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DEFINING REALITY: APPLYING DOUBLE DESCRIPTION AND  
CHAOS THEORY TO THE PRACTICE OF PRACTICE

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INTRODUCTION

Two themes are addressed in this article. The first involves efforts to understand the processes of directed reform and unanticipated change in school districts. The data reported here come from a long-term collaborative project, whose research objectives have included an analysis of the influence of mainstream notions of school reform and change on a school district in the Navajo Nation which I call Pinnacle Unified School District.<sup>1</sup> The direction of the research is "studying up";<sup>2</sup> primary emphasis has been placed on the behavior and beliefs of district administrators. The author has been involved as a change agent who brought many of her ideas about school reform to the district.<sup>3</sup>

The second theme involves the development of a theoretical framework for understanding and portraying the very complex course of these reform efforts. In this paper I bring together process data from my research and an emerging and illustrative conceptual framework by which I try to explain it. In so doing, I test the heuristic capabilities of my framework against "tales from the field."

IN THE BEGINNING...

This essay has evolved from several knotty questions which arose in the course of my fieldwork. One is, "How do you address all the many different versions of reality that emerge during the course of a study?" The second is, "Given these different versions of reality, what alternative ways of understanding human behavior could account both for the stasis-inducing qualities of structure, on the one hand, and the dynamism of individual particularity, on the other?" The third is, "Why does

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1. All names in this article other than that of the author and other cited authors are pseudonym.

2. Leslie Roman, "The Political Significance of Other Ways of Narrating Ethnography: A Feminist Materialist Approach," in *The Handbook of Qualitative Research in Education*, ed. Margaret D. LeCompte et al. (San Diego, Calif.: Academic Press, 1992), 555-95.

3. Margaret D. LeCompte, "Controlling the Discourse of Culture." [paper presented at the American Educational Research Association Meetings, Atlanta, 12-16 April 1993]; Margaret D. LeCompte, "Frameworks for Hearing Silence: Why Are We Telling Stories When We Are Supposed to Be Doing Science?" in *Naming Silenced Lives*, ed. Daniel McLaughlin and William Tierney (New York: Routledge, 1993); Margaret D. LeCompte, and A. Gary Dworkin, "Giving Up on School: Student Dropouts and Teacher Burnouts (Newbury Park, Calif.: Corwin Press, 1991); Margaret D. LeCompte, "School Reform in the 1990's: What's Hot and What's Not" [Keynote speech presented at the district-wide inservice of "Pinnacle" Unified School District, October 1990]; Margaret D. LeCompte, and A. Gary Dworkin, "Educational Programs: Indirect Linkages and Unfulfilled Expectations," in *Beyond Welfare: New Approaches to the Problem of Poverty in America*, ed. Harrell R. Rodgers (Armonk, N.Y.: M.E. Sharpe, 1988), 135-68.

change seem so difficult to bring about, whether it is sought in organizations, systems, or interaction among individuals?"

This work is grounded in my fieldwork in a school district on the Navajo Reservation well-known for its innovative educational practices. It includes as part of the data — or as one of the voices in the dialogue — my own participation over the past three years as an invited consultant, change agent, and researcher for the school district. In addition to three years of rather traditional ethnographic data collection — interviews, observations, collection of documents and artifacts — part of my method has been to solicit assistance in the construction of a text that describes events in Pinnacle School District. In a sense, each of the stories told here has been told at least twice, initially by me and then as cross-checked and modified by the participants. My fieldwork also draws on my own past background as a school administrator, which has helped me achieve some legitimacy and understanding with the teachers and school administrators with whom I have worked as a university-based researcher.

#### A SEARCH FOR NEW FORMS OF ORDER

My initial data collection and analyses were grounded in symbolic interactionism.<sup>4</sup> That is, I was concerned with how people constructed the meanings that governed their actions, and how those actions, as well as interactions with others in the district, informed and shaped subsequent behavior and meaning.<sup>5</sup> My goal was to explore how these meanings defined the realities in which people lived and thus affected processes of change. I soon discovered that change — at least in the direction that district personnel said was desirable — was not taking place. This was puzzling, given the commitment of people in the district to innovation and change. Further, the symbolic interactionist perspective I had been using, by itself, was insufficient to explain the glacially slow pace of reform I had observed. In earlier work, I have begun to develop a theoretical framework in trying to address the apparent stalemate in Pinnacle District.<sup>6</sup> In it, I take issue with some aspects of current rhetoric in collaborative, critical, and multivocal research, suggesting as an alternative that the conduct of such research, as well as the analysis and interpretation of the data it yields, is better informed by two alternative frameworks. The first is chaos theory, whose "order within randomness" and focus on regularities among simple, minutely different, apparently discrete and unrelated phenomena pose, to me, an antidote to

4. Herbert Blumer, *Symbolic Interactionism: Perspective and Method* (Englewood Cliffs, N.J.: Prentice-Hall, 1969); Irving Goffman, *The Presentation of Self in Everyday Life* (Garden City, N.Y.: Doubleday, 1959); and Niels W. Brarø, *Indian and White: Self-image and Interaction in a Canadian Plains Community* (Stanford, Calif.: Stanford University Press, 1975).

5. Margaret D. LeCompte and Daniel McLaughlin, "Witchcraft and Blessings, Science and Rationality: Discourses of Power and Silence in Collaborative Work with Navajo Schools," in *Power and Method*, ed. Andrew Gitlin (New York: Teachers College Press, 1994, forthcoming).

6. LeCompte, "Frameworks for Hearing Silence."

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the inadequacy of current theoretical frameworks for explaining social system dynamics.<sup>7</sup> The second is Gregory Bateson's notion of "double description," from which I develop the idea of a kind of double consciousness that researchers must adopt in order to understand the contexts and people they are studying.<sup>8</sup> Double description generates the complex data needed to examine phenomena from multiple perspectives; chaos theory provides the rationale for multiple perspectives as well as a framework for affirming and understanding change in systems.

In this first section of the essay, I provide a brief description of chaos theory and double description. The second half of the paper consists of two vignettes or stories which I use as vehicles for an illustrative analysis using both chaos theory and double description.

#### THE DISORDERLY PROCESS OF ETHNOGRAPHY

One focus of this paper is the lack of pattern or order alluded to in my first question: What do ethnographers do with the multiple stories and realities they find in their field sites? Ethnographers traditionally have been asked to discover some kind of order and sense within the whirling, buzzing, noisy jumble of human behavior. However, sometimes what is observed in the field seems to make no sense, given any form of order we currently understand. No consensus, no consistent whole, can be pulled from the multiple stories informants tell the ethnographer. When no synthesis is apparent, many ethnographers have resorted to telling a group of stories and letting the reader decide how to integrate them.<sup>9</sup> My solution to this dilemma has been to search for a new form of order.

