

Chapman University

Chapman University Digital Commons

Psychology Faculty Books and Book Chapters

Psychology

2009

Coherence, Complexity, And Information Flow: Self-Organizing Processes In Psychotherapy

David Pincus

Chapman University, pincus@chapman.edu

Follow this and additional works at: https://digitalcommons.chapman.edu/psychology_books



Part of the [Movement and Mind-Body Therapies Commons](#), [Other Psychiatry and Psychology Commons](#), [Other Rehabilitation and Therapy Commons](#), and the [Psychology Commons](#)

Recommended Citation

Pincus, D. (2009). Coherence, complexity, and information flow: Self-organizing processes in psychotherapy. In S. J. Guastello, M. Koopmans, and D. Pincus (Eds.), *Chaos and complexity in psychology: The theory of nonlinear dynamical systems*(pp.335-369). New York: Cambridge University Press.

This Book is brought to you for free and open access by the Psychology at Chapman University Digital Commons. It has been accepted for inclusion in Psychology Faculty Books and Book Chapters by an authorized administrator of Chapman University Digital Commons. For more information, please contact laughtin@chapman.edu.

11 Coherence, Complexity, and Information Flow: Self-Organizing Processes in Psychotherapy

DAVID PINCUS

The True Nature of Psychotherapy

What is psychotherapy? This simple question can stimulate hours of discussion, producing more new questions for each new answer. For example, one may ask if there is a single answer to what psychotherapy is, or if in fact psychotherapy is always different for each unique client. Probing deeper, one may also wonder if scientifically informed "theories" of psychotherapy really add to the "truth" of what therapy is for any given client, or whether truth is actually derived through a constructive process. Such questions raise the question of the merits of "truth" versus "utility," as even the most scientifically controlled or "manualized" approaches to treatment encourage the therapist to accommodate any approach to fit the values, goals, and unique situations of the client. It appears that defining psychotherapy is a difficult matter, creating practical and scientific questions that are worthy of deep exploration.

Psychotherapy has a great tradition of such deep self-examination. For example, Frank and Frank (1991) have influenced two generations of therapists with the well-reasoned yet apparently controversial suggestion that modern psychotherapy is based more on applied rhetoric than on scientific discovery. The psychotherapy field has generally been forced to conclude that factors common across approaches are better predictors of treatment outcome than are the use of a specific technique (Orlinsky & Howard, 1995), particularly the quality of the therapist-client relationship (Orlinsky, Grawe, & Parks, 1994). Unfortunately, this clear and ubiquitous set of findings has not deterred the proliferation of more than 400 purportedly distinct "theories" of psychotherapy (Garfield, 1995). Each of these new theories may be characterized by considerable overlap with other approaches (past and present) and a difficulty in demonstrating any true scientific advancement beyond showing that the treatment is generally effective.

This situation has led many prominent researchers to turn away from the quest for the final new approach, toward the ways in which the therapeutic

relationship and other common factors of therapy may be better understood and enhanced to make therapy more effective. These investigations have led down more philosophical avenues, examining such things as the social roles of clients, the cultural aspects of science, and the role of the therapist from cultural and historical perspectives. For example, Orlinsky and Howard (1995) wrote:

The modern scientific psychotherapies can be seen as modes of healing that have been reinvented to suit the secular, rational, and technological culture that predominates among the middle and elite strata of urban industrial society. [p. 5] . . . a *professional service* that provides *personal help* in the sphere of *private life* under the symbolic authority and guidance of *scientific knowledge* [italics in original] . . . This combination of professional service with personal attachment . . . is a defining and distinctive feature of modern psychotherapy. (p. 9)

Psychotherapy is a strange profession indeed. Session after session the therapist's job is to create in 50-minute segments the most unique and open relationship that each client is likely to experience in his or her life. It is no wonder that the vast majority of therapists see scientific principles as antithetical to this process (Crane, Wampler, Sprenkle, Sandberg, & Hovestadt, 2002; Garfield, 1998). On the job, the psychotherapist must serve such disparate functions as diagnostician, source of emotional support, coach, referee, leader, follower, and healer. This interpersonal balance of psychotherapy continually unfolds over numerous scales of time, from exchange to exchange, emotion to emotion, session to session, from beginnings to ends to new beginnings. Therapists are pulled by competing biopsychosocial forces throughout, as they attempt to stay present and aware of these processes, within the client, within themselves, and among the two.

The common thread that could tie together these questions about the science and the practice of psychotherapy is the therapeutic relationship. A number of key questions remain in this regard, such as: Which interpersonal processes are therapeutic? When are they most therapeutic? Which interpersonal processes are destructive? When are they most destructive? Which specific techniques or heuristics might therapists use to intervene in the direction of healthy functioning? How may we use this ubiquitous *interpersonal space* in which we do our work to assist our clients in *moving from here to there*?

Many of the deeper basic science questions have remained as well, such as: Why does this interpersonal process exist in the first place? What purpose does it serve in human relationships in general? Perhaps some individual clinicians have achieved momentary states of wisdom in this regard. For the great majority of us, however, we get a rare and fuzzy glimpse at the apparent meaning of interpersonal processes only now and then. At the same time, the optimistic among us await the scientific development of a single objectively testable theory of psychotherapy that may unite the field under a single paradigm. The more cynical among us watch with amusement as the development of integrative approaches attempt to keep pace with the development of "new theories."

This chapter is written in the spirit of optimism, suggesting that self-organization is just such a general theory that may assist in providing a deeper, scientifically grounded understanding of the complex biopsychosocial processes involved in psychotherapy. To provide some foundation to this rather grand suggestion, the following review rests on five more specific theoretical propositions stemming from self-organization theory: (a) Order emerges naturally from the exchange of information among individuals (i.e., agents) involved in psychotherapeutic interactions; (b) this emergent self-organizing interpersonal system is open, interacting with neighboring systems across scales of time (i.e., moment-to-moment, week-to-week) and biopsychosocial space (i.e., from physiological systems, through self-systems, and up to larger-scale social networks); (c) mindfulness practices act to open, balance, and reintegrate self-organizing biopsychosocial systems by utilizing natural processes of recursion within these systems; (d) the most commonly studied interpersonal processes (i.e., control, closeness, and conflict) are emergent structures, arising from patterned flows of information exchange, and feeding back to regulate subsequent flows over time in a circular manner across scales; and (e) self-organizing interpersonal information flows and emergent regulating structures naturally evolve toward the edge of chaos, with shifts toward rigidity and complexity reflecting evolutionary demands (see Fig. 11.1 for this general model which will be used throughout this chapter).

The analysis of these propositions begins with an integrative review of traditional theories of interpersonal process through the lens of nonlinear dynamical systems (NDS) and self-organization theory in particular. Next, the contemporary empirical and theoretical developments using NDS to understand psychotherapy process are reviewed. Finally, some general conclusions are drawn, and avenues for future research are suggested. The goal here is not to do away with the rich diversity in approaches to therapy. Rather, the aim is to frame such approaches as *approaches*, rather than as *theories*, and to tie these approaches together through a deeper understanding of self-organizing interpersonal processes in psychotherapy.

With these goals in mind, five specific questions pertaining to depth, breadth, and clinical relevance are addressed: (a) How may we begin to integrate the various theories and approaches to psychotherapy within a common scientific framework? (b) How and why do interpersonal systems emerge? (c) Why do these systems always seem to involve a mixture of both coherence and complexity? (d) What is the significance of ubiquitous relational processes such as control, closeness, and conflict? (e) What is the true meaning of interpersonal patterns?

From Roots to Branches: Historical Development of the Process-Oriented Psychotherapies

With more than 400 supposedly different ways to do the same rather complex job, it seems that the last thing the field needs is yet another approach: *chaos therapy* anyone? No? Yet development within the field of psychotherapy has been

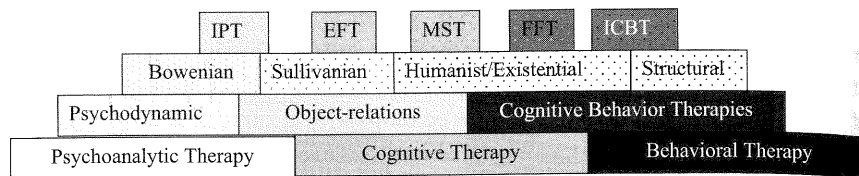


Figure 11.2. A conceptual diagram representing an evolution in psychotherapeutic approaches. Older, foundational approaches are located at the bottom of the pyramid. Newer, more integrative approaches are at the top. The gray-scale represents the underlying research model's focus on nonobservable phenomena (i.e., thoughts). The dotted background of the third level represents the nonscientific constructivist influence that permeated many of the approaches of the 1950s to the 1970s. This pyramid contains only a very narrow subset of the full number of approaches and the complex patterns of influence among approaches. IPT = interpersonal therapies; EFT = emotion-focused therapies; MST = multisystemic therapies; FFT = functional family therapy; ICBT = integrative cognitive-behavioral therapies.

the basic systemic concepts have remained. For example, the psychodynamic clinicians have focused heavily on the repetitive relational processes associated with the particular internal conflicts of clients (Luborsky & Crits-Christoph, 1998). The object-relations clinicians (i.e., Bowlby, 1982) have focused on the ego and its recursive self-relations (i.e., autonomy and coping) and outward other relations (i.e., objects and intimacy needs). Furthermore, self-relations and other relations are proposed to be either balanced (flexible and complex), or unbalanced (extreme and rigid). The humanists (i.e., Rogers, 1951) have focused more explicitly on the inherent potential for growth and flexibility within individuals and the factors that promote integration and growth, such as empathy (i.e., shared understanding and connection) and mindful acceptance (i.e., non-judgment and congruence). Similarly, the existentialists (i.e., May, 1977) have focused on experiential awareness that may bring healing through connection to larger values, bringing flexible meaning to an inherently chaotic world.

Horney's (1966, 1970) psychodynamic model provides a good starting point to examine the systemic commonalities among these analytically based approaches. Horney (1970) suggested that individuals may use three primary strategies to meet interpersonal needs: (a) *moving toward*, accepting and accommodating the needs of others to gain intimacy or closeness with others; (b) *moving against*, pushing others to accommodate one's need to establish dominance or control; and (c) *moving away*, a strategy of self-protection through withdrawal and avoidance. Healthy individuals are defined by their ability to apply flexibly any of the three strategies depending on the goodness of fit with the particular interpersonal context, whereas dysfunctional individuals rigidly cling to one approach without regard to its usefulness. Furthermore, the rigid strategy of dysfunctional individuals is thought to take on a quasi-adaptive function (leading to short-term relative fitness), whereby the problem is employed as

its own solution. Rigid overuse of one particular strategy becomes self-sustaining through positive circular feedback over time.

