Ed Tronick. THE INTRODUCTION. The Neurobehavioral and Social
Emotional Development of the Infant, Norton Press, 2007

Introduction

Why are some infants, children, and adults happy and robust and others
sad and withered? How are mothers and infants similar to and different from
therapists and patients? What are the developing infant's capacities for
neurobehavioral self-organization? How are early infant–adult interactions
organized? How are self- and mutual regulation related to developmental
processes? Is there a process that can explain normal as well as abnormal
development? Is the process of "meaning-making," in which humans make sense
of their self in relation to the world, only in their heads, or is it in their
bodies as
well? This broad set of questions is addressed and looped back to in this book,
which compiles my writing and thinking over the past 30 years.

 A central goal of this book is to present my Mutual Regulation Model
(MRM) of infant–adult interaction. The MRM sees infants as part of a dyadic
communicative system in which the infant and adult mutually regulate and
scaffold their engagement with each other and the world by communicating their
intentions and responding to them. The book presents my thinking and research
that led to the MRM and its elaboration into ideas about meaning-making,
biopsychological states of consciousness, and how they are expanded in

engagement with others and the world.

 From my first studies of infants ducking to avoid virtual objects on a
collision course with them (Ball & Tronick, 1971) [Chapter 27?], to my studies of
infants making sense of their interactions with depressed mothers ((Tronick &

Weinberg, 1997) [Chapter 20], the focus of my research has been on the nature
of how people live in the world and how they change both themselves and their
relation to world over moments, hours, days, and years. My aspiration is to
develop a theory that has the qualities of being experientially-near and clinically
authentic, broad and integrated, and developmental and culturated at its core.
This goal is hardly in hand—it is a work in progress—but I offer this version of the

theory as one step in an ongoing effort towards its development.

Psychobiological States of Consciousness

The Sense-of-Oneself In the World

My organizing idea is, as Bruner (Bruner, 1990) stated, that humans are
makers of meaning about their relation to the world . They are purposeful. This
idea of private meaning is explored in theories as diverent as psychoanalysis to
the idea of Socratic exploration in cognitive-behavioral theory. My MRM theory
weds Bruner's view of humans as meaning-makers with dynamic systems theory.
It sees humans as complex systems, as hierarchical multileveled
psychobiological systems that constantly work to gain energy and meaningful
information to make sense of their place in the world. This sense-of-oneself in the
world equals the totality of meanings, purposes, intentions, and biological goals
operating in every moment on every component and process at every level of the
system from molecules to awareness.

This totality of meanings can be conceptualized as a psychobiological
state of consciousness. A state of consciousness (the whole of an individual's
self-organization) guides an individual's engagement with others, with the world

of things, and with their engagement with themselves. To use Walter J.
Freeman's phrase, consciousness is how individuals thrust themselves into the
world (Freeman, 2000). Of course, as psychobiological states, states of
consciousness are not unique to humans, but in humans they contain unique
species-specific qualities of human meaning-making processes and experience.
And parenthetically, the lack of consideration of species-specific qualities is what

renders fallible arguments about chimpanzees or any other animal having
awareness and consciousness equivalent to humans. Certainly they may have
consciousness, but it is a chimpanzee form of consciousness, not a human form.

The private meaning of one's place in the world can be thought of as a
psychobiological state of consciousness, an assemblage of the totality of
meanings, purposes, intentions, and the like, from every component of the
multiple levels of organization and functioning of the individual. Using the term
consciousness can be misleading, for in my usage it does not imply that the
individual is aware of the private meaning. Rather, the private meaning is
inherent in the organization of the flow of an individual's psychobiological state
as
he or she acts in the world.

To capture what I mean by a state of consciousness, consider the
multilevel cascade of meaning, both in and out of awareness—including
emotions and thoughts, perceptions and actions, as well as feelings in your arms,
feet, gut, and hands—as the wash of adrenalin flows through you when your
plane is thwacked and shaken in flight by mother nature punishing humans

hubris, because we all know it is impossible for something so big to fly. The

multilayered totality of this state of consciousness is not and could not be completely in awareness. Indeed, much of being in the world is out of awareness, including most of the processes that produce experience. And we must not forget that states of consciousness and awareness for that matter are not singular concepts but rather broad terms referring to many forms of consciousness and awareness: reflective alertness, preconscious, unconscious, dynamic unconscious, reverie, daydreaming, the multiple states of sleep, meditation, and mindfulness, and even the biologically-oriented physiologic, neurologic, endocrine, and other somatic states. The knowing in a state of consciousness is like Bollas's "unknown known" (Bollas, 1987). However, there is even more that is unknown, because what is unknown is not only in the un- or preconscious. The unknown is also in and of our biopsychological organization and the processes that generate meaning, much of which are not available to consciousness. But no little internal observer is needed to catch the meaning; it is inherent in our biopsychological state of consciousness.

