

**TRANSFORMATIONS IN DISCIPLINARY
KNOWLEDGE ASSUMPTIONS AND
THEIR IMPLICATIONS FOR REFORMING THE
UNDERGRADUATE CURRICULUM**

By

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Abstract

In the various debates over what directions reform of the undergraduate curriculum should take, too little attention has been paid to the implications of the critical theory arguments of the past three decades which have dissolved the methodological and subject-matter boundaries that putatively defined and separated the disciplines.

INTRODUCTION

This essay begins abruptly and ungracefully because it is an outline of the main argument of a longer work in progress, tentatively titled *Boyer, Bloom, Hirsch and the Debates About Reforming the Undergraduate Curriculum*, which attempts to answer the question why, after more than a decade of increasingly voluble calls for reform of the undergraduate curriculum from diverse constituencies both inside and outside of the academy, there has been so little consensus about what new curricular structures should be implemented. Many of the reforms instituted so far amount to little more than a cosmetic rearranging of the discipline bound introductory courses of the smorgasbord general education non-programs that have prevailed since the mid to late 1960s. Despite significant gains in interdisciplinary study during the past decade (Newell 1986; 1988) there exist few team-taught core programs that integrate the social sciences and humanities with the histories of science

and technology. Even after more than two decades of a developing ecological consciousness and the increasing recognition that most of the significant modern dilemmas must at some level be approached holistically, such inherently interdisciplinary courses as those falling under the "science, technology and society" rubric, those dealing with aspects of world hunger and global food security, international peace and conflict, the numerous problems arising from the confrontation of social needs and desires with environmental limitations, as well as those attempting to recover and integrate heretofore invisible histories of women, Afro-Americans, and other traditionally ignored groups, remain but token offerings on most campuses. It is ironic that these have engendered highly visible and often acrimonious debates far out of proportion to their actual implementation.

The explanation I offer for this sorry state of affairs is that, until recently, few of the would-be reformers, and fewer yet of the large number of faculty who continue to be unconvinced of the need for any reform, have looked to the contemporary disciplinary methodological debates for rationales either for or against reform, or, more important, for indices of the directions that curricular change ought take. Yet, this is where the boundaries of subject matter, what and how we think we know, and how we validate our knowledge claims, are disputed and negotiated. Our pedagogies and curricular structures should follow from and become consistent with our altering methodological and epistemological assumptions. These might better provide the main guidelines for curricular reform than the often-conflicting goals and motives of diverse reform movements, since they are central to the intellectual enterprise of the university and cannot be, as many of the calls for change have been, casually and usually spuriously dismissed as stemming from the ambitions of administrators, the cyclical revisions of a professional education establishment, or the social/political programs of any single group.

The following is a brief sketch of the major changes in knowledge assumptions that I think have taken place in the last thirty years. I first attempt to outline the primary methodological and epistemological premises that dominated the American academic world in the late 1950s. Then I look at the challenges to these prevailing assumptions during the ensuing decades from three broad, overlapping but distinguishable, critical movements intersecting from different beginnings: (1) the rise of "contextualism" and the rehistoricizing of the humanities and social science disciplines after a period of their being dominated by ahistorical, synchronic, critical theories; (2) the historicizing of the natural sciences, challenging beliefs about the relationship between "method" and

"science," circumscribing notions of "certainty," and restoring the process of discovery to social and institutional contexts; (3) revisions of the presumed relationships among language, mind, and reality offered by various linguistics-based movements like structuralism, deconstruction, hermeneutics, semiotics, generative grammar, and those attempting to model "mind." Finally, I offer what I take to be the implications of these disciplinary and cross-disciplinary disputes for reforming the undergraduate curriculum.

KNOWLEDGE ASSUMPTIONS DOMINATING THE 1950S

In the early 1960s when *The Two Cultures and the Scientific Revolution* caught the public imagination, among other things, C.P. Snow articulated a number of prevailing assumptions about the nature of science, its practices, and its benefits. The two primary theses of the book were generally acceptable within the academic world: *One*, that the "scientific culture" made modern Western industrial society possible but was unappreciated by the more vocal and publicly prominent "literary culture" that ostensibly "civilized" that society, and that these Two Cultures had stopped talking to one another with impending disastrous results for the state of knowledge in the present, and society in the future (1959:1-23); *Two*, that there would be no lasting peace so long as the majority of the peoples of the world lived in poverty; the proposed key to their development was a massive infusion of capital, technology, and scientific/technological education (1959: 43-52). This last proposal was based on an implicit historical assumption that this was the key to Western development and predominance, hence, ipso facto the model to be emulated. Snow had published an earlier version of the *Two Cultures* in the October 6, 1956 *New Statesman* (1959: 55), a year before the Russians launched Sputnik, but there is little doubt that it was this latter event that shook public faith in the educational system and underpinned the popular reception of his critique when the book was published in 1959.

Although a great-and-still-unresolved debate about education was engendered, most of the arguments were over what sorts of changes would heal the Two Culture split, provide the scientific/technological competencies necessary to maintain economic progress and military security, and help the underdeveloped. Snow's basic premises were seldom challenged because they were so widely shared. I think this is partly indicated by the reforms that were usually offered, advocating more required science and mathematics courses to lend rigor and precision to the thinking of arts types, and more humanities courses to civilize the science

barbarians. The study of culture remained separate from the study of nature, as if we were not biological creatures dependent upon the physical world (Pulteney 1986:17). Such reforms imply the acceptance of exclusive modes of thinking, ways of knowing, separate methodologies as differentiating at least the broad disciplinary groupings of the modern academy.

At this time, the putative methodology of the sciences, i.e., the path by which precision, probability, predictiveness, and even "truth" were to be arrived at and confirmed, the touted "scientific method," dominated the academic imagination. There were prevailing assumptions about what was to count as scientific knowledge, and how this related to other kinds of knowing. These assumptions organized the academic disciplines in terms of prestige and power with the natural sciences at the pinnacle and the social sciences next in descending order, depending on the degree to which a discipline could claim to emulate the methodology of the natural sciences and, like them, produce "hard" knowledge.

"Soft" knowledge was the province of the humanities, which generally occupied the lower rungs and had a similar but even more schizophrenic relationship with "science" than did the social sciences. On one hand, the humanities often defined themselves against the natural sciences, accusing them of creating a dehumanized, mechanistic natural world--the old "disenchantment of nature" charge (Berman 1984: 57)--and of producing knowledge that was too often only reductionist, quantitative, and instrumental. On the other hand, in practice the humanities accepted the dominance of "science," sharing the prevailing epistemological and methodological assumptions of the era as each discipline attempted to establish itself separate from others by arguing an "essential" subject matter, particular approaches, methods, and practices. Each discipline sought a rock of certainty like the one presumed to underpin the natural sciences, an unassailable foundation that would justify the discipline as a necessary specialty, defending its intellectual credibility and, hence, its claims to institutional space and support.

The prevailing conflation of "scientific method," "scientific knowledge," and "natural sciences," that made all three terms seem to be synonyms, was a mark of the time. This conflation was itself underpinned by commonly held, but seldom explicit assumptions about history: about when and where the modern world began and what part "science" played in those origins.

What in the 1950s gave, and continues to give, the natural sciences their predominance was their association with technology. We still talk as though science and technology are inseparable: as in "science, technology, and society" courses. The sciences were and still are seen as providing the knowledge base, the understanding of the inner-workings and fundamental laws of nature that technology was presumably built on. At this point in time, technology was commonly viewed without reservation as the progressive engine of industrial and commercial advancement. Except for the anti-nuclear weapons movement, which was on the rise in the late 50s, neither science as both a mode of knowing and an institutional enterprise, nor the quest for unlimited technological power, had many detractors who were publicly well-known. Earlier dissident voices were not widely recovered until after the early 1960s' discovery of what the 19th century term, "ecology," might actually imply for human behavior. This is when the microscopes, mathematics, and measuring devices of modern science, heretofore regarded as unqualifiedly progressive, presented us with "hard" evidence at the micro level of what ancient thinkers could only intuit: that everything is connected to everything else, and thus for every action there really is a reaction. Hence, there never can be, nor ever was, such a thing as a "free lunch." There are no "winners" without "losers," because these don't exist as separately definable entities measured against absolute norms and separate essences, but only in relation to one another. Any gain anywhere, any change anywhere, is somebody's or something's loss or transformation somewhere.

If in 1959 you asked, why do the "natural sciences" possess such explanatory power, such predictiveness and seeming certainty, what supports their claims to cumulative, progressive knowledge, the answer almost inevitably was and still popularly is: "Physical scientists have the scientific method. The social scientists, for the most part, do not. Perhaps as old as science itself, the scientific method is a basic set of rules and principles that roughly outline the way scientists are to conduct investigations." The quotation is from an article by Steve Benowitz in the Ohio State alumni magazine, *Quest* entitled, "Is Social Science Really a Science at All: How 'hard' are the 'soft' Sciences?," published in spring 1987 (p. 10). Like the Ptolemaic cosmos, and spontaneous generation, some hypotheses take a long time to fade away.

