
Rethinking Intractable Conflict

The Perspective of Dynamical Systems

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Intractable conflicts are demoralizing. Beyond destabilizing the families, communities, or international regions in which they occur, they tend to perpetuate the very conditions of misery and hate that contributed to them in the first place. Although the common factors and processes associated with intractable conflicts have been identified through research, they represent an embarrassment of riches for theory construction. Thus, the current task in this area is integrating these diverse factors into an account that provides a coherent perspective yet allows for prediction and a basis for conflict resolution in specific conflict settings. We suggest that the perspective of dynamical systems provides such an account. This article outlines the key concepts and hypotheses associated with this approach. It is organized around a set of basic questions concerning intractable conflict for which the dynamical perspective offers fresh insight and testable propositions. The questions and answers are intended to provide readers with basic concepts and principles of complexity and dynamical systems that are useful for rethinking the nature of intractable conflict and the means by which such conflict can be transformed.

Keywords: intractable conflict, dynamical systems, complexity, attractors

Conflict resolution should be easy. Conventional wisdom, enshrined in scholarly analyses (cf. Deutsch, Coleman, & Marcus, 2006), has it that conflict arises when people feel their respective interests or needs are incompatible. Defusing a conflict, then, is tantamount to eliminating the perceived incompatibility and creating conditions that foster common goals and values. A conflict that has become intractable should be especially easy to resolve through such interventions. After all, a conflict with no end in sight serves the interests of very few people, drains both parties' resources, wastes energy, and diminishes human capital in service of a futile endeavor. Even a compromise solution that only partially addresses the salient needs and interests of the parties should be embraced when they realize that such a compromise represents a far better deal than pursuing a self-defeating pattern of behavior that offers them nothing but aversive outcomes with a highly uncertain prospect of goal attainment.

Conflict resolution, of course, is at times anything but easy. To be sure, many antagonistic encounters stemming from incompatible interests are short-lived and run their course without causing irreparable damage to either party. But a small portion of relationships that are mired in conflict become protracted affairs, to the point of seeming intractability. Such conflicts can be extremely detrimental and become self-sustaining, displaying marked resistance to intervention even in the face of rational considerations that would seemingly defuse the animosities at work (cf. Azar, 1990; Bennett, 1996; Bercovitch, 2005; Burton, 1987; Coleman, 2003; Goertz & Diehl, 1993; Kriesberg, 2005; Marshall & Gurr, 2005; Pearce & Littlejohn, 1997).

This imperviousness to rationality suggests that the problem of intractability says more about psychology than it does about objective reality. An intractable conflict is one that has become entrenched in cognitive, affective, and social-structural mechanisms, a transformation that effectively distances the conflict from the perceived incompatibilities that launched it. This transformation can occur in conflicts in marriages, in work settings, between political groups in communities, and between warring nations. As a conflict becomes a primary focus of each party's thoughts, feelings, and actions, even factors that are irrelevant to the conflict become framed in a way that intensifies or maintains the conflict. It is as though the conflict acts like a gravity well into which the surrounding mental, behavioral, and social-structural landscape begins to slide. Once parties are trapped in such a well, escape requires tremendous will and energy and thus feels impossible.

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The Dynamical Perspective

This simplified scenario of intractable conflict, captured in the gravity well metaphor, has clear parallels to a wide variety of phenomena not only in the social sciences but also in the physical sciences. Indeed, recent years have witnessed the advent of a perspective in the physical sciences and mathematics that identifies the dynamic and inertial processes that are common to everything from slime molds to galaxy formation. This perspective, which underlies dynamical systems theory and models of complexity, emphasizes the inevitable and spontaneous organization of discrete elements into global patterns that, once formed, resist disruption and other sources of change (cf. Holland, 1995; Kelso, 1995; Schuster, 1984; Strogatz, 2003). Even a highly volatile phenomenon—whether a tornado, a swarm of locusts, or a crowded sidewalk in Manhattan—can be viewed as the coordination of elements and forces into a higher order entity that becomes self-sustaining and orderly. Our aim in this article is to show the relevance of this perspective for illuminating the nature of intractable conflict and to suggest new strategies for resolving such conflicts that follow from this understanding.

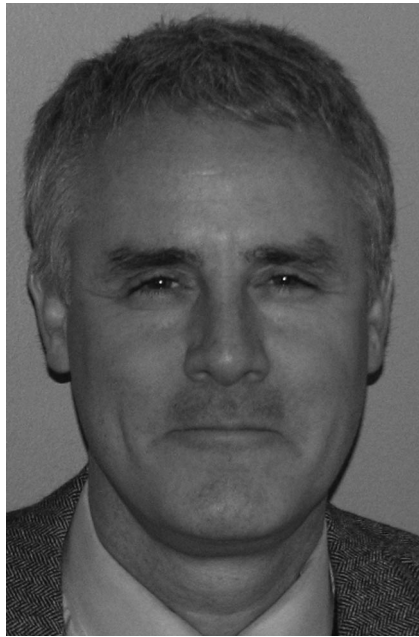
Although developed in mathematics and the physical sciences, the principles of dynamical systems and complexity have potential application to the fundamentals of human experience. This potential has become increasingly manifest since the 1990s, and the dynamical perspective has emerged as a primary paradigm for the investigation of psychological processes at different levels of personal and social reality. To date, dynamical models have been advanced to explain and predict a wide range of processes, from self-concept and social judgment to the emergence of public opinion and societal transitions (see reviews by Guastello, Koopmans, & Pincus, 2009, and Vallacher &

Nowak, 2007). We feel that the dynamical perspective is ideally suited to capture the dynamics of intractable conflict, and over the past several years we have begun to reframe this topic in dynamical terms (e.g., Coleman, Bui-Wrzosinska, Vallacher, & Nowak, 2006; Coleman, Vallacher, Nowak, & Bui-Wrzosinska, 2007; Coleman, Vallacher, Nowak, Bui-Wrzosinska, & Bartoli, in press; Nowak, Vallacher, Bui-Wrzosinska, & Coleman, 2007). Our efforts to date have been largely theoretical, even metaphorical, in an effort to show how conflict intractability can be understood in terms of basic dynamical properties. Having laid this conceptual groundwork, we propose that the next step is to use the propositions and tools of the dynamical perspective to explore well-defined issues in concrete contexts involving real human conflicts.

The Problem of Intractable Conflict

Before we describe the dynamical perspective on intractable conflict, it is important to clarify the scope of the problem with respect to both real-world concerns and theory construction. As the world enters the 21st century, protracted social conflicts represent pressing problems undermining the security and well-being of societies worldwide. Today, there are over 30 wars and violent conflicts being waged around the globe; approximately 40% of intrastate armed conflicts have lasted for 10 years or more, and 25% of wars have lasted for more than 25 years (see <http://globalsecurity.org/military/world/war> and Marshall & Gurr, 2005). The enduring conflicts in Israel–Palestine, Kashmir, Cyprus, Sudan, and the Democratic Republic of Congo are just a few examples. A study of international conflicts between 1945 and 1995 identified 18 cases of intractable interstate relationships that produced 75 militarized and violent conflicts that resisted hundreds of attempts at resolution and posed serious threats to regional or international security (Bercovitch, 2005). In these settings, entire generations of youths are socialized into conflict, a condition we know to perpetuate destructive conflict. These circumstances often lead to incalculable human suffering, including destruction of vital infrastructure, division of families and communities, and extreme violence, dislocation, and trauma to individuals (Cairns & Darby, 1998; Coleman, 2000). In fact, scholars have linked the events of September 11th, 2001 to the sociopolitical conditions that fester in hot zones of intractable conflict (Crocker, Hampson, & Aall, 2005). Indeed, enduring conflicts have been linked to one half of the interstate wars since 1816, with 10 out of 12 of the most severe international wars emerging from protracted destructive relations (Bennett, 1996). The seeming immunity to resolution has led many scholars to label such conflicts *intractable* (cf. Coleman, 2003).