For example, if an individual rigidly uses a moving-toward strategy to get close to others, he or she will tend to subjugate assertiveness and autonomy for the sake of acceptance by others. When the strategy works, garnering social approval, the strategy gets stronger, and when the strategy is ineffective, the individual is motivated to work even harder to please others on the next possible occasion. The same process of self-fulfilling prophecy happens regardless of the strategy used, as those who move against find themselves constantly under attack from others and those who move away find themselves constantly alone. Over time, rigidity leads to rigidity, as short-term interpersonal adaptations aimed at avoiding a *narcissistic injury* (Kohut, 1977) block the development of more flexible longer-term adaptive strategies.

In each case the internal conflict is maintained by the circular regulatory mechanism involving the use of the problem to solve the problem. Within the individual, rigid flows of self-other information emerge across time and within psychosocial space: putting oneself down to stop feeling exploited, striking first to reduce attacks, and abandoning others so as not to be abandoned. Within these psychodynamic models, one may glean a first piece of clinical wisdom that may be retained in the study of interpersonal processes from an NDS perspective. Hypothetical Proposition (1): *the fundamental process underlying conflict is rigidity, which may spread across the intersection of the psyche across time and scales of biopsychosocial space.*

Sullivan and Rogers: Interpersonal Process and Humanism

The 1950s brought the ideas of two clinical theoreticians to the forefront of popular therapy, with approaches that have come to be considered distinct from their psychoanalytic roots: Carl Rogers's *Humanism* (i.e., client-centered therapy; 1951) and Harry Stack Sullivan's (1953) *interpersonal psychiatry*. Rogers (1957) was the first to place theoretical focus on the common factors of psychotherapy. Specifically, Rogers identified (a) *empathy*: understanding the experience of the client in an *as if* manner (Rogers, 1957, p. 829); (b) *unconditional positive regard*: unfettered esteem for and nonjudgment of your client as a human being; and (c) *congruence*: a state of mindful self-acceptance and self-integrity. Subsequent research by Rogers (and others; for a review, see Orlinsky & Howard, 1986) has indeed confirmed the necessity of these common factors to treatment outcome.

Rogers's (1951) humanistic theory of personality suggests that psychopathology is the result of conflicts between the phenomenological *self* as subjectively perceived by the client, and the *organism*; the client in a more objective sense and as typically perceived by others. Self versus organism conflicts were thought to be created during early interactions with caregivers involving empathic failures, misattuned caregiving responses, leading to internalized *conditions of worth*

within the developing child that were self-sustaining over time. Herein, one finds a strong linkage with earlier psychodynamic models of conflict.

Such self-conflicting parent-child misattunements include statements such as: "You're not tired, you just had a nap," "You're not hungry, you just ate," or "Why are you sad? We're having fun." In sufficient quantity, these empathic failures are believed to build up internal conflicts within the child, blocking certain internal experiences and leading to a lack of self-understanding (i.e., "maybe I'm not really sad?") and in the worst case conditions of worth (i.e., "if I am sad, I'm no good"). The objective sadness of the organism is at conflict with the subjective experience of the self, such that certain experiences bring conflict and incongruence (a lack of structural integrity) within the self. Within the process of therapy, accurate empathy and radical acceptance on the part of the congruent therapist is believed to create an ideal interpersonal context that would allow for self-repair (Rogers, 1951). When viewed from an NDS perspective, it is clear that the same psychodynamic principles describing the spread of unresolved conflict and rigidity remain within these humanist traditions.

However, a paradox lies within the fact that humanist and other more modern approaches to therapy embrace these same principles with respect to conflict, balance, and change, while rejecting psychodynamic traditions as a whole. Within contemporary psychotherapeutic practice, one would be hard-pressed to find any approach that has not adopted these humanistic principles, or an empirical study that has not found them to be beneficial when balanced with some change-oriented activity (Orlinsky & Howard, 1995). Indeed, even the most recent trends in behavioral therapy (for a review, see S. C. Hayes, Follette, & Linehan, 2004) have converged with the work of process-oriented psychotherapy researchers (Lynch, Chapman, Rosenthal, Kuo, & Linehan, 2006; Sexton, Alexander, & Mease, 2004), resulting in the common notion that successful psychotherapy ultimately involves a balance between stability and complexity, acceptance and change.

Yet these traditions remain in isolation from one another. Lacking a comprehensive scientific framework to couch this process of balance within the behavioral traditions and still refusing to merge with the nonbehavioral therapeutic traditions, these clinicians have instead relied on dialectical philosophy as a metaphor to guide treatment development and explain efficacy. This appears a rather extreme maneuver in and of itself, particularly considering the radical empirical foundations underlying the development of behaviorism in psychology. Lynch et al. (2006) described dialectical philosophy as applied to behavioral therapy in the following manner:

The process by which a phenomenon, behavior, or argument is transformed is the dialectic, which involves three essential stages: (1) the beginning, in which an initial proposition or statement (thesis) occurs; (2) the negation of the beginning phenomenon, which involves a contradiction or "antithesis;" and (3) the negation of the negation, or the synthesis of thesis and antithesis. Essentially, tension develops

between thesis and antithesis, the synthesis between the two constitutes the next thesis, and the process is repeated ad infinitum. Dialectical philosophy also posits that reality is composed of interrelated parts that cannot be defined without reference to the system as a whole. Similarly, a whole system is composed of parts and cannot be defined without reference to its parts. The system and its parts constantly are in a state of change or flux, and changes in one influence changes in the other. When applied to the understanding of human suffering, this ontological principle of interrelatedness and wholeness leads to a systemic and contextual conceptualization of behavior. (pp. 461-462)

In addition to the lack of integration with the psychodynamic traditions, it is also apparent from this passage that the contemporary behavioral approaches have made an ironic connection to dialectical philosophy rather than using an equivalent yet empirically oriented approach grounded in self-organization.

The modern psychodynamic approaches, typically renamed as *interpersonal* approaches to therapy, rely implicitly on the same general principles of change. For example, the acceptance-change *dialectic* is clearly exemplified through the use of *process comments* in Teyber's (2005) interpersonal model of therapy. Process comments involve the therapist engaging the client in a discussion of the here and now unfolding of interpersonal processes within the therapist-client relationship. In this manner, the therapist and client may actively cocreate the interpersonal reality in which they are operating. For example, the therapist may model congruence in the here and now: "When I hear you asking that question, it pulls me to want to give you reassurance and care." In this example, the therapist is being honest and focusing attention on an interpersonal pull or *attractor* within the session, while at the same time maintaining psychosocial distance from the attractor through mindful acceptance. Process comments may serve a number of other functions as well, such as allowing a therapist to deliver a challenge to the client that would otherwise be likely to bring about conflict or resistance: "How sure are you right now that what you're telling me is really the whole story? Because I'm feeling a strong pull to challenge what you are saying right now."

Ultimately, each of these examples involves opening up the interactive space to allow for more flexibility in the exchanges of information between therapist and client. It is one thing to tell clients that they may break down information boundaries and discuss anything that they may be experiencing. It is another thing altogether to do this actively within the relational space. The term *emotionally corrective experience* (Alexander & French, 1980; Teyber, 2005) is used to describe novel exchanges that may emerge from such process comments. The term describes the breaking down of rigid, emotion-laden information boundaries that have served to spread the internal conflicts of a client across time and biopsychosocial space. Intrinsic to such notions one may generate a second theoretical proposition that is informed by NDS and builds on the former proposition regarding the equivalence of conflict and rigidity: *Psychotherapy works through*

the resolution of conflicts, which open up the boundaries that regulate a client's biopsychosocial flows of information.

From the perspective of self-organization theory, this proposition may explain why mindfulness-based approaches have become so popular over the past decade across the various approaches to therapy and why such approaches tend to be so effective (Baer, 2003; Eifert & Forsyth, 2005). Mindfulness practices in therapy come originally from the Buddhist traditions of meditation and involve "intentionally bringing one's attention to the internal and external experiences occurring in the present moment" (Baer, 2003, p. 125). Mindfulness, be it interpersonal in the form of process comments or internal in the form of non-judgmental self-reflection, may in theory obtain its power through recursion, which assists in the resolution of conflicting flows of biopsychosocial information. Mindfulness involves turning one's flows of information on one's flows of information. Therein the self becomes loosely involved with the self, and within the relationship, the individuals loosely relate about their relations. As such, a third theoretical proposition may be proposed: *Mindfulness practices act to open, balance, and reintegrate self-organizing biopsychosocial systems by utilizing natural processes of recursion within these systems.*

At the same time as Rogers was converting notions of internal conflict into the humanistic perspective, Sullivan was translating the relational aspects of analysis into a tradition that would become the foundation for family therapy (i.e., Minuchin & Fishman, 1974), group therapy (i.e., Yalom, 1985), and the modern interpersonal approaches to therapy. Sullivan's basic premise is that psychopathology is primarily a manifestation of one's degree of positive connection to others, rather than some internal process. This idea is most clearly reflected in his definition of personality as "the relatively enduring pattern of recurrent interpersonal situations" that occur over the life span (Sullivan, 1953, p. 111). Sullivan's focus on interpersonal needs closely resembles psychodynamic premises (i.e., Horney, 1970), as well as the earlier analytic theory of Adler (1930), which was also a balance model involving needs for power and affiliation. Despite these equivalencies, Sullivan was the first to suggest that personality is largely driven by the social environment rather than vice versa. Furthermore, Sullivan focused on the interactive nature of person and situation, including the self-regulating flexibility that comes from conflict resolution, be it social, individual, or, more likely, mixed. Sullivan's ideas were later formalized for research purposes within the interpersonal circumplex models (Leary, 1957; Wiggins, 1979), which have continued to be of influence in social psychology research.

The Conjoint Therapies: Adventures in Avalanche Control

Whereas each of the individual therapy traditions outlined in the previous subsections has dealt with the spread of internal conflict up to the interpersonal domain, Sullivan's interpersonal psychiatry provided a foundation for the

development of the conjoint therapies, which focused on the converse: resolving interpersonal conflicts help the individual. Perhaps the clearest example of this notion of group dynamics flowing downward into individuals is within the various approaches to family therapy. The traditional belief espoused within these approaches is that individual pathology may be more accurately conceptualized as a symptom of larger-scale problems of family relations. In a classic example, a child is pulled toward misbehavior by the family system because the misbehavior serves to distract the family from underlying marital conflicts. Some contemporary family therapists have challenged this unidirectional explanation and emphasized the practical need to consider systems across scales, from family to individual and back (Diamond, Diamond, & Liddle, 2000).

