Journal of the Canadian Historical Association
Revue de la Société historique du Canada

Presidential Address: Historical Thinking, C.P. Snow's Two Cultures, and a Hope for the Twenty-First Century

Chad Gaffield

Volume 12, Number 1, 2001

URI: https://id.erudit.org/iderudit/031139ar
DOI: https://doi.org/10.7202/031139ar

See table of contents

Publisher(s)

The Canadian Historical Association/La Société historique du Canada

ISSN

0847-4478 (print)
1712-6274 (digital)

Explore this journal

Cite this article

Gaffield, C. (2001). Presidential Address: Historical Thinking, C.P. Snow's Two Cultures, and a Hope for the Twenty-First Century. *Journal of the Canadian Historical Association / Revue de la Société historique du Canada*, *12*(1), 3–25. https://doi.org/10.7202/031139ar

Article abstract

During the past thirty years, researchers have reconceptualized historical change within and across societies. At the time of the "new social history" in the 1960s and 1970s, scholars may have argued about method and the relative importance of "top-down" and "bottom-up" forces but they generally shared key assumptions about historical change including linearity, singularity, and simplicity. By the 1980s, however, historical thinking was becoming part of a campus-wide reconceptualization of change that emphasizes non-linearity, multiplicity, and complexity. An analysis of the discipline of History illustrates how this reconceptualization is laying the foundation for unprecedented horizontal connections of the humanities, social sciences, natural sciences, engineering, and biomédical fields. C.P. Snow's description of Two Cultures may still apply to many aspects of university life but the profound rethinking now underway in History and other disciplines points to the possibility of interconnected scholarly cultures.

PRESIDENTIAL ADDRESS
DISCOURS DU PRÉSIDENT

Historical Thinking, C.P. Snow's Two Cultures, and a Hope for the Twenty-First Century

CHAD GAFFIELD

The words of C.P. Snow's "The Two Cultures and the Scientific Revolution" have resonated in educational debate since their publication in 1959. While Snow's own objectives and assumptions have been largely forgotten, the core of what Snow claimed continues to attract attention both among scholars and in general discussion. "I believe," he said, "the intellectual life of the whole of western society is increasingly being split into two polar groups...at one pole we have the literary intellectuals...at the other scientists." In describing this split in terms of "two cultures," between a "literary" or "traditional culture" and a "scientific culture," Snow perceived two solitudes: the scientists and the non-scientists.[1] Much to his surprise, this perception produced a "flood of literature" as "if a nerve had been touched almost simultaneously in different intellectual societies, in different parts of the world..." Snow rightly concluded four years later that this world-wide attention demonstrated that "the ideas that produced this response couldn't possibly be original," since "original ideas don't carry at that speed." In other words, Snow was far from alone in perceiving a great divide between the Arts and Sciences.[2]

Since the 1970s, I have often thought of Snow's Two Cultures while reading in the archives or teaching or engaging in discussion at a scholarly conference. At other times, Snow's words have come to mind as I participated on a university committee or as I tried to enhance the importance of the social sciences and humanities on political agendas. Often, it seemed, the Arts and Sciences were, indeed, scholarly solitudes. At the same time, however, an alternate image of university life, quite un-Snow-like, also competed for my attention as I undertook research, teaching, and other academic activities. This alternate image is of an inherently integrated research world in which different

1 C.P. Snow's essay was given as the Rede Lecture at Cambridge in May 1959 and was published as a paperback pamphlet in England and in hardcover in the United States by Cambridge University Press. Snow responded to the debate launched by his essay in *The Two Cultures: A Second Look* (1963) and *The Case of Leavis and the Serious Case* (1970). All of this material as well as other essays were compiled by Snow in *Public Affairs* (New York: Charles Scribner, 1971).

2 *The Two Cultures: A Second Look*, 48.

ways of knowing and of thinking about the world do not reflect "polar groups" but rather different strategies for addressing similar questions and for depicting preferred answers. While recognizing the importance of a great divide separating campus activity according to disciplines, I have nonetheless become increasingly convinced that a common, fundamental shift is taking place in the ways in which scholars are thinking about their work. This shift is evident in the new ways in which researchers in diverse fields are explaining how change occurs. In stylized terms, scholars across the Arts and Sciences have been abandoning assumptions of linearity, singularity, and simplicity in their thinking, and have begun embracing concepts of non-linearity, multiplicity, and complexity. One result is the beginning of an unprecedented dialogue among the disciplines despite the continued importance of structural and organizational separations.

The parallel development in various disciplines of common ways to think about change may not be surprising since researchers in all fields grow up and form world views within the same general social, economic, and cultural matrix.[3] The issue at hand is not that history should be considered a "science" like physics but rather that historical thinking, the ways in which we think about change over time, has itself changed in keeping with (sometimes ahead, sometimes behind) changes in the ways in which researchers in physics as well as in fields such as biology and chemistry view interactions over time and space.[4] At the same time, however, and despite the shared cultural matrix, the parallel development of thinking in history and the sciences has not been adequately understood or even fully recognized by either historians or scientists. This ignorance partially results from the institutional structures of the Two Cultures, but also from a dominant public discourse about this separation that no longer reflects current research thinking. At least in part, this out-dated dominant discourse and the accompanying institutional structures and programs have been maintained because their untenable underpinnings have not been clearly recognized and thus not effectively exposed by those considered to be non-scientists, including historians.[5]

3 This point is emphasized in the stimulating analysis by Lawrence W. Levine in "The Unpredictable Past: Reflections on Recent American Historiography," *American Historical Review* 94/3 (June 1989): 671-679.

4 Stunningly insightful, stimulating and helpful analyses of history in comparison to the physical sciences have been consistently offered by Ian Winchester since the 1970s; particularly relevant here is "History, Scientific History and Physics," *Historical Methods* 17/3 (Summer 1984): 95-106. Similarly, see Hubert Watelet, "Et que suggère une comparison de l'histoire et de la physique que?" *Carrefour: Revue de réflexion interdisciplinaire* 8,2-9,1 (1988): 141-154

5 At the same time, it should be emphasized that Snow's views have been contested from many different angles over the years; for example, see F.R. Leavis, *Two Cultures? The Significance of C.P. Snow* (New York: Pantheon Books, 1963).

It is in this context that the following discussion compares historical thinking in selected fields of research to the scholarly thinking about change in aspects of the natural sciences and engineering.[6] This comparison suggests that the kind of complexity now recognized by historians in their analyses of change has similarities to the complexity studies that have been undertaken in other disciplines from chemistry to computer science.[7] Such similarities across the disciplines are not part of a re-enchantment, not a return to a holistic perspective, but rather are pointing to an unprecedented worldview of physical and human change. In this sense, the ambition of this discussion goes beyond the epistemological preoccupation of C.P. Snow with ways of knowing to also focus on the metaphysical question of how we imagine constructs of change. The concluding claim is that the stage has now been set for new campus-wide conversations in which C.P. Snow's Two Cultures have no place.