Despite the widespread and destructive nature of intractable conflict, this phenomenon has yet to be conceptualized in an agreed-upon and coherent fashion. The failure to achieve consensus regarding the fundamental processes underlying intractable conflict, and the corresponding failure to generate effective strategies for transforming such conflict, is not due to a lack of effort on the part of the scientific and practitioner communities. To the



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contrary, numerous theories, research initiatives, and intervention strategies have been proposed over the years (cf. <http://www.beyondintractability.org>; Azar, 1990; Burton, 1987; Cairns & Darby, 1998; Coleman, 2003, 2004, 2006; Crocker et al., 2005; Goertz & Diehl, 1993; Kelman, 1999; Kriesberg, 1998, 2005; Kriesberg, Northrup, & Thorson, 1989; Lederach, 1997; Pearce & Littlejohn, 1997; Pruitt & Olczak, 1995). To some extent, the problem in framing a coherent theory reflects the inevitable idiosyncrasies of each conflict. Common factors and processes have been identified, but they represent an embarrassment of riches for theory construction. The task for theory construction is integrating these diverse factors into an account that is coherent yet allows for prediction and a basis for conflict resolution in specific conflict settings.

We propose that adopting the perspective of dynamical systems will promote the emergence of such an account. In particular, we suggest that the proximate causes of intractable conflict (e.g., competition over scarce resources, ideological differences, protection of personal or group identity) belie a more fundamental tendency that can be observed in systems throughout nature—the integration of basic elements into a global state that provides coherence and stability for the system. This tendency, which generates and is maintained by a host of dynamic processes, cannot be reduced to traditional motivational assumptions such as hedonism, self-esteem, or self-interest, whether immediate or long-term. The press for higher order coherence, moreover, is robust with respect to the idiosyncratic features of specific conflict scenarios and thus provides a framework within which the complex nexus of proximate causes of intractable conflict can be understood and investigated. The central issue for conflict resolution in these cases is not how to resolve the issues in dispute but

rather how to transform the system from the coordinated ensemble of dynamics perpetuating the conflict to a different coherent state that allows for benign (or positive) relations between the parties.

The Dynamical Perspective on Intractable Conflict: Frequently Asked Questions

Because many readers are unfamiliar with the dynamical systems perspective, it is useful to clarify the key concepts and general hypotheses associated with this approach to intractable conflict. Accordingly, we have developed a set of basic questions¹ concerning intractable conflict for which the dynamical perspective offers fresh insight and testable propositions. Some of these questions represent fundamental features of conflict that have been addressed throughout the years. Others represent seemingly paradoxical features of conflict that are difficult to understand through the lens of canonical models of conflict. All are intended to provide readers with basic concepts and principles of complexity and dynamical systems that are useful for rethinking the nature of intractable conflict and the means by which such conflict can be transformed. We hasten to add that this account does not dismiss classical accounts that trade on notions such as power, justice, competition over resources, identity, entrapment, and in-group–outgroup relations. To the contrary, these concepts are incorporated into the heart of the dynamical perspective.

Question 1: How does dynamical systems theory account for the genesis and maintenance of intractable conflict?

Conflict is not inherently bad. To the contrary, disputes and disagreements are inevitable in human affairs and are essential to the construction of a shared reality, problem solving, participatory governance, and adaptation to changing circumstances. Conflict can escalate beyond a point that has benefits, however, promoting instead protracted malignant relations that are destructive to all parties concerned. How does a basic and largely adaptive feature of social life degenerate into a persistent pattern of behavior that brings out the worst in human nature?

The key to understanding the genesis and maintenance of intractable conflict centers on the notion of *attractor*. In generic terms, an attractor refers to a subset of potential states or patterns of change to which a system's behavior

¹ As background for the set of questions and answers, we encourage readers to visit a website devoted to the dynamics of intractable conflict, <http://www.dynamicsofconflict.iccc.edu.pl/>, where we present 20 frequently asked questions concerning the relevance and application of dynamical systems theory to social psychological phenomena in general (Vallacher et al., 2008). This question–answer set introduces the basic concepts, principles, and methods we consider to be especially useful in reframing personal, interpersonal, and collective processes. Nonetheless, the present question–answer set on the dynamics of intractable conflict has been written so that it can be understood in its own right by scholars and practitioners in social science, conflict resolution, and peace studies.

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converges over time. Metaphorically, an attractor “attracts” the system’s behavior, so that even very different starting states tend to evolve toward the subset of states defining the attractor. In the absence of an attractor, a system can change and evolve in response to whatever influences and forces it experiences. When a system’s dynamics are governed by an attractor, however, the system is resistant to perturbing influences that would otherwise move it to a different state or pattern of changes. An external factor might promote a temporary change in the state of a system, but over time the system will return to its attractor.²

An example of an attractor for a simple system is the behavior of a pendulum in the presence of friction. No matter how one swings the pendulum (i.e., regardless of the initial conditions), after some time the pendulum will stabilize pointing downward. Thus, all the trajectories ultimately converge on a single state that represents the attractor for pendulum dynamics, and any disturbance of this state will have only a temporary effect. A system, however, may have more than one attractor. When a coin is tossed, for example, it can land on one of its two sides, each representing an attractor for the coin’s dynamics.

In complex systems—systems composed of many interconnected elements—attractors develop as the elements influence each other to achieve a relatively coherent state or pattern of changes that provides coordination for the elements (cf. Haken, 1978; Hopfield, 1982; Strogatz, 2003). The emergence of coherent system-level properties by means of self-organization represents a universal property of nonlinear dynamical systems and provides an important link between areas of science as distinct as biology and economics. The synchronized flashing of fireflies (Strogatz, 2003), for example, seems quite different from the synchronized firing of neurons associated with pattern recog-

nition and consciousness (cf. Hopfield, 1982; Tononi & Edelman, 1998), but both phenomena illustrate the tendency for the elements of a system to become coordinated and to promote the emergence of coherent system-level properties and behavior. Once a system-level property has emerged, it constrains the subsequent behavior of the elements composing the system and resists forces that threaten the system’s coherence. An attractor is thus similar to the notion of equilibrium or homeostasis (cf. Cannon, 1932; Miller, 1944).³ In many systems, the equilibrium is an *energy minimum* in that it represents a state or pattern that minimizes the incompatibility among the elements.

In psychological and social systems, an attractor can be described as a restricted range of mental states and actions that is commonly experienced by a person or group. At the individual level, the thoughts and feelings that arise in the stream of thought can influence each other to take on a common meaning and promote the emergence of a coherent higher order belief or social judgment (cf. Tesser, 1978; Vallacher, Nowak, & Kaufman, 1994). Once a global mental state develops, it resists subsequent input that threatens to undermine it. In the context of a positive view of someone, for example, information that the person is “critical” may be interpreted as a virtue (“constructive”) rather than a vice (“mean-spirited”). Similar dynamics are operative in the emergence and maintenance of norms, attitudes, and fashions in a social system. Individuals, who may differ initially in their personal preferences, influence each other to adopt a shared reality (cf. Kenrick, Li, & Butner, 2003; Nowak, Szamrej, & Latané, 1990). Once a collective state comes to characterize the thought processes of interconnected individuals, there is strong resistance to new information or forces that threaten to undermine it. Thus, discrepant information is discounted or reinterpreted to fit the prevailing view, and individuals holding deviant ideas are subject to intense influence from the local majority or are ostracized.

Attractors do not necessarily represent goals, values, or other desired states. A person with low self-esteem, for example, may initially embrace flattering feedback from an acquaintance, but over time such a person is likely to discount or reinterpret this feedback, displaying a pattern of self-evaluative thought that converges on a negative state (Swann, Hixon, Stein-Seroussi, & Gilbert, 1990; Vallacher, Nowak, Froehlich, & Rockloff, 2002). At an interpersonal level, a person might display a persistent pattern of antagonistic behavior in his or her social relations despite efforts to avoid behaving in this manner. And in an intergroup

² Three types of attractors have been identified in dynamical systems: fixed point, periodic (including multiperiodic and quasiperiodic), and deterministic chaos. We have found fixed-point attractors to be the most relevant to issues of intractable conflict, and they provide the focus of this article. Periodic and chaotic evolution are expressed in various social processes (Guastello et al., 2009; Vallacher & Nowak, 2007), though, and may prove useful in the investigation of social conflicts as well (see, e.g., Hanson & Sword, 2008).

³ More precisely, a fixed-point attractor corresponds to a stable equilibrium. An unstable equilibrium, referred to as a *repellor*, represents a state that the system tries to avoid.