Unfortunately, innovations such as these are slow and hard to come by in the field of family therapy because of the radical constructivist traditions on which the field was founded (Nichols & Schwartz, 2005). Indeed, there is still a rather strong antiscience streak within the family therapy community, which serves to magnify the split between empirical research on the one hand, and clinical theory on the other (Diamond et al., 2000; Sprenkle & Blow, 2004). As a result, family systems theory has seen little change over the past 30 to 40 years (Nichols & Schwartz, 2005).

Nevertheless, the term "systemic" continues to be a powerful buzzword used by professional guilds in family therapy – for example, in mission statements to guide professionals and as a pedagogical requirement for training in accredited programs (see, for example, the Commission on Accreditation for Marriage and Family Therapy Education, 2005). Yet there is almost no mention within the field of family therapy of contemporary systems concepts (i.e., NDS) or research involving NDS theory or methods. Indeed, the term "systemic" is typically treated as equivalent to "relational" or to convey a value for diversity within psychotherapy. As such, modern family therapy is paradoxical at its core; it is devoted to its founding within the general systems concepts of the 1960s and 1970s (von Bertalanffy, 1950; also see Davidson, 1983, for a summary of general systems theory) but is almost completely cut off from the contemporary systems models that have grown from these earlier concepts.

However, when one removes the politics and constructivist influences of the past, rational analysis of the various family systems concepts suggests that the underlying theoretical mechanisms are actually equivalent across the various family systems theories between these family theories and the individual therapy traditions and also a number of theories from social psychology. The distinctions among approaches, rather, tend to lie in modality (i.e., how many people are seen at once) and technique. For example, Bowen's (1978) analytically based approach to family therapy focuses largely on *differentiation*, which is equivalent to the original analytic term *individuation*, each of which describes the process by which family members become decoupled along the familiar dimensions of closeness and control. Bowen's approach also relied on the central

concept of relational *triangles*, stable interpersonal structures involving three group members whereby conflict between two individuals could be *detoured* (see Minuchin & Fishman, 1974, for the overlapping concept of detouring). For example, a parent may find a dysfunctional yet quasi-adaptive manner of managing intimacy-related marital conflicts by pulling one of the children into the role of confidant (increasing the child's level of closeness and control within that parent-child relationship). The upside for the family system is avoidance of marital conflict, whereas the downside is the positioning of the child into a developmentally inappropriate regulatory function within the family. Vital interpersonal boundaries to both the child and the family's longer-term adaptations have been crossed. Specifically, both parents will be limited in their abilities to provide the necessary structure (e.g., control) and support (e.g., closeness; see Baumrind, 1983, for independently derived parenting styles comprising these equivalent dimensions) for that child.

The predominant style of therapy from the Bowenian tradition is for the therapist to join the system, enter into a stabilizing triangle with conflicting individuals, and act within that triangle to discharge carefully the stored up information behind the unresolved conflict. Conflict resolution is accomplished by using the therapist as a mutually agreed upon go-between for information exchange. In the interest of theoretical integration, it is worthwhile to point out that in addition to the overlapping concept of *detouring* from structural family therapy (Minuchin & Fishman, 1974), the triangles suggested to provide conflict balance by Bowen are essentially identical (although less precise) to Heider's (1958) balance theory from social psychology.

Minuchin's (Minuchin & Fishman, 1974) structural family therapy is the other major family therapy tradition apart from Bowen's (see Nichols & Schwartz, 2005), which is primarily distinguishable based on technique rather than theory per se. Structural family therapy focuses more directly on the information boundaries and subsystems within families. For example, in the family situation outlined earlier, a structural family therapist would suggest that the boundaries around the family's *executive subsystem* are too diffuse (with respect to both power and intimacy) and the intimacy boundary (i.e., emotional cutoff) between the parents is too rigid, whereas a Bowenian therapist would describe the situation in equivalent terms such as differentiation of the child from the parental relationship or as the family system being *enmeshed*. Minuchin's approach typically involves activating the family to increase flows of information in a particular area, flooding a dysfunctional boundary, while at the same time creating other more functional boundaries to damn up dysfunctional flows. For example, after joining with the family system, a structural family therapist may frame the relationship between the parent and child as a metaphorical *affair* and challenge the detached spouse to end these transgressions and fight to save the marriage. Structural family therapy tends to involve more heated exchanges among family members and more complex maneuvering from the therapist.

Each of these two dominant approaches to family therapy appears to be focusing on self-organizing dynamics within families. Each approach seeks to shift structural boundaries to the flow of information to bring the regulatory functions of closeness and control into balance and to move related conflicts toward resolution. For example, one may use Bak's (1996) NDS model of self-organized criticality to understand the commonality among different approaches to resolving family conflicts. Bak (1996) suggested that information discharge in self-organizing systems is optimally poised within a critical region at the *edge of chaos*. Family conflict may be viewed as an example of such a process of information discharge. Just as avalanches involve discharges of matter in physical systems at criticality, family conflict may serve to discharge information in order to maintain an adaptive mix of coherence and complexity. When viewed in this manner, one finds that the fundamental differences among schools of family therapy may be integrated based on the methods used to promote movement of the family toward criticality, allowing for subsequent self-regulation and growth.

Bowenian therapists typically release such *information avalanches* by acting as a go-between in a therapeutically created triangle, leading to increased mindful reflection (i.e., less emotional reactivity) among conflicting family members. Structural family therapists (e.g., Minuchin & Fishman, 1974) tend to build up structural boundaries where needed (to hold appropriate information in place) and to apply strategic *blasts of psychosocial dynamite* in other areas to break down boundaries and release pent-up information in a more sudden manner. Ultimately, then, the theories of family therapy are equivalent to the individual-therapy theories, despite their differences in scale and method of intervention. They all work toward conflict resolution, shifting the biopsychosocial flows of information. Such a view is consistent with empirical studies of family process, which thus far have generally showed that it is balance of supportive and structuring by the therapist that best predicts positive outcomes (Friedlander, Wildman, Heatherington, & Skowron, 1994). With respect to theory to guide future research a fourth theoretical proposition may be offered: *Relational phenomena involving closeness and control serve a regulatory function within self-organizing interpersonal systems, maintaining the structural coherence of boundaries that guide information flows within the group. Conflict processes act to increase the level of rigidity and constraint in these boundaries.*

Group psychotherapy (Yalom, 1985) when viewed through an integrative and systemic lens, relies on equivalent mechanisms of conflict resolution as well. The similarities are so complete, in fact, that one could easily conceptualize the individual process-oriented approaches to therapy as special cases of group therapy, comprising a therapist-client group of two. Indeed, Yalom's (1985) descriptions of group therapy process focus on the group as a place in which clients' interpersonal conflicts will naturally emerge, where they may be safely resolved to the benefit of each member and as a place where new and more flexible interpersonal behaviors may be safely practiced and generalized.

Yalom's approach is more conceptually based than research based out of necessity, because the large theoretical and empirical gaps in the traditional understanding of small-group processes (Bednar & Kaul, 1994). As such, Yalom's approach includes 11 therapeutic factors (e.g., altruism, the instillation of hope, interpersonal learning, etc.) that have been identified as important factors through self-report surveys of group members. These factors are not designed to be independent, mutually exclusive, or integrated under a common theory of group process. Again, the priority has been on practicality rather than science.

Within Yalom's approach, the artful task of the therapist is to act through the leadership role within the group to create a climate that enhances each of these 11 factors. In doing so, the group climate becomes a microcosm in which members have opportunities to practice novel interpersonal strategies leading to what is akin to a set of emotionally corrective experience across the members. Group cohesion, or a sense of *we-ness*, is identified as a key group-level precondition to interpersonal experimentation according to Yalom (1985). Cohesion may be considered analogous to the therapeutic alliance of individual therapy.

The group therapist uses the leadership role to artfully direct the force of cohesion toward the goal of allowing for constructive conflict within the group. In this manner, control and closeness become more flexible among members, and open conflict is increasingly tolerable. The primary technique again is the use of process comments. With increasingly flexible relations with respect to control and closeness among members, social and internal conflicts may be resolved, as members relate in ways to which they are not typically accustomed. If this process goes well, the group develops a social climate that is flexible enough to withstand and supportively confront even the most pathologically rigid interpersonal behavior of its members.

Although Yalom (1985) did not use NDS concepts explicitly, he did suggest that interactive flexibility is necessary within the group: "A freely interactive group, with few structural restrictions, will, in time, develop into a social microcosm of the participant members" (p. 28). Therefore, in terms of observable patterns of interaction, therapy groups develop ideally in such a way as to allow for the exchange of information between as many different members as possible. This ability for therapeutic groups to form strong external boundaries, to endure repeated and escalating conflicts, and to become increasingly open internally over time is arguably the main set of factors that distinguish them from other relationships. This process of increasing coherence and complexity is also a good fit for empirical modeling using self-organization theory.

Pavlov's Buddha? Contemporary Cognitive-Behavioral Therapies

Before concluding this review of interpersonal processes traditions in psychotherapy, it is worthwhile to point out that similar notions of conflict and rigidity may be found within cognitive-behavioral therapy (CBT) traditions of

psychotherapy as well. Admittedly, direct references to interpersonal processes and conflict tend to be relatively rare in CBT. This may be largely attributable to the historical desire for CBT practitioners to distinguish themselves from their less empirically oriented psychodynamic counterparts from the past. However, one could make the case that the only theoretical difference between contemporary CBT and the psychodynamic therapies is the size or scale at which each approach operates. CBT is a highly specific, detailed, and structured approach to therapy in which one closely examines specific thought processes or behaviors. In contrast, psychodynamic therapies take a broader perspective, examining more vague patterns of self and other in mental, emotional, and behavioral processes. Again, one finds a difference in approach, more than underlying theory. Indeed, one may even suggest that this difference essentially boils down to the therapist's perspective, near versus far.

Through the lens of NDS, it becomes clear that traditional cognitive therapies have always focused on the identification and modification of rigid and extreme belief systems (Ellis, 1977) through the use of methods aimed at opening these beliefs to novel flows of information (i.e., Beck, 1970). More recent acceptance-based cognitive approaches have made a subtle shift, aiming to change one's relations with cognition (i.e., de-fusion), essentially decoupling the broader self from any particular thought, through the use of acceptance and mindfulness-based techniques (Eifert & Forsyth, 2005; S.C. Hayes, Strosahl, & Wilson, 1999). Sharing the goal of increasing flexibility with traditional cognitive therapy, these approaches present a more clear-cut process orientation, aiming to modify one's hold on beliefs, rather than to modify directly the beliefs themselves. Like modern interpersonal therapies, the focus is on process rather than content.