On the other hand, in some ways a biological state of consciousness is also about being in the world and the processes creating that "being in." Put yourself in the shoes of a 1 year old and try to experience and actually express the flow of her meanings as she watches her mother go toward the door leaving her with an unknown stranger, only to see her mother stop, turn around, come back, feel her mother pick her up, and hear her say "You are coming with me!" The child's sense of this event (and perhaps yours, too) is not only an unconscious awareness, but it is in all of her being.

Expanding States of Consciousness

I believe that successful growth or expansion of states of consciousness is governed by principles from dynamic systems theory that require all living systems—humans included—to garner energy and information from the world in order to maintain and increase the complexity and coherence of the organization and structure of their states of consciousness (i.e., their sense of self and their place in the world). The three ways of expanding complexity and coherence are: (1) interacting and communicating with people, (2) acting on things, and, as Modell would argue (Modell, 1993), (3) engaging our private selves. When humans are successful in appropriating meaning into themselves, our biopsychological state moves away from entropy, becomes information rich, exists at the edge of chaos, and new properties (meanings) emerge. When humans are unsuccessful in appropriating meaning, the biopsychological state dissipates, loses complexity, and properties of the system are either lost or become fixed.

A particularly effective way of growing and expanding complexity occurs when two or more individuals convey and apprehend (i.e., take hold of) meanings from each other to create a dyadic state of consciousness. This dyadic state contains more information than either individual's state of consciousness alone, and when individuals co-create a dyadic state they can appropriate meanings from it into their own states of consciousness and increase its complexity. This is referred to as the Dyadic Expansion of States of Consciousness Model, which is elaborated on in Part III of this book. The mutually expressed and apprehended

co-created meaning of "WE are together" is more complex than the individually expressed message "I want to be with you," conveyed and understood, for example, by the simultaneous gaping smiles of an infant and her father.

Some Qualities of a Theory of Human Development

Clinically Authentic

My emphasis on an experientially-near and clinically authentic theory of human development derives from my recognition that good clinicians know things about how individuals experience and "do" life that researchers often don't know and can't "do." Though we must recognize that clinicians' intriguing descriptions can at times actually be little more than hermeneutic theoretical musings, more often than not they present us with experiential data about how people make sense of the world—important data that demand explication. Unfortunately, some clinicians themselves often have little appreciation for the way scientists think. This lack of appreciation may lead clinicians to undervalue what the researcher knows, or paradoxically, and far too often, to undervalue their own clinical knowledge. A case in point for some psychodynamically-oriented clinicians is when they embrace neuroscience's cold cognitive concept of unconscious processes without realizing that they are ignoring valuable aspects of the original concept of the "dynamic unconscious."

Reciprocally, some researchers fail to appreciate the phenomenon of a dynamic unconscious that demands explanation. So, the worlds of the clinician and the researcher have become somewhat polarized. But to give up grappling with the mysteriousness of the dynamic unconscious, projective identification,

body memory, or the "spooky kookiness" (at least for me, when I first bumped into them) of the concepts of the "unknown known," the "analytic third," or the idea that thinking is fuzzy and illogical, is to give up the struggle to understand the all too real "lived" lives of clinicians' patients (and everyone, for that matter)
and their mysteriousness.

Broad and Integrated

In order to begin the study of the meaning people make of themselves and their relation to the world, the theory must be broad and integrated. Much theorizing is based on deep, powerful but bounded insights (attachment, adaptation, ego, re-entry, or intersubjectivity), which in the hands of their adherents promise more than they can deliver. As a consequence, the concepts lose their focus and their explanatory power is diluted as they are stretched to account for more than they can encompass. Furthermore, when these concepts are investigated, the research is often weak because alternative hypotheses are not investigated. Take, for example, the vast body of correlated and predictive research on attachment theory. Much of the research "mothers" the theory because alternative conceptualizations are rarely evaluated against attachment theory, and causality is too often implied from the correlations. Moreover, in the hands of some attachment theory is extended to account for phenomenon as diverse as intersubjectivity or borderline personality. Similar critiques can be made of concepts such as projective identification, adaptation, and sensory integration. Far too often the result—especially in a clinical setting—issectarian positions and incestuous blood feuds.

