic music, including music by Elvin Jones, Nine Inch Nails, and Madras Lalitangi Vasanthakumari, but I also suggest that polyrhythms characterize the sound editing and voiceover experiments in video or performance works such as Marlon Riggs’ *Tongues Untied*. Indeed, according to Wikipedia’s page on “Polyrhythm,” polyrhythm “is the generating principle; the meter is in a permanent state of contradiction.”

sharing their reflections on their own knowledge work are all intended to provide multiple partial perspectives that students may investigate and quilt together in various combinations and arrangements.

The course on Western culture emphasizes multiple ways of telling stories about the West, for instance, and suggests that many such stories are necessary to even get a glimpse at the way that the “West” has been a complex and politically fraught category. The comparison of Judges and the *Oresteia* is an illustration, also, of the course’s approach to polyrhythm; students are encouraged to make sense of Western cultures not by subordinating all narratives into one overarching narrative but by seeking multiple narratives, even ones that offer contradictory tensions with other narratives. In this case, the relationship between the Biblical and Greek traditions is shown to be one that is examined only through specific and politically non-innocent acts of comparison performed centuries later. Making sense of the similarities or differences between these traditions is not a matter of searching for viable essentializing statements about each culture, but rather a process of learning to listen to the dissonances and harmonies of multiple comparisons at once.

The course on Change and Shapeshifting fosters a polyrhythmic view of change, because each unit title makes sense as an object of study only when multiple narratives are engaged. The research-based student-centered structure of the course also aids in making the course polyrhythmic. Again, this polyrhythm can encourage students to consider how they might find meaningful comparisons among topics of discussion that are not in neighboring disciplines or otherwise “obviously” comparable; instead, the

comparability stems from whether the topic *pushes* at the boundaries of how to conceive of particular kinds of changes.

The third course, on Transdisciplinarity and Unlikely Comparison, also encourages polyrhythmic understandings of knowledge work by using course units that are only readable when multiple narratives are considered in conjunction. Each unit does not seek to cover the ‘major’ or dominant uses of that keyword. Instead, each unit seeks to test the flexibility and multiplicity of that keyword; such an exploration of these keywords demands polyrhythmic knowledge work. Additionally, the course asks students to engage in questions about the nature of transdisciplinary inquiry, the potential for directed use of unlikely comparison, and the distinctions that might be made between different kinds of transdisciplinarity with different engagements in feminism or other forms of resistance. These questions, by their very broad emphasis on systems of knowledge and multiplicities of narratives and connections, provides opportunities for polyrhythmic knowledge work. It is important here to note that polyrhythm should not be considered *an instance* in which sense-making depends on engaging with multiple narratives at once. Instead, pursuing polyrhythmic knowledge work is about *practicing the skill* of engaging with multiple narratives, rather than reducing the number of narratives to one.

The unit on “Noise/Signal” also encourages more polyrhythmic approaches to knowledge work, in that each of the materials asks students to think more polyrhythmically, and in that the unit keywords themselves, “Noise/Signal,” encourage students to think more critically about the processes by which (multiple) narratives are understood either as signal or as noise. Furthermore, the differences among the unit

materials – the unlikeliness of the comparison -- presents a challenge for students, and asks them to practice considering multiple *bases of comparison* at once; students *must* engage in multiple interpretative practices and perspectives in order to make sense of the unit. Again, this is characteristic of the other units in the course as well.

The most important polyrhythmic practice in the third course, however, is for students to think about how the various units relate to one another. In exploring each keyword, students are asked to engage in specific transdisciplinary conversations that connect identity politics, arts, humanities, and sciences. Additionally, students can consider how their methods of comparison and their disciplinary reconfigurations *differ* from one unit to the next; *the way* students, in the unit on “Noise/Signal,” put discourses on mathematics and discourses on ethnicity into conversation, for example, might be utterly different from the way they do so in the unit on “Deviation.” The thread throughout the course, then, is not just an *accumulation* of tactics for transdisciplinary inquiry, but an exploration of *how and why* different transdisciplinary formations take shape, using students’ own comparative work as the primary examples.