If in 1959 you asked, what does the scientific method consist of, you generally received a textbook description of an "empiricism," an "inductive reasoning" process, little different from the four-part procedure

advocated by Francis Bacon and others in the early 17th century: (1) the objective observation and collection of data to; (2) the derivation of assumptions, hypotheses, from these data by inductive reasoning, to; (3) validating, or at least refuting, the hypotheses with the appropriate tests, experiments, resulting in; (4) "certain," predictive, knowledge. Add Descartes' mathematicizing and his "reductionist" and "essentialist" methodology of dividing, reducing, a problem until its essence, the irreducible, the certain, is arrived at, and the bulk of the era's proclaimed assumptions about the scientific method are covered. For most, the terms "scientific" and "empirical" covered the same procedural grounds. Note that here again, in what I will label an ahistorical period, it is simply assumed that the proclaimed secret to the success of modern science has historically specific 17th century origins.

The knowledge produced by the scientific method was considered to be progressively cumulative: i.e., once established, validation does not have to be repeated (though it always can since experiments and results are supposed to be replicable). Hence, it becomes part of a permanent base to be extended and built upon. Such knowledge was considered to be universal, i.e., cross-culturally transmittable, available to anyone across time and place who understands whatever "language," mathematical or natural, it is communicated in. This is because "nature" was assumed to be everywhere the same and method ostensibly guaranteed that our discoveries, descriptions and predictions were highly accurate and independently verifiable.

Disciplines outside of the natural sciences gained prestige to the degree they too could claim to practice an empirical methodology, quantify/mathematize both problem and solution, or derive predictive and cumulative knowledge. Universality was supported by the tacit assumption that the way to true knowledge was objective, value free, that is, free from a priori cultural and individual prejudices. Hence, the academic world was pervaded by an ideology of positivism, a scientism, that was not perceived as an ideology or a mind-set or a paradigm, but simply as the superior path to knowing. It was a nice little inconsistency in an era when both classic 19th century claims for positivism as a method and contemporary "logical positivism" were often denigrated.

Knowledge was supposed to be communicated in the most precise and unambiguous language possible; hence, the superiority of subjects that lent themselves to mathematicizing. But there were also general assumptions about natural language and its relationships with mind and reality that supported the desiderata of precision, clarity, and

unambiguousness. Language was assumed to be transparent: i.e., we represent and transmit reality through language; it is a neutral medium, a vehicle. We attempt to select the appropriate words to communicate thoughts we already have, to express a pre-existent reality. The ideal was an unambiguous connection between word and thing, between signifier and signified, between term and referent: with referent and signified defined as the actual external thing or quality or idea pointed to. Writing was the representation of something already there; either in one's head or out there in the real world. Meaning preceded writing and speaking.

Various dichotomies were the norm: e.g., denotation was superior to and separable from connotation; ditto for substance and style, content and form, literal and figurative. Metaphor and metonymy were seldom regarded as modes of comprehension, ways of seeing, central to the structure of thought itself, and thus inherent in all writing. They were figures of speech which, along with the other tropes, were the province of literature and rhetoric-as-persuasion, pleasurable aesthetic fictions or untruths, lies. Hence, they were to be avoided by those who would write clear, unambiguous expository prose.

These assumptions about language prevailed across disciplinary lines, except of course in literature departments where diametrically opposite views defined the very uniqueness of the subject itself, providing the "essence" that justified literature as a separate institutional discipline (Brooks 1971a, b; Frye 1957: 73-75). However, it might be noted that literary criticism was supposed to be written in accordance with the dominant assumptions about how language worked outside of "poetry," "fictions." English and language faculty often taught about poetry in terms of one conception of how language worked, and freshman composition almost in terms of its opposite. This dichotomy simply seemed to reflect the ancient Western argument between philosophy and poetry played out over the years in various dualities: fact/interpretation, analysis/narrative, discrimination/association, description/persuasion, reason/feeling, truth/fiction, ad absurdum. For most, this argument had been increasingly and overwhelmingly won by philosophy from the 17th century onward. So long as distinct boundaries were maintained among mind, reality, and language, among our perceptions/ideas, a "nature" which was everywhere the same, and the representations of either by culturally particular sounds or marks, the underlying contradictions were unobtrusive.

AHISTORICISM DOMINATING THE 1950S

While all of the dominant assumptions of the era underwrote specialization and the separation of the disciplines, they also underpinned a predominant ahistoricism that characterized most of the disciplines. The major critical movements of the time emphasized the synchronic over the diachronic, the permanent pattern over historical change: the "self-contained" artifact, or society, or culture, with its presumably fixed internal relationships whose meanings were to be unlocked, "discovered," by some objective/authoritative critic, reader, observer, ethnographer. This is seen in the New Criticism that dominated literature, in the structural/functionalism ruling sociology, in the "presentness" of the field-work and the structural/functional theory of anthropology, in the pure Descriptivism that dominated American structural linguistics, and in the "behaviorism" of psychology.

Even history itself was close to being ahistorical with its narrow emphasis on elites and ideas (Stone 1981: 5-7). And ironically, it was even there in the Great Books, the historical "classics" approaches of political science, and philosophy, and literature; since these were often taught out of context as embodiments of "the" perennial questions, or of universal wisdom transcending time and place: Plato and Shakespeare and Machiavelli "our contemporaries." And even when they were put in a supposedly historical context, they were often evaluated in terms of their timeless logic, consistency, and coherence; that is, they were interpreted in the light of philosophers' universal criteria that often belie the historians' context in which the particular, the temporal, the contradictory, the irrational, and change, are often more illuminating and closer to the realities of any given epoch (Pocock 1971: 3-41; Skinner 1969).

Maybe the greatest irony of this ahistoricism was that it, along with a number of the assumptions I have noted here, was underpinned by an interpretation of Western history that was usually only implicit and that went something like the following: Since science provided the knowledge-base for technology, and since technology had been the main force behind the Industrial Revolution and then modern medicine, which together were assumed to have made possible the great population growth and material well-being of the 19th and 20th centuries, the triumph of Western society over the harsh forces of nature--"modernity" itself--was perceived as having its origins in the 17th century rise of science. The Industrial Revolution was also regarded as having given Western culture its present world-wide economic and political dominance. These views,

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ipso facto, conflated scientific knowledge and technology and the natural sciences, which, in turn, were defined by the methodological expositions--the "texts"--of Bacon, Galileo, Descartes, Newton, et al. This is basically a "philosophers'" view of Western history, a "great ideas" approach.

The Democratic Revolution, the other half of the Twin Revolutions that were deemed to have actualized or realized "modernity" at the end of the 18th century, had its presumed origins in the secular, rational, political philosophy of Hobbes, and Locke, and the Enlightenment philosophes.

For Whig versions of history, all of this was progressive. The scientific and rational secular thought of the 17th century made the break with Medieval religious authority, scholasticism, superstition, and other constricting forces that was necessary for the eventual founding of modern democratic, liberal economic, industrial society--the apex of an evolutionary process. Knowledge evolved upward from magic to religion to science. Societies progressed through stages from hunting and gathering to settled agriculture to commerce to industry. ("Post-industrial" as the next "evolutionary stage" is a concept seldom articulated in the 1950s.) This 18th century vision of Montesquieu, Turgot, the Scottish Enlightenment, et al., of the natural development of societies through stages, is one of the dominant foundational assumptions of sociological thought from the works of Adam Smith and Karl Marx down to, up to (?), the present (Meek 1977:14-32; Bock 1978; Bottomore 1978).

There was also another common literary/humanities and general conservative view of this same history that was much more ambivalent about the "progress" of modernity and which saw the 17th century rise of science as having produced a split in some putative Medieval and Renaissance synthesis or wholeness: e.g., T.S. Eliot's "dissociation of sensibility," the bifurcation of head and heart, reason and emotion, prose and poetry, society and nature, that he claimed happened in the 17th century (1924: 30-43). For this side, the Copernican cosmology displaced earth and humans from the center of the universe, the center of creation. And, while the later triumph over the privations and pestilences of nature was good and useful, the best of instrumental science, "modern man" lost his soul, spirituality, morality--fill in the blank with your favorite--by "disenchanted" nature, though mostly by trying to organize social and political life by unmediated reason, by empirical/scientific approaches.

Both of these interpretations take for granted that the modern world, for good, or for ill, or somewhere in between, has its roots in the science and philosophy of the 17th century.

The foregoing assumptions and this version of history cohere as a mind-set, an intellectual world-view or an ideology, an epistemological paradigm dominating academe in the 1950s. It continues at present to be the major contending force in the recent debates about curriculum reform, though I think it currently has little status at the level where critical theory is made and debated. At the time, it was almost never seen as one of a number of possible epistemological models, but as the evolutionary survivor of a number of unfruitful starts and less fit species of knowledge making/discovering. The very concept of paradigms and models limiting and selecting and even creating what we "see" and "know" did not become common currency until a number of challenges to the prevailing nexus of assumptions were more generally recognized. The use of the term, paradigm, itself did not become popular until after the publication of T.S. Kuhn's 1962, *The Structure of Scientific Revolutions*, although the concept was increasingly part of the intellectual ambience of the time. Quentin Skinner (1969: 7) notes, "this notion of the priority of paradigms has been very fruitfully explored in..." E.H. Gombrich's 1960, *Art and Illusion*. And the German, *weltanschauung*, was also commonly part of the Anglo-American intellectual baggage of the era.