To begin with, it should be emphasized that my knowledge of scholarly debates on the other side of campus is that of a non-specialist in keeping with the divided curriculum that is characteristic of twentieth-century schooling. Unknown to me, the debate provoked by "The Two Cultures and the Scientific Revolution" occurred when I was sitting in elementary and high school classrooms. At the time, I had certainly never heard of C.P. Snow but I remember being aware that arithmetic and our basic science classes were somehow different from the "reading" subjects. The subjects with numbers were talked about differently and seemed to attract the interest of different students. Moreover, the reaction to success and failure seemed different. The exclamation that "Hey, I got an A in math" always drew a different look than if the results were in history or English. Everyone seemed to agree that the really smart, intellectually intimidating kids were those who could add columns of numbers instantly, magically turn that fraction into a decimal, and mysteriously make that long division come out evenly. Over time, I remember that this distinction became more and more pronounced. By high school, students seemed clearly divided into two groups: those who could do math and those who could not. And I also remember something about expectations. Boys were expected

6 This discussion draws upon only a small portion of recent historiography for illustrative purposes; for examinations of a fuller range of diversity in concept, method, and research strategy in historical studies over the same period, see Peter Burke, ed., *New Perspectives on Historical Writing* (University Park: Pennsylvania State University Press, 1992); Joy Parr, "The New Social History: Twenty Years On," in *Labouring Children: British Immigrant Apprentices to Canada, 1869-1924* (second edition, Toronto: University of Toronto Press, 1994), vii-xxii; Jean-Paul Bernard, "L'historiographie canadienne récente (1964-94) et l'histoire des peuples du Canada," *Canadian Historical Review* 76/3 (September 1995): 321-353.

7 For the purposes of the following discussion, my definition of these studies is quite inclusive, beyond what is sometimes called the new science of complexity; see Mitchell Waldrop, *Complexity: The Emerging Science at the Edge of Order and Chaos* (New York: Simon and Schuster, 1992).

to do well in math; girls were expected to love reading. The issue was not who did well as much as how failure was seen. For a boy, failure in arithmetic seemed a lot more unacceptable than failure for a girl. Similarly, not liking books – not doing the dreaded summer reading list – somehow was more tolerated for boys, especially for those who had good math marks. Teachers really expected girls to read all those novels during July and August even if they were succeeding in math.

If C.P. Snow had come to my Grade 6 classroom, I do not think he would have been surprised by our little microcosm of his Two Cultures. Our experience would have been seen as another illustration of the separate groups of Arts and Sciences, the hierarchy of disciplines with the sciences on top, and the gender character of this cultural divide.[8] From my perspective, though, other factors were at work. I liked arithmetic for aesthetic reasons; numbers were fun to play with. It was also good, of course, that there were no summer reading lists for math, and rarely was there homework or the need to memorize and regurgitate "facts" in tests. History, in contrast, was a lot of hard work. So many names, dates, and facts to remember; what were those six causes of World War I? Only in university and by chance, did I discover that history was not a memory contest, and that the past could be as challenging and intriguing as any matrix of numbers. Only then did I begin to suspect that there were really not Two Cultures but rather different ways of knowing and different ways of thinking about change.

Of course, memories are memories, as we insist all the time now. Clearly, the ways in which we think about the past are connected to the ways in which we think about the present.[9] However, if I jump forward in time to reflect on research policy debates of the past decade, Snow's Two Cultures seemed as vibrant then as decades earlier. In the early 1990s, for example, an attempt was made to merge the Social Sciences and Humanities Research Council and the Canada Council for the Arts as part of a federal government cost-cutting initiative. Toward this end, Mme. Paule Leduc was named as head of both agencies with a view toward subsequent full integration of the administrative structures. The initial reaction of the research community was surprise and bewilderment; as historians, for example, we wondered why we should be grouped with writers, musicians, and actors. The answer, as articulated by members of the Senate sub-committee reflected a Two-Culture world-view; the Senators had trouble understanding why humanists and social scientists were so opposed to the proposed merger rather than being keen to pursue synergistic and collaborative

8 For an historical analysis of the status hierarchy of disciplines, see Marjorie Garber, *Academic Instincts* (Princeton, NJ: Princeton University Press, 2001).

9 A fascinating study of the distinction between history and the past is offered by Colin M. Coates and Cecilia Morgan in *Heroines and History: Representations of Madeleine de Verchères and Laura Secord* (Toronto: University of Toronto Press, 2001).

activities with those in the performing and creative arts. Only after many submissions and extended debate that emphasized research as a distinguishing characteristic of the Social Sciences and Humanities Research Council, was the government convinced to abandon the scheme to save funds by administratively grouping all those in the "Arts."[10]

Then in the early 1990s, the federal government launched the Science and Technology Review, a major effort to examine all the ways in which funding was provided for research and development in Canada, including the work of the funding councils. Despite the fact that the Social Sciences and Humanities Research Council and other agencies such as Statistics Canada were within the purview of this review, it was only after significant pressure was placed on the government by the Social Science Federation of Canada that humanists and social scientists were actually included in the effort. Similarly, in 1994, the newly founded Humanities and Social Sciences Federation of Canada had to lobby aggressively to ensure participation in the Working Group that was created to develop ethical guidelines for research involving humans. Even though this Working Group was formally established by the three funding councils that represent all the disciplines, the initial place at the table of those associated with the SSHRCC was marginal at best; perhaps predictably, the first draft documents were attacked as an attempt to apply a bio-medical model to all research activities. In this case, the oversight or omission of those such as historians was not the result of governmental perceptions but rather of research administrators; only belatedly was it agreed that all scholars, either from "Arts" or "Sciences," faced ethical issues when undertaking research involving humans, and that therefore they all had to be well-represented on the Working Group.[11]

Despite these episodes, the pattern in which humanists and social scientists are viewed as members of the "Arts" and therefore not immediately included in initiatives launched by those identified with the "Sciences," continued during the late 1990s with the creation of the Canadian Foundation for Innovation (CFI) in 1997. By focussing on funding for the construction of research infrastructure, this federal agency was created to significantly enhance the ability of scholars to contribute to the advancement of knowledge in an increasingly international and competitive research environment. Unfortunately for those such as historians, the government officials and scholars who conceived and developed CFI did not think to include the humanities and social sciences but rather defined its focus in terms of "science" and "technology" (thereby making eligible the disciplines covered by the Natural Sciences and Engineering

10 Chad Gaffield, "Merging of councils may be unproductive affair," *The Ottawa Citizen*, 25 March 1992; and Chad Gaffield, "Le projet de Loi C-93: un pas en avant...vers l'arrière," *Interface*, mars-avril 1993.

11 Tri-Council Working Group, *Final Report: Code of Ethical Conduct for Research Involving Humans* (Ottawa, 1997).

Research Council of Canada), as well as the "environment" and "health" (thereby making eligible the disciplines of the Medical Research Council of Canada). Once again, protests by the learned societies under the leadership of the Humanities and Social Sciences Federation of Canada (HSSFC) met with initial surprise; those such as historians need research infrastructure? When CFI officials themselves admitted that the example of databases showed that this question could, indeed, be appropriately answered, they still kept the door closed based on the wording of the legal documents that created the new agency. Since these documents specified "science," the claim was that it was simply impossible to fund the humanities and social sciences unless the proposed research infrastructure could be included under the themes of health and the environment. But maybe, the HSSFC argued, the original documents were written in French and the word *science* should have been translated as "research" and not "science." No, the response came back, the CFI creators meant "real" science. Only after two more years of continued pressure did CFI officials formally acknowledge that all researchers need infrastructure, and that, in fact, the social sciences and humanities are eligible and indeed welcome to apply for funding.