#### CHAOS THEORY: ORDER AND PATTERN WITHIN RANDOMNESS

Chaos theory provides one way of looking at both order and change, one which, though first applied to the physical world, finds increasing relevance in the human world as well.<sup>10</sup> In the sense used by mathematicians, physicists, chemists, and an increasing number of literary critics, physical and social scientists, chaos does not mean purposeless or totally random disorder. Rather, the term "chaos" is a technical term referring to randomness within systems, or a form of order that rejects traditional Newtonian forms of predictability and uniformity deriving from linear

7. James Gleick, *Chaos: Making a New Science* (New York: Viking, 1987).

8. Gregory Bateson, "Difference, Double Description and the Interactive Designation of the Self," in *Studies in Symbolism and Cultural Communication*, ed. F. Allan Hanson (Lawrence: University of Kansas Publications in Anthropology, 1982), 3-8; Pamela J. Annas, "New Worlds, New Words: Androgyny in Feminist Science Fiction," *Science Fiction Studies* 5 (1978): 143-56; and LeCompte, "Frameworks for Hearing Silence."

9. For discussions of this strategy, see Bella Brodski and Celeste Schenck, *Life/Lines: Theorizing Women's Autobiography* (Ithaca, N.Y.: Cornell University Press, 1988); Clifford Geertz, *Works and Lives: The Anthropologist as Author* (Stanford, Calif.: Stanford University Press, 1989); George Marcus and Michael Fischer, eds., *Anthropology as Cultural Critique: An Experimental Moment in the Human Sciences* (Chicago: University of Chicago Press, 1986); Mary Mason, "The Other Voice: Autobiographies of Women Writers," in Brodski and Schenck, *Life/Lines*, 19-44; McLaughlin and Tierney, *Naming Silenced Lives*; Stephen A. Tyler, "Postmodern Ethnography: From Document of the Occult to Occult Document," in *Writing Culture the Poetics and Politics of Ethnography*, ed. James Clifford and George Marcus, Berkeley, Calif.: University of California Press, 1986; and Roman, "Political Significance of Other Ways of Narrating Ethnography."

10. Gleick, *Chaos*.

systems such as those found in classical physics. As the fictional mathematician, Ian Malcolm, says in the novel, *Jurassic Park*: "Chaos explains how the real world works....[Chaos] means there are hidden regularities within the complex variety of systemic behavior. Chaos theory says complex systems have an underlying order [and] that simple systems can produce complex behavior."<sup>11</sup>

Linear order creates the predictability or regularity found in linear systems among *individual* events, items, or phenomena. It is this order which social scientists assumed the physical sciences, especially physics, to have — and which, in an *unfortunate parody*, most traditional social sciences tried, however inappropriately, to emulate.<sup>12</sup> Chaos theory, by contrast, is a theory of regularities within nonlinear systems and processes — systems which had hitherto been considered too difficult to study or too wild and unusual to be of interest.<sup>13</sup>

Chaos theory is concerned with a search for underlying simplicities, principles, or regularities in what otherwise appear to be complex, random, unpredictable, or chaotic events and systems, such as the weather or human culture. Chaos theory elucidates the shape of processes but does not predict the exact behavior or characteristics of any specific individual parts or happenings within the system. What is important about chaotic order is that what appears to be extreme complexity, infinite variability, and even randomness of events when viewed close-up begins to fall into ordered patterns when looked at from a different vantage point in time, space, scale, or conceptual frame. For example, by examining glass on intermediate scales — of several atomic or molecular units rather than just one — scientists recently have found in it a kind of crystalline order quite different from the *amorphous structure* it heretofore was held to possess.<sup>14</sup> Like *fractals*, cloud formations, the expansion and contraction of animal populations, the beating of the human heart, and many other phenomena which also exhibit chaotic order, everyday human existence consists of thousands of events — and thousands of interpretations of those events — which closely resemble each other but are not exact duplicates. Seen in close proximity, or from one vantage point alone, they do not make any kind of sense. Seen from other vantage points, patterns begin to emerge, just as a crystalline order now can be found in glass.

These patterns or orderings often are based on a few extremely simple mathematical rules or conceptual explanations which create an order or pattern without eliminating the unpredictability or uniqueness of individual events.<sup>15</sup> Such randomness within a system often provides a better model for naturally occurring phenomena than does regularity within a system.

11. Michael Crichton, *Jurassic Park* (New York: Ballantine Books, 1990), 75.

12. Evelyn Keller and Christine Gronkowski, "The Mind's Eye," in *Discovering Reality*, ed. Sandra Harding and Merrill Hintikka (Boston: D. Reidel, 1983), 207-25.

13. Gleick, *Chaos*.

14. Ivan Amato, "A New Order in Glass," *Science* (7 June 1991): 1377.

15. Marion Dobbert and Ruthanne Kurth-Schai, "Systematic Ethnography: Toward an Evolutionary Science of Education and Culture," in LeCompte et al., *Handbook of Qualitative Research*, 93-161; and Gleick, *Chaos*.

Chaos theory addresses the problem of stability by viewing it as abnormal; absolute regularity, in fact, frequently describes the condition of a *perfectly static* system, in imminent danger of collapse because it is unable to respond adequately to new or unique conditions. This is the case with the human heart; scientists now know that immediately before a cardiac arrest, the human heart achieves a perfectly regular beat. Thus traditional medication for heart patients, whose goal was to regularize the heart rate, may actually put such patients at risk because their hearts cannot respond adequately to external stimuli. Human social systems may behave in the same fashion. To the extent that they remain static and do not respond to new conditions, they may be in danger of painful, sudden, and violent perturbations, or even collapse. This is why I believe that chaos theory, with its model of apparent complexity and randomness within systems, is a good model for culture. It retains complexity and dynamism while challenging the stasis of structural functional models which still dominate, however implicitly, the social sciences, even in the work of critical theorists. Such models can describe what happened at a point in time, but they do not do a very good job of addressing dynamism, adaptation, and change. For example, one explanation of the current crisis in urban schools in the United States may be that neither the schools themselves nor the society in which they are located have been able to respond adequately to new external conditions of crime, poverty, and racism, rendering many schools near dysfunction. My question has been *how to explain such a dysfunctional inability to change*. For this, I have drawn on two components of chaos theory: the so-called "Butterfly Effect" and "strange attractors." THE "BUTTERFLY EFFECT," OR HOW LITTLE PROBLEMS CAUSE BIG CRISES

Understanding ordering principles does not explain the causes of violent and apparently unpredictable changes in systems. However, what Edward Lorenz called "sensitive dependence on initial conditions" or the "Butterfly Effect" does provide some guidance.<sup>16</sup> The Butterfly Effect examines very tiny inputs to a system. Scientists principally study linear systems, in which outputs can be expected to be more or less in proportion to the size or characteristics of an input. Hence, they usually are concerned only with big inputs, believing that since these are the only ones likely to have an impact on the system, they are the only ones worth studying.

The Butterfly Effect, however, considers *nonlinear systems*, and the impact of inputs so small that scientists have previously tended to overlook them, view them as irrelevant "noise," or to try to control them away. The effects of very small inputs can, as they multiply throughout complex systems over time, translate into profound and violent alterations in the system. Lorenz, the meteorologist who discovered the effect, described it as the "notion that a butterfly stirring the air today in Beijing can transform storm systems next month in New York."<sup>17</sup> Critical to the Butterfly Effect are points of instability, or places that are extremely sensitive to small inputs. An example might be a very small rock resting on top of a snow-packed mountain. A small push can send it tumbling down, creating a large avalanche.