Conclusions

The courses discussed in this chapter, and the analyses performed based on the sample Units, argue for an undergraduate curriculum that takes seriously the politics of comparison. By centering the intersections among the sciences and humanities, and by employing feminist technoscience’s engagements with the agencies of knowledge work, these courses create new transdisciplinary, polyrhythmic configurations through which students and instructors can understand the work that they do.

The first course offers a new approach to teaching Western cultures that centers the “uses of the past” in order to allow students to form an understanding of Western cultures while critically examining the forces that shape their understanding. The second course encourages students to consider how change is narrated, and how it might be narrated better. The third course asks students to draw on the disciplinary and other knowledge that they have and to reconfigure its boundaries to explore or challenge what comparisons are productive or meaningful. In each case, the course is designed to help students explore the political and ethical stakes of narrating similarity, continuity, connection, separation, and difference.

While each course is designed to be appropriate for a variety of different departmental sites, I would especially argue that each of these courses would work well as courses in Comparative Literature programs and departments, and as examples of what a feminist technoscience-centered Comparative Literature might look like. The courses include a number of examples of both literary and visual culture, including many “artistic” and theoretical works. Comparative literature’s more traditional focus on analyzing literary works would therefore be of great benefit to the comparisons enacted in these courses, even as close literary analyses are not the foremost goal. Most importantly, however, each course aims to empower students to push at assumptions and boundaries surrounding *what comparisons can and should be made*. The “subject matter” of Comparative Literature need not be “literature” in the most conservative definition of the term, and indeed for many years it has *not* been restricted to older definitions of “literature.” Rather, it is possible to consider the subject matter of

Comparative Literature as *comparison itself*: its diverse locations, its surprising results, and its political and ethical entanglements.

There are other findings of note in this chapter as well. One such finding is that attending to the intersections of the sciences and humanities encourages multicultural, feminist, and otherwise diverse perspectives. Attending to these intersections is not one more thing on the long list of items that humanities courses must attend to; this chapter does not view items such as theory and non-Western perspectives and political contexts and feminist points of view as items that are sometimes “added-on.”¹⁸⁵ These various changes should not be viewed as “add-ons” at all, in fact, since they make more sense when understood as a series of connected shifts that shape the motion or rhythm of knowledge work. Furthermore, attending to the intersections between the sciences and humanities is not something that instructors might do *in addition to* these other moves; rather, attending to these intersections is a tactical way to *center* these relatively recent additions while preserving the strengths of more traditional humanist curricular practices. Being more inclusive of science-humanities connections should help make “humanities curricula” more globally and multiculturally aware, for instance, *if the inclusions center the questions of agency and accountability that feminist technoscience and related communities put forth.*

Particularly, the polyrhythmic approach, examples of which are found in this chapter, applies feminist technoscience questions to comparative literary study in a way that *shifts the question*, from whether to teach the “old” story or the “new” story, to how best to teach students to explore what it means to live in a world shaped by the tensions,

¹⁸⁵ The struggle to transform rather than simply add another line to the curriculum has of course been a priority for some communities since their inception; Women’s Studies is a good example.

resonances, and possibilities of multiple stories. The term “polyrhythm” might also be useful to the theorization of transdisciplinarity in that it can apply to class discussions, course units, particular texts, collaborations, movements, and many other sites. Furthermore, “polyrhythm” is a good way of describing transdisciplinary work that brings together fields or disciplines or knowledge worlds that are considered greatly disparate. This is largely because the metaphor of polyrhythm specifically does *not* suggest that coherence or comprehensibility depends on whether the knowledge worlds are “close” or “far” from each other; in valuing polyrhythm as a characteristic of transdisciplinarity, there is no assumption that knowledge work drawing on both physics and mathematics will necessarily make more sense than knowledge work putting physics and philosophy into conversation, or mathematics and feminism, or either with ethnomusicology, to use just a few examples.