If he had heard the debates launched by the proposal to merge SSHRCC with the Canada Council, or by the initial composition of those involved in the Science and Technology Review and the Tri-Council Working Group on Ethics in Research Involving Humans, or by the founding definition of eligibility for grants from the CFI, C.P. Snow would have not been surprised. These debates, indeed, initially reflected the perception of Two Cultures and a hierarchy of academic disciplines. At the same time, however, their resolutions would have quite astonished Snow; in fact, each debate led to the inclusion and considerable integration of researchers from across the campus. The result was that, in a variety of ways, the discussions of the 1990s were quite different from those of the 1950s. By the year 2000, observers may have still perceived that universities were divided by Two Cultures, but there was an emerging conviction that this division could no longer be justified. It is still clear that many obstacles, especially budgetary, remain in place to prevent the kind of structural change that would dismantle the differential legacies of the previous commitment to separate and unequal academic cultures. Nonetheless, recent debates suggest that a new image of teaching and research has now gained currency among scholars, and that it is beginning to be reflected in institutional structures.

Perhaps because of my initial preference for arithmetic, I have actively attempted to follow some of the major scholarly debates in the natural sciences and engineering, and since the 1970s, have been struck by the extent to which these debates have increasingly resonated with those at the heart of historical discussion. Indeed, the different ways in which historians have been analysing the past are strikingly similar to the new perspectives about change that are

being described in disciplines such as chemistry, biology, and physics. These new perspectives have become the focus of an expanding literature aimed at non-specialist readers. The fact that this literature has included best-sellers illustrates the extent to which current debate in the sciences resonates with those in popular discussion. It is not the substantive details and technical underpinnings of the new scientific perspectives that explain this popularity but rather the vocabulary, expressions, and metaphors used to describe how change occurs; in other words, it is the ways in which change is being discussed in the physical sciences that is attracting interest from non-specialists. As Donald N. McCloskey emphasizes, "The talk of engineers and the talk of historians connects in the way that metaphors connect with stories."[12]

The connections between perspectives in fields such as biology or physics and those in history first struck me at the time of the "new social history" when debate raged between those who argued for and against "quantitative" and "qualitative" research strategies. In many ways, this debate reflected the arts/sciences dichotomy; indeed, C.P. Snow welcomed the social history movement since he viewed it as more scientific and therefore an improvement over the established historical literature. This view never struck me as convincing at least in part because I did not see numerate historians gleefully feeding punchcards into whirling machines while others scribbled notes from piles of archival documents. Rather, few of the so-called "quants" seemed to like numbers any more than the so-called traditional historians. Instead, the systematic study of routinely generated sources such as the census, parish registers, and assessment rolls did not primarily result from a desire to make history "scientific," but rather followed a belief in the need to examine evidence about the historically anonymous. The need to learn some computer programming for data entry and analysis was rarely greeted with any enthusiasm by those doing master's and doctoral theses, since most history students had taken only Arts courses since high school; not surprisingly, much of the early quantitative research reflected the poor background that historians had in statistical analysis.

The new social history debate exposed the extent to which "traditional" historians depended upon quantitative statements in their interpretations, and often made claims about the "anonymous" in the absence of any evidence. In fact, viewed from the perspective of thirty years later, the thinking dominant on both sides of the new social history debate shared key assumptions about the study of the past. In the 1960s and 1970s, scholars may have perceived a clear distinction between the relative legitimacy of the study of numbers and the

12 Donald N. McCloskey, "History, Differential Equations, and the Problem of Narration," *History and Theory* 30/1 (1991): 21-36. For an example of collaboration between a physicist and historian, see Robert Nadeau and Menas Kafatos, *The Non-Local Universe: The New Physics and Matters of the Mind* (New York: Oxford University Press, 1999).

study of words in the discipline of history, but within a few years this distinction could no longer be maintained. As Paul Perron and his colleagues have explained, "A digit in numerical representation, for instance, has the exact same structural features in representational terms that, say, a noun in language has – i.e. both are signs with specific forms, functions, and meanings...The difference between a digit and a noun is thus not to be located in structural patterns, but in the different functions of the representational systems to which they pertain."[13]

The realization that studying numbers and studying words are fundamentally similar research activities not only undermined the qualitative/quantitative dichotomy but also pointed to the shared assumptions underlying historical work in the 1960s and 1970s. Scholars may have argued vehemently about their approaches and interpretations but the dominant historical thinking remained convinced of a Newtonian, mechanistic model of change.[14] In other words, both sides of the quantitative/qualitative debate were operating within the same conceptual framework; it is the dismantling of this framework (in light of the debates launched by the new social history) that led to a substantial reconfiguring of historical thinking during the closing decades of the twentieth century.[15]

A major feature of the dismantling of the historical thinking still dominant during the 1960s and 1970s was the increasing rejection of dichotomies in the historical analyses proposed during the closing decades of the twentieth century. Just as scholars began moving away from a distinction between qualitative and quantitative approaches to a more integrated view of historical research, they also began abandoning conceptual dichotomies in favour of more discrete analyses in their interpretations. For much of the 1960s and 1970s, historians debated a series of juxtapositions such as traditional/modern, public/private, and illiterate/literate. A familiar conclusion of these debates was a rethinking of these terms as exclusive concepts that described phenomena that scholars increasingly viewed as partial, incomplete, mixed, and ambiguous.

13 Paul Perron, Leonard G. Sbrocchi, Paul Colilli, and Marcel Danesi, "The Semiotic Bridge," in Perron *et al*, eds., *Semiotics as a Bridge between the Humanities and the Sciences* (Ottawa: Legas, 2000), 12-13.

14 Innovative and compelling studies of historical thinking during the nineteenth and twentieth centuries have poured forth in recent years such as Mary Poovey, *A History of the Modern Fact* (Chicago: University of Chicago Press, 1998) and Bonnie G. Smith, *The Gender of History: Men, Women, and Historical Practice* (Cambridge, Mass.: Harvard University Press, 1998).

15 In keeping with the spirit of the overall analysis presented here, my sense of the timing of the reconfiguring of historical thinking is purposely vague. However, the winds of change were certainly blowing by the early 1980s as evident in Peter H. Smith's efforts to promote analysis of "the relationship between statistical reasoning and the historical imagination"; see the special issue entitled "Statistics, Epistemology, and History," that Smith guest-edited for *Historical Methods* 17/3 (Summer 1984).

Rather than seeing change as before-and-after and as either/or, scholars increasingly asked "to what extent" and "in which ways." Different societies were recognized (depending on the focus of analysis) to be "traditional" *and* "modern," just as space could be "public" *and* "private," and individuals could be both "illiterate" *and* "illiterate" *to some extent*. Rather than assuming any yes/no answers to historical questions, scholars began asking "to what degree?" in recognition of the characteristically partial quality of all associations. Certainly researchers still used words such as traditional and modern but they did so in ways that implied elements of continuity and overlap as well as discontinuity and distinction. Similarly, scholars anguished less over either/or decisions (such as those needed to categorize artisans in occupational classification systems requiring singularity) and, instead, began embracing concepts of hybridity and liminality in analysing questions of identity and social change.