The smorgasbord general education non-programs that developed in the 1960s, when core requirements tended to be dropped, are often blamed on external social factors impinging on the university, such as a rising permissiveness, or the fragmenting forces of the civil rights movement, gender strife, and war protest, or, à la Allan Bloom (1987: 28-43), the centerless vacillations of relativist intellectuals within the academy. While higher education is certainly inseparable from changes that take place in the larger society, I will contend that the dropping of core courses was also perfectly consistent with the prevailing assumptions that underpinned radical specialization, continually growing departmentalization, and the mechanistic wishful-thinking that introductory samples from different disciplines would be synthesized by the student into a more holistic view. Faculty did not have to make connections consciously, they only had to teach their specialties, no matter how narrow, and the larger picture would somehow magically emerge in the minds of their students. This coincided neatly with the dominant economic assumption that everyone pursuing their own self-

interest conduced to the good of the whole; only here we had a psychical "invisible hand" bringing things together.

From the 1960s onward, most of the assumptions that reigned in the 1950s have been challenged, altered, and sometimes overthrown in the intra- and inter-disciplinary disputes over methodology and epistemology. There are three broad and overlapping critical movements that I can do no more than crudely outline here that have affected all of the disciplines and that have significant implications for the restructuring of the undergraduate curriculum. These are: (1) a number of different language-based movements that have altered perceptions about the relationships among mind, language, and reality, which I lump into a single broad movement because my main interest here is in the implications of the assumptions they appear to continue to share, rather than the differences dividing them; (2) the rehistoricizing of most of the humanities and social science disciplines; (3) the historicizing of both the natural sciences and the scientific method.

TRANSFORMATIONS: THE LINGUISTICS- BASED CRITICAL MOVEMENTS

Among the language-based movements,¹ probably the most publicly visible has been the legacy of French structuralism (not to be confused with the "structural" of structural/functionalism, or pre-Chomskyan American structural linguistics, or its common use as a synonym for "interconnected") by way of figures like Levi-Strauss and Roland Barthes out of the earlier linguistics work of Saussure, Jakobson and the Prague School, and Russian Formalism. Structuralism was already being transformed into post-structuralism/deconstruction, via Foucault, Derrida and others (including Barthes himself) in the 1960s, before it became popular in the American academic world during the 1970s. As Hazard Adams notes, "... North American criticism hardly had a structuralist phase at all..." (1986:1). For convenience I will use the term "deconstruction," since this movement incorporates the primary assumptions of structuralism that are important for my purposes here, and since it seems to be a more adequate rubric for the state of contemporary critical theory in this tradition than structuralism. Whether post-structuralism is more than a synonym for deconstruction is a question beyond the scope of this essay, though in popular use they appear to be treated as such and I will do so here.

The Nietzschean, phenomenological, and Saussurian roots of deconstruction are shared with the modern versions of Medieval and Renaissance "sciences of interpretation," the contemporary semiotic and hermeneutic movements represented by figures like Eco, and Gadamer, Ricoeur, and Habermas. There is the seminal influence of the "hypothesis" of Edward Sapir and Benjamin Whorf. There is also Cartesian linguistics, the generative grammar movement begun by Noam Chomsky's work that displaced the Descriptivism that dominated American linguistics. Foucault acknowledges that Chomsky rediscovers "rationalism" (1986: 146). Generative grammar is one of the foundations of what Howard Gardner titles, *The Mind's New Science* (1985), the new cognitive science with its artificial intelligence models that is a fusion of computer languages, psychology, philosophy, neurology, and linguistics.

When these various movements are taken together, despite important disagreements and numerous conflicts within and among them, they have blurred most of the nice distinctions prevailing in the 1950s; like those between ideas and language, creative and expository, literal and figurative, deductive and inductive, fact and value, subjective and objective, description and persuasion, reality and representation, reader and text, social and individual, etc.

Words are "signs," and, like other non-verbal signs, carry no fixed or inherent meaning in themselves, nor do they have any "natural" relationship to the specific things, or ideas, or qualities they refer to, but derive their meaning from their place, their position within an underlying "system"; that is, in relationship to, in comparison and contrast with, the other signs in an underlying system or "code" or "grammar." It is in this sense that signs are said to be "arbitrary," i.e., their value, their meaning, changes according to their juxtaposition, according to those on either side of them at any given time. Thus their relationship to what they signify or mean is conventional rather than necessary or inherent.

There is nothing particularly new or problematic in the idea that our words have no inherent connection with their referents, except possibly for those propounding the natural superiority, or the innate correctness of a particular national tongue or class or regional dialect. It was a common assumption of numerous pre-Saussurean 19th century linguists that different peoples used different sounds and different marks to represent ideas and reality, "things already in the head" and "things already out there." Hence, signs themselves were inescapably conventional. However, it was and is still commonly assumed--one of the important

contemporary intellectual dividing lines--that while different cultures use different sounds and marks, these refer to or represent, the same basic reality, the same primary experiences. While signs might be arbitrary, conventional, reality/nature is assumed to be everywhere the same. Thus, the different cultural sounds and marks represent basically the same natural, inherent divisions of reality.

There is an additional implicit "mechanistic" and "essentialist" assumption underlying this, i.e., that reality consists of separate interacting phenomena, each with its own irreducible nature, its own "essence" that defines, circumscribes, sets it off. These often-invisible phenomena, "nature's secrets," may be discovered or known, and then represented or referred to by "agreed-upon," i.e., conventional, sounds and/or marks (words, signs). Language is thus assumed to be a cultural medium, transparent, a neutral tool, through which we communicate our ideas, discoveries, etc. Mind, language, and reality are neatly distinct entities. The accuracy, the "truth," lies in the accuracy of our perceptions, our ideas about the divisions of nature, and reality, not in language, although we often mis-speak, misrepresent, or are misunderstood because we are not careful enough choosing the "right words" to "represent" our ideas.

Where and whether our ideas exist outside of the signs that represent them, and to what degree our languages "select" the parts of reality we take cognizance of and then assume as the whole, are fundamental issues raised by the contemporary language movements. For many, they have transformed the separate categories of mind, language, and reality into a dynamic, recursive, and indistinct continuum: mind/language/reality.

Cultures once ranged from modern to primitive, often in the sense of superior to inferior according to the putative accuracy and variety of their notions of reality. This sense has not been expunged by more "neutral" contemporary references to simple and complex societies. Dominant cultures knew more, possessed the truth. It was assumed they must have, or they would not have become dominant. Such hierarchies were hardly ever ascribed to the power of one culture or group or class to compel another to accept its intellectual and spiritual along with its physical dominance. Once accepted, the physical compulsion could become invisible. Superiority was/is always true for the "winners" at any given time (point in history), because they were/are mostly the ones who got/get to "write," "create," the histories, "signify" the truths. Until, of course, the next age "revises" them.

Central to most of the contemporary language-based critical movements are premises that challenge the foundational assumptions of the 1950s. There are a number of implications that follow if reality is not viewed as composed of fixed, interacting essences, but is instead conceptualized as a dynamic seamless web, where separateness is only a temporary condition because what is a thing at one point in time/space, or on a particular level, becomes, blends, transforms into something else, a different thing, at another point or on a different level. Such a view of reality is not just that of the contemporary language movements out of Saussure, Nietzsche, Whorf, et al.; but, I would contend, has been underwritten by evolutionary biology, contemporary genetics/microbiology, as well as post-Einsteinian physics.

One implication of this view, the one that made Saussure and Sapir such seminal figures, is that not only are signs arbitrary, conventional, and cultural, but so are our taxonomies, categories, our divisions of reality. Different cultures do not just use different sounds and marks to represent divisions of the same fundamental reality. To one degree or another they divide a seamless dynamic reality in different places. It is often pointed out that if only the sounds and marks were arbitrary, then translation would amount to the enviable mechanical task of finding the words in one culture corresponding to those in another that refer to the same divisions, or things. If this were the case, translation really could be left to fast sorting machines like computers. That the opposite pertains, to a greater or lesser degree depending on the mutual "foreignness" of the cultures, argues for the cultural conventionalism of signifieds, meanings, the taxonomies of reality, as well as of signifiers.

And if this is so, then signifiers and signifieds, sound and sense, are inextricably paired. They have no separate existence. Sounds without sense are simply noise, and signification exists only by way of sounds or other markers. In this way the sign becomes a fusion of signifier and signified. Hence, signs are no longer regarded as signifiers referring to particular bits or qualities of external reality, but to our ideas, concepts, categories, and taxonomies of reality. No one denies either an external reality full of things, processes, and other life-forms; or, that what we call ideas might be stored and exist in the brain/mind in other forms or codes than natural language. But, for all practical purposes, both our ideas and our perceptions of reality are only knowable and transmittable in our sign systems, our languages. This is reflected by the present popular cliché/truism of conferences and writing centers: "How do I know what I think until I see what I say?"