Similarly, the CBT approaches have shared the goal of helping individuals open up relatively closed and ineffective behavioral habits through the use of effective problem-solving skills (i.e., Meichenbaum, 1975), experiential exposure (Barlow, Allen, & Choate, 2004), and values clarification (S. C. Hayes et al., 2004). Implicit across all approaches and innovations to CBT, however, is the primary goal of opening relatively closed and rigid systems to new sources of information to increase flexibility and self-regulation. In this respect, all of the traditions of therapy converge.

Lauterbach (1996) provided one clear example of the study of conflict from a cognitive-behavioral perspective. Defining internal conflict as *conceptual* in nature and involving an "incompatibility between beliefs, values, and attitudes" (p. 214), Lauterbach (1996) grounded psychodynamic notions of conflict within an integrative model comprised of Heider's (1958) notions of balance and Festinger's (1957) notions of cognitive dissonance, a similar integration undertaken by a number of contemporary social psychologists (i.e., Matz & Wood, 2005). Using a comprehensive measurement paradigm that reflects this *balance perspective*, Lauterbach (1996) found some promising results. For example, more

conflicted individuals are more likely to have psychosomatic illnesses and more severe psychiatric symptom profiles. Furthermore, levels of internal conflict tend to decrease in lockstep with symptom severity over the course of psychotherapy. Empirical studies from social psychology have repeatedly demonstrated similar results, that internal conflict involves rigidity, psychopathology, and general biopsychosocial dysregulation (Eid & Dieiner, 1999; Gallo, Smith, & Ruiz, 2003; O'Connor, 2002; Schultz & Searleman, 2002; Shaver & Brennan, 1992).

Despite the lack of explicit focus on conflict and rigidity (not to mention no understanding of NDS) within the clinical approaches to CBT the concepts are assumed implicitly throughout. For example, cognitive therapies have traditionally focused on the identification and restructuring of rigid dysfunctional beliefs (i.e., Ellis, 1977). Although there are many methods of cognitive restructuring, each essentially focuses on bringing new information to an existing dysfunctional belief system. This new information is intended to increase the flexibility of rigid and nonadaptive beliefs, allowing the client greater flexibility in coping responses as well as more flexible means of affective regulation.

The Nonlinear Elephant in the Office: The Common NDS Assumptions of Therapy Process

None of the approaches reviewed thus far makes any specific reference to self-organization or related concepts from NDS. Yet practical concerns have drawn each approach to include a central focus on: (a) rigidity and flexibility; (b) control, closeness, and conflict as organizing parameters underlying interpersonal processes; (c) interactions among the individual and interpersonal scales; and (d) the use of mindfulness and related techniques to resolve such conflicts to improve balance and integrity across these scales. The lack of internally consistent and empirically testable systemic grounding to these approaches has allowed them to evolve over the history of psychotherapy as if they were distinct theories, rather than different approaches to working with a common underlying biopsychosocial process. Yet each of the seemingly distinct clinical traditions shares a number of common systemic mechanisms believed to underlie psychotherapeutic process (a): Context-specific constellations of interpersonal control and closeness emerge naturally and automatically from interpersonal information exchanges. (b) These emergent processes serve a regulatory function within self-organizing interpersonal systems, maintaining the structural coherence of boundaries that guide the information flows within the group from which they have emerged. (c) Conflict processes emerge from imbalances in the constellations of control and closeness among group members, acting to increase the level of rigidity and constraint with respect to information flows. (d) The resulting rigidity of conflict may spread beyond the individual psyche to neighboring systems, across scales of both size (down to biology and up to culture) and time (from moments to years). (e) Process-oriented therapies aim to resolve

conflicts (increasing flexibility) through techniques that open these relational boundaries, allowing the client more complex yet integrated flows of psychosocial information. The common theoretical thread here is self-organizing flows of information, which helps to provide a deeper explanation of the ongoing questions and unexamined assumptions of psychotherapy process.

This chapter began with a reevaluation of mainstream psychotherapy theory using self-organization as an integrative theoretical framework. Indeed, clinicians and researchers have been able to develop a good degree of knowledge without the benefit of NDS theory or methodologies, which have only arrived to the clinical psychology literature within the last 10 years or so. At this point, I turn to the next step in the study of process, clinical theory that is both empirically testable and also explicitly nonlinear and systemic, using NDS concepts literally rather than as metaphor.

Interpersonal Processes in Psychotherapy

Pincus (2001; Pincus & Guastello, 2005) has developed an integrative model of interpersonal processes known as the 5-R model, based on much of the same clinical theory reviewed earlier, along with the initial theoretical concepts of several authors who had already been suggesting that family systems theories could be updated through the use of NDS principles (Butz, Chamberlain, & McCown, 1997; Elkaim, 1981; Koopmans, 1998, 2001; Ward, 1995). The basic assumption of this model is that interpersonal relationships serve an information processing function, regulating flows of information over time. Arising from this basic information regulatory function are the various complex and phenomenological aspects of interpersonal reality, which serve as the contexts for meaning within biopsychosocial health.

The name "5-R" refers to the five domains most frequently cited as targets of treatment by the various approaches to family therapy: *rules, roles, relationships, realities, and response patterns* (Pincus, 2001), which also overlap with control, closeness, and conflict (i.e., 3-Cs; Pincus & Guastello, 2005). Again, with the basic function of interpersonal process as regulation of information flows, *rules are defined as the boundaries that channel such flows*. For example, the initial conditions in psychotherapy are marked by a brief discussion by client and therapist as to the rules that will govern their working relationship. In the case of process-oriented treatments, these rules may be described as a combination of a relatively closed external boundary on the flows of information (i.e., confidentiality) with increasingly permeable and fluid internal boundaries to allow for new and potentially adaptive relational strategies (i.e., detailed exploration of hidden and emotionally painful topics). This combination of extreme professionalism along with extreme intimacy is unique among modern relationships (Orlinsky & Howard, 1995) and arguably provides the necessary relational context that provides for the optimally structured yet open relationship to emerge.

As opposed to norms, which are used in social psychology to describe expectations for appropriate behaviors, rules are more broadly viewed as the boundary conditions around interactive behavior (see Fig. 11.1). They are hypothetically overdetermined, maintaining their coherence not only through expectations but also through an array of cognitive processes such as attitudes, momentum (i.e., habit), as well as the interactive responses of other members' interactants (i.e., a disapproving look). In other words, rules are reflected in cognitive processes such as expectations but may not be reduced to individual cognition. Instead, rules emerge from the collective behavior of interacting individuals.

The next *R* in the model, *roles*, is defined as the unique constellation of rules that may be ascribed to an individual within an interpersonal process. Control is a central dimension within any role distinction, emerging quickly and automatically within groups (Bales, 1999) and theoretically forming the basis for some of the driver-slave dynamics that may regulate flows of information within the relationship.

It is through roles that individual- and group-level self-organizing dynamics may hypothetically interface. For example, a relatively healthy individual would be expected to have internal boundaries (self-relations) that are flexibly integrated, combining coherence and complexity; Marks-Tarlow (1999) developed this theme in a theoretical account of the self-organization of the self. Such an integrated yet flexible individual would be able to assume more flexible role relations with others. Koopmans (2001) described such a process of spreading conflict through social roles through a process he refers to as *N-binds*. *N-binds* represent in an updated NDS-based conceptualization of double binds a well-known concept from the history of family therapy. Interpersonal binds involve mixed social messages from which there is no escape. Benign examples occur everyday, such as when a casual yet disliked acquaintance asks you what's the matter because "You look really upset." If you are upset, but admit it to this person, you will have entered a vulnerable and uncomfortable position of intimacy. If you are not upset (the more typical scenario), you are in a position of having to make the subtle suggestion that he or she is wrong and somewhat insensitive. If the question annoys you, so that now you *are* in a bad mood when you were otherwise fine, you are now really trapped! Similar traps happen within intimate relationships as well, such as if a romantic partner says during a conflict, "... but I still love you." If you protest, you are denying a positive statement (at the level of content at least). If you accept the statement, you are going along with the notion that your transgressions warranted an evaluation of your love-worthiness. At a minimum, *N-binds* may represent a particularly strong process whereby conflict spreads across scales through contradictory flows of information pertaining to roles.

Working in the opposite direction, relational processes that break down rigid interpersonal boundaries and allow new flexible boundaries to emerge would be expected to cascade down into the self-system, bringing flexible flows of information to the individual consciousness. Indeed, the current model suggests that

one would expect self-similar dynamics to emerge across scales from individual to group and back. This suggestion may help to make deeper sense of the recent line of social psychology research outside of the NDS paradigm that have demonstrated the bidirectional flows of conflict and conflict resolution across these scales (De Dreu & van Knippenberg, 2005; Matz & Wood, 2005; McGregor et al., 2005; McKimmie et al., 2003; O'Connor & Dyce, 1997). The notion of self-similarity in flows of information also provides an empirically grounded explanation for the psychodynamic phenomena of *identification* (i.e., internalizing the conflicted dynamics of parents) and *recapitulation* (i.e., recreating past conflicts in the present; Teyber, 2005).

The third *R* in the model stands for relationships, which may be defined as *constellations of two or more roles involved in the exchange of information* (Pincus, 2001). Along with gradations in control, closeness may be considered to be a universal dimension of relationships (see Fig. 11.1). The current model proposes that conflict emerges from imbalances on these two dimensions, leading to the emergence of rigidity. This explanation helps to ground the empirical findings reviewed earlier, which have consistently demonstrated that imbalances in either of these dimensions is associated with spreading biopsychosocial dysfunction (see Leary, 1957, and Wiggins, 1979, for circumplex models containing these two dimensions). This updated NDS-based interpersonal model also helps to make sense of the ubiquitous notion in psychotherapy that conflict and conflict resolution are necessary for psychosocial growth and that egalitarian and flexible relations are ideal for facilitating such growth within the therapeutic context.

The fourth *R*, *realities*, is defined as shared, group-relevant information structures. Theoretically, they are the same as social realities described by Festinger, Schachter, and Back (1950). Realities are the most abstract of the 5-Rs and are determined primarily through cognitive processes in which typical interaction patterns are perceived and stored in long-term memory. As coherent structures of flowing information within and among individuals, this self-organized conceptualization of realities helps to make sense of the power of the group context to radically transform the personalities of individuals within a group (i.e., Zimbardo, Maslach, & Haney, 2000). In addition to roles, this conceptualization also helps to inform the notion of how emotionally corrective experiences actually work within the psychodynamic traditions. When a new and more flexible response pattern emerges within the therapeutic relationship, this new pattern may unleash intense emotion along with an irreversible increase in the flexibility of the self and other schemata of a client. Therapy works not just through insight or information flows within the brain but changes that spread across emotional boundaries into the therapy relationship and beyond.