16. Edward Lorenz et al., "Deterministic Nonperiodic Flow," *Journal of the Atmospheric Sciences* 20 (1963): 130-41.

17. Gleick, *Chaos*, 8.

The Butterfly Effect exists in nonlinear systems, or systems that do not conform to laws of ordinary predictability. Scientists have been trained to view these systems as anomalies which contradict the stereotype of "real" science, the science of periodic, predictable, and linear models.<sup>18</sup> Consequently, such systems are not often taught to novice scientists, whether in natural or social sciences. Because social scientists have emulated what they believe to be the model of "real" science, predictability and regularity also have been thought to characterize social or human systems.

It is becoming increasingly clear, however, that *predictable* and *linear* systems are, in fact, anomalies, and that *nonlinear* systems are perhaps the most common systems of all. They include most biological systems; fluid systems except under the most placid of conditions; the weather; and the shapes of leaves, trees, coastlines, and crystals. In my opinion, they also include most social systems, including school districts such as Pinnacle. While Lorenz described the Butterfly Effect in terms of weather systems, I believe that it is an excellent way to explain much that seems inexplicable or disconnected in human social life. In social systems, a very small event, such as the assassination of the Archduke in Sarajevo, can reverberate throughout a system to cause a very big event, in this example, World War I. In my fieldwork, a simple remark by a superintendent to a group of teachers hit a critical point of instability in the system — one related to the teachers' historical and generic distrust of administrator motivations — and caused a big blow-up (described below). Other sensitivities provided a catalyst for resistance to change.

The Butterfly Effect is, however, far more complicated. Nonlinear systems have critical points of instability throughout. Therefore, such systems are sensitively dependent not only on initial inputs, but on inputs at any point of time or place, or on any scale. The problem for researchers is not only to discover what the underlying ordering principles are; they also must discover the composition of whatever critical points of instability at which the system might be sensitive. In fact, the existence of Butterfly Effects can alert researchers to the potential future effects of small events observed today.

With this information, it may not be possible to predict exactly which teacher would explode or what kind of change would occur, but at least it would be apparent that *some sort of change would occur, and one could have a general idea of the areas that it would affect*. To understand fully what precipitated the teacher blowup following the Pinnacle District superintendent's statements would require going backwards in time and elsewhere in place to see what other sensitivities, obstacles to communication, or barriers to information flow might help to explain events in the present.

#### STRANGE ATTRACTORS

In mechanical and physical systems, attractors are analogous to a center of gravity; they are points within an orbit that attract a system to it. Strange attractors

18. Gleick, *Chaos*; Keller and Grontkowski, "The Mind's Eye"; and Joyce McCarl Nielson, "Introduction," in *Feminist Research Methods*, ed. Joyce McCarl Nielson (Boulder, Colo.: Westview Press, 1990), 1-41.

exist in complicated systems which may have more than a single attractor. They are called "strange" because they provide a source of both complexity and simplicity, and of both randomness and determinism. Viewed mathematically, strange attractors produce graphs or diagrams in which the points wobble around a fixed set of points, never producing a predictable or replicated path, but keeping within some general boundaries. This produces variety within bounds — a description that well describes the wobbling around various kinds of innovation or problems that characterize school reform efforts — or in the case of Pinnacle District, patterns that resist change.

Strange attractors also exist in school systems, in the form of rigidities or other factors that both dampen and drive change. Change, or reform, is damped by forces that tend to bring change to a halt, and driven by inputs that stimulate change. In school districts, the cumulative effect of damping and driving forces cancel each other out, so that while the general wobbling or oscillation of the system creates a varied picture, the system never shifts from a relatively predictable or familiar pattern. While increased input of information is, as N.K. Hayles asserts, the source of the randomness and creativity that drive change, such inputs also are a source of frustration that damps it.<sup>19</sup>

#### ISSUES OF REALITY, STABILITY, AND CHANGE

One of the principal criticisms of traditional, or normal, science is that it renders issues of change — or revolution — in systems of order so problematic. If change does occur, it does so in the context of a paradigm shift, with subsequent re-normalization and stasis.<sup>20</sup> Since chaos theory is, in fact, a way of looking at order and systems, it could lead back into a sort of deterministic trap: that while there was process and dynamism *within* the system, systems ultimately would become rigid because of the ordering principles underlying them. However, the Butterfly Effect provides insurance against this kind of normalization of structure or conceptual ossification. As a characteristic of complex, nonlinear, aperiodic systems, the Butterfly Effect ensures systemic health by assuring that systems always will be subject to change. This is because instabilities, which are sensitive to prior conditions, are built into each variable that constitutes the system. These instabilities create the dynamism — the processual change — which has been termed "chaos"; without it, systems atrophy because they cannot change and adapt.

Sensitivity to initial conditions, whenever they may have occurred, assures that systems will be able to respond to novel conditions. This type of behavior and pattern of response characterizes human systems. Human systems, even schools and classrooms, also are complex, nonlinear, and aperiodic. As a consequence, they too exhibit chaotic forms of order, which are in fact not irrational or random. For example, every day in a classroom differs, but seldom does a day occur that is so radically different that it is *unrecognizable from the others*. Should such a radical

19. N.K. Hayles, *Chaos Bound: Orderly Disorder in Contemporary Literature and Science* (Ithaca, N.Y.: Cornell University Press, 1990).

20. Thomas B. Kuhn, *The Structure of Scientific Revolutions*, 2d ed. (Chicago: University of Chicago Press, 1970).

difference occur, it will be as a consequence of new conditions, which will in fact alter the way the classroom operates altogether. In that way, change will actually facilitate system survival.

Recognition of such fluidity in human life raises another question. In chaotic systems, what constitutes reality? To me, it now seems that reality must consist of the rules governing the process. The rules by which the game is played *can* be known with some degree of certainty, though not the individual or specific events or strategies within any given game. This certainly is the case with cultural systems. One may know the rules for proper behavior at a given event; how the rules are applied varies somewhat, depending on the individual participants, as well as the time, place, and situation of that event. At least at one level, these rules and regulations are analogous to the mathematical principles by which Lorenz explained the chaotic behavior of water wheels, weather, and boiling liquids. This formulation conforms to much sociological thinking, in which individuals interact with and on social systems which, in setting forth existing sets of socially determined rules, expectations, and obligations, constrain individual behavior but do not completely determine it.

#### DOUBLE DESCRIPTION, OR "WHO REALLY IS TELLING THE TRUTH?"

In this section, I shift from a discussion of chaos theory itself to an analysis of the kind of data needed to generate a "chaotic" interpretation of events. These data yield multiple interpretations of events — the "buzzing, whirling, noisy jumble" of the ethnographic field site. These can be viewed either as random idiosyncracies, or as sources of diversity yielding information. A principal concern is how to reconcile them — a concern traditionally framed in terms of ferreting out the "true" or "real" story.