What differentiates sounds is their relationship and place in a culturally peculiar system of sounds, and what makes them meaningful is their corresponding place in a culturally peculiar system of divisions of reality, of meanings. The problem of course is that meaning is self-referential, self-contained in the sense that there is no appeal outside of the system that makes a particular sign meaningful. Hence we can only translate, mediate, between systems to the degree they are commensurable. There are no universal "natural languages," despite the capability for what we call natural language apparently being generic and species-specific to hominids. Particular sign systems are inescapably cultural/historical and not natural/universal. Hence, relationships, systems, and dialogues (the continual interaction and transformation through time) must also be studied, as opposed to but not replacing the reductionist tradition of studying individual elements--"things in themselves."

In all of these movements there is a replacement of "essentialism" by locating meaning in dynamic relationships, in ongoing dialogues, among elements within a system, and between the underlying system and the individual whose utterances are made meaningful in accordance with that system. This necessity for interacting pairs, for ongoing dialogues at all levels, is reflected by the new "rationalisms" such as Saussure's basic concept of the interaction between *langue* and *parole*, Chomsky's conception of "competence" underlying "performance," and the relationship between the individual interpreter and an interpretive community in the hermeneutic tradition.

The "oneness," or "singularity" of essentialism is replaced by "twoness." There must be two or more interacting elements to have "meaning", before we can "know." This "binarism" underlies both the natural-language mind/reality approaches and the artificial-language computer modeling of mind. It also shifts "meaning" from its former locus in a text, where it was to be discovered and comprehended by an objective and authoritative reader/interpreter, to now being created in the dialogue between reader and text, neither of which has an existence apart from the other, except of course a physical one. That is, they are functions of and defined by one another. This same language-based shift in premises about the fundamental relationship between ethnographer and subject society has been recently anthologized in Clifford and Marcus, *Writing Culture* (1986).

The study of languages as systems of signs, the study of non-verbal sign systems, the study of cultures as networks of sign systems,

and the study of "texts," necessarily brings or should bring together phonetics, syntax, and meaning/semantics, or, sound, structure, and sense. These still tend to be divided variously among linguistics, grammar, literature, anthropology, philosophy, and psychology. All writing, not just "poetic," is now seen as metaphoric and metonymic, connotative as well as denotative, rhetorical as well as representational. And because all language is metaphoric and the phrase "literal and figurative" no longer indicates the difference between two separate, "essentialist," categories of language, but is itself a metaphor indicating a relational continuum between dead, dying, and new metaphors, everyone in the academy is inescapably involved in the problems of interpreting "texts": not just those in literature, languages, and philosophy. Most people in the university study the world through words. Even the few who study it directly transmit their researches in the "texts" of lectures and publications.

The foregoing does not have to be construed as indicating that since the divisions of reality are arbitrary/cultural they all must have equal truth value. There seems to be little serious doubt that there are repetitive elements of reality, e.g., the "building blocks," the "universals" of nature, that are amenable to validation by "prediction" in a manner that purely cultural elements cannot be. And some ways of knowing are superior to others at predicting, hence at enabling us to control the behavior of those elements. At the same time, it is obvious that a dynamic seamless reality is infinitely divisible. Given this, even taxonomies and divisions that are "true" are always reductionist, limited, and partial (as of course are all divisions). This leaves room for a multitude of other possible divisions and categories.² Hamlet's injunction, "There are more things in heaven and earth, Horatio, than are dreamt of in your philosophy," captures the idea of alternative possibilities without negating the truth value of those things we might validly claim to know.

The contemporary critical theory problems should be neither those of an extreme cultural relativism in which all groups and modes of knowing are deemed a priori to get things equally right, nor the simplistic notion that there is only one kind and one method of knowing equated with "truth." The serious contentions are about what belongs to the natural/universal and what to the cultural/particular, and where these are inseparable. They are about where, when, and why different methodologies/ways-of-knowing and canons of validation might be appropriate. The implications of the contemporary language-based critical movements are that much of human behavior that was traditionally claimed as natural/universal has been increasingly recognized as cultural. More than a century of ethnographic studies searching for the "universal,"

"nature," in human behavior would seem to confirm this (Geertz 1973: 33-54). One of the main contributions of all the language-based critical movements, the one that has been probably the most disturbing for many and the one that Barthes (1972 [1957]: 137-145) claimed long ago as the primary mission of "semiology," has been to strip away the premises and illusions that allowed historically specific cultural preferences, and cultural systems of thought, to appear natural, as the very order of things, as universal truths.

TRANSFORMATIONS: THE REHISTORICIZING OF THE DISCIPLINES

The language-based critical approaches link at various places with the second group of cross-disciplinary movements that I labeled the "rehistoricizing" of the disciplines. I use this term because the general ahistoricism of the 1950s was of relatively recent origin in many of the humanities and social science disciplines, e.g., in sociology, the historical legacy of Marx, Weber, Durkheim, et al., reigned until the rise of structural functionalism in the 1930s and 40s. On the other hand the history of science, the "historicizing" of the natural sciences, is for all practical purposes a post-WWII phenomenon (Aggasi 1963).

One of the significant effects of this rehistoricizing has been to return historical thought to a place of prominence in Western culture as a history of historiography itself has been gradually recovered. Both J.G.A. Pocock in *The Ancient Constitution and the Feudal Law* (1957) and Donald Kelley in *The Foundations of Modern Historical Scholarship* (1970) argue that a modern historical consciousness--one that recognizes that truths, laws, and customs are relative to time and place and in the process of changing--developed in France in the 16th century. This was not produced by historians, but by the discovery of legal scholars and lawyers engaged in interpreting customary laws that were believed to be unchanged from "time immemorial," that Roman law, Canon law, and Feudal law were historically specific and had evolved over time. And they did this building on the philological techniques of the great language scholars of the Renaissance recovery of the Classics, who, in attempting to understand the revived Ancients in their own terms, had discovered that the meanings of words were not inherent and fixed. Rather, they changed with time and place as the cultures, whose meanings they were, changed. The same words have different meanings in different contexts. Context is all. "Ripeness is all" as a statement acknowledging the centrality of time, context, might be the elemental Renaissance maxim. It elevates the

importance of knowing "when" to equal status with the Medieval emphasis on "how" and "what," on timeless primary assumptions and fixed principles.

In the 1950s it was usually assumed that a modern historical consciousness began with the German historicism and philology of the late 18th century, or with Vico's reaction to Descartes earlier in the century (Kelley 1970: 5-7). It now is taken to begin well before the 17th century, though it is still common to find otherwise fine contemporary works making the old assumption (e.g., Williams 1977: 23-24; Swingewood 1984; 10-12). It is not a later Romantic reaction to science, nor the product of some kind of anti-essentialist "modern relativism."

Political science was rehistoricized by the political histories and historiographic theories of scholars like Pocock (1957,1971) and Quentin Skinner (1969), who might be regarded as "contextualists" reacting against the political science "classics" approach that had so removed seminal "writers" from their historical contexts, from the problems and the questions of their time that their works were responding to, that they had become mythologized. And most of their contemporaries, some of equal importance, and the social milieus they had inhabited, had become either caricatured or made invisible. The key to the study of "past political ideas" is language with all its problems of interpretation, because most of what remains from the past are writings, texts: "For the [political] historian it is primarily, I think, the study of the language used in a particular society to discuss political problems, and of the light thrown, often inadvertently, by the use of that language upon the character of that society and the events taking place in it" (Pocock 1971: 104). [On the inseparability of tropological ("poetic") language, history, and historiography, see Hayden White, *Metahistory* (1973).]

The critical proclamations of contextualists throughout the disciplines have remapped the history of ideas and our approaches to the past.³ The title of J.G.A. Pocock's 1971 collection of essays, *Politics, Language, and Time*, captures what I think are the main concerns of this contextualism and its inherent interdisciplinarity. For "Politics," substitute the field or discipline of your choice. The interpretation of texts begins with the context that a work was created in since, as the hermeneutical tradition among others has long noted, the primary interpretive question should be what problems or circumstances or questions was the work responding to (Bleicher 1980:42-43 & 114).

The rehistoricizing of literary study is strongly influenced by contextualist theories. But it and other fields are also implicitly rehistoricized by deconstruction theory, since the main breaks with structuralism are primarily over Levi-Strauss's assumption that the continual act of structuring was fixed, had an essence, reflected the structure of mind in itself; and over his claims to transcend such essentialist oppositions as those between nature and culture, method and truth, while in actuality maintaining them in the terms of his discourse (Derrida 1981 [1966]). For Derrida and others these were contradictions, the places that Levi-Strauss had tried to have it both ways, where he was caught in the traditional trap of Western dualism of always assuming a permanence, an essence, an origin. Levi-Strauss had leapt to an unwarranted conclusion from the Saussurean underpinnings that both structuralists and post-structuralists share. Unwarranted conclusions and contradictions are not particularly surprising, and should be regarded as ultimately unavoidable. Derrida claims that Saussure himself had made a similar mistake when he "privileged" speech over writing (1976 [1967]: 27-53).