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context, warring factions may display conciliatory gestures when prompted to do so but revert to a pattern of antagonistic thought and behavior when the outside interventions are relaxed (Coleman et al., 2007). In short, when a system's dynamics are governed by an attractor, the system will consistently evolve to a particular state, even if this state is not hedonically pleasant, and will return to this state despite being perturbed by forces that might promote a more pleasant or ideal state.

The attractor concept is illustrated in Figure 1, which reflects the gravity well metaphor noted at the outset. The ball represents the current state of the system and the valleys represent two attractors for the system. The ball will roll down the hill and come to rest at the bottom of the valley, which represents a local energy minimum. Each attractor can be characterized in terms of two basic properties. A *basin of attraction* specifies the range of states that will evolve toward the attractor. This feature is represented by the width of each valley in the figure. A system with a wide basin “attracts” a broad range of states, including information and events that seem inconsistent with the attractor. A system with a narrow basin “attracts” a smaller range of states and thus is less able to absorb inconsistent ideas and events. In the figure, the basin of attraction for Attractor A is somewhat wider than the basin of attraction for Attractor B. This means that a wider variety of states will evolve toward A than toward B.

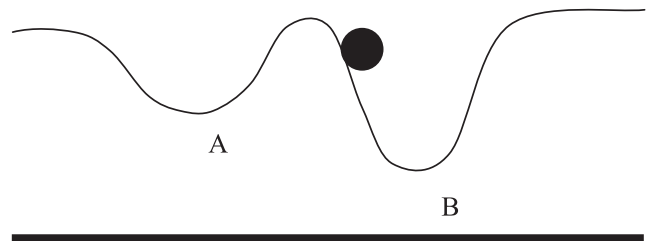
An attractor can also be characterized in terms of its *strength*, or resistance to change. This feature is represented by the depth of each valley in the figure. It is difficult to dislodge a system from a strong attractor even when perturbed by strong external influences, whereas a relatively weak influence can dislodge a system from a weak attractor. In the figure, Attractor B is stronger than

Attractor A. This means that once a system is at Attractor B, it is more difficult for it to be dislodged by external influence.

We propose that a protracted malignant conflict reflects a strong attractor with a wide basin of attraction. The strength of the attractor reflects its capacity for maintaining a coherent cognitive, affective, and behavioral orientation among the parties to a conflict. When destructive conflict is associated with a deep attractor (as in Attractor B), an attempt to address the current state of the conflict corresponds to pushing the ball uphill. It not only requires considerable effort but also is likely to be futile, since once the pushing force is relaxed, the ball will roll back to the attractor. This corresponds to some peace agreements, initiated at great expense by the international community, that eventually collapse after the fanfare of the initial breakthroughs subsides. A wide basin of attraction means that a broad range of ideas and action possibilities will eventually evolve toward the dominant mental and behavioral pattern characterizing the parties to the conflict. Even positive information that contradicts the negative view of members of an outgroup is transformed by a variety of cognitive and social mechanisms until it fits the predominant view. Thus, a peaceful overture or a logical appeal emphasizing the nonproductive nature of the conflict might initially be taken at face value but over time will become reframed until it provides evidence in support of, rather than in opposition to, the predominant response tendency of the person or group.

Knowing the attractor landscape of a system is essential when attempting to anticipate the fate of introducing a new element—a communication, an overture, even an unanticipated but significant event—particularly when the element is open to different interpretations or has unclear implications. Assume, for example, that a group has an attractor for negative relations with another group. The width of the basin of attraction determines whether a positive act by the other group will be assimilated to the attractor or instead will represent an inconsistency that holds potential for dislodging the system from the attractor. If the attractor has a wide basin, the positive act (e.g., a conciliatory gesture) might be reframed in negative terms (e.g., as weakness or deception). If the attractor has a

Figure 1
*A Dynamical System With Two Attractors
Corresponding to Constructive Relations (A) and
Destructive Relations (B)*



narrow basin, the same element cannot be as readily assimilated and might move the system to a different attractor (corresponding to reconciliation).

The strength of the attractor decides whether the inconsistent element (e.g., a positive act) will have any effect in moving the system away from the negative state. If the attractor is relatively weak, the inconsistent element may influence the state of the system, perhaps moving it gradually toward a different pattern of thought and action. Additional inconsistencies might even transform the system, moving it to a different (new or latent) attractor. If the attractor is strong, however, even very inconsistent information may not affect the state of the system. A highly conciliatory gesture by the other group, for example, is unlikely to change the way the group is perceived. Instead, the gesture will be discounted in importance or suppressed in communication and discussion.

At some point, though, the inconsistent elements may become sufficiently numerous or significant that they succeed in transforming the system. The stronger the attractor, the more numerous or significant the inconsistencies must be to have this effect. When this threshold is reached, the system will show a sudden and qualitative change to a new (or previously latent) attractor. We suggest that these basic processes may underlie the radical shifts observed when communities move rapidly from peace to violence (as occurred in the 1994 Rwandan genocide), or from violence to peace (as seen in the emergence of peace in Mozambique in 1992; see Bartoli, Bui-Wrzosinska & Nowak, in press). After this transformation, the system will display the same resistance to inconsistent (now negative) information and the same nonlinear transformation when a threshold of inconsistency is reached.

This scenario suggests that when a system has two strong attractors (e.g., one maintaining positive relations between two groups and one maintaining negative relations), the same element (an event, a communication, etc.) can be responded to in very different ways depending on which attractor is currently manifest. This tendency, referred to as *hysteresis*, is a signature phenomenon of nonlinear dynamical systems. With respect to intractable conflict, knowing the respective strength and basins of attraction for the set of attractors defining the relationship between the parties is critical for anticipating the impact of information or events that might have a single unequivocal meaning (e.g., positive or negative) when viewed from outside the conflict.

Question 2: How does an attractor differ from more familiar notions, such as "schema," "goal," "attitude," or "disposition"?

The attractor concept has much in common with these and other familiar psychological constructs. Indeed, each of them can be conceptualized as an attractor for a specific type of system. In traditional approaches, however, these phenomena are commonly investigated as fixed structures, with little consideration given to their dynamic properties. By framing them in terms of attractors, we can recapture the dynamics that are often lost in theoretical accounts.

A schema, for example, has attractor properties in that it constrains the dynamics of perception and thinking, causing the stream of thought concerning an object or event to converge on a specific set of values (e.g., interpretations, judgments, beliefs). A goal, in turn, represents an attractor in that it steers actions toward the attainment of a particular state while resisting the temptations of other action possibilities. In similar fashion, the concept of attitude describes the values of thoughts, feelings, and actions that are most often experienced when one is in contact with the attitude object and to which a set of psychological mechanisms promotes convergence after one receives contradictory information. Having a positive attitude toward a person, for example, does not rule out the possibility of experiencing negative feelings toward the person on specific occasions but rather suggests that such feelings are intrinsically unstable and infrequent. A personality disposition, meanwhile, represents a person's tendency to behave in a consistent manner despite interpersonal and situational forces that mitigate against such behavior or promote other types of behavior. It describes not a single value on a dimension of personality but rather the attractor for a system of interacting mechanisms producing and controlling thoughts, feelings, and behaviors in a certain domain.

Reframing these familiar notions in explicitly dynamical terms highlights their common properties and thus provides theoretical unity across otherwise diverse domains and levels of experience. Investigating schemas, goals, and the like from a dynamical perspective thus may illuminate the origin, evolution, and transformation of the collective states that provide stabilization of people's thoughts, feelings, and actions. It is worth emphasizing, too, that a dynamical system may have more than one attractor governing its dynamics. Identifying the structure of attractors in a system thus provides insight into the possible coexistence of different (and potentially conflicting) schemas, goals, attitudes, and dispositions governing a person's functioning under different conditions.

Question 3: What promotes the development of a strong negative attractor for social relations and conflict?