At the same time, historians began abandoning the hope that they could separate themselves as persons from the object of their study. The ideal distinction between historians and history gave way to a recognition that the values, assumptions, and preoccupations of scholars were inherent ingredients of the ways in which the past was analysed and interpreted. The new question for historians came to concern the point in their research at which they should adopt a realist stance, one that assumed a clean separation between the historian and the past. As historical debate moved from the new social history to the "linguistic turn" of the 1980s and the cybernetic challenge of the 1990s, the proposed answers to this question covered the full spectrum from "at the start of research" to "never." By the turn of the century, many scholars agreed that neither extreme of the spectrum is appropriate or even possible. Rather, the dominant view now is that historians have no choice but to adopt *at some point* a realist stance in order to undertake their studies, and that this stance cannot be adopted unflinchingly throughout any research project; in other words, the appropriate formulation of the realist question asks "at what point?" (rather than if) and "to what extent?" (thereby rejecting the all-or-nothing extremes).[16]

In addition to the rethinking of dichotomous, discrete categories, historical thinking has also increasingly moved from the singular to plural in conceptualizing the past. As historians of education began replacing "literacy" with "literacies," for example, other scholars started using "families" rather than "the

16 This debate was most intense initially about research strategies where the question could not be side-stepped, such as in oral history. Similar debate at the core of other disciplines such as sociology focussed on rejecting the participant-observer dichotomy while all researchers sought common epistemological ground in developing the guidelines for research with humans; see, for example, the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans* (Ottawa, 1998).

family," and "identities" rather than "identity."[17] These examples illustrate the extent to which researchers agreed by the early 1980s that the characteristic emphasis on singularity in documentary evidence and in routinely generated sources such as the census reflected a particular perspective rather than the range of thought and behaviour in past societies. For example, nineteenth-century census enumerators usually required a single answer to each of their questions. Thus, each person was required to write down one response in each column concerning characteristics such as occupation or "origin." During the 1970s, historians increasingly recognized that this requirement produced evidence that has to be used prudently since other sources revealed that so many individual lives actually involved multiple rather than singular features. Research project after project found that those in the labour force usually combined a variety of occupational activities during the year in keeping with the seasons and their own talents as well as the changing diversity of economic opportunities. In this sense, the historical analysis of an individual as a "farmer" or a "lumberer" has to be done in a way that acknowledges the fact that their occupational identity was characteristically multiple rather than singular. In the same way, scholars are attempting to see the plural "origins" of individuals despite the fact that the historical evidence often reflects an insistence on singularity in which children were categorized in terms of only one parent, usually their father. It is also in this sense that scholars no longer use expressions such as the history of "the family" (thereby implying a single definition) but rather emphasize the plural, "families," in recognition of the multiplicity of forms, structures, and ideologies in specific societies.[18]

The conceptual shift away from dichotomies and from the singular to the plural in historical thinking can be compared to the questioning of "clean separations" in the natural sciences, and to the rise of "fuzzy logic" in engineering. Logicians in the 1920s first identified the key concept of fuzzy logic, the idea that everything is a matter of degree. In this view, clean separations can be said to exist but only in an artificial and exceptional sense. Bertrand Russell, considered the godfather of fuzzy logic, used the concept of vagueness in arguing that "everything is vague to a degree you do not realize till you have tried to make it precise." By the 1990s, proponents of fuzzy logic such as Bart Kosko,

17 For a relevant discussion that focuses on literacy, see Harvey J. Graff, "The Shock of the 'New' (Histories): Social Science Histories and Historical Literacies," *Social Science History* 25/4 (Winter 2001): 483-533.

18 In my own case, for example, I wrote a chapter in the early 1980s entitled, "Wage Labour, Industrialization, and the Origin of the Modern Family," for *The Family: Changing Trends in Canada*, ed. Maureen Baker (Scarborough, Ont.: McGraw-Hill, 1984), 21-34. In the late 1980s, I revised this chapter for the second edition under the title, "The Social and Economic Origins of Contemporary Families," while the editor similarly changed the book title to the plural; see *Families*, ed Maureen Baker (Scarborough, Ontario: McGraw-Hill Ryerson, 1990), 23-40.

emphasized that "up close, things are fuzzy" and focussed on "the mismatch problem: the world is gray but science is black and white."[19] As a result, researchers in the natural sciences and engineering have been moving from an assumption of bivalence to an appreciation of multivalence. The practical results range from fuzzy logic camcorders to automated train systems that are based on concepts of "gray" and "to some degree." It is this change in thinking that resonates with the increasing acceptance by historians of the idea that it is inappropriate to seek sharp clarity in juxtaposing categories, concepts, or contexts. Rather, historical research results are now often presented (using other expressions) in terms of "fuzzy sets" defined by Kosko as "a group of elements that belong to only some degree to the group as a man belongs to only some degree to a political party or to a circle of friends or to an economic class."[20]

As historians rethought their pursuit of "clean separations," they increasingly abandoned the jigsaw metaphor of historical research that remained dominant in the era of the new social history. In this metaphor, researchers saw themselves as placing new pieces of knowledge to help complete an overall historical puzzle; the highest praise a book could receive was to be labelled "the definitive study." During the 1960s and 1970s, the major missing pieces were seen to be the labouring or working classes, women, and minority ethnic groups, and thus researchers strove to add knowledge about those who had previously been ignored by historians. Soon, however, it became clear that the "historical puzzle" was not composed of discrete pieces; indeed, the addition of each new "piece" seemed to change all the other pieces. Rather than resulting in a more complete picture of the past, research findings often raised new questions about previous conclusions. By the late 1970s, E.P. Thompson's insight that class should not be conceptualized as a "thing" but as a "relationship" was being used to study diverse aspects of historical change.[21] While studies of the working class were calling into question interpretations of elites, research on women was problematizing earlier studies of men, and the histories of minor-

19 Bart Kosko and Satoru Isaka, "Fuzzy Logic," *Scientific American* (July 1993): 76-81. Bart Kosko, *Fuzzy Thinking: The New Science of Fuzzy Logic* (New York: Hyperion, 1993), 8. The claim here is not that such thinking is now characteristic of the natural sciences and engineering; in fact, strong opposition is evident, as in William Kahan's conviction that "Fuzzy theory is wrong, wrong, and pernicious...Fuzzy logic is the cocaine of science." See ibid., 3.

20 Kosko, *Fuzzy Thinking*, 115. For a survey of the emergence of the "new fuzziness" in one historical field, see Philippe Carrard, *Poetics of the New History: French Historical Discourse from Braudel to Chartier* (Baltimore: The Johns Hopkins University Press, 1992). Also relevant is Mark Starowicz's recent remark in an interview about "Canada: A People's History" that "Good history and good journalism turn things grey in the best sense of the word." See Tod Hoffman, "Making History," *McGill News* (Fall 2001): 21.

21 E.P. Thompson, *The Making of the English Working Class* (Harmondsworth: Penguin, 1963).

ity groups were challenging established views of the majority.[22] It soon became clear that better understandings of any particular topic rippled through other aspects of historical interpretation. No historical phenomenon was simply a "thing" but instead was composed of relationships; there were no discrete pieces of an historical puzzle.[23]

As it became clear that research results were not simply additive, the jigsaw metaphor became less and less evident in historical thinking. Rather than being described as "definitive," the best books are now said to raise new questions and to stimulate further research. In Canada, the mid-1970s stand out in retrospect as a historiographical turning point with the publication of Louise Dechêne's *Habitants et marchands* in 1974 and Michael Katz's *The People of Hamilton* in 1975. The enduring contribution of both books is two-fold: the ways in which they opened up whole new areas of research that forced re-examination of the established understandings of key periods of historical change; and, most importantly, how the authors came to grips with their surprising findings by conceptualizing such change in terms of continuity *and* discontinuity, stability *and* movement, as well as inequality and differentiation within aggregate patterns.[24] Although not fully recognized at the time of publication, it is these characteristics that unexpectedly contributed significantly to the re-thinking of historical change that occurred during the closing decades of the twentieth century.[25]

Along with abandoning the jigsaw model of additive historical research, the results of the new social history also encouraged historians to dismantle the single-variable interpretive framework that often implicitly and sometimes explicitly characterized comparative studies of historical change. Within this framework, it was considered important and meaningful in and of itself to com-

22 See, for example, Joy Parr and Mark Rosenfeld, eds., *Gender and History in Canada*, (Mississauga, Ontario: Copp Clark, 1996), and Kerry Abel, "Tangled, Lost and Bitter? Current Directions in the Writing of Native History in Canada," *Acadiensis* 26/1 (1996): 92-101.