The alternative to eclecticism, however, is problematic because a theory can all too easily become an assemblage of unrelated pieces lacking a theoretical anchor. Clinicians are often eclectics, but their eclecticism lies in the
fact that they have to decide what to do in the moment and cannot wait. On the other hand, eclecticism for a theorist or researcher is not imperative because they have the privilege of not having to act, of not knowing, and therefore being able to say they don't know without facing criticism. Unfortunately, sectarian, eclectic, and broad theories alike often fail the tests of being experience-near or clinically authentic. Consider artificial intelligence models, mathematical models of the mind, and a host of neuroscience models of the brain in which the experiencing individual is not even present.

Developmental

Of particular concern for me is that much theorizing is a-developmental
and fails to conceptualize each individual as actively engaged in a change
process with him- or herself, others, and things. Many neuroscience and
psychological models conceptualize the individual or the brain as if they(they??),
like Athena Goddess of Wisdom, emerged from Zeus's forehead fully formed.
Another version of an a-developmental perspective is when theorists create
virtual backward developmental histories from the adult state that inevitably lead
to the kind of adult (often weirdly like the theorist himself, such as Freud and
Piaget) that the theory purports to explain (known as "adult-endstate" models).
Examples of adult-endstate models include seeking out infant precursors to
borderline adults, or attributing adult cognitive capacities to infants. Endstate

models fail to critically appreciate the uniqueness that emerges from the
messiness, unpredictability, unique vicissitudes of development, the complex
multidirectional interaction of lived experience, genes, and brain structures, and
the complexity of the emergent qualitative changes that occur during
development. Therefore, such virtual developmental histories and adult-endstate
models of lifespan development are hazardous for understanding human
functioning, experience, and ontogenetic change, and for guiding clinical
practice.

Though it is often difficult to keep in mind and to think through in its full
complexity, it is necessary to recognize that experience, genes, and brain, as
well as the structures and processes of all three, are not only fundamentally
different at different ages, but their constant interplay is also different and
makes
for qualitative differences in the totality of the biopsychological organization of
the
individual in each moment over the lifespan. Attempting to understand how
things continue to change must be a constant consideration because change
affects what is happening now, and what is happening now affects the future. An
infant experiencing the toxic stress of abuse for the first time is affected
differently than a toddler, and the toddler who chronically experienced stress as
an infant experiences it differently than the toddler who did not experience undue
stress. These differences are not only differences in the content of the past, they
are also constitutive, embodied, and embedded in the actual operation of the
processes that generate the toddler's sense of place in the world.

The operation of systems, such as the hypothalamic pituitary access or
the vagal systems, are experience-dependent. A history of toxic stress changes
how processes operate and, in turn, how the individual functions in the world.
The stressed toddler operates—sees the world—with greater vigilance and
fearfulness, and the differences in this toddler's process of meaning-making will
continue to influence what she experiences as she gets older by constituting her
very meaning-making processes themselves. Though it is an overstatement,
change in development argues for the idea of a continuous and ongoing process
of all affecting all.

 Culturated

Possibly the process least considered, least understood, least thought
about, least incorporated into our biopsychological theorizing, developmental
theorizing, and clinical work, is culture. Culture is often referred to, even
deferred
to, but only superficially and rarely well: "Of course culture is important. (Lets
move on)." A large array of theories are "universalist"—we all evolved, we are all
biological, every one of us carries around our hunter-gatherer genes and our
opportunistic brains, such that the differences among different cultural
communities is a matter of differences in the content filed in our brains. Along

with being romanticized, the universalist view satisfies our Western fantasies for
equality and equi-potentiality. What could be wrong with that? Unfortunately
much of it, if not wrong, is wrongheaded, and certainly incomplete.