The idea of trying to figure out which informant really is telling the truth reminds me of the long and still unresolved argument over the reliability and validity, or truth value, of ethnographic work.<sup>21</sup> John P. Dean and William F. Whyte's article called "How Do You Know If the Informant is Really Telling the Truth?" and a related one by George J. McCall on data quality control, state a traditional set of assumptions about informant veracity.<sup>22</sup> The first is that the problems of validity are actually technical problems that can be resolved by sufficient rigor and meticulous attention to training of researchers. The second is that problems of validity arise because for a variety of reasons, informants are unable or unwilling to tell the truth.<sup>23</sup>

21. See Margaret D. LeCompte and J.P. Goetz, "Problems of Reliability and Validity in Ethnographic Research," *Review of Educational Research* 52, no. 2 (1982): 31-60; Yvonna Lincoln and Egon Guba, *Naturalistic Inquiry* (Beverly Hills, Calif.: Sage Publications, 1985); M.A. Eisenhart and Kenneth R. Howe, "Validity in Educational Research," in LeCompte et al., *Handbook of Qualitative Research*, 643-81; and Margaret D. LeCompte and J. Preissle, *Ethnography and Qualitative Design in Educational Research*, 2d ed. (San Diego, Calif.: Academic Press, 1993).

22. John P. Dean and William F. Whyte, "How Do You Know if the Informant is Telling the Truth?" in *Issues in Participant Observation*, ed. George J. McCall and J.L. Simmons (New York: Random House, 1969), 105-15.

23. See George McCall, "Data Quality Control in Participant Observation," in McCall and Simmons, *Issues in Participant Observation*, 128-42.

However, Dean and Whyte's title could be re-cast to ask, "of all the many truths being told by my many informants, which ones make a difference in the course of events?" rather than asking "how do you know if the informant is really telling the truth?" The former position rejects no interpretation as invalid. The stance of traditional researchers, who simply say that the informant is lying, is saying something he or she thinks the researcher wants to hear, or is deranged, is inadequate because each of these versions of truth constitute reality to some informants in the system. As such, researchers must both include them in their description, and examine them for their impact on sensitive initial and subsequent conditions.

#### A DEFINITION OF DOUBLE DESCRIPTION

Bateson suggests that double description is a way of looking at and understanding a world that consists of multiple realities. Double description precedes and is required for an analysis using chaos theory. Using a visual metaphor, Bateson asserts that if descriptions are generated with only one eye, the brain receives phenomenological perceptions which lack the depth perception derived from integrating perceptions from both eyes.<sup>24</sup> Depth perception comes from "a combination of two versions of the outside universe very slightly different from each other," versions that differ from each other in logical type.<sup>25</sup> These differences arise because, in this example, looking with only one eye sends data from only one perspective to the brain. Binocular vision, by contrast, involves seeing a phenomenon with both eyes so that, in effect, the researcher has two or more descriptions rather than one. Bateson points out that double description creates a boundary problem because it is constituted by the blurring of two or more distinct and different visions. Because single vision only produces the image of a discrete unit, double description is needed to blur the clear boundaries between units such as "self," "other," "mind," "body," "object," "subject," "researcher," and "researched." This blurring, or double vision, is what actually creates double description. While double description renders a blurry picture, it nonetheless is a much more adequate portrayal of phenomena, because the blurring of differences between the images (or data) creates depth perception, just as the binocular vision of human beings does. In science, this depth consists of location in contexts of time, place, and belief.

Unique to Bateson's conception is the importance ascribed to *difference*. Rather than celebrating mere single or unitary vision, Bateson advocates striving for the greater accuracy and multidimensionality produced by attention to diversity and difference. With one "eye," researchers record what they "see" the subject doing, creating a record of the participant's activities, often in the participant's own words. With the other, they record a whole range of other data, including what they themselves are doing and what others involved in the research setting are feeling and doing. Thus, in the practice of the project, the boundaries between researcher-as-reporter and researcher-as-participant become blurred. The double description I recorded during my fieldwork included data on what I saw others doing; what those

24. Bateson, "Difference, Double Description."

25. *Ibid.*, 3.

others told me they were doing; what I thought I was doing; and, to the extent possible, what others thought I was doing.

#### ACHIEVING DOUBLE DESCRIPTION

Double description generates what Geertz called "thick description."<sup>26</sup> Bateson says that the practice of double description requires three kinds of learning. The first is learning details, the second is learning the patterns and contexts in which relationships occur, and the third is learning to change and adapt to new situations.

The first two kinds of learning involve more or less static situations. However, Bateson built dynamism into his concept of double description by defining as critical the third kind of learning — how people figure out how to engage in the process of change. He termed this kind of learning "deutero-learning." Deutero-learning is what permits — or forces — "interactants to change so as to fit themselves to the ongoing pattern of relationships" between people, between people and any chunk of the physical environment, or between people and any other kind of environment.<sup>27</sup> Without the ability to engage in deutero-learning — or adaptation and learning *how* to adapt — people cannot "make sense" of their world. As I have indicated elsewhere, the deutero-learning process often is lengthy and painful; since it is hard-won, the sense people make of the world is rather stable and resistant to change.<sup>28</sup> Researchers need to access the deutero-learning processes engaged in by their research participants in order to discern the participants' sense-making processes; this also may make clear where resistance to change is located.

#### DOUBLE DESCRIPTION AND DOUBLE CONSCIOUSNESS

Double description requires double consciousness, or a form of empathy or intersubjective understanding that involves more than simply trying to understand unilaterally how subjects make sense of the world, and more than a simple additive procedure whereby the description rendered thickens with the inclusion of an increasing number of voices. Double consciousness is an awareness or embrace of the "other" in ways that link researcher and researched. Furthermore, double consciousness also necessitates links to an external context. No act can be justified simply within its own context. The text created within the study, whether by the researcher alone or in collaboration with participants, and the sense of reality it conveys, is mediated by and situated not just within itself, but within constraining networks of time, place, beliefs, and historical context. This is why events in Pinnacle District did not make sense — either to me, and as I describe in the vignettes, or to the people in Pinnacle — until they were examined from the multiple vantage points of person, time, place, and cultural context mandated by chaos theory.

26. Clifford Geertz, "Thick Description: Toward an Interpretive Theory of Culture," in *The Interpretation of Cultures*, ed. Clifford Geertz (New York: Basic Books, 1973), 3-33.

27. Bateson, "Difference, Double Description," 5.

28. LeCompte, "Frameworks for Hearing Silence."

#### DEVELOPING DOUBLE CONSCIOUSNESS

As I have indicated elsewhere, many researchers find the actions of their informants inexplicable.<sup>29</sup> In part, I think that this is a consequence of poor fieldwork technique and inadequate time in the field. Role theorists and symbolic interactionists tell us that people enter settings with different sets of expectations, aspirations, and background experiences. These differences provide a context that helps explain differences in how people experience, interpret, and subsequently describe their experiences in any given setting or interaction. From these differences arise what researchers have come to call "multiple voices" or multiple realities. If researchers do not spend enough time exploring the lives of their research participants and expend meticulous effort chasing down alternative explanations and viewpoints, they never will be able to recognize, elicit, describe, and elaborate the multiple contexts that generate the different levels of reality within which their informants operate and the voices they use to describe those realities. Only these varied contexts can generate double description.

In the remainder of this essay, I will try to show how chaos theory helped to make sense of the kinds of phenomena I observed in Pinnacle School District, and how the data I needed to use chaos theory had to be assembled using double description and double consciousness. Double description rendered possible rich data on the meaning and symbolic uses of interaction in the immediate setting of Pinnacle. Chaos theory provided a vantage point from which a way out of the impasses I encountered could be discerned. Of critical importance to this analysis is an examination of the relation between social systems or structures and individuals; social systems do not exist independently of the people who inhabit them. Rather, systems and structures are constructed by humans and act in ways that can be illuminated by chaos theory.