The fifth and final *R* in the model stands for *response patterns*, the observable repetitive back-and-forth patterns of interaction within therapy. These patterns hypothetically serve as the raw material for clinical inference within treatment

and at the same time may be operationalized for empirical study. For example, NDS methodologies may be used to extract turn-taking or other behaviorally defined patterns during treatment for both quantitative (i.e., entropy) and qualitative analysis (clinically meaningful exchanges). Because the 5-R model suggests that higher-order relational processes emerge through self-organizing mechanisms from information flows, the complexity of response patterns should reflect the complexity of these higher-order relational processes. Areas of conflict, for example, should result in rigid patterns of interaction, a phenomenon supported both by clinical wisdom and empirical research, yet heretofore lacking in theoretical grounding.

NDS Methodologies

It is not sufficient to take the grand theories of the past, add NDS jargon to them, and then contend that these theories have been improved in some meaningful way. Unfortunately, this type of theory building does happen on occasion. For the theoretical mechanisms underlying psychotherapy to become truly refined through the use of NDS principles, those principles must be used to make specific predictions, and those predictions must be investigated using methodologies capable of assessing NDS concepts. It is through NDS-informed methodology that one may ascertain whether a nonlinear model is applicable to a given phenomenon at all, and, if so, how applicable it may be.

The widespread adoption of new methodologies in psychology is notoriously slow, and methods that are able to capture the richness and complexity of psychotherapy research have been particularly hard to come by (see Snyder & Kazak, 2005, for a recent review in the context of family therapy). There are some noteworthy exceptions, however. For example, extensive research has been completed using nonlinear differential equations to model marital interactions (Gottman, Murray, Swanson, Tyson, & Swanson, 2002). Within this area, empirical research into nonlinear reciprocal patterns of influence within couples (i.e., how strongly does negativity from a wife pull for negativity from a husband) has been used to develop models of marital stability over time.

Another set of techniques referred to under the rubric of *state-space grids* (Lewis, Lamey, & Douglas, 1999) has been used to investigate interpersonal interaction patterns in terms of rigidity versus flexibility (Granic, Hollenstein, Dishion, & Patterson, 2003; Hollenstein, Granic, Stoolmiller, & Snyder, 2004). State space grids are essentially a method of graphing the sequential behaviors of two individuals during an interaction. One individual's behavior is tracked along the *x*-axis and the other's behavior along the *y*-axis, forming a two-dimensional square grid. For example, one could track three possible behaviors (i.e., positive, negative, and neutral) between a parent and child by coding each behavior in sequence across the grid. There is nothing inherently grounded in NDS within this aspect of the approach, which is quite similar to traditional sequential

analysis techniques such as Markov chains and other methods based on the examination of transition probabilities within a matrix (Bakeman & Gottman, 1997).

However, Lewis et al. (1999) suggested that the movement across the grid may be used as a way of assessing attractors underlying interpersonal processes. Within this context, state space grids have been used to investigate such things as the presence and strength of fixed-point attractors in the course of anxiety and depressive disorders (Katerndahl & Wang, 2007) and the complexity in movement in parent-child interactions (Hollenstein et al., 2004).

Tschacher, Scheier, and Grawe (1998) examined coherence within the therapeutic alliance using principle components analyses and Shannon entropy values from self-report measures acquired over the course of therapy. Tschacher et al. (1998) found that the number of factors and entropy values each decreased in sync over the course of therapy, suggesting that coherence in therapist-patient viewpoints increases as the therapeutic alliance is formed across sessions. Furthermore, the degree of coherence was a significant predictor of treatment outcomes.

The methodology most relevant to the current theoretical discussion is known as *orbital decomposition* (OD; Guastello, 2000; Guastello, Hyde, & Odak, 1998; Pincus, 2001; Pincus & Guastello, 2005). OD is an NDS approach designed to measure the complexity within hierarchical patterns within a categorical time series, such as a series of utterances within a small-group discussion that have been coded in some objective manner. In this respect, the method is a specific example from the broader class of symbolic dynamics procedures (see Guastello et al., 1998, for further discussion). It is this ability to identify and isolate longer, hierarchical patterns, and to produce direct measures of entropy within these patterns that most clearly distinguishes the technique from other approaches (i.e., state space grids).

Although it is grounded in mathematics, conceptually OD is a rather simple approach to understand. One begins with a series or *string* of utterances, for example, made within a small group. For instance, one may track the interaction within a family therapy session simply in terms of who speaks in what order. In a typical 50-minute session, one may find that there are approximately 300 turns at speech taken, which may be recorded based on who spoke (T = Therapist, F = Father, M = mother, C = child). The entire coded conversation, then, is a time series of categorical data in the form of T-F-M-F-T-C-F-M, for example. Next, the researcher records all possible pairs within the time series (i.e., strings of Length 2), for example: T-F, F-M, M-F and so on, followed by triples (i.e., T-F-M, F-M-F), quadruples, and so on. A variety of empirically based rules of thumb may be used to determine the ideal length of strings at which one will obtain the optimal analysis of the discussion (Pincus & Perez, 2006). Once this optimal string length is identified, a variety of indices of entropy may be derived on the basis of the recurrence structures within the patterns in the discussion.

For example, a discussion comprising almost exclusively T-F-C repetitions would be a relatively rigid conversation, whereas a more-or-less equal distribution of all possible patterns would produce higher measures of entropy (i.e., Shannon entropy and fractal dimension). An estimate of Lyapunov dimensionality may be calculated on the basis of the number of distinct, immediately recurring patterns (analogous for periodic orbits within a strange attractor; see Guastello, 2000, for a full explanation of the derivation of this methodology). In addition to measures of entropy, which may be used as the outputs of any variety of statistical prediction equations (Pincus & Guastello, 2005), one may analyze highly repetitive patterns or long patterns in a more clinical or qualitative manner as well (Pincus, 2001). Numerous other quantitative analyses may be added to these basic procedures, such as estimates of structural integrity within the relationships, measures of transients within the relationship dynamics (i.e., qualitative transitions to the underlying relational processes), or quantitative assessments of the contribution of each group member to overall structure and integrity of the discussion (Pincus & Perez, 2006).

Empirical Validation of the 5-R Model

In an initial empirical test of the 5-R model, Pincus (2001) used OD and found evidence for self-organization (i.e., low-dimensional chaotic patterning and high levels of pattern repetition) within a clinic-referred family discussion using measures of Shannon entropy (equal to 8.68) and Lyapunov dimension (1.7). This result has been replicated (Pincus, 2005) across multiple sessions of family therapy using tests of the inverse power law (IPL) model (R^2 ranging from .86 to 1.00, mean = .93). This result suggests that the turn-taking dynamics of family therapy sessions was fractal and was exhibiting complex self-organizing dynamics at the edge of chaos.

Similar results were observed in a study of group-therapy process (Pincus & Guastello, 2005), with a significant fit ($R^2 = .95$) between the distribution of patterned recurrences in turn-taking dynamics during a group-therapy session and an IPL model. Furthermore, Pincus and Guastello (2005) found that a multivariate regression model including measures of conflict, control, and closeness accounted for 48% of the variance within this IPL model. Together these results suggest that the turn-taking responses of the group were reflecting an underlying self-organizing process with a fractal temporal structure. The results also suggest that control, closeness, and conflict among members were behaving as emergent structures within that process, consistent with the predictions of self-organization theory applied to interpersonal process, particularly the 5-R model.

The gold standard, however, in science is the experiment, which provides the best possible evidence for cause. The results reviewed earlier may be considered to be quasi-experimental inasmuch as they involve controlled regression analyses on time-dependent order parameters (i.e., entropy and structure). Nevertheless,

systemic models need not sacrifice rigor for holism. With these empirical goals in mind, Pincus (2005) conducted a series of studies on experimentally created groups using a similar paradigm as the family and group therapy studies outlined earlier. The specific aim was to determine whether the controlled induction of internal conflict within a single member of an experimentally created group is sufficient to reduce the entropy in turn-taking dynamics of the group as a whole. Results from a single-group experimental design (e.g., ABA design) suggested just that: with significant drops in entropy in group dynamics following the induction of conflict within a single group member (Pincus, Fox, Perez, Turner, McGeehan, 2008).

A series of six experimental replications (24 discussions in all), furthermore, were consistent with these results. Levels of induced conflict within group members and subsequent conflict resolution among the members (ABAB designs) accounted for approximately 20% of the variance in the entropy of response patterns. Higher levels of conflict induction within group members was associated with significant drops in entropy in group dynamics, and higher levels of subsequent conflict resolution were associated with significant increases in entropy. Furthermore, the turn-taking dynamics of all groups fit strongly the IPL model (R^2 ranging from .86 to .99, mean = .94 across the 24 discussions, Pincus, 2005).

These results suggest that conflict creates structural changes within hierarchical self-organizing interpersonal dynamics. Conflict narrows information flows within the individual's cognitive, behavioral, and emotional systems, leading to rigid personality dynamics (i.e., all-or-nothing thinking). Furthermore, individual conflicts spread to the group level, causing a narrowing of the information flows at the broader level of interpersonal relationships. When viewed from the broader evolutionary context of self-organization, it seems that conflict is a necessary evil within the adaptive processes of biopsychosocial systems. In the short term, conflict narrows information flows to protect the structural integrity of the hierarchical systems (i.e., self-relations and interpersonal relations), whereas conflict resolutions appear to be a precursor to adaptive growth. Altogether, this research supports a fifth theoretical proposition: *Self-organizing interpersonal information flows naturally evolve toward the edge of chaos, with shifts toward rigidity and complexity reflecting evolutionary demands on biopsychosocial systems.*

Related Empirical Results Using the NDS Perspective

A number of studies examining various relational contexts with variations in nonlinear modeling and methods have found similar results as those informed by the psychotherapy-oriented 5-R model. Within the domain of group therapy, Burlingame, Fuhrman, and Barnum (1995) measured fluctuations in the number of therapeutic statements over the course of a 16-week group therapy

process and found that the complexity (using fractal dimensions) increased over the course of the therapy, peaking at around the two-thirds mark (around Session 10) and then decreasing. This group therapy pattern was similar to the results of Badalamenti and Langs (1992), who found increasing complexity (using Shannon entropy) in verbal utterances over the course of individual (dyadic) treatment. Together these results suggest that interactive complexity tends to increase over time as therapeutic relationships evolve. Yet while interactive complexity appears to increase over the course of therapy, the shared understandings among therapist and client with respect to goals, procedures, and expected outcomes tend to become more coherent (Tschacher et al., 1998). Together these results suggest that the self-organizing coherence in psychotherapy process involves an open and positive coordination in the therapeutic expectations, which facilitate open and flexible behavioral exchanges among members.