23 In this spirit, Bryan Palmer has recently argued that "There is no possibility of adequately seeing power and its consequences *only* from below, just as the night cannot really be understood apart from the day." See *Cultures of Darkness: Night Travels in the Histories of Transgression* (New York: Monthly Review Press, 2000), 456.

24 Louise Dechêne, *Habitants et marchands de Montréal au XVIIe siècle* (Paris and Montreal: Plon, 1974); and Michael Katz, *The People of Hamilton: Family and Class in a Mid-Nineteenth-Century City* (Cambridge, Mass.: Harvard University Press, 1975). Bettina Bradbury subsequently used both books as points of departure for her acclaimed study *Working Families: Age, Gender and Daily Survival in Industrializing Montreal* (Toronto: McClelland and Stewart, 1993).

25 A retrospective look by way of subsequent studies is offered by Sylvie Dépatie *et al*, eds., *Habitants et marchands Twenty Years Later: Reading the History of Seventeenth and Eighteenth Century Canada* (Montreal and Kingston: McGill-Queen's University Press, 1998). More generally, see the special contributions to the "Roundtable" in *Social Science History* 22/1 (1998).

pare specific characteristics across societies, such as fertility levels, school attendance rates, or the proportion of adults who could read and write. Researchers soon emphasized, however, that such single-variable comparisons could often be highly misleading. Similar overall literacy or fertility rates, for example, could have resulted from quite different dynamics. At the same time, diverse rates did not always have distinct consequences. As a result of these research findings, scholars of the new social history helped move the study of social change in the direction of multi-causal, contextually dependent analyses. Unlike the case in the 1970s, few researchers now expect to find that any single characteristic or behaviour (such as literacy or fertility patterns) consistently and adequately explains any aspect of historical change. Rather, comparative studies of specific topics now anticipate the need for multi-causal, contextually dependent analyses.[26]

Just as with the increasing recognition of the inappropriateness of privileging "clean separations" in historical thinking, the abandonment of the jigsaw metaphor and single-variable interpretive frameworks can be compared to the difference between linear theories and non-linear theories in the sciences. As Kosko explains,

> A linear theory gives you the whole from the parts. Add up the parts and you get the whole. Study how the parts behave. Then stitch the parts together and you have studied the whole. Quantum mechanics does this with matter waves and light waves. You can add up waves to get one big wave and you can decompose a big wave into several small waves. [In contrast] A nonlinear theory does not give you the whole from the parts. The parts do not add up to the whole. That is nonlinearity. Groups do not behave as their members behave. You can study arms and legs and organs and other parts and still not know how a human being behaves or how a mob behaves. System complexity exceeds subsystem complexity.[27]

In the same sense, research findings of the new social history moved scholars toward a greater appreciation of the different ways in which general phenomena have been articulated in specific contexts. At a macro level, historians of literacy, for example, have documented an increasing ability to read and write in many societies since the eighteenth century. However, this trend is not linear, consistent across time or space, or the result of similar developments in

26 Tamara K. Hareven focussed on this change in historical thinking is her important article, "The History of the Family and the Complexity of Social Change," *American Historical Review* 96/1 (February 1991), where she observed that the "main dissatisfaction with the studies of change over time that have emerged in the 1970s has been their linearity and their generalizations for the entire society based on the experience of one class, usually the middle class." (p 124).

27 Kosko, *Fuzzy Thinking*, 108.

each setting. Learning (or not learning) to read and write occurred differently in different contexts, and had diverse meanings for individuals in distinct settings *to some extent*.[28] Similarly, researchers have documented since the 1960s the rise and fall of fertility rates over time and space.[29] Their work has revealed considerable complexity behind overall changes in many societies, even in the case of the so-called western demographic transition of the later-nineteenth and twentieth centuries. Historical demographers first emphasized that certain birth control efforts were well-underway much earlier than previously assumed, and then they revealed how fertility declines were not always simply associated with major changes such as urban, industrial development or mass schooling. Literacy rates cannot be consistently correlated in a linear way with fertility declines; in other words, the ability to read and write has not always had the same meaning in terms of how individuals see themselves or their reproductive behaviour. Thus, historians of literacy and those of historical demography have encouraged each other to move toward interpretations that address questions of context: under what conditions? in which setting? to what extent for different individuals and collectivities?[30] The results of such research helped undermine the view that a constellation of forces interacted consistently to produce "modernity." As a result, scholars now tend to perceive multiple historical paths rather than single trajectories of historical change, and to emphasize the uneven character of these paths for different groups (or "subsystems") within societies (or "systems").

In keeping with this changed historical thinking, historians have redefined the ways in which they pose and address questions about the past. In the 1960s and 1970s, historians were generally still seeking Big Answers to the Big Questions often at the nation-state level and sometimes even across the continents or Western society. However, the continual presentation of research findings that exposed the limits of each new major interpretation encouraged scholars to re-examine what they considered to be an appropriate level of explanation. As a result, for example, intensive studies of certain places that were ini-

28 Harvey J. Graff, *The Labyrinths of Literacy: Reflections on Past and Present* (Sussex: Falmer Press, 1987).

29 Examples of this work include Charles Tilly, ed., *Historical Studies of Changing Fertility* (Princeton, N.J.: Princeton University Press, 1978), and the recent synthesis assembled by Michael R. Haines and Richard H. Steckel, eds., *A Population History of North America* (Cambridge: Cambridge University Press, 2000).

30 Such interconnections are examined in Gérard Bouchard, "Marginality, Co-Integration and Change: Social History as a Critical Exercise," *Journal of the Canadian Historical Association* ns 8 (1997): 19-38; Danielle Gauvreau, *Québec: Une ville et sa population au temps de la Nouvelle France* (Sillery: Les Presses de l'Université du Québec, 1991); Peter Gossage, *Families in Transition: Industry and Population in Nineteenth-Century Saint-Hyacinthe* (Montreal and Kingston: McGill-Queen's University Press, 1999); and Chad Gaffield, "Schooling, Children, and Family Reproduction in Nineteenth-Century Ontario," *Canadian Historical Review* 72/2 (June 1991): 157-191.

tially undertaken in the pursuit of general knowledge often produced such inconsistent findings that scholars began recognizing that context is crucial in determining the specific articulations of widespread change. It is in this sense that historians now seek to understand the range of diversity or the horizon of possibilities associated with specific historical phenomena rather than to offer a single analysis that can be generalized.[31]

One key characteristic of the new social history as well as of subsequent studies involved systematic research on specific settings at the regional and micro-historical levels. In the 1960s and 1970s, such research reflected the hope that large processes could be understood by examining single articulations of them in representative settings; in other words, industrialization could be probed through research on specific cities and agricultural change could be examined in selected townships. Soon, however, it became clear that all the world was not Philadelphia; rather than single articulations of large scale processes, historians came to appreciate the myriad ways in which widespread change actually occurred in different settings. In my own work in regional history, I have conceptualized the relationships between "big structures/large processes" and specific times and places in terms of the "unique convergence of non-unique phenomena."[32] In this approach, it is assumed that class, gender, ethnicity, and other non-unique phenomena converge in sufficiently unique ways to explain the specificity of a particular setting much as an individual's identity is revealed by a combination of traits rather than any single characteristic. Moreover, this approach assumes that comparative studies will show that all the unique convergences associated with specific regions describe a *range of diversity* about which general understandings can be developed. For some regions such as those experiencing rural industrialization or rapid commercial growth, this range of diversity may be substantial or modest, and thus would call for quite different general understandings. Similar objectives underpin the continued attraction of micro-historical research that seeks to systematically

31 Innovative examples of this approach include Lynne Marks, *Revivals and Roller Rinks: Religion, Leisure, and Identity in Late Nineteenth-Century Small-Town Ontario* (Toronto: University of Toronto Press, 1996), and Donald F. Davis and Barbara Lorenzkowski, "A Platform for Gender Tensions: Women Working and Riding on Canadian Urban Public Transit in the 1940s," *Canadian Historical Review* 79/3 (1998): 431-465. This pursuit by historians can be usefully compared to the discussion about self-organization as a principle of nature; see Stuart Kauffman, *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity* (New York: Oxford University Press, 1995).