In short, the courses developed here are examples of, and arguments for, a polyrhythmic, agency-aware, feminist technoscience, transdisciplinary comparative curriculum. This curriculum challenges students, iteratively and not simply as an afterthought, to analyze the politics of their own knowledge work. In this way, the proposed curriculum prepares students to be resisting subjects that can deal ethically and analytically in a world of increasing complexity, contradiction, appropriation, and hybridization.

Chapter 5: Conclusions

Summary of Arguments and Contributions

This dissertation began with the question of what kind of knowledge work the humanities should engage in. Some of my arguments have taken a broad view of this question, attempting to point to overall patterns that feminist and other agency-minded knowledge workers might take advantage of, while other parts have attended to specific tactics and sites engaged in this goal. Diverse pressures have lowered the perceived value of more traditional humanistic inquiry, which in turn accelerates the processes by which humanities are being forced to transform themselves. At the same time, it arguably has never been more necessary for knowledge workers (and most people today are knowledge workers) to be able to move flexibly and savvily among different worldviews, frameworks for thinking, subject positions, multiculturalisms, and a variety of literal and metaphorical borders. Unlikely hybrids, encounters, and juxtapositions are proliferating, this making the already constant influx of “the new” exponentially vaster in quantity and kind. By focusing on the agencies of knowledge work, the humanities can engage with this wide variety of shifts and draw on the traditional strengths of the humanities in exploring ethics, epistemologies, and narratives.

Clearly, the humanities will need to become more transdisciplinary; they will need to continue to change and push at boundaries, and to hybridize various knowledge practices, a process that feminist, critical race, materialist, and postcolonial theorists among others have long been engaged in. My aim in this project is to open up some new and important lines of inquiry into how we might imagine the kinds of hybrid practices

the humanities –and comparative literature in particular – might enact. Therefore, before the fuller summary of the dissertation that follows below, it will be useful to briefly review the dissertation by considering the models of knowledge workers it has considered. For poetic license, the phrasing that follows will be overly optimistic perhaps, but the purpose is to clarify key ways of thinking about the humanities’ aims.

The humanities, we hope, will find the hybrid practices that help the humanities to thrive – in other words, that enable the humanities to help important conversations to thrive. As part of these hybridizing humanities, we might expect the humanities to become more like a cyborg, reconfiguring its parts, adding new knowledge practices and discarding others, continually reshaping the ways that technology and other knowledge work becomes embodied or lived. They will stretch and change angle enough (and open their edges enough) to move “orthogonally” among other disciplines, more interested in the interactions among knowledge worlds than in fixing the boundaries of these worlds. The humanities will become more “differential,” moving among power-mapping tactics in tactical ways, building bridges among locations, and making visible boundaries that have been rendered invisible. They will intra-act with the universe in ways that show their awareness of the relationships of agency of which they are a part, and they will be mindful of when and why they enact cuts that separate some parts of the world from others. The humanities will be like Varo’s knowledge workers, perhaps, sometimes happy and sometimes disturbed, but always deeply, multiply engaged and connected, and always aware that knowledge work is a source of unpredictable transformation, often melding the knowledge worker with her surroundings in uneasy but powerful ways. They will be like Ada, making connections that render it impossible to place their work

into easy categories or locations, allowing their work to travel and meet with surprising subjects and objects. They will be like the peaceful guerillas that Plant praises, or the viruses, always looking for ways to use marginality as a strength. They will be weavers, who bring together threads that wouldn't seem to make a coherent pattern but do. Or, they will be like grass, or like a rhizome, neither one nor many, their organization emerging rather than being determined at the root. They may be polyrhythmic, well-practiced at telling many stories at once, because one is never enough to say what needs to be said. They do not have blind loyalty to the past, but they are aware of its uses, and how to shape those uses of the past. They welcome proliferations of selves and subject positions, and they are well-equipped to tell ethically aware stories about change. And, they are constantly looking for ways to more creative and more political ways to imagine how signals might be filtered from the noise of a deeply interconnected world of nearly infinite possibilities for inquiry.