An overlapping line of research has examined more precisely the putative adaptive route through chaos to increasing self-organized flexibility that may occur for clients during the course of therapy. Hayes and Strauss (1998) have had some success in finding what appear to be bifurcations during the course of cognitive therapy for depressed individuals. The hallmarks they observed were sudden disorganization (and worsening) in depressive symptoms immediately preceding improvements in functioning. Subsequent research has found that sudden gains are rather common in successful therapy, occurring in about 40% of cases in both CBT and psychodynamic treatments for depression and resulting in better treatment outcomes when compared with clients without sudden gains (Tang, Luborsky, & Andrusyna, 2002).

The most extensive research applying NDS to psychosocial processes has been carried out within the context of marital interactions (Gottman et al., 2002). The general research results in this area have suggested that interactive rigidity within marital conversation is predictive of marital dissatisfaction and divorce. More specifically, Gottman et al. (2002) have been able to predict marital dissolution with a 94% rate of accuracy using a differential equation model based on matches and mismatches in couples' interactive response styles. In general, they have found that regulated couples appear to respond to one another with a positive-to-negative ratio equal to or greater than 5 to 1. On the contrary, a dysregulated cascade toward marital dissatisfaction and potential separation ensues when the response styles of couples lead to negativity that falls below this 5-to-1 level. Related empirical studies have demonstrated that this process of conflict-driven instability is reflected at the smaller biological scales as well. For example, physiological linkage (i.e., rigidity in the mirrored stress responses of couples) accounts for approximately 60% of the variance in self-reported levels of marital dissatisfaction (Levinson & Gottman, 1983). Furthermore, the most toxic variety of rigid interactions, contempt (e.g., "thumbing your nose" at another person), puts the object of that contempt at risk for heart disease at levels comparable to poor diet and smoking (Gottman et al., 2002).

Guastello, Pincus, and Gunderson (2006) extended Levinson and Gottman's (1983) results on physiological linkage in marital satisfaction, demonstrating that such linkage occurs during routine interactions among strangers getting to know one another and is associated with social sensitivity as well as conflict. Furthermore, Guastello et al. (2006) found that, in addition to a relatively simple nonlinear model for ups and downs of physiological arousal within individuals, linkage also occurs in the exchange of entropy across individuals, with the entropy levels of one individual predicting the entropy levels of the other individual at a lag of 20 seconds. The nonlinear regression model was based on the Lyapunov exponent. The exchanges of physiological entropy were usually symmetrical, although a few were asymmetrical with one individual driving the complexity in physiological responses of the other (e.g., driver-slave dynamics). Importantly, many of the linkages within the dyads would have been missed if only a linear analysis were used.

With respect to theory, these initial results suggest that the self-organizing processes found between individual and interpersonal scales extend further down into the physiologies of individuals engaged in relationships with others. These results are consistent with the latest wave of clinical approaches espousing a perspective typically referred to as *interpersonal neurobiology* (i.e., Siegel, 2006). In addition to inspiring new perspectives for clinical work, such results may provide a theoretical foundation for future NDS-informed approaches to health psychology (i.e., Pincus & Sheikh, in press).

Although the use of NDS in child psychopathology research is not the focus of the current chapter, it is worth mentioning the recent interest that has been paid to updating classic models of reciprocity and social learning using NDS (see for example, Granic & Patterson, 2006). For example, Granic et al. (2003) examined the dynamics of videotaped parent-child interactions in a group of one hundred forty-nine 9- to 10-year-old boys over a span of several years and found a significant increase in that the number of interactive states and transitions among those states during the 12- to 13-year age range. These results suggest that the complexity of family dynamics may undergo a *phase shift* (an irreversible systemic reorganization toward greater organizational flexibility) in response to the maturational influences of an individual child as he or she reaches adolescence. On a systemic level, this naturally occurring process may be equivalent to the type of adaptations that appear to be occurring over the course of psychotherapy.

Research using similar NDS models and methods has also found that rigidity in parent-child interactions predicts developmental trajectories toward psychopathology during the transition from kindergarten to first grade (Hollenstein et al., 2004), and similarly that rigidity in peer dynamics was predictive of enduring psychopathology during the transition from early adolescence to young adulthood (Dishion, Nelson, Winter, & Bullock, 2004). This interpersonal process-oriented NDS research extends the traditional psychopathology

research results reviewed earlier, suggesting again that rigidity is connected to psychopathology, spreading both within and among individuals. Inasmuch as these NDS studies have tracked the development of these psychosocial processes as they occur naturally, over the course of critical periods of development, the case for self-organizing processes underlying healthy and unhealthy psychosocial development appears strong.

Although Gottman (1991; Gottman, et al., 2002) uses fixed-point attractors rather than the broader concepts involved in self-organization to interpret his results, it is rather simple to apply these results to a model involving self-organizing biopsychosocial processes. Specifically, when conflicting flows of interpersonal information cross critical thresholds (e.g., less than a 5:1 ratio for positive to negative statements), rigidity may spread across scales of time and size, making the system less flexible, adaptive, and robust against turbulent flows from neighboring systems in which the relationship is nested.

Fredrickson and Losada (2005) have used chaos theory to support their findings that a similar ratio (greater than 2.9:1.0) underlies positive versus negative mental health processes over time. In their study, they obtained daily records of subjective positive and negative emotional experiences from 188 participants over the course of 28 days. The ratio of 2.9:1.0 served as the cut point dividing healthy from unhealthy participants. The ratings over time in this study were not analyzed to produce measures of flexibility. Rather, the 2.9:1.0 results were interpreted in relation to the results of a prior math modeling study of group dynamics, with the similar ratio found in this context taken as evidence of a universal principle of biopsychosocial balance.

In this prior study, Losada (1999) had run a simulation model of team performance using the Lorenz (1993) equations for meteorological chaos. Using empirically derived parameters from real groups within the simulation model, Losada (1999) found that values above the 2.9:1.0 ratio among parameters produced a more chaotic result than values below this ratio. Using these and other similar results from related research (including the work of Gottman et al., 2002), Fredrickson and Losada (2005) suggested that chaos theory may be used as a general theory to understand human biopsychosocial growth. They further suggested that the output of such theory will be general mathematical laws that may be used to assess and promote such growth.

Subsequent research will surely examine these bold suggestions in greater detail. In particular, future studies should determine whether such systems truly involve deterministic chaos (e.g., few variables producing unpredictable behavior as in meteorological models), or complexity through self-organization (e.g., many variables becoming coupled to produce ordered emergent processes). Each theory has been used to support the notion that more open processes are healthy, and more closed processes are not. The primary difference may be seen as the underlying mechanism involved, which is major distinction that needs to be made. Therefore subsequent studies aiming to differentiate between the

two models will need to use empirically derived measures of entropy rather than the results of simulations from an a priori simulation model. Specifically, if equations such as those of Lorenz are used in a psychosocial application, one is predisposed toward finding chaotic dynamics.

Summary and Conclusions

Conceptualizing interpersonal processes from an NDS perspective, one may suggest some deeper answers to the five theoretical questions posed at the outset of this chapter. We began with a question: How may the various theories of psychotherapy become integrated within a single testable theoretical framework? It is suggested that self-organization theory may be used as a general framework for weaving together the various empirical and applied approaches to psychotherapy. When viewed as self-organizing flows of information, nested between the biological scales and broader society, interpersonal processes appear to be open self-organizing systems that adapt through self-regulating feedback mechanisms, leading to complex synchronization phenomena within and among individuals.

Second question: How and why do interpersonal systems emerge? Self-organizing interpersonal processes are an inevitable and naturally occurring set of emergent phenomena. Self-organization arises automatically once human beings begin to engage in a process of exchange information. They arise because we talk, and we talk because they arise.

Such processes serve an adaptive regulatory function for individuals, as well as the emergent systems in which the individuals are nested. Furthermore, one might suggest that once a sufficient number of linkages are made among two or more individuals (i.e., constellations of closeness and control across different domains), an emergent order with respect to flows of information exchange over time will naturally emerge and begin to evolve. This emergent order is commonly known as a *relationship*, whereas the subsequent flows of information are called *conversations*. When you talk to people, you develop relationships with them, which determine the subsequent ways that you talk with them and so on. This is why psychotherapy is known as "talk therapy" and invariably relies on the method of conversation.

Our third question was: Why do psychosocial systems invariably display a mixture of coherence and complexity? Self-organizing interpersonal systems are both coherent and complex because such a balance allows for optimal systemic evolution. Coherence provides stability, structure, and supportive coregulation. Complexity allows for novel adaptations and robustness against the inevitable turbulent flows that spill over from neighboring biopsychosocial systems.

Fourth question: What is the evolutionary significance of control, closeness, and conflict? It is suggested here that control and closeness are emergent structures within interpersonal systems, aspects of the relationship that

serve regulatory functions, holding the system together. Generally speaking, one would expect that a flexible and balanced combination of control and closeness within relationships would be the healthiest state, reflecting flexible and adaptive structure-making processes within the relationship. At the same time, special situations would require a different mix of these two coherence-making processes. For example, parents need to provide higher levels of both structure and support for younger versus older children. These systems would be expected to appear more rigid and predictable in their behavioral outputs, and yet provide a better fit for the relatively rigid internal dynamics of the young children. War, or other extreme threat contexts, would provide other examples in which some measure of rigidity would be ideal.

Conflict is theoretically a second-order emergent property arising from discrepant and constraining flows of information, within or among individuals and often both. It is suggested that these conflicting flows typically involve a lack of coordination with respect to closeness and control. For example, when one person wants more distance than the other or when two or more individuals want to be in charge at the same time, conflict will emerge. Short-term conflict and rigidity may serve an adaptive function by increasing the structural integrity of the interpersonal system as it prepares to accommodate and evolve more complex flows of information (i.e., a new and adaptive mode of role taking by one or more members). Chronic unresolved conflict conversely, may be the hallmark of pathology, at both individual and also interpersonal levels. Furthermore, it is possible that some systems evolve toward a reliance on chronic unresolved conflict as a source of structure, rather than mutual closeness or reciprocal control. In these situations, conflict may appear to be the only thing holding the relationship together.

Question five: What is the meaning of interpersonal patterns? Interpersonal patterns are the ubiquitous observable sign of the self-organizing processes that characterize human relationships. Humans who examine their own or others' relationships will perceive repeating patterns in their modes of connection and synchronization with others. Interpersonal approaches to therapy most clearly focus on these patterns, allowing them to emerge within a safe and open therapeutic relational context. Next, these approaches focus on the therapeutic relationship itself in a recursive manner to allow for conflict resolution and adaptation in the client's biopsychosocial systems.