In benign conflicts (and everyday social relations), the links among different thoughts, feelings, and action tendencies reflect a relative balance between *positive (reinforcing)* and *negative (inhibiting) feedback*. Elements linked by positive feedback reinforce and amplify one another's current states. A hostile thought about a person or group, for example, elicits other negative thoughts or transforms neutral thoughts into negative ones, and through repeated iterations of this linkage, the separate thoughts coalesce into a coherent negative judgment. In most social contexts, however, this potential for the spread of negativity and conflict escalation is restrained by inhibitory feedback among elements. A hostile action toward a person, for example, might promote feelings of regret or guilt or perhaps a consideration of the person's benign or positive qualities. Such thoughts effectively restrain the hostile impulses, establishing a tempered stance in the social relationship.

When an attractor begins to develop in a system, the balance between reinforcing and inhibiting feedback is diminished or lost altogether, with elements serving primarily to reinforce or amplify each element's current state through positive feedback loops. By itself, any element is open to change when exposed to other elements with a different meaning or implication for action. Knowing that a person has a political ideology that differs from that of one's ingroup, for example, may set the stage for thinking negatively about him or her, but if other elements of information have not been linked with this element, outside influences could prevent one from forming a negative judgment. Once a global assessment has developed, however, the positive feedback loops among the elements offset the impact of new information that might overwhelm any single element. So if the person's political ideology has become linked to judgments of his or her honesty, intelligence, and patriotism, one's judgment of the person will be more immune to subsequent discrepant information.

In conflict situations, the shift toward reinforcing feedback loops promotes the emergence of strong attractors that are resilient in the face of potentially disconfirmatory events and information. At the individual level, an incongruent piece of information is considered in light of the ensemble of congruent information and is likely to be reframed to fit the prevailing meaning (e.g., Tesser, Martin, & Cornell, 1996). In social systems, communication among group members bolsters the group's attractor for thought and behavior and buffers individuals within the group from outside influence (cf. Nowak et al., 1990). This is particularly evident in isolated, extremist groups of all flavors (see Bartoli & Coleman, 2003). In both cases, a perturbing influence might have an immediate impact on the state of the system, but over time the mutual support among the system's elements restores the system to its attractor.

It remains to be determined what factors are responsible for the breakdown in self-regulatory mechanisms in strong conflict attractors. The balance of power, the degree of interdependence, the level of cooperation versus competition, the salience of ideology and social identity, and the zero-sum nature of resources in some conflicts are plausible candidates. Other likely factors that transcend conflict per se include stress, threat, mortality salience, strong emotions, time pressure, and any condition that undermines controlled (conscious, deliberative) mental processes, which play a central role in self-regulation (Vallacher & Nowak, 1999). Identifying the factors that change the balance between positive and negative feedback in mental and social systems provides an important agenda for empirical research.

Question 4: Intractable conflicts are undesirable and destructive to all parties, yet they are maintained for very long periods of time and resist attempts at resolution—why?

Traditional theories of motivation are hard pressed to explain the persistence of destructive conflict. Apart from being intrinsically unpleasant and defined in terms of neg-

ative emotion, protracted conflicts destroy lives, tear apart families and communities, divert attention and energy from more productive pursuits, and rarely produce happiness or even satisfaction. Nor are the goals of conflict often achieved, particularly in cases of intractable conflict that persist through many generations with no end in sight. Hedonism, enlightened self-interest, achievement motivation, and other classic motives fall short in attempting to explain this enduring feature of human existence. Even if such motives could be identified (e.g., ingroup solidarity afforded by outgroup antagonism), there are other means by which these motives could be satisfied without entailing the enormous trade-offs in costs and adverse consequences of intractable conflict.

Despite the self-destructive potential of entrenched conflict, attractors satisfy two basic psychological motives. First, *they provide a coherent view of the conflict*, including the character of the ingroup, the nature of the relationship with the antagonistic party, the history of the conflict, and the legitimacy of claims made by each party. These views, of course, are often in direct opposition to those of members of the outgroup, as is evident in many accounts of the conflict in the Middle East (cf. Bar-Tal, 2000; Rouhana & Bar-Tal, 1998). Attempts to instill a different view, even one that might allow for peaceful resolution of the conflict, threaten the subjective "accuracy" of the current view and are resisted. Thus, new information might strike an outsider as a basis for rethinking the rationale for a conflict yet be discounted or reinterpreted by the parties themselves in order to make it consistent with the prevailing view of the conflict. This function of attractors is especially critical when the parties encounter information or actions that are open to interpretation. An attractor serves to disambiguate actions and to interpret the relevance and "true" meaning of information.

Second, *attractors provide a stable platform for action*, enabling each party to a conflict to respond unequivocally and without hesitation to a change in circumstances or to an action initiated by the other party. In the absence of an attractor, the conflicting parties may experience hesitation in deciding what to do or may engage in internal dissent that could prevent each party from engaging in a clear and decisive course of action. At the individual level, such dissent is experienced as ambivalence or uncertainty. At the group or societal level, internal dissent represents disagreement among the individuals comprising the respective ingroups or societies.

A conflict governed by attractor dynamics can appear not only at odds with classic hedonic concerns but also ironic with respect to conventional notions of information processing. Classic theories and lines of research in social psychology suggest that ambiguous and conflicting information makes people vulnerable to new interpretations and attitudes and thus sets the stage for change and transformation at the individual, interpersonal, and collective levels (cf. Deutsch & Gerard, 1955; Festinger, 1954; Sherif, 1936). In mental, interpersonal, or intergroup relationships governed by attractor dynamics, however, we propose that there is an *inverse relation* between information ambiguity

and transformation. When an attractor provides coherence for complex and ambiguous information, it is especially vulnerable to new ideas that provide a different way of integrating such information. Hence, a new perspective regarding an ongoing conflict, although serving the disambiguation function, represents a challenge to the established pattern of thinking and undermines the associated platform for action. Change in response to such information is therefore strongly resisted. We suggest, in fact, that the greatest potential for a sudden eruption of violence exists when there is a challenge to the validity of an attractor providing coherence for information that is difficult to verify. Ironically, when change does occur, it tends to be wholesale rather than incremental in nature, with the party's thoughts, feelings, and action tendencies coalescing into a new attractor or moving to an existing attractor that had previously been latent in the system. This scenario has intriguing but largely untested implications for conflict escalation and resolution (which are developed in the response to Question 10).

The heightened resistance to ideas or interpretations that challenge an attractor based on ambiguous and difficult-to-verify information can be seen at the individual level. When a subjectively important but difficult-to-verify attitude is threatened by an alternative perspective, for example, one or more cognitive mechanisms are engaged to thwart the threat and reaffirm the attitude (e.g., Tesser et al., 1996). Recent theory and research on self-concept, meanwhile, suggest that people who have high self-esteem with an unclear relation to accomplishments and other sources of objective information tend to be the most defensive in response to criticism and unflattering appraisals, often resorting to violence against the source of the threatening feedback (cf. Baumeister, Smart, & Boden, 1996). We suggest that this connection characterizes attractor dynamics at the level of groups and societies as well. If this is indeed the case, it provides insight into certain intractable conflicts that erupt into violence when new information calls into question the legitimacy of one or both parties' stable pattern of thought and behavior. The ironic connection between the complexity and ambiguity of information and a group's resistance to change has yet to be empirically verified and thus provides a promising agenda for research on the dynamics of conflict.

Question 5: At what level of social reality do attractors of conflict exist?

Attractors represent formal properties of dynamical systems and thus characterize the dynamics of systems at all levels of reality. Cognitive processes and intergroup relations are clearly different phenomena, for example, but each can be described in terms of stable patterns (e.g., interpretation in cognition, social distance in intergroup relations) that provide coherence and unequivocal platforms for action. Accordingly, conflict can be characterized with attractors at different levels of social reality. At the level of the mind, attractors represent stable patterns of thought and affect concerning the parties to the conflict (e.g., oneself and another person in interpersonal conflict,

the ingroup and the outgroup in intergroup conflict), as well as the history and nature of the interpersonal or intergroup relationship. At the interpersonal and intergroup levels, attractors represent stable and recurring patterns of relations between the parties to the conflict. The mere mention of the conflicting party—let alone an encounter with the party—may promote well-learned and automatic response tendencies at different levels of action meaning.