I make no claim that this dissertation has achieved these ideals – indeed it would be desirable to be less Eurocentric, more engaged with previous time periods, and more in-depth with recent technological shifts – but this dissertation has raised many possibilities for theorizing about ways for the humanities to become a more hybrid and agency aware set of knowledge practices and the stakes in doing so.

Specifically, this dissertation has argued that a comparative literature that centers the intersections among the humanities and sciences will make for a more socially engaged, more feminist comparative literature. In particular, feminist technoscience approaches will help comparative literature to continue to challenge and reformulate the boundaries that determine what makes a comparison meaningful.

In addition, the dissertation theorizes transdisciplinarity in several ways. It experiments with and develops methods to enact transdisciplinary inquiry, so that the dissertation itself serves as *an example* of transdisciplinarity. It also defines transdisciplinarity in a way that emphasizes change, process, and self-reflexivity.

The dissertation also demonstrates that “comparison” is a subject of great theoretical importance, to the study of transdisciplinarity and elsewhere. Therefore, comparative literature and, I would argue, the humanities more generally should do more to make “comparison” an object as well as a method of study. Additionally, comparative literature and the humanities should adopt transdisciplinarity an important *value* of comparative work.

It has also been shown here that engaging in unlikely comparisons – with the specific goals and questions that feminist technoscience offers – is therefore vital to pursuing more agency-aware knowledge work that attends to difference, complexity, and change.

The comparison of the works of Karen Barad and Remedios Varo brings together two works that have not been considered in conjunction elsewhere, despite their many resonances. The comparison shows how feminist technoscience approaches might expand the processes by which meaningful comparisons are made, by proposing that the way the agencies of knowledge work are narrated is a productive and ethically aware basis of comparison. Additionally, the discussion promotes the use of Barad as a theoretical framework useful for discussion many kinds of discourses. It also fills the need for discussions of science and agency in the work of Remedios Varo, and also provides concrete ways of considering the role of narrative in works of different genres and media.

The chapter furthermore utilizes Barad and Varo to explain the political stakes of narratives about science, especially in their articulations of connections, observations, exclusions, and relationships. I also suggest in this discussion that application of theory is itself a comparative act, which is a way to understand theory's role in Comparative Literature and also a way of de-hierarchicalizing the relationship between theory and the object that theory is applied to.

Cyberfeminist narratives of Ada Lovelace reveal that cyberfeminism has made important innovations in understanding the history of technology in a non-linear, anti-patriarchal way that takes seriously the commitment to acknowledge the agencies and subjectivities of the "object" of knowledge that the subject desires to know. These relationships of agency are used to show how cyberfeminists establish a matrilineage of technology, and the stakes in doing so. Networks and emergence-related metaphors prove vital to narrating the agencies of knowledge work. Like the previous chapter on Barad and Varo, this chapter takes seriously the idea that theoretical works may be viewed as creative works and vice versa; furthermore, viewing them this way enhances the understanding of both. In addition, the chapter reveals the central role comparison plays in resisting and transforming notions of linear time, and the related narratives of connection; as mentioned in the chapter, a comparative act can enact relationships with other points in space and time, which again demonstrates the theoretical importance, and vast possibilities, of "comparison."

The chapter on transdisciplinary pedagogy demonstrates specifically how a transdisciplinary, feminist-technoscience-centered Comparative Literature could be enacted in undergraduate coursework. Using and expanding upon the previous chapters'

articulation of the politics of comparison, this chapter argues for using “comparison” as a way to decenter, challenge, and reconfigure disciplinary and other boundaries in undergraduate education. Furthermore, the chapter shows that attending to the intersections between the sciences and humanities is not in the least something to be “added on” in a single chapter of a humanities course, but is instead something that should be integrated throughout, in order to provide the kinds of disciplinary border crossings that help students explore the agencies of knowledge work. This chapter also puts forth an original term, “polyrhythm,” in order to theorize the sense-making processes that transdisciplinary work might encourage. Each of the three courses described in the chapter demonstrates how feminist technoscience and comparative analysis might be used to help students learn intellectual material at the same time as they learn to inquire into the agencies and histories that shape their interactions with that material. There are also original comparisons or analyses made in the discussion of each course, and so the chapter contributes to the understanding of the course materials analyzed. Similarly, the chapter makes contributions to the study of specific topics such as change, proliferation, and noise and signal. Like previous chapters, this chapter explores the stakes in choosing a basis of comparison; this chapter expands on this topic by providing concrete ways for students to inquire into this process of choosing a basis of comparison, and how it is deeply and multiply entangled with disciplinary, political, and other locations.