Self-organization appears to hold great promise in guiding the future clinical developments and research into interpersonal process in psychotherapy. The theory is specific enough to allow for research predictions and simulations, yet broad enough to account for the unique aspects of each individual psychotherapy encounter. In addition, the theory allows for relationships to be modeled in a number of ways, depending on the goals of the study. For example, when viewed in terms of microprocesses such as turn taking in conversations, the evidence has been quite consistent in suggesting that verbal behaviors produce

recurrence structures consistent with an IPL model. In this context, models such as the 5-R model hold promise for understanding the connections between structural rigidity in the flows of information at the moment-by-moment interactions and the broader relational processes that emerge from those interactions (i.e., conflict, closeness, and control). Ultimately, the application of an NDS concept such as self-organization may allow clinical psychology to switch from a process of microparadigms that compete simultaneously, splintering over time rather than ever truly being replaced or refined. Perhaps psychotherapy research will discover its first laws in just over 100 years of its existence as a scientific discipline? Perhaps there will be the first true paradigm, a truly integrated theory of psychopathology and psychotherapy that still allows for as many unique approaches as there are clinicians?

Each of these approaches may be considered to be a creative means of working with interpersonal processes. None of them need be a *theory* per se, but rather a set of approaches to be used for case conceptualization and treatment planning. Self-organization could be the actual *theory*, which may be modeled in a number of respects depending on the goals of the researcher or clinician. For example, on a larger time scale, it may be useful to model self-organizing interpersonal processes in terms of catastrophes (i.e., cusp) – for example, if one wishes to capture a phase change in the dynamics of a group after an evolutionary phase shift (Byrne, Mazanov, & Gregson, 2001; Guastello, 2000, 2002, 2005). Or at a smaller scale, one may wish to examine the biological synchronization that underlies interpersonal self-organization processes.

These regulatory processes may also be captured in terms of more qualitative indices as well, such as Gottman et al.'s (2002) predictive models of marital stability using regulation of positive and negative affect. Finally, it may be useful to analyze interpersonal process such as family dynamics, through the use of attractor dynamics. For example, rigid boundaries or conflict avoidance dynamics could be represented as a relatively high surface or repeller on the family's behavioral manifold. Open conflict or diffuse boundaries could be represented as fixed points; and mismatches in these dynamics among members could be represented as saddles (e.g., attractor on one side and repeller on the other). This type of conceptualization could be done qualitatively, on the basis of clinical information gleaned from sessions, or more quantitatively, such as by constructing attractor manifolds based on patterned behavioral outputs coded from videotape. Simulation models could be generated and examined on the basis of attractors as well.

The common thread through each of these analytic strategies is self-organization, and so each analytic approach does not need to become a "theory" with its own cults of personality, disciples, and "certified" practitioners. Self-organization theory suggests that interpersonal processes emerge naturally as information is exchanged among humans, that these processes serve a regulatory function for the affects, cognition, behaviors, and physiologies of

interactants. Furthermore, the research reviewed here suggests that structural rigidity, integrity, phase shifts, and other measures of process may be useful in understanding relational evolution. On a more specific level, the five theoretical propositions listed at the outset of this chapter, and the five additional principles developed throughout, may be used as guides for continuing research from this perspective.

In homage to the power of process, let us finish with a recursive examination of both the content and process of self-organization on the broader scientific and clinical contexts. The systemic nature of the NDS perspective allows interpersonal processes to be understood through a diverse set of theoretical and clinical models, allowing for an artistic richness in epistemology and approach, while retaining the ability for a more integrated search for empirical discovery and justification. One is left with a coherent scientific framework that allows clinicians to be infinitely creative. On the broadest level, the NDS approach may then serve to reintegrate research and practice in psychotherapy.

References

- Adler, A. (1930). *The neurotic constitution: Outlines of a comparative individualistic psychology and psychotherapy* (B. Glueck & J. E. Lind, Trans.). New York: Dodd, Mead.
- Alexander, F., & French, T. M. (1980). *Psychoanalytic therapy: Principles and applications*. Lincoln: University of Nebraska Press.
- Badalamenti, A. F., & Langs, R. J. (1992). The thermodynamics of psychotherapeutic communication. *Behavioral Science*, 37, 152–180.
- Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice*, 10, 125–143.
- Bak, P. (1996). *How nature works: The science of self-organized criticality*. New York: Springer-Verlag.
- Bakeman, R., & Gottman, J. M. (1997). *Observing interaction: An introduction to sequential analysis* (2nd ed.). New York: Cambridge University Press.
- Bales, R. F. (1999). *Social interaction systems: Theory and measurement*. New Brunswick, NJ: Transaction.
- Barlow, D. H., Allen, L. B., & Choate, M. L. (2004). Toward a unified treatment for emotional disorders. *Behavior Therapy*, 35, 205–230.
- Baumrind, D. (1983). Familial antecedents of social competence in young children. *Psychological Bulletin*, 94, 132–142.
- Beck, A. T. (1970). Cognitive therapy: Nature and relation to behavior therapy. *Behavior Therapy*, 1, 184–200.
- Bednar, R. L., & Kaul, T. J. (1994). Experiential group research: Can the canon fire? In A. E. Bergin & S. L. Garfield (Eds.), *Handbook of psychotherapy and behavior change* (4th ed., pp. 631–663). New York: Wiley.
- Bowen, M. (1978). *Family therapy in clinical practice*. New York: Aronson.
- Bowlby, J. (1982). *Attachment and loss: Vol. 1. Attachment* (2nd ed.). New York: Basic Books. (Original work published 1969)

- Burlingame, G. M., Fuhrman, A., & Barnum, K. R. (1995). Group therapy as a nonlinear dynamical system: Analysis of therapeutic communication for chaotic patterns. In F. D. Abraham and A. R. Gilgen (Eds.), *Chaos theory in psychology* (pp. 87–105). Westport, CT: Greenwood Press.
- Butz, M. R., Chamberlain, L. L., & McCown, W. G. (1997). *Strange attractors: Chaos, complexity, and the art of family therapy*. New York: Wiley.
- Byrne, D. G., Mazanov, J., & Gregson, R. A. M. (2001). A cusp catastrophe analysis of changes to adolescent smoking behavior in response to smoking prevention programs. *Nonlinear Dynamics, Psychology, and Life Sciences*, 5, 115–137.
- Commission on Accreditation for Marriage and Family Therapy Education. (2005). American Association of Family Therapy, COAMFTE Page. Retrieved December 18, 2007, from http://www.aamft.org/about/COAMFTE/index_nm.asp
- Crane, D. R., Wampler, K. S., Sprenkle, D. H., Sandberg, J. G., & Hoverstadt, A. (2002). The scientist-practitioner model in marriage and family therapy doctoral programs: Current status. *Journal of Marital and Family Therapy*, 28, 75–83.
- Davidson, M. (1983). *Uncommon sense*. Los Angeles: Tarcher.
- De Dreu, C. K. W., & van Kippenberg, D. (2005). The possessive self as a barrier to conflict resolution: Effects of mere ownership, process accountability and self-concept clarity on competitive cognitions and behavior. *Journal of Personality and Social Psychology* 89, 345–357.
- Diamond, G. M., Diamond, G. S., & Liddle, H. A. (2000). The therapist–parent alliance in family-based therapy for adolescents. *Journal of Clinical Psychology*, 56, 1037–1050.
- Dishion, T. J., Nelson, S. E., Winter, C. E., & Bullock, B. M. (2004). Adolescent friendship as a dynamic system: Entropy and deviance in the etiology and course of male antisocial behavior. *Journal of Abnormal Child Psychology*, 32, 651–663.
- Eid, M., & Deiner, E. (1999). Intraindividual variability in affect: Reliability, validity, and personality correlates. *Journal of Personality and Social Psychology*, 76, 662–676.
- Eifert, G. H., & Forsyth, J. P. (2005). *Acceptance and commitment therapy for anxiety disorders: A practitioner's treatment guide to using mindfulness, acceptance, and values-based behavior change strategies*. Oakland, CA: New Harbinger.
- Elkaim, M. (1981). Non-equilibrium, chance and change in family therapy. *Journal of Marital and Family Therapy*, 7, 291–297.
- Ellis, A. (1977). Rejoinder: Elegant and inelegant RET. *The Counseling Psychologist*, 7, 73–82.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Evanston, IL: Row, Peterson.
- Festinger, L., Schachter, S., & Back, K. (1950). *Social pressures in informal groups*. Stanford, CA: Stanford University Press.
- Frank, J. D., & Frank, J. B. (1991). *Persuasion and healing: A comparative study of psychotherapy* (3rd ed.). Baltimore: Johns Hopkins University Press.
- Frederickson, B. L., & Losada, M. F. (2005). Positive affect and the complex dynamics of human flourishing. *American Psychologist*, 60, 678–686.
- Friedlander, M. L., Wildman, J., Heatherington, L., & Skowron, E. A. (1994). What we do and don't know about the process of family therapy. *Journal of Family Psychology*, 8, 390–416.
- Freud, S. (1905). Three essays on the theory of sexuality. In J. Strachey (Trans. and Ed.) *The complete psychological works, vol. 7*. New York: Norton, 1976.