Because of the feedback among levels in a dynamical system, an attractor that initially develops at one level of reality is likely to forge attractors at other levels. A conflict may develop over issues of resource allocation, for example, and the negative interactions associated with this conflict could promote psychological attractors (i.e., negative attitudes) that are consistent with, and serve to maintain, the interpersonal conflict. Once a psychological attractor develops, the conditions that generated the conflict (i.e., resource allocation) could be mitigated without resolving the conflict if the attractor is strong and has a wide basin of attraction. The change in objective conditions, for example, could be interpreted in a manner that reinforces rather than undermines the negative feelings toward the other party. In conflict situations, then, an interpersonal or intergroup attractor promotes a social judgment attractor, which then reinforces the interpersonal attractor, and so on, in a reciprocal reinforcing feedback loop.

Because of the feedback linking levels, a conflict initially associated with one level of reality is likely to spread to other levels, creating the potential for overlapping and mutually reinforcing attractors that serve to anchor the conflict. This expansion of attractors can become encoded in cultural beliefs and traditions, adding yet another level to the conflict that can promote long-term intransigence and resistance to attempts at conflict resolution. For example, the annual Orange Walk held in Northern Ireland each July, which celebrates the Protestant victory of Prince William of Orange over King James II in 1690, evokes past grievances and losses associated with the protracted conflict over Ireland that trigger latent psychosocial attractors for more hostile Catholic-Protestant relations.

Question 6: How can one identify the attractors in an intractable conflict?

In one sense, this is a simple issue, almost trivial. If people are embroiled in an ongoing conflict, their respective patterns of thought and behavior are manifest and need only be described. But in another sense, the identification of attractors in a conflict is a very challenging problem. This is true for both descriptive and formal reasons.

Descriptively, the functional equivalence (equifinality) of thought and behavior can make it difficult to determine whether a party to a conflict is displaying a stable pattern, engaging in routine but nonmeaningful action, or acting in accord with very different concerns from one occasion to the next. Consider, for example, a person who attacks someone's line of reasoning, prevents another person from taking a short-cut through his or her territory, and refuses to answer an e-mail message from yet another person. Does this represent a pattern of behavior that could

qualify as an attractor, or do these acts each reflect entirely different meanings despite their similarity with respect to an “antagonism” attitude or schema? Perhaps the attack represents “constructive criticism,” the territorial defense represents “reinforcing norms of appropriate conduct,” and the e-mail neglect represents “setting priorities in one’s work.” More generally, because actions can be identified and performed with respect to widely different higher level meanings (Vallacher & Wegner, in press), it can prove difficult (and misleading) to judge whether there is a pattern in a person’s behavior, and if so, what the pattern is.

Formally, the identification of an attractor is difficult because an attractor is defined mathematically in terms of differential or difference equations and topographically in terms of phase space portraits (cf. Liebovitch, 1998; Nowak & Lewenstein, 1994). In real-world conflict settings, these formal approaches to attractor identification may be unrealistic or impossible (for notable exceptions, see Gottman, Swanson, & Swanson, 2002; Kugler & Coleman, 2009; Losada & Markovitch, 1990).

However, attractor identification is possible because of the two properties described above: the attractor’s *strength* and *basin of attraction*. The basin of attraction is manifest as the diversity of information or events that are assimilated to the attractor. For an attractor with a wide basin of attraction, even highly discrepant information (e.g., a positive overture by an antagonist) is interpreted or reframed to make it consistent with the attractor. Strength is manifest as the resistance to change in the person or group’s pattern of thought and behavior in response to events or information that are outside the basin of attraction. If the attractor is relatively weak, the system might change in response to even a few inconsistencies that are beyond the basin of attraction. If the attractor is strong, however, the system will resist change until a great deal of information or evidence outside of the basin of attraction has accumulated. Such information might be discounted or suppressed until a critical threshold of inconsistency is reached, at which point the system will demonstrate a catastrophic change to a new or previously latent attractor that provides coherence for the perturbing information.

These properties provide basic guidelines for how one might identify the attractors in an intractable conflict. The general strategy is to assess how a person or group responds to conflict-relevant information that varies along a basic dimension (e.g., positive vs. negative actions by an outgroup). The range of information on this dimension that is assimilated to the attractor (e.g., by reinterpretation or rationalization) would indicate the width of the basin of attraction. The manner in which a person or group responds to information outside the basin of attraction would indicate the strength of the attractor. A strong attractor would be indicated if a large amount of such information is tolerated before the system undergoes change and if the change is catastrophic (sudden and wholesale), rather than incremental, when it occurs. Before this tipping point is reached, a person or group with a strong attractor is likely to display rapid and highly defensive responses to the inconsistent information. Implementing this general strat-

egy in a systematic fashion to identify the attractors in a conflict situation represents a high priority for research.

Question 7: How is “power” incorporated into the dynamical account of conflict?

It is probably the exception rather than the rule that two interdependent entities—whether individuals, groups, or nations—have equal power. Personal relations are often characterized by differential dependency, with the less dependent person being in a position to dictate what the dyad does (Rusbult, 1983; Thibaut & Kelley, 1959); social or demographic groups in a society differ in their social capital, wealth, and education, and these assets translate directly into differential influence in shaping public policy (Deutsch, 2006; Sidanius & Pratto, 1999); and nations differ enormously in their respective military prowess, access to resources, and global influence (Zartman & Rubin, 2002). Despite the ubiquity of power asymmetry, intractable conflict is a relatively rare occurrence in social life (Bercovitch, 2005; Fisher, 2006). Such quiescence, of course, could simply reflect recognition of reality and a corresponding resignation concerning its fate on the part of the less powerful entity. Because the more powerful entity is expected to prevail if conflict becomes manifest (e.g., over access to resources), the less powerful entity does not provoke such conflicts and is prepared to settle for less if a conflict cannot be avoided. From this “realism” perspective, if the less powerful entity saw an opportunity to change the power imbalance in its own favor, it would experience little hesitation in doing so.

The dynamical account provides a different way of reconciling power asymmetry with peaceful coexistence among interdependent entities. Over time, the pattern of interaction and influence between such entities is likely to be internalized by both entities as an attractor that serves the key functions of attractors described earlier: coherent understanding and an unequivocal action orientation. Thus, the attractor provides a lens for constructing the past, interpreting the present, and anticipating the future, and it creates a stable platform for the entities’ behavior vis à vis one another (e.g., Coleman et al., 2007). And because attractors resist destabilization, perturbations to the relationship will be actively resisted—not only by the more powerful party but by the less powerful party as well. A change in status upsets the equilibrium in the relationship, thereby reducing the coherence of both parties’ thoughts and feelings and undermining the relevance of their action scripts. So rather than embracing an opportunity to change the balance of power, the less powerful entity attempts to reinstate the status quo.

Just such counterintuitive effects have been documented in research on system justification theory (cf. Jost, Banaji, & Nosek, 2004) and social dominance theory (Sidanius & Pratto, 1999). Members of disadvantaged groups (e.g., racial and ethnic minorities), for example, commonly justify the status quo and feel that the social system perpetuating their lot in life is basically fair (see also Lerner, 1980). Even when disadvantaged people publicly express dissatisfaction with the status quo, assessment of their

unconscious attitudes often reveals a pattern of ingroup and outgroup evaluation that is consistent with the power asymmetry (Jost, Pelham, Brett, & Carvallo, 2002). As with other instances of attractor dynamics, this tendency illustrates how the functions served by a stable attractor trump the usual panoply of basic motives (e.g., hedonism, enlightened self-interest, achievement, self-esteem).

This state of affairs does not mean that power imbalance is irrelevant to conflict. Asymmetry in influence and access to resources clearly can fuel antagonism between individuals, groups, and nations. Marriages are terminated when dominance and subjugation become unbearable for one of the partners, for example, and social systems undergo civil wars and revolutions in response to real or perceived power asymmetries between groups. In the dynamical account, this effect occurs when one or both parties escape the pull of the existing attractor, which enables information and events to be interpreted in a different way and provides a new platform for action. There are two scenarios by which this can happen (described more fully in the response to Question 10).