For all of these reasons, it would benefit Comparative Literature to center the intersections of science and the humanities, and particularly feminist technoscience. It is by now a commonplace that the humanities are in something of a crisis; financially marginalized, and culturally relegated to being associated with the past more than the

future, the humanities are in the process of rearticulating themselves to address the new and complex challenges of the world. While it is vital to grapple with the inequalities that characterized past (and present) humanities scholarship, it is in some cases desirable to keep those aspects of the humanities which have proven useful to resisting oppressions. The humanities might not remain the “humanities” in exactly the same form for any length of time, but its attention to knowledge, and more recently, to difference and connections, show that these changes, threatening as they may be, also provide opportunities to transform the nature of knowledge work, and to make it more agency-aware and ethically engaged.

Future Possibilities

The dissertation opens up several possibilities for further research that could be pursued. The development of a feminist-technoscience-centered comparative literature is clearly a project of great enormity. While it may not be desirable to actively work against other perspectives on what comparative literature should be, simply making this approach a larger part of comparative literature (and how it understands its own interdisciplinarity) is itself a large project.

Certainly, there are many works of feminist technoscience that were not discussed here that might be used for this purpose; for example, this dissertation did not extensively address how feminist technoscience theorists have inquired into narratives about the human (and non-human) body; such a focus would have a wide applicability in the study of traditional “literary” works and also the kinds of transdisciplinary comparisons this dissertation argues for. Since feminist technoscience and comparative literature are both

fields that are continuing to change, more possibilities of interaction will continue to arise. This new center for comparative literature also raises the question of when and where mathematical, scientific, or computer languages might be considered to be akin to “natural” languages.

The main purpose, however, of this dissertation’s method and arguments, however, is to show the political and ethical value of engaging in new and unlikely – and agency-aware – comparisons. The main area for future work, then, may be in the exploration and experimentation with these vast possibilities of unlikely comparison.

In addition, it will be useful to consider the possibilities for further research suggested by each chapter. Based on the findings of Chapter 2, the comparison of the works of Karen Barad and Remedios Varo, it has been shown that the way agencies are narrated is a valuable way to compare and interpret a wide variety of materials. This basis of comparison might be applied to any materials that narrate knowledge work, a category which excludes very little. Furthermore, further analyses along these lines would bring more attention to how we tell stories about knowledge, and how these stories in turn affect what kinds of knowledge get made.

Furthermore, it would be useful to apply Barad’s theories to a number of creative works to see how they play with the processes by which a work of art is “cut” from its other entanglements. It would also be useful to examine more fully how Varo’s depiction of agencies reveals Varo’s connection to surrealist, mystical, and other communities, and in what other works Varo theorizes about the nature of knowledge work.

In addition, it would be interesting to further explore the application of theory as a kind of comparison. This is a broad topic, and could be approached in any number of

ways. While the connection between the general and specific is not always considered comparative, per se, by focusing on comparison – similarity and difference- one can more readily focus on *the processes* by which a work of theory is determined to have applicability to a particular item that it is applied to. It would also be interesting to see how these comparative/application processes vary in different disciplinary and other locations, perhaps by a comparison of different applications. As the chapter suggests, the processes by which theory is “applied” could be a central question for Comparative Literature, and one that encourages transdisciplinarity and attention to differences, agencies, and ethical stakes.