Contradictions and metaphysical assumptions are inevitable since they are inherent in the language/culture we have inherited. Even those most highly conscious of this and most able to acquire a distance or a disinterested perspective will still miss some of their/the culture's contradictions. Nobody gets it all right. And those who get a lot of it right only do so for a while and within a particular historical context, even if these span millennia. Whether or not this is true of the truths we hold in the present is unverifiable until they change, which may happen long after we are gone, or never. Such an assumption is only made probable or improbable to one degree or another by our experience and knowledge of the past, i.e., history. The conclusion favored by deconstructionists is that there is only a perpetual structuring/destructuring. This is a radical historicizing, since it points to a continual flow and change, motion without stasis, meanings and truths without permanent origins or permanence.

History and other disciplines were rehistoricized by contextual movements, the historiographic debates of the 1960s, and the profound influence of *Annales* historians like Marc Bloch, Lucien Febvre, Fernand Braudel, Le Roy Ladurie, et al. The *Annales* school initiated the "New history" that reacted against the prevailing narrow histories of elites and "great men" and disembodied ideas as the main sources of change. These great actors and agents represented but the ephemeral superstructures that

were underpinned and driven by the great and enduring and more glacially changing substructures of geographical environment, biological necessity, economic desire, migration patterns and population change, agricultural and other technological innovations, popular culture, and "mentalities": that is, the mind-sets, the dominant world-views of an epoch, or a people, or a sub-culture (Stone 1981: 12-27). These are the contexts that shaped the famous military, political, economic and intellectual actors, who have been handed down to us too often as the only players in the drama of historical change.

The importance for my purposes here is not the historiographic debates about how substructure and superstructure actually interrelate, or about what drives whom or vice versa, but the now widespread recognition of the interconnectedness and inseparability of the physical environment, material culture, and intellectual *milieu*. The New history was the first wave of eco-environmental histories, tying this movement to the rising ecological consciousness of the 1960s and to the rapidly developing histories of science and technology of the era. Given the social and material foci of this movement, it is no accident that the rehistoricizing of anthropology comes in no small part from this direction. And, since the *Annales'* scholars were influenced by the methods of anthropologists like Marcel Mauss almost from the beginning, they provide one of the ways that history became anthropologized (Clark 1985: 181). The fusion of the two disciplines is central to the "histories of *mentalités*" (Damton 1984: 3-7).

Charles Tilly argues that sociology is largely rehistoricized in the 1970s, when "The successes of historical demography provided a model for contemporary students of marriage and the family, as well as for other demographers." It also emerged when Western policies for alleviating world hunger and aiding the development of Third World countries began to be perceived as failures (1981: 38; also see Stone 1981: 1346). The aid, technology, education formula based on traditional social science concepts of the historical evolution of societies (which in turn was underpinned by debatable assumptions about our own historical development) simply did not seem to work. Some began to think that the failure was not due just to uncontrolled population growth, or conflicting and unstable political regimes, venal local elites, the lack of technological and educational infrastructures, or our own hypocrisies; but, that in the West "developing first" (a euphemism for coming to dominate the rest of the world?), there were created the very structural conditions in the control and use of resources, the ownership of technology, economic dependencies, and unequal power relationships, that made it now seem unlikely that others could ever develop in the same way. This meant that

sociologists and others advocating development solutions had to reexamine the history of European expansion from the 15th century voyages of exploration onward that connected the long-isolated peoples of the world into a "modern world system" under Western hegemony, the "Europeanizing" of the earth that took place well before the birth of the Industrial Revolution (e.g., see Braudel 1975 [1949], Wallerstein 1974, Mintz 1985, Crosby 1987).

Demographers and historians of population change informed us that our premises about the Industrial Revolution and modern medicine being responsible for the great population rise of the present world might be wrong, because medicine had little effect until very late in the 19th century, and population was on a continuous upward trajectory for almost a century before the Industrial Revolution began (see Riley 1986 for a brief survey of rationales for population growth 1670-1820). The great effects of that revolution on population growth and life expectancy do not come until well into the 19th century. These are not idle historical curiosities if one is offering models for development, and policies for controlling population growth, or making claims about the number of human beings the known resources of the planet might sustain. It is with this interest in the rise and development of the modern world system and historical demographic studies that sociology comes together with the *Annales* and Anglo-American New historians.

TRANSFORMATIONS: THE HISTORICIZING OF THE NATURAL SCIENCES

The 1960s saw the rapid rise and development of histories of science and technology. Science and scientific method, which had more or less been treated as hagiography by the dominant "inductivist" historians, now became the subjects of serious historical scrutiny. This is not to denigrate the handful of pioneers, but to note a trend (see Agassi 1963 for an historiography of the history of science).

Examining scientific practice rather than theory, and looking at the historical contexts of scientific change, the historians told us that scientific discoveries had little to do with the precepts of Baconian empiricism or textbook descriptions of scientific method. Deriving hypotheses, they argued, has much more to do with hunch, feel, intuition, and experience than with anything one could infer from raw data. Scientific discovery was and is more the product of technologies like microscopes and telescopes, and hearing and measuring instruments, and

experimental devices and apparatuses that revealed structures heretofore hidden to the unaided senses, than it is the result of some philosophical method (deSolla Price 1984: 54). They also told us that if we looked at zoology, anatomy, and botany instead of physics, the 16th century might have a better claim as the birthplace of modern science than the 17th (Schmitt 1981: 172-177).

Historians of popular poetry told us that the new Copernican cosmos disrupted psychic life less than we used to suppose, and that the new 17th century science was widely admired, celebrated in verse, and emulated as telescopes and, later, microscopes became available and astronomy and natural history became popular social pursuits (Jones 1966).

The historians have altered our assumptions about the inherent links between science and technology, pointing out that science had little direct influence on technology before the late 19th century, and that most of the great technological transformations from the Medieval world to late in the Industrial Revolution developed from trial and error, not from the application of a knowledge of principles and laws and theories. Even historians like Arnold Pacey, who see more of a connection between science and technology in areas like the "hydraulic engineering" of the Renaissance, take great pains to note that to "progress is to thread a maze, not to follow a straight highway As long as historians believed that science would only go forwards and that the direction of technical progress was always the same, they interpreted the researches and inventions of previous generations as a struggle to lay the foundations of our present technological achievement. Now it is more easily possible to see that the thinkers and inventors of the past were making quite different explorations from ours into technological possibility and that they were promoting quite different directions for technical progress, motivated by the social priorities of their own time" (1976: 3).

Technology has a more ancient history than science. This is implicit in one of the traditional primary definitions of humans as "toolmakers." Given this basic assumption, it is amazing how little time has been devoted to the effects of technological change in traditional humanities and social science courses. And since technology is the extension of our political, economic, and spiritual values to the actual transformations of our physical and social environments, as well as ourselves and other life forms, it should be regarded as the responsibility of many groups in society, with scientists being but one.

Common textbook descriptions of the four-part empirical/scientific method have been discredited by most historians and philosophers of science. Despite the seemingly irreconcilable differences between Popperians and Kuhnians--two of the main camps in the "realist"/"conventionalist" debates, the argument over the extent to which we discover truths that are inherent in reality and/or the degree to which we socially impose them--both sides have cut the ground from under the first part: objective observation. Here the historians and philosophers of science link up with the various language/mind proponents. Objective observation, the value-neutral collection of facts, data, appears to exist only as a precept, not an actual practice. Facts only become facts in light of prior assumptions or hypotheses, that allow us to select, discriminate, differentiate and render static those particular bits and pieces from the seamless dynamic web of reality that we label facts. This is not to claim we preselect the facts, but that we observe and collect them within prior paradigms, hypotheses and belief systems. They are what tell us which types or categories of differentiations will count as facts for particular purposes. Thus we never start with a clean slate. There are no new beginnings. We play the game within prior and given rules that tell us what things will count and what things won't. But the rules get changed over time by new discoveries, new information, powerful actors and institutions, accident, and fashion. Furthermore, it is almost never easy to neatly separate one from the other.

It is difficult to find traditional empiricists, because it is now hard to believe that hypotheses can be, or ever could have been, logically inferred or induced simply from collections of data, even organized ones (Wisdom 1987: 11-13). The only reason one collects data is to validate, or confirm, or exemplify some hypothesis or model or paradigm or belief that provides both the rationale for, makes meaningful, the activity of observing/collecting a particular category of phenomena in the first place, and the basis from which what is allowed to count as data has been deduced. Inductive and deductive are not two separate modes of logical thought, but labels for temporary shifts of emphasis in a continuous cognitive process. New hypotheses are derived by the hunches, guesses, "intuitions," and imaginative leaps, the creative playing of "what if," of experienced practitioners in a field coming up against problems, anomalies and contradictions that the hypotheses, or paradigms they are working within cannot incorporate or explain.