To start, memory, genes, the brain, and even culture hardly constitute file
cabinets. Each is a complex of continuous dynamic processes. Equally

important, each of these processes and others unnamed or not yet known are
part of a multidirectional set of processes in which experience regulates and
shapes, and, in turn, is regulated and shaped by, the same set of processes.
Consider how language experience over the first few years of life modifies the
very sounds an individual can discriminate—what the individual can actually
hear, as well as what the individual can actually speak. This process is one that
involves the interaction of experience, genes, and the brain, and how they work
together to modify what an individual can experience and can do in the world.
Infants in all cultures appear to start with the same capacities, but soon become
French or Javanese or English listeners and speakers. They do have different
content in their minds but more importantly, their brain processes have been
tuned, structurally modified to do the language they have been exposed to and
nothing is more cultural than language.

This simultaneous narrowing and refining process may occur in other
experiential domains as well. Research seems to suggest that early experience
with the faces of one's ethnicity—the faces seen leaning over the crib—increases
visual discriminative skills within a particular range of faces and diminishes
visual
skills outside of that range; that is, what is seen as well as the capacity for
seeing
is modified by the exposure. Thus, we can only imagine (and we have spent too
little time in such imagining) how such differences in the way a cultured seeing,
hearing, touching, smelling, playing, and interacting constitute what we do and
feel in the world long before we understand the symbols of our culture.

 Indeed, I previously thought it was foolish to argue that peoples who lived
in the forest as foragers as opposed to pastoralists who lived on the plains saw
the world differently. After all, perception created universal Kantian categories. I

no longer think this. Much more likely these different peoples experience the
world differently and they are not always able to experience the same thing in the
same way. Efe (pygmy) infants interact with every individual in their group every
day and will go to any one of them when distressed. As a consequence, their
experience of the attachment landscape is one of secure bases wherever they
look, as opposed to the singular (sometimes double) vision of Western infants,
who usually only turn to their immediate caregiver. Thus it takes no great stretch
of imagination to hypothesize that to the extent that the local fullness of all the
domains of experience are cultured, so too will the biopsychological processes
generating experience be cultured. And, what domains of experience are not
cultured?

In my view, culture is not an external factor with an arrow aimed at the
individual. Rather, it is inside the individual as much as anything else is inside
the individual. Oddly, seeing culture as inside the individual is a challenge for
psychologists and neuroscientists even though so much of their work is getting
inside peoples' heads in an effort to see how the inside affects the outside—for
example, how one's attachment to one's mother affects other relationships. Yet
neither one's mother nor one's attachment to her is a-cultural. The way she
moves and talks and interacts with her child as well as with others are not simply
expressions of her uniqueness; they are a manifestation of a cultured

uniqueness. Her "cultured way" is transferred to her child, affecting what the

child experiences and how the child experiences him- or herself in the world.

Thus, the criteria for my theoretical perspective are as follows:
experience-near and clinically informed, broad and integrative, developmental
and culturated. And actually, there is another: The theory has to be testable and
generative of hypotheses, not simply descriptive. It is especially important to
keep this criterion in mind when so much of my thinking is influenced by dynamic
systems theory, which is so general, experience-far, and powerfully descriptive.
Dynamic systems theory is more easily used as a kind of meta-theory rather than
a deeply instantiated psychological theory of how people live and make sense of
their place in the world. Yet so much of my effort is aimed at instantiating it.

The Mutual Regulation Model (MRM)

Infant Self-Organizing Neurobehavioral Capacities

I will start with my Mutual Regulation Model (MRM) because it is
foundational and intimately related to my thinking about the Dyadic Expansion of
States of Consciousness Model, and the complexity and coherence of
individuals' ways of being in the world.(Tronick, 1989; Beeghly & Tronick, 1994)
The MRM views the infant and the caretaker as parts of a larger regulatory
system. Let's start with the MRM's view of the infant.

The MRM postulates that infants have self-organizing neurobehavioral
capacities that operate to organize behavioral states (from sleep to alertness)
and biopsychological processes—such as self-regulation of arousal, selective
attention, learning and memory, social engagement and communication,

neuroception, and acting purposefully in the world—that they use for making
sense of themselves and their place in the world. In the first several chapters of
this book I present research on this postulate.