First, new information and events can be encountered that are outside the basin of attraction. The more powerful entity, for example, may engage in an especially unwarranted fashion that cannot be rationalized as acceptable (e.g., brutality, humiliation). Or information may come to light about the high-power entity that cannot be reconciled with prevalent beliefs and judgments concerning the entity (e.g., evidence that the high-power entity's flattering history had been falsified). Even if the inconsistent actions and pieces of information are initially discounted or suppressed, they hold potential for sowing the seeds of an alternative attractor for the relationship. Once a threshold of inconsistency is crossed, the relationship can undergo a profound transformation as the attractor loses its power to constrain thoughts, feelings, and actions concerning the relationship. This is the prototypical scenario of many insurgency movements, such as that depicted between the Algerian independence forces and the French in the classic film *The Battle of Algiers*. A new configuration can then emerge to provide coherence and a far different platform for action.

Second, an attractor can lose its pull if the reinforcing feedback loops among elements are weakened or reversed. The disassembly of an attractor is a difficult task, although contemporary research in social psychology provides clues as to how this can be accomplished. Inducing people to focus on the details of an event or a communication, for example, serves to isolate these elements and thus weaken the connections among them (cf. Vallacher, Nowak, & Miller, 2003). This is a tactic often used in mediation when disputants are encouraged to explore the specific needs and interests that underlie their more recalcitrant global positions regarding a conflict or relationship (see Kressel, 2006). The press for coherence associated with attractor dynamics then sets the stage for the emergence of a new pattern of thought and behavior concerning the relationship.

Both scenarios are more likely to alter attractors for power relations under conditions of instability. When marriage partners experience a marked change in their life circumstances (e.g., job loss, winning a lottery), for example, new information and events are experienced that cannot easily be assimilated to their existing attractor for the relationship. And because novel information and events are experienced in detailed (low-level) terms, there is potential for the emergence of an entirely different attractor that links the low-level elements in an alternative configuration. In similar fashion, intergroup relations characterized by power asymmetry can become destabilized during periods of rapid societal transition (Nowak & Vallacher, 2001), setting the stage for the emergence of a new attractor that reflects dissatisfaction with, rather than justification of, the power imbalance. During such periods, those individuals in the low-power group who are better educated or have more social contacts outside the group are typically in the vanguard of change (see reviews by Gurr, 1970, and Tyler & Smith, 1998). Presumably, such individuals have greater access to information that undermines the existing attractor or that suggests alternative perspectives and action possibilities concerning relations with the more powerful group (Gersick, 1991).

In a rapidly changing world, the balance of power between groups and nations may change frequently. Because such changes upset an established equilibrium, they unleash emotions and generate new actions, which can produce a spike in the frequency and intensity of conflict. The group with greater power is likely to feel considerable threat as the attractor connoting dominance is challenged or disassembled. The violence exhibited by lower middle-class males in the southern United States in response to desegregation in the mid-20th century is an example of this scenario. The group with less power, meanwhile, may be especially volatile as negative feelings (e.g., humiliation and anger), unfulfilled wishes, and suppressed actions become manifest. Even if there is progression toward redressing a power imbalance, such feelings may intensify rather than diminish if the rate of change is perceived to be insufficient by the ascendant group. Theory and research on personal satisfaction suggest that the rate of progress in achieving one's goals is more important than the magnitude of the discrepancy between one's current state and the desired state of affairs (Carver & Scheier, 1999; Hsee, Abelson, & Salovey, 1991). This can be seen at the level of intergroup relations as well. Thus, movement toward greater power symmetry may paradoxically lead to increased dissatisfaction in accordance with relative deprivation (cf. Merton, 1957). Such a "rising expectations" scenario characterized the push toward equality on the part of African Americans and women in American society in the 1960s.

From a dynamical perspective, the rate of progress toward a desired state of affairs (such as equality of power) is one of many possible temporal patterns of change in both self-regulatory dynamics (Vallacher & Nowak, 1999) and social change (Nowak & Vallacher, 2001). There may be short bursts of acceleration, for example, that are punctu-

ated by longer periods of stabilization. It remains for future research to identify the dynamic patterns characterizing changes in power relations, both between individuals and between groups, and to map these patterns onto different scenarios of conflict and peaceful transformation.

The dynamical perspective provides a parsimonious integration of conflicting accounts of power asymmetry—one emphasizing stability (e.g., system justification, restoration of the status quo), the other emphasizing the potential for conflict (e.g., dissatisfaction, redress of the power imbalance). Research explicitly addressing these accounts has yet to be conducted, however. Computer simulations, experiments, and archival analyses are needed to identify the critical factors (e.g., social instability) underlying the proposed transformation in attractor dynamics (cf. Nowak, 2004). If an account of power asymmetry is confirmed, an ethical question concerning intervention arises: Is it preferable to promote peaceful relations characterized by power asymmetry or to promote equality if that entails the genesis of conflict and violence? Perhaps the answer to this question lies in developing a better understanding of the necessary yet not destabilizing rate of change between groups in conflict over power.

Question 8: How is “justice” incorporated into the dynamical account of conflict?

Justice is an important foundation for interpersonal and intergroup relations. It tempers self-interest, promotes the emergence of social norms, and can generate cooperative and altruistic behavior. In this sense, a concern with justice serves to stabilize social relations and provides regulatory mechanisms (inhibiting feedback loops) that constrain each party’s behavior. But justice is often in “the eye of the beholder,” and this subjectivity can serve to intensify rather than mitigate conflict under some circumstances. Particularly when there is an unequal division of resources, the potential for conflict is enhanced when the parties frame the issue in terms of justice. The disadvantaged group may see itself as victimized and view the other group as unfair, greedy, and bad. These perceptions legitimize aggressive action in the service of restoring justice. For its part, the advantaged group may consider its greater access to resources to be a reflection of its superiority and greater deservingness. It may see the other group as inferior and deserving of its lesser access to resources. Both groups, in other words, frame the conflict in terms of justice—but with entirely different notions of what constitutes justice. In effect, justice often amounts to justification (Lerner, 1980) and is therefore prone to the various cognitive mechanisms that are used to protect a coherent worldview against contradictory ideas and actions.

Disagreements about justice are not an inevitable consequence of inequality, however. Once a pattern of thought and behavior concerning an interpersonal or intergroup relationship is established, it functions as an attractor that resists change. If two groups have a long history of inequality, and if this state of affairs is legitimized by cultural values and a shared historical narrative, there may be little impetus for change. Maintenance of the status quo

is clearly advantageous for the person or group with greater access to resources. But as noted in the response to Question 7, low-power groups are also inclined to bolster the status quo and thus tend to resist changes that would be to their advantage (Jost et al., 2004; Sidanius & Pratto, 1999). Attractor dynamics, in other words, may be more important than simple self-interest in dictating how the groups define justice and deal with inequality. As with power asymmetry, basic conditions must be met before injustice in a relationship is recognized and serves to generate actions aimed at restoring justice (see Deutsch, 1985; Gurr, 1970; Merton, 1957). It remains for future research to identify these conditions and document their effects at different levels of social reality (interpersonal, intergroup, international).

Question 9: What is the role of religion in the origin, maintenance, and resolution of conflict?

Religion can play very different, even inconsistent, roles in conflict. On the one hand, religion provides constraints on actions of a self-serving or hedonistic nature while promoting actions that reflect moral values conducive to peaceful and cooperative relations with other people. Most religions emphasize impulse control, tolerance, and a concern for the welfare of others. These features of religiosity hold potential for the prevention and peaceful resolution of conflict. On the other hand, most religions divide mankind into good versus evil, saints versus sinners. The distinction between good and evil is too often manifest as the distinction between those who share one’s religious beliefs and those who do not. Thus, even if someone from a different faith behaves in a morally commendable fashion, he or she may be judged negatively (e.g., as an infidel) by virtue of worshipping a different god or embracing a different creation myth.

When religious faiths fall along ethnic, regional, demographic, or national lines, religiosity tends to intensify the natural tendency to favor one’s ingroup (e.g., one’s nation) over an outgroup (e.g., another nation). If conditions promote ingroup versus outgroup conflict (e.g., competition over land or resources), the polarization of ingroup–outgroup dynamics associated with religion can enhance rather than defuse conflict. Indeed, by perceiving members of the outgroup as evil or damned, the constraints (inhibiting feedback) against aggression and violence are weakened. Ironically, then, religion can promote behavior that is antithetical to the moral values it promulgates.