I use field data excerpts to exemplify intractable misunderstandings or differences in realities within organizations and between cultures. These differences led individuals to get trapped within sets of expectations they, and others, had for how they must enact the roles they play within the social settings they inhabit. The stories presented in the following vignettes describe how these sets of expectations shaped past and present events in the school district and led, in their unfolding, to my application of chaos theory. The stories are constructed using double description; they also attempt to illustrate the development of double consciousness.

#### THE MULTIPLE WORLDS OF PINNACLE SCHOOL DISTRICT

##### VIGNETTE ONE:

##### WHOSE SIDE ARE YOU ON? THE OPPOSING WORLDS OF TEACHERS AND ADMINISTRATORS

Prior to his promotion to the position of Assistant Superintendent, Jim Aspen had served as principal of Pinnacle High School. During his tenure there, he was well-known for his open door policy to teachers and students; in fact, the door was not necessary because he was seldom in his office. Trusted and beloved by his teachers, his philosophy was that a good administrator had to be open and visible; to that end,

29. *Ibid.*

he was in and out of classrooms regularly and available as a shoulder to cry on for teachers whose difficult job he recognized and sympathized with. His concerns were not limited to teaching staff; as one teacher reported, "You could find Jim by looking for kids sitting on the floor during break or lunch hour. Find the group with a pair of long adult legs sticking out; Jim would be in the middle, having a chat with the students."

Since his move to the central office, Mr. Aspen had been deeply involved in thinking about restructuring in Pinnacle District, which centered on teacher change and shared decision making. The protagonists of the drama involved three Navajos: the Superintendent and two ancillary staff members. All other building level administrators and staff development personnel, as well as over 80% of the teachers in the district, were white. The superintendent and Jim Aspen had spent a year talking about the need to change the way teachers teach Navajo children. As their consultant, I had urged them to include teachers in their discussions of how and in what ways to change teacher behaviors and beliefs. After months of discussion, Mr. Aspen invited several teachers from each building to the seminar I taught on school reform, which they had christened the "planning team meetings." These meetings had included all of the people at administrative rank in the district, the controller, and the staff development team — but no teachers.

The next meeting of the planning group, whose topic was a discussion of Vygotskian approaches to learning, went uneventfully. Three white teachers from the high school attended, sitting in wary silence. This surprised me, because they had been among Mr. Aspen's most trusted staff members until the previous fall when he was promoted to Assistant Superintendent. They had frequently praised his sensitivity and understanding as an educational leader and friend.

The agenda for the second meeting included discussion on how to implement in Pinnacle District ideas from the Kamehameha Early Education Project (KEEP).<sup>30</sup> Mr. Aspen opened the second meeting. "You know," he said, "Teachers already have a lot of ideas about how things should go. Speaking purely hypothetically, it would be a lot easier to create the ideal school if you could just start all over again, with a brand new building and brand-new staff. That way you wouldn't have to undo so much of what had been messed up in the past." He continued, asserting that while many teachers were talented, there were others who simply did not want to change anything. Their presence made it very difficult to implement reform in existing schools. The discussion moved on to how the KEEP project had dealt with obstacles to change. After the meeting, two of the three teachers sent word to the central office that because they had been so grossly insulted, they would never attend another

30. K.H. Au, "Participation Structures in a Reading Lesson with Hawaiian Children: Analysis of a Culturally Appropriate Instructional Event," *Anthropology and Education Quarterly* 11 (1980): 91-115; K.H. Au and Cathie Jordan, "Teaching Reading to Hawaiian Children: Finding a Culturally Appropriate Solution," in *Culture and the Bilingual Classroom: Studies in Classroom Ethnography*, ed. Henry Trueba, G.P. Guthrie, and K.H. Au (Rowley, Mass.: Newbury House, 1981), 139-152; R.G. Tharp and Ronald Gallimore, *Rousing Minds to Life: Teaching, Learning and Schooling in Social Context* (Cambridge: Cambridge University Press, 1988).

meeting with the administrators. Such treatment as they had received in the meeting was no way to promote shared decision-making processes with the faculty.

In shock, Mr. Aspen dispatched me to the high school to find out what had happened. There, I found the social studies teacher — who was widely acknowledged to be one of the best teachers in the district — in tears. "I thought we were going into a meeting where we all were going plan how to change the district. And all I find out is that they plan to fire all the old teachers and start over again!"

I was dumbfounded. How, could one little remark, which I had taken as an offhanded comment, be interpreted as a precursor to dismissal? Given that all the teachers had deeply trusted Mr. Aspen just a few months previously, what worldview could the teachers have created that would permit so profound a misunderstanding and lack of trust to develop so quickly? My efforts to mediate did not change the perceptions of the teachers, and though he talked to each of them, Mr. Aspen did not learn from them what to do to remedy their anger. What had so disordered relations between Mr. Aspen and his former teachers?

To understand fully what precipitated the blowup would require another vantage point, one that looked backward in time and elsewhere in place to see what had aroused the teachers. Using concepts from a chaos theory framework, the problem would be to locate both the initial conditions that had led the "butterfly" to flap, and the instabilities within the system that were sensitive to the butterfly's wings. The interaction between teachers and Mr. Aspen pointed to a critical instability in school districts: the distrust teachers hold for administrators acts to create explosions which might, at first, seem inexplicable and random, but which could have been foreseen if initial sensitivities had been identified. Over time, Pinnacle teachers and administrators had constructed a pattern of mutual disrespect transcending even these particular teachers' good opinion of Mr. Aspen; this construction acted as a strange attractor around which attempts at changed governance wobbled, but never shifted out of existing boundaries. The failure of Pinnacle teachers to participate enthusiastically in new forms of governance, in turn, provided negative feedback to administrators. It was construed as apathy, which reinforced their conviction that teachers could not be trusted with authority. The explosion over Mr. Aspen's meeting did not lead to a bifurcation, or a shift to a new state — such as a more egalitarian sharing of power and decision making in the district — because of strange attractors within the system which damped efforts at change: factors such as poor information flow and fear of risk-taking, whose origins I discuss elsewhere.<sup>31</sup>

From the vantage point of history, the full impact of Mr. Aspen's statement also is yet to be determined, because it continues to reverberate through the system. Another way of thinking about this is in terms of systemic memory. Like elephants, systems — especially human systems — never forget. Their history never heals itself; old events still contribute to new ones. This means that old stories contribute to the

31. LeCompte, "Controlling the Discourse," and Margaret D. LeCompte and M.E. Wiertelak, "Constructing the Appearance of Reform" (paper presented at the American Educational Research Association Meetings, 20-24 April 1992, San Francisco).

interpretation of new events, making it difficult from the vantage point of a single time period to determine what actually happened in any given situation. Thus, the data needed for a chaotic analysis require a special richness. If hard scientists need difference tools to observe chaos in systems, then social scientists also need different approaches — or conceptual tools — that facilitate the development of those vantage points from which to observe patterns more clearly.<sup>32</sup> At this point in my research, I found at least one partial remedy: to make sure that as many of the stories as possible are gathered and put into historical perspective — this required double description.