My early work on neurobehavioral capacities was carried out with Berry
Brazelton as we constructed the Neonatal Behavioral Assessment Scale (NBAS;
(Tronick, 1987) [Chapter 1]. The NBAS is a neurobehavioral scale used for
evaluating infant capacities for self-soothing, habituation to disturbing events,
regulation of states, differential attention to people and things, and interaction
with adults. Infants' self-organized neurobehavioral capacities have been much
elaborated upon since then, but when we first created the scale in 1970 the infant
was viewed as undifferentiated and disorganized, reflexive with only all-or-none,
either/or states of distress or sleep, harking back to Freud's original notions. At
the time when Berry and I, along with Jerome Bruner, examined infants at the
Mount Auburn Hospital in Cambridge, we felt like we were discovering a new
species.

My later research utilized much more sophisticated techniques to
investigate infant neurobehavior. In 1993, Linda Fetters and I used computerized
kinematic analysis of movement and ultrasound brain imaging techniques to
explore how brain lesions might compromise infant self-organization (Fetters,
Chen, Jonsdottir, & Tronick, 2004) [Chapter 3]. We found that infants with almost
identical lesions would have radically different outcomes (e.g., cerebral palsy
versus normal movements), suggesting that self-organization and (still) unknown
features of experience (e.g., carrying patterns) play key roles in determining the

quality of movement. In 1996, Barry Lester and I developed a new
neurobehavioral scale, the NICU Network Neurobehavioral Scale (NNNS; (Lester
& Tronick, 2004) [Chapter 2]. The NNNS makes a detailed assessment of the
interplay between stressors and infant self-regulatory abilities. It is highly
reliable
because it is administered in a standard fashion and specifies what behavioral
states (e.g., state 1 or 2 sleep, alertness) an item can be administered in (or

not),
because the biopsychological state of the infant affects his or her response
characteristics to an item (e.g., looking at faces is different in quiet alertness
compared to active alertness).

The differential reactivity in different self-organized states is a clear
demonstration of how the sense of the world even newborns make is related to
the biopsychological state of consciousness. We have used the NNNS to
examine how stressors, such as in utero drug exposure or maternal depression,
affect infant neurobehavioral organization as well as to predict long-term
outcome. Using the NNNS we developed standardized data on newborn
neurobehavioral organization (e.g., percentiles for different neurobehavioral
performances on the items) for the first time (Tronick EZ, Rosenberg, Bohne, Lu
Lester, 2004).. And in longitudinal studies we saw relations of different NNNS
profiles and outcomes at 7 and 8 years (Lester and Tronick, 2007work in
progress). These data will aid clinicians' evaluation of newborn neurobehavior
and development and suggest forms of clinical interventions to foster
development.

Mutual Regulation

 Despite their impressive self-organizing neurobehavioral capacities,
infants' capacities clearly have limits. Even were they sufficient in the moment to
deal with an internal or external regulatory disruption, they would not be
sufficient
over time. An infant can utilize a number of mechanisms (e.g., crying, moving,
and "fetaling up") to self-regulate homeothermy, but eventually these resources
fail. A resolution to the limitation of self-organizing capacities occurred when I
recognized that an infant could not be viewed as a self-contained system.
Rather, we have to think of an infant as a sub-system within a larger dyadic
regulatory system. The other sub-system is the caregiver. I saw this larger
system as a dyadic system that functioned to scaffold an infant's limited
regulatory capacities. Interestingly, coming from studies on infant neurobehavior,
I concluded what Winnicott—coming from his clinical observations—had
postulated some 50 years before: "No baby is without a mother" (Winnicott,
1964). However, for me the immediate question not dealt with by Winnicott was
how was this regulation was guided and directed? After all, misapplied
regulation could further dysregulate an infant. A caretaker calming a crying infant
but leaving her exposed to too low a temperature actually disrupts the self-
regulatory effect of crying, which warms the infant. Calming, in this case,
exacerbates the demands on the infant.

My idea was that regulation was accomplished by the operation of a
communication system in which the infant communicated its regulatory status to
the caregiver, who responded to the meaning of the communication. An infant cry

means something ("I am in trouble"), as does a bright alert look ("I am fine"). A
parent does not see a baby's clenched hand as a fist, but without awareness
knows the baby as stressed. If this postulate of the MRM was true, infants had to
have organized communicative displays related to their internal state and to their
external intentions and goals, and caregivers had to have capacities to
apprehend and respond to the meaning of these messages. Also, as I will
address later, keep in mind that the MRM is easily extended to the self-
organizing capacities and limitations of adults and their need for external
scaffolding, albeit around issues different than those of infants. Furthermore, the
MRM can be extended to understand therapeutic change processes.