32 Charles Tilly, *Big Structures, Large Processes, Huge Comparisons* (New York: Russell Sage Foundation, 1984); and Chad Gaffield, "La région: une combinaison spécifique d'éléments non-spécifiques," in *La région culturelle: problematique interdisciplinaire*, ed. Fernand Harvey, (Québec: Institut québécois de recherche sur la culture, 1994), 27-31. An example of such historical research is Timothy J. Stanley, "'Chinamen, Wherever We Go': Chinese Nationalism and Guangdong Merchants in British Columbia, 1871-1911," *Canadian Historical Review* 77/4 (Fall 1996): 475-503.

connect individuals to large-scale historical change.[33]

The attention of the new social history to the details of everyday life, and the subsequent rethinking of historical change by the late 1970s and early 1980s was not unlike the preoccupation of physicists with the lived complexity of the physical world. Stephen Hawking pointed out in 1980 that "It is a tribute to how far we have come in theoretical physics that it now takes enormous machines and a great deal of money to perform an experiment whose results we cannot predict." At the same time, however, Hawking emphasized that such predictability was lost outside the tight control of the laboratory. As James Gleick has observed, scientists increasingly recognized that "understanding nature's laws on the terms of particle physics left unanswered the question of how to apply those laws to any but the simplest of systems. Predictability is one thing in a cloud chamber where two particles collide at the end of a race around an accelerator. It is something else altogether in the simplest tub of rolling fluid, or in the earth's weather, or in the human brain."[34]

But to say that the world is fuzzy, irregular, and unpredictable in important ways, does not harken back to the "traditional" historical descriptions of unique things happening, one after the other, along a single trajectory of time. Rather, scholars have become increasingly convinced of the importance of patterns, consistencies, and regularities across communities at the same time as they have developed enhanced appreciations of the range of diversity and complexity of historical change. This apparent contradiction is less troubling or surprising if we think along with Benoit Mandelbrot who created the word "fractal." Over and over again, Mandelbrot argues, the world displays a regular irregularity. One of his early studies involved cotton prices for which there are records since the nineteenth century. By looking for patterns not at one scale but across every scale, Mandelbrot was able to connect small changes to large ones; he was able to show that specific price changes could be considered random but that patterns over a day matched those over a month. Mandelbrot was able to produce a graph that he believes "accounts for all the most extreme events of nearly a century in the history of an essential and most volatile commodity." In other words, he was able to use an attention to scale to reveal an unexpected order in the most apparently disorderly instances.[35] The value of this work (as well as Mandelbrot's more famous research in other fields) for

33 Carlo Ginzburg, "Microhistory: Two or Three Things That I Know about It," *Critical Inquiry* 20 (1993): 10-35; and Edward Muir and Guido Ruggiero, eds., *Microhistory and the Lost Peoples of Europe* (Baltimore: Johns Hopkins University Press, 1991).

34 Stephen Hawking, "Is the End in Sight for Theoretical Physics?", quoted and discussed in James Gleick, *Chaos: Making of a New Science* (New York: Viking, 1987), 6-7.

35 Benoit B.Mandelbrot, *The Fractal Geometry of Nature: Updated and Augmented* (New York: W.H. Freeman and Company, 1983), 339. Also see Ron Eglash, *African Fractals, Modern Computing and Indigenous Design* (New Brunswick, Jersey: Rutgers University Press, 1999).

historians is not in the details of his findings but rather in his appreciation of the connections among different levels of analysis. In thinking about historical change, the example of fractals reminds us that the question of regularities or irregularities depends upon the frame of reference.[36]

In regional and microhistorical studies, therefore, the objective is not to arrive at Big Answers to Big Questions but rather to specify multiple smaller answers to Big Questions; to qualify analyses by identifying *under what conditions*, and *in which settings*, and *to what extent* for different individuals and groups that large-scale change can be discerned. This objective can be compared to the challenge of combining the descriptions of the large-scale structure of the universe as proposed by Einstein's theory of general relativity with those of quantum mechanics, which is focused on the sub-atomic level.[37] In current historical thinking (as in aspects of the physical sciences), it is no longer assumed that big causes necessarily have big effects, or that big effects must have resulted from big causes.[38] In the same way, historians have become, along with their colleagues in the sciences, increasingly sensitive to the extent to which even slightly different initial conditions can have long-term, major consequences. In studying geographic mobility, for example, scholars have come to appreciate a complexity of patterns that includes a certain unpredictability about which individuals and families stay or leave, and about the origins and destinations of migrants. Many studies of such population movement began in search of consistent push-pull factors but ended with new appreciations of the complex character of such historical change.[39]

Taken together with other socio-demographic studies, such research pushed historical thinking in ways that can also be connected to recent debate about chaos theory. As N. Katherine Hayles has argued from the viewpoint of literature:

> The Newtonian paradigm emphasizes predictability. Such a mindset is exem-

36 As an example of the historical usefulness of the metaphor of fractals, see H.W. Brands, "Fractal History, or Clio and the Chaotics," *Diplomatic History* 16/4 (Fall 1992): 495-510.

37 Stephen Hawking examines this challenge in *The Universe in a Nutshell* (New York: Random House, 2001).

38 In this spirit, Donald Akenson's book that analyses the enormous struggle of Irish Catholics and Irish Protestants is entitled *Small Differences: Irish Catholics and Irish Protestants, 1815-1922* (Montreal and Kingston: McGill-Queen's University Press, 1987). Similarly, Serge Courville, Jean-Claude Robert, and Normand Séguin, "Population et espace rural au Bas-Canada: l'exemple de l'axe laurentien dans la première moitié du XIX^{e} siècle," *Revue d'histoire de l'Amérique française* 44/2 (Fall 1990): 243-62. Also, see David S. Landes, "What Room for Accident in History? Explaining big changes by small events," *The Economic History Review* 47/4 (November 1994): 637-656. For a journalistic discussion, see Malcolm Gladwell, *The Tipping Point: How Little Things Can Make a Big Difference* (Boston: Little, Brown, 2000).

39 Most notable in this regard is the nuanced, research-intensive study by Gérard Bouchard, *Quelques arpents d'Amérique: Population, économie, famille au Saguenay, 1838-1971* (Montreal 1996).