#### VIGNETTE TWO:

##### CULTURAL CONSTRAINTS AND CONFLICTS, OR, I'M PEDALING AS FAST AS I CAN

Mr. Aspen and Daisy Benally, the coordinator of a group of specially funded programs, had long been allies in moving the local school board ever-closer toward school reform. Mr. Aspen had worked closely with the Board, which was made up of Navajo businessmen and women from the community, and counted some of the Board members as critical representatives of community opinion. However, he trusted Mrs. Benally to be an even more valuable source of information about the community, Navajo life in general, and the schools. As a local Navajo, Mrs. Benally is deeply involved in the politics of the local chapter house. She is a school administrator, responsible for writing and administering grants and supervising the staff who are responsible for vocational programs. She has organized parent involvement and cultural programs, and presides over a district-funded community center housed in a beautiful hogan-like structure with meeting spaces; a library of books, audio and videotapes, and materials on Native Americans. Several educators in the district have described Mrs. Benally and her assistant to me as "born-again Navajos," or people who had at one time been estranged from traditional ways, but who are now enthusiastically promoting a renaissance of traditional beliefs and practices. Mr. Aspen feels that Mrs. Benally "really represents the Navajo perspective. And we really need that." He also describes her as someone with "a lot to offer the district" but that "she doesn't have enough to do. She should be spending more time working with staff development. She needs to be doing more with programs for kids."

Since Mrs. Benally had been involved in several staff development meetings where planning for a curriculum compatible with Navajo culture had been the focus, I wondered why administrators believed that the Community Center she ran had little impact on teaching, and why the cultural programs she directed took place mostly after school and in summer school programs. Mr. Aspen believed that these were patronized by adults from the community, rather than by regular students.

Daisy Benally was clearly frustrated by the added tasks the Assistant Superintendent wanted her to do. On a tour of her library, she complained,

A lot of the teachers, they just aren't serious about really supporting Navajo culture. This library is full of books and tapes, and the teachers never come in here. The other day, I had Steve Darden [a Navajo consultant on Native American culture] here to talk about the way Navajos learn from their hand [as a mnemonic device], and I thought that the Middle School kids would really like it. And the principal never even returned my call. If the administration were really serious about

32. Dobbert and Kurth-Schai, "Systematic Ethnography."

Navajo culture, they would be hiring some local Navajos as administrators. I work really hard to build up Navajo culture and the meanings — the sash, what it means to make moccasins, the sand paintings and the weavings. It isn't just art classes. I learned all those things from my grandmother and my aunts and they really help me learn about my culture. So I try to bring them back to the Navajo people because they've almost forgotten them. I do my job all day long, and then I organize these afternoon and evening classes in Navajo language and culture and the storytelling and all that. It's a lot, a lot of work. If a teacher doesn't show up, I just teach the class myself, and I taught myself to do some of the things we couldn't find teachers for. It's an extra four hours on top of a whole day. And it isn't in my job. Since the teachers and administrators never even come in here, they really don't understand what I do.

She then showed me shelves of account books and proposals.

I have to write all those proposals and keep all those budgets. Every few months, there are more reports to write. And I have to keep an inventory of all the equipment and everything we buy so the government don't get us in trouble. They [the administration] just don't understand how much work it is. And I'm just me and a secretary. I can't do anything more unless they take over some of what I'm already doing. Like all those Johnson-O'Malley proposals: they are due in July and they think I'm just going to be here on my vacation doing them. We put in two whole fields of corn this spring and I have two men coming to chop them in July. I've got to be there to supervise them. And the chapter house — that takes time, too. Sometimes none of the other officers are around and I have to sign a check or make a decision about something for the community. I can't just drop all that. If they ask me to do more, I'll quit.

Jim Aspen already understood the contracting and budgetary process because oversight of contracts and budgets was part of his job as superintendent. While he might not have understood all of Mrs. Benally's community responsibilities, he did have some idea of the scale of programs for which she was responsible. The questions for me became, what could explain his belief that she "didn't have enough to do?" and what consequences this belief would have for Pinnacle District.

#### A COLLISION OF WORLDS

Each of these examples represents what I have come to define as *conflicts or collisions* between and among world-views. The meeting between Mr. Aspen and the high school teachers represents a collision between the world of teachers and that of central office administrators. Yet another apparently inexplicable conflict is between the Navajo world and the Anglo world, as illustrated in part by the case of Daisy Benally. In the context of Pinnacle School District, conflicts between cultural worlds go deeper, and add to the complexity of the research site. Donna Deyhle and others document some of these conflicts:<sup>33</sup>

- Anglos want to get things done quickly and efficiently. They say, "Navajos talk in circles and never get to the point." Navajos retort, "Anglos are always in a hurry. They interrupt people and never want to hear the whole story."
- Navajos say that anything really important takes time to discuss. If a topic is worth talking about at all, it's worth having a meal over. Anglos argue that a meeting with Navajos never accomplishes anything, and they take *all night!*

33. Donna Deyhle, "Empowerment and Cultural Conflict: Navajo Parents and the Schooling of Their Children," *Qualitative Studies in Education* 4, no. 4 (1991): 277-97; Donna Deyhle, "Constructing Failure and Maintaining Cultural Identity: Navajo and Ute School Leavers," *Journal of American Indian Education* (January 1992): 24-47; Jerry Lipka, "A Cautionary Tale of Curriculum Development in Yup'ik Eskimo Communities," *Anthropology and Education Quarterly*, 20, no. 3 (1989): 216-32; and Karen Swisher and D.M. Pavel, "American Indian Learning Styles Survey: An Assessment of Teacher Knowledge," unpublished paper, Arizona State University.



• *Navajos learn by modelling the behavior of experts.* They watch carefully, not attempting an action until they feel they can do it fairly well on the first try. Anglo novices are encouraged not to fear initial failure, but to go ahead and attempt behavior in which they clearly aren't skilled, so that in successive trials they can approximate a more competent performance.

Niels Braroe has documented how such differences structure behavior and belief in a community of whites and Indians so that over time, patterns of mutual distance, distrust, and contempt are solidified.<sup>34</sup> In *Pinnacle District*, these issues are played out in conflict between Navajo children and Anglo teachers, between Navajo and Anglo administrators and teachers, and between and among all members of the community. They create collisions which impede communication, make the two groups define each other as shifty, hostile, untrustworthy, rude or uncaring, and generate less enthusiasm about cooperative work. My question, both as an action researcher and a scholar, has become: How can these issues be resolved so that some sort of coherent description of events can be made? The problem is that the "field" in which I worked is constituted of multiple realities, each of which is shaped by the expectations that individuals bring to and create in the social roles they play. Only by using a strategy of double description was it possible to identify and get inside of these realities so that their effect on each other became clear.

In the context of a school district deeply committed to reform, these issues complicated the everyday rigidity of institutional culture. Perhaps I was naive, but I had expected to see at least some movement toward the goals articulated by the administrators and teachers. As I have indicated elsewhere, few of the original plans for culturally oriented teaching and learning were implemented.<sup>35</sup> Real change in schools, it seemed, almost never happened. In searching for a way to understand why cycles of reform always ended up back where they started,<sup>36</sup> I began to ask whether the obstacles derailing change could be attributed to the existence of, and the lack of attention to, multiple realities. Could these patterns of interaction be understood, and that understanding communicated in the course of collaborative action research so that change — in directions which, at least in Pinnacle School District, are considered desirable — might be achieved?