In a sense, the end of the theory of the self-contained infant was also the
end of one-person psychology. This formulation also overlays a deeper question
pondered in multiple places in the book: Given their self-organizing capacities,
what do infants (and adults) "know" about themselves and the world? We will

come back to this question.

"Messy" Interactions, Intersubjectivity and Reparation

My thinking about regulation and communication led to my studies of the organization of infant-adult (mothers and fathers and strangers) face-to-face interaction as presented in Part III of the book. I devised a technique using reel-to-reel videotape recorders and hand-cranked slow-motion to micro-analytically code the communicative expressions of infants and adults and their interactions. This technique now seems crude, but it functioned as a temporal microscope expanding time. In these groundbreaking studies we discovered the temporal

organization of the dyadic communication system, contingencies of signaling (of meaning), synchrony and attunements (Tronick, 1989).

I developed statistical approaches to analyzing the time series streams of infant and adult communication, though as gently pointed out by my friend John Gottman, our initial application of these techniques was problematic. Later, using better techniques with guidance from John, we discovered the bidirectional (mutual) influence of the infant and the adult successfully challenging the idea that the infant was passive. Our results (Cohn & Tronick, 1988) [Chapter 16] demonstrated infants initiating contact and responding to turn-taking signals and to specific emotional displays in specific ways as well as signaling to their adult partner their evaluation of what the adult was doing. Our findings on infant self-organized capacities raised questions about one directional analogy of the therapeutic process (Tronick & Cohn, 1989) [Chapter 12].

It was at this time and in considering the mutuality of infant-adult interaction that I borrowed Habermas's concept of intersubjectivity and brought it into the developmental literature. Intersubjectivity is a concept about the exchange of meaning. I suggested that in the infant-adult interaction there is a mutual apprehension in which each understands what the other intends. Others (Trevarthen & Hubley, 1978) seized this concept more fully than I, but I felt that although intersubjectivity required an exchange process it glossed over and did not explain the nature of it. Critically, intersubjectivity does not explain how acquiring meaning and creating shared meaning states grows the complexity and

coherence of the individual. Nonetheless, intersubjectivity is a pre-cognition to meaning- making, states of consciousness, and their dyadic expansion.

Initially, the organization of the infant-mother interaction seemed clear: It was bi-directional, synchronous, and coordinated. Indeed, these dyadic phenomena were impressive. Here were small infants actively engaged in a very fast (micro-second) exchange of information. But as my research progressed, findings began to emerge that demanded a different take on what was going on in the interaction. Among others, the most telling finding seemed to be that much of the time there was a lack of coordination between the infant and the adult. I felt compelled to characterize and understand what I saw as the "messiness" of the interactions. I described this messiness as a mismatch of the affective states and relational intentions that occurred when the infant and adult were conveying non-matching meanings: Infant: "I want you to look at me." Adult: "I want to look away." Most importantly, I recognized that re-achieving a matching state from a mismatching state was a mutually regulated reparatory process.

This view of the reparatory organization of the interaction was an alternative to the dominant view of the interaction as highly synchronized or attuned. The synchrony model of the interaction (to which many of us ascribed at the time, and to which some theorists still do) not only does not reflect the findings on interactions, it also romanticizes the mother-infant relationship. Further, it leads to pathological clinical judgments of the normal, typical and ubiquitous messiness of infant-adult relationships. For that matter, messiness

characterizes most if not all social relationships, such as Gottman's

characterization of marital relationships (Gottman & Levenson, 1988). My idea of a messy reparatory organization of the interaction was also the foundation for the Boston Process of Change Group's view of psychoanalysis as a sloppy process (Boston Change Process Study Group, 2002).

The Still-Face Perturbation

To evaluate these hypotheses, I created the face-to-face/still-face (FFSF) paradigm. The paradigm is based on a simple a priori deduction: If infants are regulating the state of the interaction and themselves by responding to adult regulatory input, meanings, and intentions, then if the adult's communications are perturbated, the infant should detect this disruption, attempt to correct it, and react to it in meaningful ways. In the experiment, we instructed the adult to hold a still-face and not move or talk after a period of normal interaction with the infant. The now well-known results were dramatic. Infants attempted to solicit the mother's attention and when their efforts failed they looked away, withdrew, and expressed sad and angry affect. The infant was actively regulating the interaction and was apprehending and responding to the adult's perturbated communication. The critical implication is that in normal exchanges infants also apprehend and respond to the adult's expressed meaning.