Framed in dynamical terms, religion captures the defining properties of an attractor. A religious faith provides certainty: a coherent view of the world, both with respect to moral values and cosmological truth, and a stable platform for personal and collective action. Information or events that are inconsistent with the religious worldview represent potential threats to the validity of that view and thus can promote intense defensive reactions (as seen in the current debates between creationism and the theory of evolution). The cognitive biases observed when personal attitudes are contradicted are on full display when information or events challenge a group’s religious beliefs. Indeed, because reli-

gion by definition reflects faith rather than reason or empirical evidence, discrepant information or events are likely to be experienced as especially threatening and to promote very intense reactions in the service of reinstating the mental and social system at its attractor.

In the modern world, the threats to religions are numerous, from advances in science that challenge the wisdom of sacred texts (e.g., the origin and age of the universe) to increases in contact among people from cultures with different religious convictions and lifestyles. From this perspective, it is not surprising that many intense and prolonged conflicts today are associated with religious differences. Because the central controversies cannot be resolved conclusively (e.g., determining which god is the real one or which prophet is likely to be vindicated), religious-based conflicts are likely to be protracted, with victory and defeat (or genocide, at the extreme) representing the only perceived means of terminating the conflict. This gloomy scenario is especially likely to be manifest under conditions that reinforce a group's conviction that other groups must recognize the zero-sum nature of moral and cosmological truth.

Although religious differences have been associated with intergroup conflicts throughout human history, other factors often must be operative before religion can bring ingroup–outgroup relations to the threshold of serious conflict and warfare. People of different faiths can coexist peacefully, for example, if the available resources do not have a zero-sum quality and the groups are not in a state of confined interdependence (e.g., Hardin, 1968). It is also the case that religion is often used to justify aggression that is actually undertaken for very different reasons. Thus, ingroup leaders sometimes exploit religious differences to engage citizens who would otherwise not be inclined to aggress against the outgroup. Finally, most religions converge on moral codes that are beneficial for social relations. Efforts designed to emphasize these rules of interpersonal behavior can offset the intolerance associated with good versus evil categorization. There are numerous instances in history when calls to a higher morality defused conflicts and brought about interpersonal and intergroup harmony.

Question 10: How can an intractable conflict be resolved or at least transformed into a benign conflict?

A defining feature of attractor dynamics is the tendency of a conflict to resist external influence and to return to the attractor if influence is temporarily successful. Attempts to challenge directly the validity or practicality of an attractor for intractable conflict are therefore often doomed to fail and in fact are likely to intensify people's beliefs and energize their response tendencies. Imagine, for instance, one's reaction to an acquaintance who takes it upon himself or herself to explain to one in detail why one's pro-choice (or pro-life) position on abortion is erroneous. Odds are, one will likely tune this person out, confront him or her, or move away and avoid him or her in the future. This makes the resolution of intractable conflict a daunting task. There

are three basic scenarios, however, by which one might change the dynamics of an intractable conflict.

In one scenario, an understanding of how attractors are created can be used to “reverse engineer” a malignant attractor. Attractors develop as separate elements (e.g., issues, events, pieces of information) become linked by reinforcing feedback to promote a global perspective and action orientation. Reverse engineering thus entails changing some of the feedback loops from reinforcing to inhibitory, thereby lowering the level of coherence in the system. One strategy is to reinstate the salience of individual elements, devoid of their integration with other elements. Psychological research provides clues regarding this “disassembly process” (cf. Vallacher, Nowak, Markus, & Strauss, 1998; Vallacher & Wegner, in press). For example, disruptions to ongoing action tend to make people sensitive to the overlearned details of the action, as do instructions to focus on the details of a narrative rather than on the narrative's larger meaning. Such a situation occurred in Boston in 1994, when a series of violent shootings at family-planning clinics there forced the pro-life and pro-choice communities to carefully reexamine their activities and rhetoric and forge new approaches to the issues. When habitual actions and generalized judgments and beliefs are deconstructed in this way, people become vulnerable to new interpretations that provide an avenue of emergence to a coherent perspective. In effect, the tack is to recapture the complexity of a conflict attractor and reconfigure the elements to promote a more benign form of coherence.

In the second scenario, the key is moving the system out of its manifest attractor into a latent attractor that is defined in terms of benign or even positive thoughts, actions, and relationships. In most interpersonal and intergroup contexts, there are many elements of relevant information and many possible ways of configuring these elements to achieve a coherent perspective and a stable platform for action. Just as perceptual elements can be organized to promote different gestalts, social information can take on a host of different meanings with diverse action possibilities. At any given time, however, only one attractor is likely to be manifest in people's orientation toward other people or groups—just as a single figure–ground relation characterizes perception at a single point in time. The other possible attractors are latent and may be invisible, both to the parties involved and to outside observers. Yet these latent attractors may become manifest in sudden fashion under some circumstances and promote a notable change in the relations among people and groups.

There are reasons for suspecting the existence of latent attractors in relationships whose manifest tendencies are malignant. Many protracted conflicts, for example, involve a long history between the parties, including stretches of time characterized by positive relations. The relations between Ukraine and Poland, for example, go back many decades, and during this time mutually beneficial trade and cultural relations were often manifest. Indeed, the strained relations that developed as a result of World War II can be considered the exception rather than the rule in Ukrainian–Polish relations. Presumably, then, there is a latent attractor

for positive relations between the two societies that was supplanted by a negative manifest attractor after the war. With this in mind, it is not surprising that the mutual antagonism gave way in a dramatic fashion to mutual support during the Orange revolution in Ukraine in 2004–2005. In effect, the two countries shifted their respective figure–ground relations and began to interact in a qualitatively different manner that reflected an attractor that had been latent for years.

We propose that latent attractors may be an inevitable consequence of developing a manifest attractor. In emphasizing some elements while ignoring or downplaying others to bolster a particular orientation toward another person or group, people often have to suppress or discount particular ideas, feelings, and action tendencies. These suppressed elements of thought and behavior may become self-organized to promote their own attractor, in the same way that marginalized individuals in a social system form clusters with internal coherence (Nowak et al., 1990). Under certain conditions, the latent attractors formed in this fashion may suddenly become manifest, just as minority groups can suddenly exert significant influence in a social system when various conditions are met (cf. Moscovici, 1985; Nowak & Vallacher, 2001).

This scenario has some surprising, even ironic, consequences. Even a very strong attractor will have a limited basin of attraction and thus will exclude a wide variety of information that is discrepant from the attractor's value. An explicitly peaceful overture by an outgroup, for example, is difficult to reconcile with the ingroup's negative attitude and thus may be discounted as an anomaly. Should enough incidents like this occur, however, they may begin to coalesce into a new attractor reflecting benign or positive attitudes toward the outgroup. At this point, if an event or intervention temporarily defuses the conflict, the newly formed latent attractor could suddenly become manifest and redirect the ingroup's thoughts, feelings, and actions vis à vis the outgroup.

The existence of latent attractors serves as a reminder that change often conforms to a nonlinear scenario. What appears to be sustained antagonism between two groups can suddenly give way to relatively benign or even positive relations if an event—even a seemingly insignificant one—pushes the group out of its current basin of attraction into the basin of a previously latent attractor. Thus, although peacekeeping missions, conflict resolution initiatives, reconciliation processes, and trust-building activities often appear to be largely ineffective in situations with groups locked in a protracted struggle, they may be acting to establish or bolster a sufficiently wide and deep attractor basin for moral, humane forms of intergroup interactions that provide the foundation for a stable, peaceful future. The gradual and long-term construction of a new attractor may be imperceptible, but it prepares the ground for a positive state that would be impossible without these actions. By the same reasoning, of course, peaceful relations between groups may show a sudden change to a negative or even violent pattern of intergroup behavior if conditions

have created the foundation for a latent attractor comprised of negative thoughts, feelings, and action tendencies. It remains for future research to assess the viability of this scenario and to identify the conditions that can promote the sudden salience of a previously latent attractor.

The third scenario goes beyond moving the system between its existing attractors to systematically changing the number and types of attractors. In a nonlinear dynamical system, a wide range of variables can produce quantitative effects in the system's behavior, but usually only a small subset of them promote noteworthy qualitative changes. Small changes in the value of these *control parameters* can produce bifurcations—qualitative changes in the system's attractor landscape (cf. Nowak & Lewenstein, 1994; Ruelle, 1989). Bifurcations can take many forms, including a change from a single attractor to two attractors, a change from a single attractor to a periodic attractor (oscillation between two or more coherent states), and a sequence of changes from a single attractor through periodic and multiperiodic attractors to a chaotic attractor (a complex trajectory of behavior that never repeats and is highly sensitive to initial conditions). In each case, bifurcations occur at specific thresholds in the values of the control parameter.