Since this famous first tenet of the old empiricism has been displaced, it is no surprise to find that the implicit and explicit

empiricism that dominated academic thought in the 1950s has been replaced by new "rationalisms," underlying and prior systems of rules, and grammars. Now, however, they are secular, naturalistic ones, as opposed to the God-centered rationalism of Descartes. Unlike his, they are not fixed, but transform over time in the dialogue between system and actor. I think this is apparent in the above, where one is always acting, choosing, collecting in light of some a priori hypothesis, paradigm, ideology, or belief system. It can be seen, as I noted earlier, in Saussure's langue, the underlying "system" as Durkheimian "social fact," that makes meaningful *parole*, the sounds that individuals utter within a given language system as individual speech acts. It can be seen in Chomsky's species-genetic language capability concept, where the priorness of "competency" makes possible the individual speaker's "performance." A priori rules, systems, grammars, and codes are what allow a handful of sounds or a few signs to generate virtually infinite numbers of meanings. It is implicit in the relationship between the individual interpreter and the interpretive community of the hermeneutic tradition. One might note here that in the 1950s Locke was an "empiricist"; by the late 1970s, the empiricist/rationalist distinction had broken down (Aarsleff 1982: 11, 19-35). Somewhere in between, the intellectual winds veered sharply.

The fourth part of the Baconian method, the "certain" knowledge that would result if the other procedures were accurately followed, has also been discarded by both sides of the realist/conventionalist arguments. This is obvious in the conventionalist position. But it should be noted that Popper's "falsification" thesis--i.e., that hypotheses cannot be validated, but only falsified, that we can never be sure that the effects we predict, observe, measure, actually result from the causes our theories and hypotheses postulate, but that we can know the obverse--effectively changes "certain" to, at best, "highly probable" (1959: 78-92).

But I consider most of the arguments over certainty red herrings in the way they have been cast in absolute/relative terms, so that those claiming "all knowledge is relative" are unfairly charged with a lack of standards, and even with that 19th century canard, nihilism. Of course, a number of those who make this claim should not be surprised, since they often appear to leap from, "if all knowledge is relative," to the untenable non-sequitur, "then it is equally relative." They fail to distinguish between highly probable and improbable, supported generalization and unsupported, contexts that are replicable and those that are not. Maybe most important, they fail to distinguish between ways of knowing that subject fundamental assumptions to challenge and those whose basic premises are unquestionable. Because no episteme possesses absolute, hence universal truths, does not mean that some episteme might not

produce more probable and hence more widely encompassing and accepted ones that are more demonstrably instrumental and predictive.

However, certainty has been much overplayed in the disputes over scientific method. Barbara Shapiro has pointed out that despite Bacon's claim that his method would produce certain knowledge, at least in 17th century England, in most fields of knowledge outside of religion and morals, e.g., law, natural philosophy, experimental science, literature and language theory, it was generally accepted that a high degree of probability was as close as truth could be come to. The Royal Society adopted Bacon's research program, but quietly dropped the claim to arrive at certain knowledge (Shapiro 1983: 9-13). Andrew Skinner, examining *The History of Astronomy* (circa 1756) by Adam Smith, has pointed out that Smith, while regarding highly the methodological excellence of Newtonian science, viewed Newton as having established a more satisfying philosophical system than the crisis-ridden cosmologies that preceded his, though one still subject to change. Smith, whose *Wealth of Nations* is still credited by many followers with having established economic "laws" comparable to those produced by the physical sciences," like [T.S.] Kuhn, works in terms of systems (paradigms), within which development takes place (Kuhn's route to normal science) until finally overtaken first by the crisis state and then by revolution (i.e., the substitution of one paradigm for another" (1979: 35). Derek deSolla Price contends it is during the 19th century, when chemical and electrical experiments in numerous areas are beginning to translate into the applied sciences of "fertilizers," "dyestuffs," "anesthetics" and "antiseptics" that "... pioneers like William Whewell were writing histories of science that canonized these experimental procedures into the scientific method" (1984: 55).

With the first and fourth parts of the old empiricism, qua scientific method in ruins, what is left is that assumptions, hypotheses, explanatory models, however arrived at, have to be tested and questioned, challenged by experiment, argument, example, experience--whatever might be appropriate. This in itself is no small thing, because what is left still separates most knowledge traditions from modern Western "science." It separates modern Western thought from what C.S. Lewis labeled, "Old Western" thought,⁴ which primarily deduced phenomena and experience from or reconciled them to, unchallengeable first premises, basic assumptions, or revealed truths, whether in the realm of theology, political theory, Aristotelian science, or the inherited collective wisdom of the past. While the testing of assumptions separates what is left of the old empiricism from other modes of thought, it characterizes or at least is

claimed by all of the academic disciplines and not just the natural sciences.

One could argue that the major break with Old Western thought comes not with 17th century science but is articulated by the 15th and 16th century Florentine Civic Humanists represented by Machiavelli and Guicciardini (Pocock 1975; Skinner 1978). Machiavelli puts forth the new approach most boldly in Part XV of *The Prince*, when he says he will "represent things as they are in real truth, rather than as they are imagined" (1961 [1514]: 90). He proposes to see the world as it is, not as we have been told it is, or believe it to be, or wish it to be. It is a primary methodological dictum that assumptions have to stand the test of "experience," the human/historical root of "experiment" that ostensibly confirms the replicable repetitions of nature. Not only did Francis Bacon almost a century later consider his own New Method as applicable to social knowledge as well as to that of the natural world, he also acknowledged this Florentine group as the progenitors of the new way of knowing: "We are much beholden to Machiavel and others that write what men do, and not what they ought to do" (1952 [1605]: Bk.2: XXI, 9).

Even the mathematicizing of Western society seems to have earlier roots than the previously accepted 17th century ones, since Alexander Murray published the first major study of the relationship of mathematics to Medieval society in *Reason and Society in the Middle Ages* (1978: 166-213).

Possibly the most important break with unchallengeable assumptions and unquestionable authority comes with the Reformation. From the 16th century onward, no single voice speaks for "Christianity," which increasingly becomes an abstract rubric for numerous competing sects and dogmas. Contemporary religious critics of science conveniently forget that it was not just the rise of the new science and the new emphasis on secular reason that distanced religious authority, but the religious civil wars that tore both European society and a centralized religious authority to pieces. Among other things, the destructiveness of Reformation and Counter-Reformation prompted a search for more neutral, less contentious and irreconcilably dogmatic forms of public discourse (see Aarsleff 1982: 239-277 on John Wilkins).

Scholars like Elizabeth Eisenstein (1979) make powerful arguments that the modern world is born with printing, the "information revolution" of the late 15th century that utterly alters Western society. The widespread dissemination and increasing quantity of information

spread scientific and technological knowledge, how-to-do-it information that was heretofore owned by the Guilds, as well as religious and political teachings and propaganda. Among other things she points out that science depends as much on the flow of information as it does on instruments and method. And it has become almost a cliché of historians that without the printing press, the Reformation itself would probably have remained but another "monkish quarrel," since Luther's views were no more radical than those of earlier reformers.

When the foregoing arguments are combined with contemporary readings of history that locate the origins of the modern nation-state in the 16th century (Shennan 1974; Anderson 1974), that treat the military revolution of the 16th century as one that "... not only transformed the conduct of war at home but also decisively accelerated the progress of Europe's expansion overseas" (Parker 1988: 3), and that recognize that it is the 15th and 16th century voyages of exploration and conquest that link the peoples of the earth together, creating the modern world system (Braudel 1975; Wallerstein 1974; Crosby 1987), it becomes difficult indeed to claim that the modern world is born with the scientific thought of the 17th century. I do believe that modern "first-philosophy" originates here. I also believe it has passed far too long as the historical explanation of the emergence of the modern world. It is a philosopher's history, a Great Books hagiography. It is part of the price we paid for our ahistoricism.

SOME IMPLICATIONS OF THESE TRANSFORMATIONS

If this broadly drawn sketch of some of the important changes that have taken place in our basic knowledge assumptions over the past three decades is relatively accurate, and if my claim that we have significantly rewritten the implicit history that underpinned the old assumptions is acceptable, then I think some things logically follow.

Removing the scientific method from the private possession of the natural sciences does much to remove an invidious hierarchy of academic disciplines on the basis of one group owning a superior method, a predominant approach to knowledge. This is particularly so when that method seems never to have been practiced as it was preached. This does not lessen one whit the very real power of the natural sciences for precision and prediction, or their ability to falsify hypotheses with replicable experiments, or their power to see into the substructures, manipulate the materials, and infer the necessary patterns and principles, of the physical universe.