With the creation of the FFSF paradigm, a number of studies followed including the creation of a simulated depression paradigm. Mothers were instructed to "Act the way you do on the days you feel blue;" none had trouble doing just that. In response, the infants became sad and withdrawn. Shortly thereafter, we began the first observational studies of the face-to-face

interactions of depressed mothers and their infants. These studies opened up a field of developmental observations of infants with parents with a variety of behavioral disorders (e.g., mothers with borderline personality disorder; (Apter-Danon G., 2004)) as well as studies of the effects of interventions (e.g., George Downing's video micro therapy; (Downing, 2003). We also studied other naturally occurring perturbations that we thought would have effects on infant self-regulation, maternal behavior, and their interaction. These included some of the first microanalytic studies of infants' or parents' blindness or deafness, infant
facial anomalies, and medical status (e.g., drug exposure, prematurity). All of these disturbances of the communicative regulatory system had effects—but not always ill effects—as dyads, such as a sighted mother and a blind infant, somehow found ways to mutually regulate their interaction and each other.

Cultured and Other Perturbations

In a critical reversal of the experimental perturbation approach, I expanded my research to include naturally occurring perturbations such as the relation of culturated forms of self- and interactive regulation and experience. I found these studies profoundly interesting and several of them are presented in Part II of the book. They all made the same point: Western models of childrearing and development are severely limited and narrow.

The study of Quechna childrearing practices in high-altitude Peru demonstrated a form of "normal" caretaking that Western theorists would have considered to be a form of stimulus deprivation inevitably leading to pathological development (Tronick, Thomas, & Daltabuit, 1994)[Chapter 9]. In Peru it did not,

though I am sure the Quechua infants and adults experienced the world differently. Likewise, the study of the multiple caretaking system of Efe foragers living in the Ituri forest did not conform to universalist or evolutionary

hypotheses
or to attachment theory, with its concept of monotropy in the niche of human
evolution (Tronick, Winn, & Morelli, 1985) [Chapter 8]. Yet the system was
"normal," and Efe infants became acculturated adults who "naturally" made
sense of the world in an Efe created culturated way.

In Kenya, Gusii mothers do not often engage in face-to-face play, a form
of play thought to be required for normal development. When asked to engage in
face-to-face play Gussii mothers turned away from their infants just as the infants
were most focused on them and most excited. This is a behavior that would be
labeled as pathological in the West, but functions to shape normal Gusii infants'
experience of the world as a Gusii, not as a Western infant. The full implications
of this work insist that not only do these different culturated
individuals-in-groups
have different experiences, but the very processes that generate experience are
culturated (Tronick & Morelli, 1991) [Chapter, 7].

Meaning Making

From thinking about reparation and therapeutic interactions and my
research on culturated communication systems, depression, children with
anomalies (cleft lip), and the range and variety of normal interactions, I came
increasingly to realize that the communication system could not be seen as an
"empty" process with referents only to measures of information (bytes) or only in
terms of the qualities of the interaction (e.g., synchrony). Bruner (1990) has

made the point forcefully that measures of information are uninformative as to
what the information is about. In particular for the human communication system
it is not how much information is being conveyed but what the information is
about. Process terms can make vastly different phenomena equivalent. For
example, privileging the qualities of the process of dancing (synchrony,
complexity) masks the differences in the dance being done (the tango, hip hop)
itself. Such terms are not uninteresting (who would want to be awkward?), but
they ignore the kind of dance the dancers are doing together. People do need
some yet-to-be-determined level of mutual regulation when they are doing
something together, but they cannot be in synchrony without actually doing
something together.

So, too, for the communication system. It is not always well coordinated
and smooth but it must be filled with something, and the "somethings" are
meaning, intentions, purposes, and the like. These meanings can be conveyed
with different communication qualities (smoothly, disjointedly) and in via different

channels (language, facial expressions, moods, gestures), but something must
be communicated. For me, the critical "somethings" are the individual's
biopsychological state of consciousness, their experiential state, their intentions
to act in the world, their cultural and somatic meanings, and their relational
intentions to be with and to create new meanings with others. Furthermore, no
alternative exists to seeing the known and unknown meaning of being in the
world for every individual as distinct and unique.