The teachers' divergent interpretations of Mr. Aspen's remark, and Mr. Aspen's and Daisy Benally's inability to understand each other's activities illustrate these obstacles to understanding. As I shall describe later, Mr. Aspen felt that his promotion to assistant superintendent required a kind of distance from school personnel quite different from the open and affiliative administrative role which had marked his tenure as principal. His teachers, however, were not privy to the rationale driving his change in perspective, and were caught flat-footed by the apparent change

34. Braroe, *Indian and White*.

35. LeCompte, "Controlling the Discourse"; and LeCompte and Wiertelak, "Constructing the Appearance."

36. Larry Cuban, "Reforming Again, Again, and Again," *Educational Researcher* 19, no. 1 (January 1990): 3-11.

in his demeanor. When they responded with shocked anger, saying that his behavior only confirmed *their* belief that no administrators can be trusted, their actions only confirmed to the central office staff that *teachers* cannot be trusted with administrative decisions.

Daisy Benally's expectations for her role led her to believe that she was doing just what Mr. Aspen wanted her to do: promote *understanding of Navajo culture*. But she was doing so in a very Navajo way, one that was not very well understood by Mr. Aspen. He thought she did not have enough to do because she was not doing what he wanted her to do, which was to reduce community pressure on him to implement something he, as an Anglo, did not feel competent to do: to get teachers to teach in ways compatible with Navajo culture. He felt that she, as a Navajo, was much better qualified to work with teachers on such issues. However, as a Navajo, she did not feel it appropriate for her to try to force her opinions or desires on others. She also, as I will explain, concentrated on teaching adults, since Navajos find them to be the most appropriate role models. Because neither could see from the other's vantage point, the actions of each was inexplicable to the other, and their perceptual tools did not permit them to achieve understanding. They resembled physical scientists whose tools fail to provide sufficient perspective, data, or conceptual frameworks for achieving a vantage point from which patterns and order can emerge from random and apparently irrational behavior. Double description facilitated an understanding of why Daisy Benally concentrated on bringing Navajo cultural activities to the culture center and why Mr. Aspen interpreted what she did to be resistance on her part to working with the regular school program.

#### INFORMATION FLOW AS A CATALYST TO CHAOS

Chaos theory states that random acts, because they are diverse, bring new inputs of information into a system. When randomness decreases, so also does the flow of new information — the single ingredient most relevant to reform and change. Insofar as school districts are complex, nonlinear systems, inadequate information flow is a major obstacle to reform.<sup>37</sup> It also seems to help explain some of the cultural misunderstandings I observed in the interaction between Mr. Aspen and Daisy Benally.

#### MEANING MAKING AND THE OBSTRUCTION OF INFORMATION

In the late spring, I found out that Mr. Aspen was planning to hire an assistant for Daisy Benally because he wanted her to work more closely with staff development — a move that he thought would give her a more direct and authoritative connection with teacher training. However, Mrs. Benally had only been told about her new responsibilities, not about the prospect of a new assistant. This partial knowledge only increased her feelings of work overload and her resistance to Mr. Aspen's overtures.

Puzzled, I asked Mr. Aspen if he had discussed the prospective new staff member with her. "Well, no, we haven't told her." "Why not?" I asked. "Oh, we just don't talk

37. Hayles, *Chaos Bound*.

all that much. She's over in the other building, and we don't get over there...if she were in *this* office we might talk more. And she's always off doing something. We don't ever seem to get together." Since Mr. Aspen's office is approximately a hundred yards from Daisy's office, it became clear that the distance to which he referred was social or cultural, rather than physical.

Like most administrators, Mr. Aspen was so preoccupied with the daily hassles of running a school district that he often failed to notice problems that did not march noisily into his office and demand attention. In typical Navajo fashion, Daisy did not force her problems on him, so he did not notice them. The normative culture of school administration also dictates not announcing personnel changes until it is absolutely certain that they can be accomplished. This is particularly true in schools on the reservation, where school politics and the educational rumor mill are enhanced and enriched by their entanglement with the politics and rumors of the local Navajo community.

The apparently nonsensical, irrational, and disorderly events I have described achieve a kind of order when seen from the perspective of the hydraulics of information flow. Sometimes, information does not trickle from one office to another. For example, one of the reasons that Mrs. Benally's office is so overloaded is that the district has no centralized student data base. Her overworked office has only an obsolete data management system. Although each office, including Mr. Aspen's, has a microcomputer that handles data it needs for its own record keeping, these high-powered machines use different software and are not networked together. Mrs. Benally's reports to the federal government require data from many offices, which, because there is no centralized data base, must be assembled each year by hand. No one has addressed this systemic problem or thought to compile records in any other way. This systemic problem constitutes one obstacle to the flow of certain kinds of information. In addition, the meanings constructed by Daisy Benally and Mr. Aspen about how they each carry out their jobs and the degree to which they are responsive to each other, constitute an obstacle to understanding. While increased information flow alone is not sufficient to bring their stalemate to end, it would help to decrease the ossification of attitudes mutually inimical to change.

#### ADMINISTRATOR NOTIONS OF SCHOOL "KEEPING" AND CONTROL VS. NAVAJO CULTURAL RETICENCE ABOUT CONTROL

In Pinnacle District, an important ordering principle for administrative behavior has to do with conceptual frameworks or belief systems about what constitutes "good schooling" and "good school keeping." As I have described elsewhere, these are framed in competing discourses, one framed by bureaucratic technical rationality, another framed by local cultural knowledge and metaphysics.<sup>38</sup> Such discourses are very complex because they vary from group to group within the district, and also from subgroup to subgroup within the Navajo community. These multiple cultural subgroups, each with its own set of shared meanings and agendas by which actions are planned, constitute a very complex system, one in which linear change cannot

38. LeCompte and McLaughlin, "Witchcraft and Blessings."

be expected. That is, notwithstanding the stimulus-response model that governs most educational planning, simple inputs to the system — such as administrative directives — cannot be expected to achieve predictable results or outputs.

Double description helped to facilitate understanding of both Mr. Aspen's and Mrs. Benally's attitudes about how they do their jobs. As a young woman, Mrs. Benally had been forced to set aside "being Navajo" in order to acquire the Anglo credentials that now ensured her current job. Her early career path is typical for Navajos who aspire to professional status. School achievement has required that Indians become white, forgetting their own language, religion, values, and beliefs. Many now are only "biological Indians" who have little if any knowledge of their own culture and history.<sup>39</sup> Daisy said, "Me and my husband made lots of sacrifices. We joke now, that we've never lived together more than three weeks at a time. He's at the mine, or over in Tuba; I'm in school or over there in another town working. But that's how we had to do it." Now in her fifties, she has been able to re-weave the fabric of a life she never intended to give up, one oriented to the community and agricultural life.