But, rather than see the source of this power lying in some putative method, it can be ascribed to a number of sources: the instruments, and measuring devices, and experimental apparatuses; the language of mathematics that describes infinitesimal divisions, proportions, and relationships in nature that are indescribable and maybe unimaginable in natural languages. There is the subject-matter itself, nature, with its apparently repetitive structures, its "universality," as opposed to historical societies with their individuality and relative non-repetitiveness. Kidneys behave much like one another, cultures often do not; fruit flies breed quickly, societies cycle slowly--if at all. Nature does not appear to be willful; that is, we believe it behaves the same whether we claim it is good or evil, or whether the qualities we attribute to it and the claims we make about its behaviors are right or wrong. Humans often behave in accordance with, or consciously contrary to, the ways they are described. For most people it does not matter if we make grave mistakes with nature in our pursuit of knowledge, if we take apart or destroy anything but other humans in the service of humanity. Because of all of these things, the natural sciences produce knowledge that is more cumulative than that produced by other disciplines. And, to the extent that nature is universal as opposed to the particularity of culture, the knowledge produced can attain that degree of universality.

What is left of the old four-part empirical method, the two middle parts, the contemporary "hypothetico/deductive" method (Wisdom 1987: 13) is, or should be, the over-arching epistemological/methodological assumption of all the academic disciplines. No knowledge that attempts to pass as publicly transmittable in a "pluralistic" society, as opposed to private knowledge, should escape the continuous testing and questioning of its basic assumptions and favorite hypotheses (see Gellner 1979, and just about everything he writes). Whether we fail to put this in practice, and to what degree, provides grounds for legitimate academic debate. This includes the various interpretive schools. As Clifford Geertz nicely puts it: "The besetting sin of interpretive approaches to anything--literature, dreams, systems, culture--is that they tend to resist conceptual articulation and thus to escape systematic modes of assessment ... they are often presented as self-validating" (1973: 24). They should not be allowed to do so.

The above should move the "demarcation" arguments about what counts as scientific, qua public, knowledge away from the internecine strife among disciplines and schools within academe to their original locus, where they are different in kind from that claimed by

unquestionable revelation, or intuition, or custom: those modes of thought whose premises are unchallengeable.

Given that subject matter or content can no longer be regarded as drawing an adequate boundary around disciplines as they institutionally exist at present, and that all the major methodological shifts that I have been concerned with here cross disciplinary lines, often dividing groups within disciplines, it seems highly unlikely that a generally acceptable definition of "interdisciplinary" can be arrived at. The very term *inter*, "among or between", implies that we have adequate definitions of the different disciplines. But we do not, beyond, of course, their individual histories of development, institutionalization, and changing methodological suppositions. If we can no longer clearly define either the disciplinary borders of subject matter/content or those of methodology (maybe we never could, it was not really tested in the days when we assumed so), then I don't see how anyone expects to arrive at an adequate definition of interdisciplinary.

Since different institutions often differently divide the disciplines, and since some disciplines are inherently more interdisciplinary than others in relation to the present general divisions (e.g., American Studies), the term will mean something different across and within institutions. Hence, I propose that we give up the quest for an essentialist and encompassing definition of "interdisciplinary," and accept the term in its vague common usage as the bringing together and interweaving of whatever is defined as the particular content and/or methods and research strategies of currently separate disciplines or fields in any given institution. This applies whether it be done by the collaboration of two or more faculty, or by a single individual, either in the development and teaching of courses, or in research.

Such a definition might shift intellectual energies away from arguments about what and what-not constitutes interdisciplinary study, towards "integrating" the knowledge, and epistemologies, and the methodologies produced within and across the disciplines; towards integrating what we think we know and believe, why we think such, and the processes by which we arrived at these. We don't need another discipline called "interdisciplinary studies," complete with its own putative methodology. That is the implicit thrust of the search for both an encompassing definition and an intrinsic methodology. But we do need institutional homes that may as well be called interdisciplinary studies, where we can practice integrating and building upon the disciplinary knowledge we have.

To teach how and why as well as what about any and all fields of knowledge necessitates thinking about processes, thinking historically. If we intend to teach students not just what we think we know about the natural world, but how and why we claim this knowledge, then the natural sciences are going to have to be historicized in the undergraduate curriculum to a much greater degree than they now are in most institutions. The histories of science and of technology also must be integrated with our political, economic, intellectual, and spiritual histories: because of the changes I have been outlining in this paper; because the natural sciences have rewritten and are constantly rewriting our cosmologies and creation narratives of how the universe, the earth, and its various life-forms, including us, came to be; and because our technologies are extensions of our political, economic, social, and spiritual values.

So far as I can see, the most logical starting place to do this on any significant scale would be in team-taught, interdisciplinary general education core programs: because general education is the responsibility of the whole institution and not particular disciplines; because this kind of integration belongs to no particular field of specialization; and because such an integrated history would provide a common foundation for all of the disciplines--a foundation, not the only foundation. I am not advocating that an integrated core should replace such general requirements as the study of languages, including mathematics, or courses in the contemporary natural sciences. But I do believe such a core could replace the separate discipline-based introductory humanities and social science offerings that usually fulfill general education requirements, in addition to providing a place for integrating the histories of science and technology with those more commonly written by the social sciences and humanities. Such an historically oriented core also might help avoid precious arguments about what separate subjects/disciplines, constituting the essential "liberal arts," should become the required foundational courses of a good "liberal education."

The historical breadth and depth of such a core will, of course, depend on the portion of the total curriculum and intellectual energies that an institution is willing to devote to this kind of education. A discussion of what even a minimal core might look like is matter in itself for a separate and much lengthier essay than the present one. I will confine myself here to one brief note on the present argument about whether one should emphasize Western or world history. This debate I find strange and irrelevant, since it ignores the historical reality that--at

least from the 15th century voyages of exploration, conquest and colonization onward--the history of Western culture is increasingly inseparable from world history. For good or for ill, it was European expansionism that linked together the separate peoples of the earth into a modern world system. A "Western civilization" course that ignores the influences and effects of that reality distorts Western history.

Although I contend that an historically oriented interdisciplinary core would provide the most intellectually defensible foundation for a good undergraduate education, it is, I emphasize, only a base.

Since most of the great contemporary issues demand interdisciplinary approaches if we are to understand their origins and implications, and since the epistemological/methodological changes cross disciplinary lines, we have to get on with the job of attempting to integrate knowledge at all levels in the undergraduate curriculum to be consistent with our altering knowledge assumptions. Not to attempt to translate into the undergraduate curriculum what a significant part of our disciplines are telling us, simply because we have little interdisciplinary expertise at present, is a Catch-22. We have to teach each other on the job, learn as we go. This means team-teaching.

The core and many of the upper-level interdisciplinary courses should be team-taught because we are just beginning, recovering (?), this kind of integration of knowledge. Hence, there are few "credentialled" experts, few professionally trained in interdisciplinary areas. Maybe there will not be for a long time, since, for the most part, contemporary universities know only how to educate specialists, which they often do splendidly. It will take a good while before we begin to balance specialization with integration. I am not at all interested in replacing specialization with general studies. Synthesis can be only as good as the knowledge being synthesized, generalizations stand or fall on the specifics they are constructed upon. The lesson of the methodological debates should be that dialogue and inseparability supplant such either/or dichotomies as analysis versus synthesis. These are temporal emphases, tendencies rather than separate entities: shifting parts of a whole that complement and define one another.

It means team-teaching because the debates imply that we cannot just require specific sequences of individually-taught disciplinary courses, or ones connected by a common theme, period, or problem. We cannot expect students to perceive interconnections we imply are there, but that cannot even be specified because the individual instructors have not made

such connections themselves. In order to make those connections, we have to work together; read each others' assignments, listen to one another's lectures, plan the courses and choose the materials together—the definition of team-teaching. In the absence of disciplinary sanctions, and other forms of disciplinary peer review, team-teaching provides the only adequate peer evaluation for interdisciplinary courses.

It could probably go without saying at this point in my argument, that if the disciplines at present possess no individual defining methodologies, and if the scientific method is not as we assumed it to be, and if separate categories like inductive and deductive have become two sides of a single coin, then it seems self-defeating to build a curriculum around "modes of thought" approaches. Here, required discipline-bound introductory courses are supposed to each represent some broad mode of thought like the aesthetic, the scientific, the historical, the social scientific, etc. Such approaches are doubly reactionary, because defined in this way they are simply the disciplines, as we assumed them to be two-decades ago, writ large. They emphasize separation rather than integration. And there is little evidence that such idealized modes represent any real practices in the way they are usually propounded. Such approaches also indicate the extreme inconsistency sometimes found between contemporary critical theory in the disciplines and the kinds of general education reforms that are often instituted.

Many of the same criticisms apply to those "writing across the disciplines" programs that emphasize the forms of writing particular to the sciences, or to the social sciences, or the humanities, or to representative disciplines. To emphasize differences in writing according to disciplines or schools, beyond the peculiar and superficial formal requirements of various types of disciplinary journals, institutionalizes those 1950s divisions and dichotomies that most contemporary thinking about language has discredited.

One of the most important of the implications of the various language-based critical movements is that the processes of writing and critical thinking really are "processes" and inseparable from content; hence, their teaching is the province and responsibility of all faculty across the curriculum. Yet, this will not be accepted until more faculty come to realize that we constantly engage in the interpretation and creation of "texts," language constructs, much more than most of us engage in any direct study of phenomena in most disciplines. We create texts that have to be interpreted in our lectures, and research papers. And in the act of creating these, we do not neatly transfer a priori meanings-in-

the-head into meaningful sounds or marks on paper, but the meaning emerges in the act of writing. "How do I know what I mean, until I see what I say?" has become a truism quoted at every writing conference and every interdisciplinary conference. Yet, we have hardly begun to translate its implications into reorganizing the undergraduate curriculum. It may be that English, language, and other departments should become textual studies centers, rather than maintaining the present dubious divisions among literature, composition, and linguistics.