> plified by Laplace's famous boast that, given the initial conditions and an intelligence large enough to perform the calculations, he could predict the state of the universe at any future moment. By contrast, chaotics celebrates unpredictability, seeing it as a source of new information. Whereas Newtonian mechanics envisions the universe through inertial reference frames that extend infinitely far in space and time, chaotics concentrates on complex irregular forms and conceptualizes them (in fractal geometry) through fractional dimensions that defeat tidy predictions and exact symmetries...The Newtonian expectation is that small causes lead to small effects, but chaotics looks at systems where minute fluctuations are amplified into dramatic large-scale changes...The world, as chaotics envisions it, then, is rich in unpredictable evolutions, full of complex forms and turbulent flow, characterized by nonlinear relations between causes and effects, and fractured into multiple-length scales.[40]

As a result of the changes in historical thinking since the 1970s, scholars have become much more comfortable with ambiguities, contradictions, inconsistencies, and unintended consequences both in historical evidence and interpretation. One unexpected result of the new social history was a heightened scholarly appreciation of the messiness of history; what began with a conviction that systematic study of more and more evidence would clarify and make precise the contours of change soon became characterized by a heightened sense of historical complexity. As a result of their work with routinely generated sources, many historians became less prone to discount, or to see as a problem, evidence that does not "fit" and less disappointed with low levels of statistically explained variance.[41] Rather, they became much more attentive to the conceptual and social importance of the exceptions as keys to understanding the overall dynamics of past societies. This trend has produced, for example, major projects devoted to the use of judicial records. The ambition here is not simply to study that minority of people who formally came into contact with the legal system, but rather to learn something about the whole society by looking at an admittedly partial experience. Such work illustrates the value of

40 N. Katherine Hayles, ed., *Chaos and Order: Complex Dynamics in Literature and Science* (Chicago: University of Chicago Press, 1991). Also see Michael Shermer, "Exorcising Laplace's Demon: Chaos and Antichaos, History and Metahistory," *History and Theory* 34 (1995): 59-83.

41 Since the 1970s, the periodic historiographic analyses of Daniel Scott Smith have contributed significantly to advancing scholarly debate on these issues: see, for example, "A Mean and Random Past: The Implications of Variance for History," *Historical Methods* 17/3 (Summer 1984): 141-148. A persuasive illustration of recent thinking about local and national patterns is Peter Baskerville and Eric Sager, *Unwilling Idlers: The Urban Unemployed and Their Families in Late Victorian Canada* (Toronto: University of Toronto Press, 1998).

examining in detail the unusual rather than dismissing it as marginal, as statistical noise.[42]

In this sense, historians have developed their own sensitivity to what is called elsewhere the "flying elephant" or single-case phenomenon. This image reminds us that even one instance can force us to reconsider a whole array of established beliefs. In my own work on the socio-cultural history of language, the discovery that a few enumerators were willing to write down two answers to the mother tongue question of the 1901 census became for me the sighting of a "flying elephant"; these dual answers showed that, despite the political and scholarly insistence on singularity at the time, and the fact that one mother tongue was specified on almost all census returns, it was indeed thinkable to have two mother tongues at the turn of the past century. In other words, the concept that something could be two things at once was already present (to a very limited extent) in popular thinking.[43] Although this thought cannot be considered statistically significant across the population at the time, it has historical significance for our understanding of the ways in which multiple identities became officially acceptable by the late twentieth century. Indeed, it is illustrative of the changing intellectual framework of recent decades that, during the late 1970s and early 1980s while scholars were moving from the singular to the plural in their historical analyses, census officials in countries like Canada were beginning to accept multiple answers to enumeration questions about characteristics such as mother tongue.

The preceding examples illustrate only some of the ways in which researchers have been developing views of historical change that connect to the new theoretical perspectives in the natural sciences, bio-medical fields, and engineering. Appropriately, these connections are themselves not linear. Historians will characteristically recoil from claims by chaos theorists about the universal behaviour of complexity or from the idea that any meaningful pattern is truly replicated across scales of perspective (as proposed by fractals). Rather, the epistemological and metaphysical connections are appropriately fuzzy, vague, partial, and limited to some extent. At the heart of the new conversations across the campus is a common conviction about the complexity of change. These conversations are emphasizing the interwoven, interrelated connectedness of complex phenomena, and not surprisingly, new metaphors are appearing across the disciplines. From N. Katherine Hayles's perspective, the waterfall has replaced the clock as the appropriate image of the world that scholars are now conceptualizing. Rather than imagining change in terms of the

42 For a selection of recent work, see Tina Loo and Lorna R. McLean, eds., *Law and Society in Canada* (Mississauga, Ontario: Copp Clark Longman, 1994).

43 Chad Gaffield, "Linearity, Non-Linearity, and the Competing Constructions of Social Hierarchy in Early Twentieth-Century Canada: The Question of Language in 1901," *Historical Methods* 33/4 (Fall 2000): 255-260.

"ordered, predictable, regular and mechanically precise" features of a clock, scholars are thinking about change in terms of a waterfall that is "turbulent, unpredictable, irregular, and infinitely varying in form."[44]

As in the natural sciences, this view of the "waterfall" of historical change supports the continued pursuit of a grand theory, a metanarrative, or a "framework" that provides the interpretive thrust required to give us a way to think about change, and to make sense for ourselves of the individual, local, immediacy of the world around us. But we need to re-think what we mean by such an interpretive thrust.[45] The interpretations that resonate most convincingly, I think, are not those that seek to replicate the works of Francis Parkman, Frederick Jackson Turner, Lionel Groulx, Maurice Séguin or Donald Creighton; indeed, any call for such linear narratives flies in the face of evidence gathered across the humanities, social sciences, natural sciences, biomedical fields, and engineering.[46]

In examining the ways in which the research results of the era of the new social history affected historical thinking, it should also be remembered that, as with all such shifting paradigms, the origins of current scholarly debate can cer-

44 N. Katherine Hayles, ed., *Chaos and Order: Complex Dynamics in Literature and Science* (Chicago: University of Chicago Press, 1991). For the discipline of history, see Randolph Roth, "Is History a Process? Nonlinearity, Revitalization Theory, and the Central Metaphor of Social Science History," *Social Science History* 16 (1992): 197-243. Recent work on how metaphors or images connect to interpretations of the world is relevant here as well; see Antonio R. Damasio, *Descartes' Error: Emotion, Reason and the Human Brain* (New York: Putnam, 1994), and Roger Penrose, *The Emperor's New Mind: Concerning Computers, Minds, and the Law of Physics* (New York: Penguin Books, 1991).

45 The need for this rethinking was clear by the mid-1980s; for one example, see Chad Gaffield, "Coherence and Chaos in Educational Historiography," *Interchange* 17/2 (Summer 1986): 112-121. A key contribution to debate as it had evolved by the early 1990s was Linda Kealey, Ruth Pierson, Joan Sangster, and Veronica Strong-Boag, "Teaching Canadian History in the 1990s: Whose 'National' History Are We Lamenting?", *Journal of Canadian Studies* 27/ 2 (1992). For an example of related scientific thinking, see Brian Greene, *The Elegant Universe: Superstrings, Hidden Dimensions, and the Quest for the Ultimate Theory* (New York: Vintage Books, 2000).