To translate this general scenario into a specific strategy for conflict resolution, it is necessary to identify the relevant control parameters that have the potential to change the attractor landscape constraining the behavior patterns in an antagonistic relationship. Attention can then be turned to investigating the form that bifurcations are likely to take in response to changes in the values of these factors. Does enhancing police security in a community, for example, simply strengthen the community's attractor for hostile relations with the local government (as was seen in 2005 when the French government sent SWAT teams into immigrant neighborhoods to quell unrest), or does it qualify as a control parameter that transforms the pattern of thinking and behavior of the community regarding the government? If this factor functions as a control parameter, does it promote the emergence of a new attractor (e.g., positive relations)? Does it introduce periodic movement between very different attractors (e.g., oscillation between positive and negative relations)? Or does it promote a trajectory of chaotic movement over time between very different patterns (e.g., seemingly random swings in thought and behavior that are highly sensitive to minor events)?

The identification of control factors and their effects on the attractor landscape of a system characterized by intractable conflict is a daunting task, but the potential payoff for success is significant. With this in mind, we have recently incorporated this approach into a simulation platform for teaching conflict negotiation and peacebuilding (Nowak et al., 2010). Changing the attractor landscape of a relationship mired in conflict may hold the key to promoting a wholesale transformation of the relationship and increasing the likelihood of sustainable peace.

Question 11: Where do we go from here?

The dynamical perspective conceptualizes intractable conflict in terms of generic processes that underlie diverse phenomena across the social and physical sciences. This does not mean that intractable conflicts are “nothing but” examples of generic processes. Human experience is clearly unique in many respects, and one should never lose sight of the idiosyncratic factors relevant to any particular conflict scenario. The dynamical account provides a scaffolding, though, on which such factors can be layered and put into perspective.

To build on this scaffold, it is necessary to translate dynamical concepts and principles into hypotheses and develop rigorous and reliable empirical methods to test these hypotheses. Because conflict is a multi-faceted phenomenon that is manifest in different ways at multiple levels of social reality, the empirical approach must be correspondingly diverse and flexible, entailing the coordination of laboratory experiments, field research, archival data analyses, and the development of formal models implemented in computer simulations. Accordingly, a cross-disciplinary approach is called for. Our own research team represents the expertise of experimental social psychology, peace psychology, cultural anthropology, nonlinear dynamical systems, and computer science. The following issues, noted in the responses to the basic questions, are currently at the forefront of our research agenda:

- First and foremost, research is essential to verify the connection between conflict intractability and attractor dynamics. Are intractable conflicts, as we propose, associated with attractors that are exceptionally strong and have a wide basin of attraction? Is one property more central to intractability than the other? Are attractor dynamics fundamentally the same for conflicts at different levels of social reality (e.g., interpersonal, intergroup, international)? Although a few studies have provided preliminary support for this proposition (see Gottman, Swanson, & Swanson, 2002; Kugler & Coleman, 2009; Losada & Markovitch, 1990), much work remains to be done.
- What factors promote the imbalance of reinforcing and inhibiting feedback loops that we propose to be responsible for the transformation of a benign conflict into a protracted, malignant conflict? To what extent is the hypothesized breakdown in regulatory dynamics associated with documented antecedents of destructive conflict such as incompatible needs and values, power struggles, perceived injustice, segregated social groups, and ideological differences? Do the factors associated with regulatory failures in everyday life—stress, intense emotion, time pressure, threat, and so forth—also undermine the operation of inhibiting feedback loops in conflict scenarios and thereby promote the evolution of an entrenched attractor for sustained conflict?
- What is the relationship between the complexity and ambiguity of conflict-relevant information and conflict intensity? If, as we propose, a primary motivation of adversaries in a conflict is maintaining the coherence of their respective cognitive, affective, and behavioral orientations, the potential for negative interactions should be enhanced when new information and events threaten one or both parties' attractors. Research directly testing this ironic connection between basic properties of information and conflict remains to be undertaken.
- Can conflicts be transformed by reverse engineering, as we have suggested? Social psychological research has shown that global mental states can be effectively disassembled into their lower level elements, creating the potential for a wholesale change in people's understanding of their own and others' actions (Vallacher & Wegner, in press). Is this approach relevant to the disassembly of strong attractors associated with intractable conflict? If so, what specific strategies would be most effective in breaking the reinforcing feedback loops among elements, in introducing inhibiting feedback loops, or in isolating the elements and thereby increasing the complexity in a coherent system of thought and behavior associated with conflict?
- What is the role of latent attractors in conflict transformation? Do they, as we propose, create the potential for sudden and catastrophic change in the nature of the relationship between adversaries in a protracted conflict? What factors promote the development of latent attractors? Does information that cannot be assimilated to an attractor create the seeds of an alternative pattern of thought and behavior? If so, would attempts to suppress or discount inconsistent information have the ironic effect of undermining a manifest attractor and promoting a transition to a fundamentally different perspective? This possibility resonates with contemporary research in social psychology (e.g., Wegner, 1994) and could be tested in experimental research.
- How and to what extent do concepts known to be relevant to conflict escalation and stalemates configure the dynamic properties of long-term conflicts? Competition over scarce resources, power differences, injustice, ideology, and religion, for example, are critical to the genesis, maintenance, and transformation of interpersonal and intergroup relations, but their respective roles have yet to be reframed in explicitly dynamical terms and tested in various conflict scenarios. Identifying the essential control parameters responsible for altering the attractor landscape of intractable conflict (e.g., promoting specific types of bifurcations) is thus a high priority for research.
- Are there asymmetries in the operation of positive and negative attractors? Attractor dynamics are not limited to negative interactions but have been shown to characterize benign and positive social relationships as well (cf. Gottman et al., 2002; Kugler & Coleman, 2009; Losada & Markovitch,

1990; Nowak & Vallacher, 1998). In a close relationship, for example, the psychological and behavioral processes of each party tend to converge on positive states. Negative thoughts and antagonistic actions may be experienced, but these states tend to be short-lived, yielding over time to the positive sentiments and behaviors defining the relationship attractor. Are attractor dynamics symmetric with respect to benign (or positive) and antagonistic relationships? Is the basin of attraction, for example, wider for a relationship characterized by hostility than for one characterized by affection? Assuming one can calibrate the respective intensity of feeling in negative and positive relationships, is there greater attractor strength (resistance to change) in one or the other type of relationship?

Conclusion and Future Iterations

The perspective we have advanced suggests that the most visible causes of intractable conflict—scarce resource competition, ideological differences, and the like—are not necessarily the critical factors for understanding the genesis, maintenance, and resolution of such conflicts. The proximate causes are not to be trivialized, of course, but they need to be appreciated in the context of basic dynamics that are often opaque—both to observers and to the parties to the conflict. Thus, a conflict progresses toward intractability as specific mental states (thoughts, beliefs, memories) and action tendencies coalesce into a strong attractor that provides coherence and an unequivocal platform for action. Resolving an intractable conflict, then, is tantamount to changing the systems' attractors. To date, we have identified three strategies for doing so: disassembling an attractor for conflict and promoting the emergence of a new (benign) attractor; strengthening a latent attractor for positive relations; and changing the attractor landscape in a system.

Yet other insights into the nature of intractable conflict are destined to emerge as concerted efforts are undertaken to investigate intractable conflict from the perspective of complexity and dynamical systems (see, e.g., Hanson & Sword, 2008). The dynamical perspective has proven to be both integrative and heuristic in many areas of science, establishing invariant principles that link seemingly distinct topics and generating new research agendas in these fields. We anticipate that this approach will serve these functions for the science of conflict as well. But, more important, we hope that the identification of fundamental conflict dynamics will provide new strategies designed to transform conflicts that serve no one's purposes yet seem impervious to resolution. Intractability might turn out to be as much an illusion as the conviction of warring parties that each has a monopoly on truth and value.

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