The other central implication of both writing and critical thinking being processes, hence inseparable from content, is that it argues against the simplistic skills/content dichotomy that has too often dominated the reform arguments. The "skills movement" is the college-level version of the Johnny and Jane can't read, write, compute, or think straight. And, for some critics, they don't know any history either; and according to others, they don't have any values. More than a few find failings in all of these areas. I include in this movement only those lack-of-history and failure-to-teach-ethics critics who imply that history can be taught as lists of content, and values as basic sets of universal norms. They seem to share the essentialist, formalist and reductionist epistemological assumptions of many of the other skills proponents.

Though I claim that a common intellectual world-view tends to underpin the critiques of those I place in the skills movement, this is an amorphous group. They differ in the skills they focus on, the reasons they give for present failings, and the rewards they propose for developing "competencies" (a favorite term, along with "accountability," of the more mechanistic-minded proponents). Their ends are often as diverse as better citizenship, greater individual autonomy and empowerment, moral agency, self-fulfillment, more remunerative employment, arming the next generation for the rigors of international and local economic and political competition, etc.

The curricular changes advocated by the skills proponents tend to fix on required individually-taught and discipline-bound core courses in composition (often now some kind of writing-across-the-curriculum program), critical thinking, mathematics, foreign languages, and the natural sciences. There is often support here for traditional Western Civilization courses, Great Books approaches, moral and ethical issues courses, and an upper-level interdisciplinary "experience" or two for breadth, synthesis.

Those who don't see any great need for altering the status quo, that significant number of the unconvinced-of-the-need-for-any-reform, seem often to cast their votes with the "skills" people. The salient reason for this appears to be that, since reform of one kind or another is inevitable--given the pressures from administrators, politicians, blue ribbon committees, and colleagues--the changes offered by the skills proponents do the least to alter the existing academic structures. So long as the reforms revolve around the development of skills, the difficult and divisive decisions about appropriate content and which subjects should be taught can be avoided. The changes proposed by the skills people may favor the growth of one area over another (e.g., English composition) but interfere little with disciplinary and departmental autonomy.

Another reason the unconvinced support the reforms advocated by the skills contingent is obvious: who can be against concentrating on the development of skills? It is like arguing against motherhood, apple pie and national security. Unfortunately, largely because of the "practical" rewards touted as the outcomes for accepting the reforms of the skills movement, the debate sometimes makes it appear as if there were two groups of faculty out there: one of whom holds foremost the practical vision of endowing students with the necessary skills to survive and thrive in a hard, competitive world; the other of whom advocates knowing some grand liberal arts tradition (read "high culture") that doesn't even include the scientific or the technological and has no immediate end, but does add breadth to the depth of specialization, while promoting thinking about long-term goals and larger issues.

I lean toward holding the skills people responsible for this contemporary caricature of the old debate between the Ancients and the Moderns. Here, the skills contingent attempts to appropriate the "practical," "modern," and "scientific" mantles. These are powerful symbols in a society beset by pressing problems and always desirous of immediate solutions. There are enough curmudgeonly defenders of a "traditional" liberal arts approach (read that which existed prior to the 1960s' "nihilism") that, with a bit of misinterpretation, willful or other, a skills/content dichotomy appears plausible. After all, a version of it has existed in English departments for a long time in some of the arguments surrounding the competition for resources between literature and composition. Hence, when those of us from the integrated studies movement argue against the reforms proposed by the skills group, it can easily seem to some that we don't hold the development of skills among our primary objectives. This ipso facto puts us in the traditionalist

content camp in the minds of those who still tend toward an either/or view of things.

Such a distorted skills/content dichotomy avoids what I think is, or should be seen as, the real debate, which is between: (1) those who think that skills can be taught "formalisticly," that is as precepts, sets of rules, procedural steps, methodological strategies, in relation to any appropriate content. For this side the content is secondary, sometimes relevant only as a vehicle for developing the skill, and that once mastered, the skill can be readily transferred to handling other contents. And (2), those for whom levels of a skill are relatively unknowable outside of the content, the "context," they are connected with or bound to. This other side finds it difficult to discuss and evaluate such abstract notions as good writing and critical thinking separate from what is being written about or talked about. (For a first-rate introduction to this problem that has sometimes gotten lost in the controversies over the possibly unwarranted conclusions represented by *Cultural Literacy*, see Hirsch 1984).

For this second group, writing is always writing about something. Learning to write well is an ongoing process necessitating continual writing (and reading); hence, the institution of a few required writing courses or even of some types of writing-across-the-disciplines programs are unsatisfactory solutions. This is not because they are not better than no reform at all, but because their inauguration usually dumps the burden on either a few departments, or on a handful of introductory courses. More important, such actions give the illusion of having solved the problem. Then we quit thinking about all that "writing as process" implies for our ways of teaching and learning across the undergraduate curriculum.

Critical thinking is not some particular kind of form, or sequence of logic, or series of procedural steps that can be profitably discussed outside of what is being thought about, despite the current vogue for faculty seminars and conferences in the teaching of critical thinking, and its widespread inclusion as a new general education requirement. Nor do skills neatly transfer from one subject matter to another. One can write what is called "good standard English" in one area and not in another. One can think "logically and analytically" in one subject and not in another. This is not to claim there is no transference, but only to argue that the transference of skills is far from mechanical. The way one moves from A to B is much more a vague combination of experience in a subject matter and intuitive and analogical leaps than an orderly, causal chain. It

is relatively easy to write well about subjects one is familiar with; and the opposite is true of the difficult and unfamiliar (Hirsch 1984).

This position implicitly argues for the primary emphasis in the undergraduate curriculum debates to be on subject matter, on content, with the development of various skills being an ongoing process ideally involving most courses throughout the total undergraduate curriculum, rather than just being the *raison detre* for a handful of general education offerings. Putting the debate in these terms refuses the ploy that one side is more practical and progressive and has the students' and society's best and most immediate interests at heart. It says that all sides have the development of skills as major objectives. The disagreement is about what kinds of curricular changes will most conduce to achieving those as well as other objectives.

Finally, if natural languages are primary among human sign systems--that is the systems by which different groups differently divide, make meaningful, signify, the seamless experiential world--then for all practical purposes, the language of any particular group becomes the primary way that group experiences the world. If this is so, and if one of our educational goals is to help students comprehend cultural differences, then I do not see how such a goal might be attained by requiring more traditional foreign language study separate from an immersion in the study of the society whose language it is. Here again, I think there has been a tendency to revert to the practices of the 1950s based on assumptions that we dropped a number of good requirements, because of societal pressures, our own lack of intellectual purpose, or the pursuit of disciplinary self-interest to the detriment of the general educational good. This view conveniently forgets that most of those requirements were also failures in their own right. The dropping of them was perfectly consistent with the dominant epistemological and methodological assumptions of the era. Ironically, a number of those who now bemoan the demise of such requirements seem still to subscribe to those very foundational premises.

If those still unconvinced of the need for any reform and those who promulgate a skills/content dichotomy advocated curriculum reforms consistent with the altering critical and theoretical assumptions of their own disciplines, they would probably not advocate or support the kinds of reforms that have been generally instituted so far.

Notes

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¹Those who desire a (not the) relative short-cut through the often torturous labyrinths of the contemporary language-based critical movements, might pursue the following sequence: Culler (1977); Barthes (1968); Leach (1976); Robey (1973); Sampson (1980); Sturrock (1979); Fish (1980); Bleicher (1980). See Anderson (1983) and Gellner (1985) for a couple of brief, accessible caveats. For a fairly comprehensive anthology of primary sources cutting across disciplinary lines see Adams and Searle (1986); for a guided tour through literary critical theory, see D. Keesey (1987).

²Nothing captures this more succinctly than Borges' (1952), "The Analytical Language of John Wilkins," with its wonderful categories from "a certain Chinese encyclopedia" that inspired Foucault's seminal *The Order of Things*: "This book first arose out of a passage in Borges, out of the laughter that shattered, as I read the passage,..." (1966: xv).

³In addition to those already noted in the text, see: Rorty, Schneewind and Skinner (1984), Aarsleff (1982), Aggasi (1963), Merton (1973), Kuhn (1975), and Hayakawa (1964).

⁴The term "Old Western," as a convenient rubric for the ways of knowing and the thought processes characterizing High Medieval and early Renaissance culture, comes from C.S. Lewis (1969 [1955]: 1-14). I acquired it, and a sense of the transformations gradually wrought in this way of seeing by the Italian Humanists--which I drastically oversimplify here--from J.G.A. Pocock's powerful *The Machiavellian Moment* (1975). For a sense of how gradual the changes were, also see Skinner (1978 vol.1) and Murray (1978).

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