Her professional life to a great extent is informed by traditional practices, as is her view of how she should proceed as an educator. She modeled, rather than dictated, what she thought teachers and educators should do — in good Navajo pedagogical fashion. She taught adults, because adults are the teachers of and role models for children, especially with regard to traditional cultural knowledge. While she made available books, tapes, and materials to teachers and anybody who came into her center, she did not push them on people who did not want them, drag people bodily in to see them, or sell them to the unconvinced. To do so would be rude, improper, and embarrassing. Navajos believe that adults should make their own decisions about what they do in life; all that others can do is set options before them. Daisy was being perfectly Navajo, but her actions were interpreted by Mr. Aspen as ineffective. Because she was not doing what he thought she should be doing, nor acting in a manner he recognized as "doing the job," he concluded that she "doesn't have enough to do."

Mr. Aspen's own experiences complicate this description. He was a good administrator, addressing the recognizable problems that confronted him daily. But he did so at a price. Daily life for bureaucratic administrators, especially in schools, consists of one trivial or nontrivial crisis after another. In Pinnacle District, administrators address lawsuits, leaking roofs, snow storms, budget crises, broken pipes, hostile parents, and quarreling personnel. There never is time for the lengthy conversations that are the warp and woof of problem solving and consensus building.

Although he tried to disavow any pretensions to being an intellectual, Mr. Aspen nonetheless was an unusually thoughtful and avid reader who was deeply interested in new educational ideas. However, he never had enough time to read, and as a consequence he and other school administrators became anxious about the adequacy

39. Deyhle, "Empowerment and Cultural Conflict," 282.

of their own knowledge base, especially when they needed to be experts in leading school reform efforts. Mr. Aspen also was frustrated because he felt so professionally isolated — even from students, teachers, and staff members he had come to know well when he was a principal. “When the buck stops in your office,” he told me, “you can’t have any really close friends.” Being isolated from fellow professionals was alien to both his personal style and his preferred style of administration. However, he felt that the objectivity needed in his new role as a superintendent required detachment — a detachment that had not been a part of his management style as a principal.

This detachment constituted a major source of unhappiness for Navajo staff members working with him. Learning things well before taking action, taking time for solving problems, hearing people out, and building consensus are the centerpieces of appropriate Navajo social interaction (whether or not they are actually manifested on a daily basis). When this pattern is missing in interaction, Navajos respond by telling other people about how the Anglos have violated this or that norm of behavior. This “gossip,” as it is termed by Anglos, is the most powerful form of social control in Navajo communities. One who transgresses a norm will almost never be told directly and immediately that one has misbehaved. Instead, one will find out, through the “rumor mill,” that other people are unhappy with what one did. The expectation in spreading the “rumors” is that the deviant will learn not to repeat the behavior. By contrast, Anglos resent this indirect form of social control, calling it “gossip” and deploring the lack of direct feedback on their actions from Navajo colleagues.

Daisy Benally did not confront Mr. Aspen with his “non-Navajo” behavior. But she coopted me into the traditional system of social control by telling *me*, knowing that I would tell him. In a traditional Navajo community, this indirect form of reprimand or corrective would be effective. However, since it was given in an Anglo cultural system in which Navajo norms are not understood, Mrs. Benally’s indirect plea is not likely to be heard.

Mr. Aspen attempted to control, or shape, Daisy Benally’s behavior by telling her directly what to do. As her supervisor, he then expected that his orders and suggestions would be followed. His directives were shaped by the wishes of the School District Governing Board, which wanted Mrs. Benally to execute a program of teacher recruitment among teacher aides who, for the most part, did not want to become certified teachers.<sup>40</sup> Mr. Aspen clearly was uncomfortable, both with the loss of what he perceived to have been a comfortable working relationship and friendship, and with her failure to carry out his wishes. Mrs. Benally did not feel comfortable, nor was she really empowered to activate more stringent coercive measures than the mild coercion and persuasion she used unsuccessfully to motivate the aides. Because neither Mrs. Benally nor Mr. Aspen understands how each is failing to meet the needs of the other, and because no framework exists to bridge their misunderstandings, no reconciliation of their difficulties is likely in the near future.

40. LeCompte and McLaughlin, “Witchcraft and Blessings.”

#### USING CHAOS THEORY TO ACHIEVE UNDERSTANDING

However disparate they may be, the problem of reconciling multiple realities means finding a consistent “whole” about which to tell a coherent story. This is the kind of tangled mess that gives researchers an epistemological and ontological migraine. However, this mess can be disentangled by looking at doubly descriptive data in nontraditional ways, using aspects of chaos theory.

One remedy is to reformulate the interaction between Mr. Aspen and Mrs. Benally and between Mr. Aspen and the teachers as events within a nonlinear human system that is sensitive to initial conditions and very small inputs. In the case of Mr. Aspen and Mrs. Benally, it appears that a critical issue involves the varying perceptions of how to activate and use a system of social control. Inputs to the systems of social control constitute the “sensitive initial conditions” in this system. Very small deviance from each other’s expectations led successively to bigger and bigger misunderstandings, reverberating throughout the system in ways that may be predictably unhappy, but whose actual direction — within certain limits — are unknown.

What chaos theory does tell us is that rigidities such as those I have described in the two vignettes act as strange attractors, or centers that damp change and make the system appear increasingly, and depressingly, resistant to reform. In the physical universe, such an increasingly stable system verges on collapse in the face of new environmental conditions. I believe that the same model applies to social systems; to translate my conclusions into school talk, a school system that is increasingly rigid is increasingly at risk. In Pinnacle District, patterns of misunderstanding, racism, and partial knowledge have persisted and impeded efforts at achieving more equitably shared decision making and culturally compatible instruction. Resistance to including teachers in these efforts comes from historical patterns of distrust; resistance to including Navajos more fully has been exacerbated by the isolation of the community and the currently static funding base for the schools, which is provided by a nearby mine. Both the isolation and the funding source are undergoing change; electronic communication, increasing mobility and sophistication of the Navajo population, and the gradual playing out of the mine promise radical change in the external environment of the school system in the near future. Under these conditions, the old equilibrium will be unable to maintain itself. The district is like a simmering teapot. As the temperature gets turned up, the convection patterns in the water become increasingly chaotic and disturbed until the whole system shifts to a new state: steam. “Turning up the heat” on the school district also increases inputs to the system, and like all complex, nonlinear systems, it will predictably shift to a new state. While we *do* know what happens to water when it boils, we do not know yet what will happen to school districts when they reach the point of perturbation. However, the science of chaos and the study of nonlinear systems is new — particularly in the social sciences. Had school districts been studied for as long as the states of water have been, we might have sufficient data to suggest some general descriptors for the direction of change. For the present, educational researchers can use chaos theory to show that stability in the face of new conditions is

unhealthy, and that we can interpret continued recycling of the same ideas — a characteristic of current school reform<sup>41</sup> — as the consequence of a strange attractor. We can seek out such attractors and work toward the construction of more flexible meanings. We can use an historical analysis to determine the origins of sensitivities within school systems. And we can look forward and backward in time, and far beyond the immediate confines of the schoolyard, for the causes and consequences of our present actions. In so doing, we may develop new tools and strategies for understanding the meaning and dynamics of educational systems.

41. Cuban, "Reforming Again" and David Tyack, "Restructuring in Historical Perspective: Thinking Toward Utopia," *Teachers College Record* 92 (1990): 170-91.

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