The chapter on cyberfeminist narratives about Ada Lovelace also offers possible paths for future research. It would be worthwhile to explore in what other circumstances one could portray relationships across time as networked; it would also be useful to explore further the advantages of using emergence-related metaphors to theorize knowledge work. It would also be useful to further examine how “ancestry” might be a useful way to discuss the history of the knowledge work of women and other traditionally marginalized groups; the term suggest profound connection and affinity but doesn’t require a direct line of influence. Additionally, this chapter proposes ways of evaluating interdisciplinary comparative work, and these proposals could be explored in a variety of comparative locations: a comparison might be valued according to how it undermines assumptions about linear time, or how it shifts the way that the past’s relationship to the present is understood. In addition, the chapter proposes a possible view of comparative work that could be tried, as a way to be more self-reflexive about knowledge work:

comparative literature might be viewed as a way of understanding how the comparatist and other agencies self-organize into readable patterns of connection.

It would also be valuable to do ethnographic/historical work on cyberfeminist cultural productions. As mentioned in the chapter, cyberfeminism should be understood as a major contributor to the understanding of the connections among, or rather, the co-constitution of, culture, gender, and technology.

The pedagogy chapter suggests a number of future research possibilities as well. Polyrhythm might be explored and developed much more, through application to many more transdisciplinary sites. Furthermore, it would be valuable to develop anthologies or online resources for courses such as those proposed. Additionally, as mentioned in the chapter, there are many other possible courses that could be developed that would use similar methods and theoretical foundations but engage with entirely different course materials.

There are also many lines of inquiry found in specific analyses that would be fascinating to pursue. Each unit that was not analyzed could, I would argue, make its own contribution both to the study of transdisciplinarity and potentially to the scholarship on the specific course materials (particular literary or scientific works, for example). There could also be much further development of a vocabulary for talking about change without relying on implied narratives of progress. In addition, a much fuller vocabulary for discussing transdisciplinarity would be useful.

Particular course materials might also be explored more. Churchill's *A Number*, the theater of Anna Deavere Smith, or the radical math of Marilyn Frankenstein are just a few examples of the rich and varied works that deserve more scholarly attention, whether

they have received much already or little at all. Frankenstein's work, in particular, is underappreciated. Moreover, it would be useful to consider the politics of the generic conventions of textbooks in order to more fully explore the politics of genre, and to use the focus on genre to make visible the normativities many textbooks enact.

Speaking more broadly, it would also be useful to more fully explore how the connections between the humanities and sciences might differ from the connections between the humanities and mathematics. Mathematics is quite different from any other discipline categorized as "science," particularly in its epistemology and definitions of rigor, its relatively low rates of overturned theories, and its great attention to the elegance of solutions. While the dissertation has not engaged with this particular topic, it would be useful to do so in light of the dissertation's argument that science-humanities intersections be the center of Comparative Literature. Studies of science and culture, particularly feminist technoscience and Science Studies, have used epistemology as a key way to understand the differences, similarities, and resonances of materials of various disciplinary locations; furthermore, they have used epistemology to explore the ways that various discourses construct genders, races, differences, identities, pasts, and so on. In light of the centrality of epistemological concerns, the extreme epistemological differences between mathematics and science are too often ignored, as mathematics is linked with science in terms such as "science and culture," and is not explored for the possibly productive tensions or resonances that the epistemological distinctiveness of mathematics might allow for. In a sense, mathematics might even be understood as a way of developing specific tactics for talking about similarity, difference, and relationality;

this too would make it useful to attend to mathematics and the humanities more specifically in feminist technoscience approaches.¹⁸⁶

The focus of this dissertation is obviously on comparative literature, but it would also be possible to consider how greater attention to comparison – as an object of study in and of itself – might enhance feminist technoscience and other fields. Another possibility for the study of comparison is to integrate this study with rhetorical approaches to comparison. Finally, it remains important to continue to develop and experiment with metaphors and terms to describe knowledge work, transdisciplinary or otherwise. In continuing to look for more agency-aware stories about knowledge, we can be mindful both of the erasures knowledge work has often performed, as well as the breadth of possibilities for narrating knowledge work differently – and thereby continue the project of producing different, more livable knowledge.

¹⁸⁶ There are feminist technoscience scholars, such as Bonnie Shulman, who do so, but they are the exception rather than the rule.

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