46 This argument adds an additional dimension to the more familiar emphasis on the specificity of perspective such as described in Steven Feierman, "Africa in History: The End of Universal Narratives," in *After Colonialism: Imperial Histories and Postcolonial Displacements*, ed. Gyan Prakash (Princeton, N.J.: Princeton University Press 1995), 40-65. Ian McKay offers good reason to be historiographically optimistic in "The Liberal Order Framework: A Prospectus for a Reconnaissance of Canadian History," *Canadian Historical Review* 81/4 (December 2000): 617-645. Also see Dorothy Ross, "Grand Narrative in American Historical Writing: From Romance to Uncertainty," *American Historical Review* 100/3 (June 1995): 651-677.

tainly be traced back to earlier times.[47] In the Canadian case, for example, Ramsay Cook's initial formulation in 1967 of the concept of "limited identities" can be seen as a move toward the plural as well as the specificity of context in historical analysis.[48] In earlier decades, Harold Innis described historical change in ways that resonate with current conceptualizations of complex adaptive systems, as John Bonnett has shown in his stunning and compelling analysis of Innis's major works.[49] Such insights prepared the way for the fundamental rethinking that unexpectedly resulted from the research projects that systematically used routinely generated sources such as the census, parish registers, notarial records, and assessment rolls.[50]

Similarly, it should be emphasized that the changes in historical thinking during recent decades seem to be part of a much larger phenomenon across the social sciences and humanities. While N. Katherine Hayles has been examining the connections between literature and chaotics, scholars in other disciplines, including those in the creative arts, have been forging new links with researchers in the natural sciences, engineering, and bio-medical fields. Musicians and artists, for example, are now incorporating concepts and methodologies from biology, mathematics, and telecommunications into their work while political scientists are using agent-based computer modelling to analyse human interaction.[51] Literary scholars are redefining the distinction between author and reader by using technologies that allow readers to become

47 The concept of paradigm has endured as a way to think about fundamental changes in thinking at least in part because of its vagueness; for a discussion of its initial articulation and subsequent debate, see Thomas S. Kuhn, *The Road Since Structure: Philosophical Essays, 1970-1993, with an autobiographical interview*, edited by James Conant and John Haugeland (Chicago: University of Chicago Press, 2000).

48 Ramsay Cook, "Canadian Centennial Celebrations," *International Journal* 22/1 (Autumn 1967): 659-663. For a recent perspective, see P.A. Buckner, "'Limited Identites' Revisted: Regionalism and Nationalism in Canadian History," *Acadiensis* 30/1 (Autumn 2000): 4-15.

49 John Bonnett, "Communication, Complexity and Empire: The Systemic Thought of Harold Adams Innis," Ph.D. thesis, University of Ottawa (2001). The pre-Innis twentieth-century discussion of how everyday actions relate to the broad sweep of history is examined by William Dray, *Philosophy of History* (Englewood Cliffs, N.J., 1964), especially in chapter 5. Also see Benjamin DeMott, "Rediscovering Complexity," *The Atlantic Monthly*, September 1988: 67-74.

50 Recent examples of the variety of this work include Gordon Darroch, "Scanty Fortunes and Rural Middle-Class Formation in Nineteenth-Century Ontario," *Canadian Historical Review* 79/4 (December 1998): 621-659, and Bruce Curtis, *The Politics of Population: State Formation, Statistics, and the Census of Canada, 1840-1875* (Toronto: University of Toronto Press, 2001).

51 For a discussion of how artists are engaging science and technology, see Steve Wilson, *Information Arts: Intersections of Art, Science, and Technology* (MIT 2001). Other examples of this trend are included in Richard I. Doyle, ed., *Renaissance II: Canadian Creativity and Innovation in the New Millenium* (Ottawa: National Research Council, 2001). An example

co-authors of the books they choose to read.[52] Long gone is the claim that computers have no place in disciplines such as history; indeed, in contrast to the initial ways in which the question of computerization divided the historical community, information technologies are now seen to offer an infrastructure to support unprecedented connections not only among historians but among all those involved in teaching and research including archivists, librarians, computer scientists, and students.[53]

In return, scholars in the physical sciences have been becoming increasingly interested in the human sciences. While it has often been justifiably claimed by those in the humanities and social sciences that scientific or biomedical models were being "shoved down our throats" in the development of research policies and programs, the reverse trend of enhanced recognition for cultural and social processes can now be discerned in research and teaching. Perhaps the most dramatic institutional transformation has been the expansion of "medicine" into "health" as the question of well-being was redefined as the prerogative of all disciplines. The result was the closing of the Medical Research Council and the creation of the Canadian Institutes of Health Research with the promise to bring together scholars from across the research landscape.

These examples of research activity across the disciplines emphasize that the current rationale for horizontal connections across the campus is quite distinct from C.P. Snow's desire to enhance the place of the Sciences or even from more recent calls by those such as business leaders to enhance the place of the Arts. Characteristically, both such calls reflect an outdated view not only of the sciences but also of the humanities and social sciences. Rather than seeing their value primarily in terms of providing writing skills or cultural background, current research findings suggest that disciplines such as history should be studied for the same reasons that chemistry or physics should be studied. The emerging thinking rejects any hierarchy of disciplines, or labels such as the soft and hard,

---

from political science is Robert Axelrod, *The Complexity of Cooperation* (Princeton, N.J.: Princeton University Press, 1997) and from sociology is Andrew Abbott, *Chaos of Disciplines* (Chicago: University of Chicago Press, 2001). It is also clear, of course, that a great deal of evidence can be presented concerning the continued importance of the Two Cultures; see, for example, Editors of *Lingua franca* (eds), *The Sokal Hoax: The Sham That Shook the Academy* (Lincoln: University of Nebraska Press, 2000).

52 Janet Murray, *Hamlet on the Holodeck: The Future of Narrative in Cyberspace* (Cambridge, Mass.:MIT Press, 1998).

53 Chad Gaffield, "Machines and Minds: Historians and the Emerging Collaboration," *Histoire sociale / Social History*, 21/42 (novembre-November 1988): 312-17; and Peter Baskerville and Chad Gaffield, "Shifting Paradigms and Emergent Technologies: Archives in the Modern Research World," in *Archives, Automation and Access*, eds. Baskerville and Gaffield (Victoria, B.C.: University of Victoria, 1986), 14-25. Also see Richard Morris, *Artificial Worlds: Computers, Complexity and the Riddle of Life* (New York and London: Plenum Trade, 1999).

inexact, and exact sciences. Rather, it makes clear that we have to emphasize to government, business, the general public, our university colleagues, and our students, the fundamental unity of research, of the common pursuit of knowledge, in which scholars from all disciplines can share insights, evidence, and hunches about how change occurs. Historians might also agree with N. Katherine Hayles's view that what is really needed is an increased "reversal of the usual flow of influence from science to literature." In her view, the humanities such as literature have a great deal to offer current research thinking about change since "when it comes to the kind of complex, unpredictable behaviour typical of nonlinear systems, literature has a longer history of dealing with it and is more suited to describe its complexities than science."[54] As McCloskey has wondered, "perhaps chaos is merely the historian's way of thinking getting into science."[55]

It is in this sense that historians, like their counterparts across the campus, are now working to develop explanations that make sufficient room for diversities, complexities, unintended consequences, uneven trajectories, continuities and discontinuities, multiple paths, conflicting paths, ambiguities, and contradictions. In all the disciplines, such explanations will be multi-layered, multi-dimensional, and, in the end, they will remain provisional, an approximation that still says, *it all depends, to some extent*. One result will be a more appropriate and grounded sense of who and what we are, how we got here, and where we might go. Or at least that is the hope.

54 N. Katherine Hayles, p. 21. The need for historians to help construct rather than simply apply concepts developed in other disciplines is made clear by those who reject the relevance of complexity studies for historical change; see, for example, Paul A. Roth and Thomas A. Ryckman, "Chaos, Clio, and Scientistic Illusions of Understanding," *History and Theory* 34/1 (1995): 30-44.

55 McCloskey, "History, Differential Equations, and the Problem of Narration," 36.