- Gallo, L. C., Smith, T. W., & Ruiz, J. M. (2003). Attachment style: Circumplex descriptions, recalled developmental experiences, self-representations, and interpersonal functioning in adulthood. *Journal of Personality*, 71, 141–181.
- Garfield, S. L. (1995). *Psychotherapy: An eclectic-integrative approach* (2nd ed.). New York: Wiley.
- Garfield, S. L. (1998). The future and the scientist-practitioner split. *American Psychologist*, 53, 1231–1232.
- Gottman, J. M. (1991). Chaos and regulated change in families: A metaphor for the study of transitions. In P. A. Cowan & M. Hetherington (Eds.), *Family transitions* (pp. 247–272). Hillsdale, NJ: Erlbaum.
- Gottman, J. M., Murray, J. D., Swanson, C., Tyson, R., & Swanson, K. R. (2002). *The mathematics of marriage: Dynamic nonlinear models*. Cambridge, MA: MIT Press.
- Granic, I., Hollenstein, T., Dishion, T. J., & Patterson, G. R. (2003). Longitudinal analysis of flexibility and reorganization in early adolescence: A dynamic systems study of family interactions. *Developmental Psychology*, 39, 606–617.
- Granic, I., & Patterson, G. R. (2006). Toward a comprehensive model of antisocial development: A dynamic systems approach. *Psychological Review*, 113, 101–131.
- Guastello, S. J. (2000). Symbolic dynamic patterns of written exchanges: Hierarchical structures in an electronic problem-solving group. *Nonlinear Dynamics, Psychology, and Life Sciences*, 4, 169–189.
- Guastello, S. J. (2002). *Managing emergent phenomena: Nonlinear dynamics in work organizations*. Mahwah NJ: Erlbaum.
- Guastello, S. J. (2005). Statistical distributions and self-organizing phenomena: What conclusions should be drawn? *Nonlinear Dynamics, Psychology, and Life Sciences*, 9, 463–478.
- Guastello, S. J., Hyde, T., & Odak, M. (1998). Symbolic dynamic patterns of verbal exchange in a creative problem solving group. *Nonlinear Dynamics, Psychology, and Life Sciences*, 2, 35–58.
- Guastello, S. J., Pincus, D., & Gunderson, P. R. (2006). Electrodermal arousal between participants in a conversation: Nonlinear dynamics and linkage effects. *Nonlinear Dynamics, Psychology, and Life Sciences*, 10, 341–375.
- Hayes, A. M., & Strauss, J. L. (1998). Dynamic systems theory as a paradigm for the study of change in psychotherapy: An application to cognitive therapy for depression. *Journal of Consulting and Clinical Psychology*, 66, 939–947.
- Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York: Guilford Press.
- Hayes, S. C., Follette, V. M., & Linehan, M. M. (2004). *Mindfulness and acceptance: Expanding the cognitive-behavioral tradition*. New York: Guilford.
- Heider, F. (1958). *The psychology of interpersonal relations*. New York: Erlbaum.
- Hollenstein, T., Granic, I., Stoolmiller, M., & Snyder, J. (2004). Rigidity in parent-child interactions and the development of externalizing and internalizing behavior in early childhood. *Journal of Abnormal Child Psychology*, 32, 595–607.
- Horney, K. (1966). *Our inner conflicts*. New York: Norton.
- Horney, K. (1970). *Neurosis and human growth*. New York: Norton.
- Katerndahl, D., & Wang, C. (2007). Dynamic covariation of symptoms of anxiety and depression among newly-diagnosed patients with major depressive episode, panic disorder, and controls. *Nonlinear Dynamics, Psychology, and Life Sciences*, 11, 349–367.

- Kohut, H. (1977). *The restoration of the self*. New York: International Universities Press.
- Koopmans, M. (1998). Chaos theory and the problem of change in family systems. *Nonlinear Dynamics, Psychology, and Life Sciences*, 2, 133–148.
- Koopmans, M. (2001). From double bind to N-bind: Toward a new theory of schizophrenia and family interaction. *Nonlinear Dynamics, Psychology, and Life Sciences*, 5, 289–325.
- Lauterbach, W. (1996). The measurement of personal conflict. *Psychotherapy Research*, 6, 213–225.
- Leary, T. (1957). *Interpersonal diagnosis of personality: A functional theory and methodology for personality evaluation*. New York: Ronald Press.
- Levinson, R. W., & Gottman, J. M. (1983). Marital interaction: Physiological linkage and affective exchange. *Journal of Personality and Social Psychology*, 49, 85–94.
- Lewis, M. D., Lamey, A. V., & Douglas, L. (1999). A new dynamic systems method for the analysis of early socioemotional development. *Developmental Science*, 2, 457–475.
- Lorenz, E. N. (1993). *The essence of chaos*. Seattle: University of Washington Press.
- Losada, M. (1999). The complex dynamics of high performance teams. *Mathematical and Computer Modeling*, 30, 179–192.
- Luborsky, L., & Crits-Christoph, P. (1998). *Understanding transference: The Core Conflictual Relationship Theme method* (2nd ed.). Washington, DC: American Psychological Association.
- Lynch, T. R., Chapman, A. L., Rosenthal, M. Z., Kuo, J. R., & Linehan, M. M. (2006). Mechanisms of change in dialectical behavior therapy: Theoretical and empirical observations. *Journal of Clinical Psychology*, 62, 459–480.
- Marks-Tarlow, T. (1999). The self as a dynamical system. *Nonlinear Dynamics, Psychology, and Life Sciences*, 3, 311–345.
- Matz, D. C., & Wood, W. (2005). Cognitive dissonance in groups: The consequences of disagreement. *Journal of Personality and Social Psychology*, 88, 22–37.
- May, R. (1977). *The meaning of anxiety* (Rev. ed.). New York: Norton.
- McGregor, I., Zanna, M. P., Holmes, J. G., & Spencer, S. J. (2001). Compensatory conviction in the face of personal uncertainty: Going to extremes and being oneself. *Journal of Personality and Social Psychology*, 80, 472–488.
- McKimmie, B. M., Terry, D. J., Gogg, M. A., Manstead, A. S. R., Spears, R., & Doosje, B. (2003). I'm a hypocrite, but so is everyone else: Group support and the reduction of cognitive dissonance. *Group Dynamics: Theory, Research, and Practice*, 7, 214–224.
- Meichenbaum, D. H. (1975). Self-instruction methods. In F. H. Kanfer & A. P. Goldstein (Eds.), *Helping people change: A textbook of methods* (pp. 357–391). New York: Pergamon.
- Minuchin, S., & Fishman, C. H. (1974). *Family therapy techniques*. Cambridge, MA: Harvard University Press.
- Nichols, M. P., & Schwartz, R. C. (2005). *Family therapy: Concepts and methods* (5th ed.). New York: Allyn & Bacon.
- O'Connor, B. P. (2002). The search for dimensional structure differences between normality and abnormality: A statistical review of published data on personality and psychopathology. *Journal of Personality and Social Psychology*, 83, 962–982.
- O'Connor, B. P., & Dyce, J. (1997). Interpersonal rigidity, hostility, and complementarity in musical bands. *Journal of Personality and Social Psychology*, 72, 362–372.

- O'Connor, B. P., & Dyce, J. A. (2001). Rigid and extreme: A geometric representation of personality disorders. *Journal of Personality and Social Psychology*, 81, 1119–1130.
- Orlinsky, D. E., Grawe, K., & Parks, B. K. (1994). Process and outcome in psychotherapy. In E. Bergin & S. L. Garfield (Eds.), *Handbook of psychotherapy and behavior change* (4th ed., pp. 270–376). New York: Wiley.
- Orlinsky, D. E., & Howard, K. I. (1986). Process and outcome in psychotherapy. In S. L. Garfield & A. E. Bergin (Eds.), *Handbook of psychotherapy and behavior change* (3rd ed., pp. 311–382). Hoboken, NJ: John Wiley & Sons.
- Orlinsky, D. E., & Howard, K. I. (1995). Unity and diversity among psychotherapies: A comparative perspective. In B. Bongar & L. E. Buetler (Eds.), *Comprehensive textbook of psychotherapy: Theory and practice* (pp. 3–23). New York: Oxford University Press.
- Pincus, D. (2001). A framework and methodology for the study of non-linear, self-organizing family dynamics. *Nonlinear Dynamics, Psychology, and Life Sciences*, 5, 139–174.
- Pincus, D. (2005, August). *Bad apples: The relationship between individual-level and group level dynamics*. Paper presented at the annual meeting for the Society for Chaos Theory in Psychology & Life Sciences, Denver, CO.
- Pincus, D., Fox, K. M., Perez, K. A., Turner, J. S., & McGeehan, A. R. (2008). Nonlinear dynamics of individual and interpersonal conflict in an experimental group. *Small Group Research*, 39, 150–178.
- Pincus, D., & Guastello, S. J. (2005). Nonlinear dynamics and interpersonal correlates of verbal turn-taking patterns in group therapy. *Small Group Research*, 36, 635–677.
- Pincus, D., & Perez, K. (2006, August). *Orbital decomposition for analyzing conversation patterns: An example using contiguous family therapy sessions*. Workshop presented at the annual meeting for the Society for Chaos Theory in Psychology & Life Sciences, Baltimore, MD.
- Pincus, D., & Sheikh, A. A. (in press). Imagery for pain relief: A scientifically grounded guide book for clinicians. New York: Routledge.
- Rogers, C. (1951). *Client-centered therapy*. Boston: Houghton Mifflin.
- Rogers, C. (1957). The necessary and sufficient conditions of therapeutic personality change. *Journal of Consulting and Clinical Psychology*, 60, 827–832.
- Schultz, P. W., & Searleman, A. (2002). Rigidity of thought and behavior: 100 years of research. *Genetic, Social, and General Psychology Monographs*, 128, 165–207.
- Sexton, T. L., Alexander, J. F., & Mease, A. L. (2004). Levels of evidence for the models and mechanisms of therapeutic change in family and couple therapy. In M. J. Lambert (Ed.), *Bergin & Garfield's handbook of psychotherapy and behavior change* (5th ed., pp. 590–546). New York: Wiley.
- Shaver, P. R., & Brennan, K. A. (1992). Attachment style and the 'Big Five' personality traits: Their connections with each other and with romantic relationship outcomes. *Personality and Social Psychology Bulletin*, 18, 535–545.
- Siegel, D. J. (2006). An interpersonal neurobiology approach to psychotherapy. *Psychiatric Annals*, 36, 248–256.
- Snyder, D. K., & Kazak, A. E. (2005). Methodology in family science: Introduction to the special issue. *Journal of Family Psychology*, 19, 3–5.
- Sprenkle, D. H., & Blow, A. J. (2004). Common factors and our sacred models. *Journal of Marital and Family Therapy*, 30, 113–129.

- Sullivan, H. S. (1953). *The interpersonal theory of psychiatry*. New York: Norton.
- Tang, T. Z., Laborsky, L., & Adrusyna, T. (2002). Sudden gains in recovering from depression: Are they also found in psychotherapies other than cognitive-behavioral therapy? *Journal of Consulting and Clinical Psychology*, 70, 444–447.
- Teyber, E. (2005). *Interpersonal process in therapy: An integrative model* (5th ed.). Belmont, CA: Brooks-Cole.
- Tschacher, W., Scheier, C., & Grawe, K. (1998). Order and pattern formation in psychotherapy. *Nonlinear Dynamics, Psychology, and Life Sciences*, 2, 195–216.
- Von Bertalanffy, L. (1950). An outline of general system theory. *British Journal of the Philosophy of Science*, 1, 134–165.
- Ward, M. (1995). Butterflies and bifurcations: Can chaos theory contribute to our understanding of family systems? *Journal of Marriage and the Family*, 57, 629–638.
- Wiggins, J. S. (1979). A psychological taxonomy of trait-descriptive terms: The interpersonal domain. *Journal of Personality & Social Psychology*, 37, 395–412.
- Yalom, I. (1985). *The theory and practice of group psychotherapy*. New York: Basic Books.
- Zimbardo, P. G., Maslach, C., & Haney, C. (2000). Reflections on the Stanford prison Experiment: Genesis, transformations, consequences. In T. Blass (Ed.), *Obedience to authority: Current perspectives on the Milgram paradigm* (pp. 193–237). Mahwah, NJ: Erlbaum.