Using the Theory to Think about Practice

There is a relation (but very far from a strict relation) between the mutual
regulation model of infant-adult interactions and patient-therapist interaction that

was at the core of the work I did with the Boston Process of Change Group
(Tronick, 1998). I saw that therapy, like infant-adult interactions, is a messy
process of match-mismatch and reparation, with two active meaning making
individuals in the room. I argued that reparation of messiness rather than
synchrony might be a key change-inducing process in therapy and development.

In development, reparation has the effect of the infant and adult coming to
experience and implicitly know that the negative experience of a mismatch can
be transformed into a positive affective match, that the partner can be trusted,
and that one can be effective in acting on the world. Also, in repairing interactive

messiness new implicit ways of being together for the infant and adult are co-
created and come to be implicitly known.

In the Boston Process of Change Group, we saw analysis as a sloppy
process with change occurring during moments of meeting when the sloppiness
was repaired. Thus, in the reparation of mismatches in therapy the patient who
may be stuck in negative affect experiences its transformation into positive affect.

Further, by working on the messiness of the therapeutic relationship the patient
(and the therapist) comes to know new ways of being with the therapist and, in
turn, with others. The reparation model and its findings clearly imply that
relationships are dyadically regulated and that the infant and the patient are
active, intentional, and capable of making reparations in the relationship. But

unlike the Boston Process of Change Group's findings, the implicit knowing that
comes with being together is not sufficient to produce change. I felt that
something else more classic in its origins was needed: a change in meaning,
made by the infant or the patient, about their place in the world.

As I touched upon earlier, successful creation of a dyadic state of
consciousness and selective appropriation of meaning from it by the individuals
creating it, expands the complexity their individual states of consciousness and
fulfills the principle of dynamic systems. But how is all of this systems theory
experience-near and clinically relevant?

 The Dyadic Expansion of States of Consciousness Model is experience-
near because there are experiential consequences to the success or failure of
the process of expanding the complexity and coherence of states of
consciousness. When new information is selectively incorporated the individual
experiences a sense of expansion, joy, and movement into the world. A
successful increase in complexity leads to a sense of connection to the other
person in the dyadic state, and a relationship to him or her emerges. Importantly,
a sense of connection to one's self develops, accompanied by a feeling of
solidity, stability, and continuity of the self. Additionally, the inherent momentum

that comes from forming states leads to a sense of impelling certitude about
one's place in the world—a sense, in or out of awareness, that "I know this
(whatever it is) to be true." By contrast, when meaning is not incorporated, or
incorporated unsuccessfully, the complexity of the state dissipates. The
individual experiences a sense of shrinkage, sadness and/or anger, and a

withdrawal and disconnection from the world, from others, and from his- or
herself. The feeling of continuity in time is compromised. Thus, a variety of
powerful experiential consequences travel with success or failure of expansion,
not the least of which is that the successful meaning making is the constitutive
process of relationship formation.

Many implications of the expansion model in clinical work are presented in
the following chapters. According to the principles of dynamic systems theory,
letting go of old meanings requires giving up organization and certitude, and
threatens the unpredictable but implicitly hoped for outcome of expansion.
Change for a patient means risking dissipation and experiencing fear or even the
terror of annihilation and the dissolution of the self. But change also means hope.

Another implication for therapeutic technique is that the therapist has to
scaffold the patient's movement towards greater complexity and coherence

rather than work on the resistance that arises for psychodynamic reasons. There are two sides to this scaffolding process. One side is to help regulate the affect that threatens the patient's willingness to risk change such that successful scaffolding then allows the patient's self-organized processes to make new meaning and fulfill his or her hopes. The second side of the scaffolding process comes from co-creating adyadic state of consciousness, in which the patient and therapist can make new, more complex and coherent meanings together. As new meanings form, the patient's feelings of trust in his- or herself and the therapist increase, amplifying the possibility of change.

Because meanings come from multiple levels in the individual, some meanings may only be available to the therapist and/or the patient in certain states of receptivity. Alert interpretative states may detect the meaning in cognitions and language and produce insight, but Ogden's (Ogden, 1997) reverie states may be needed to apprehend meanings from preconscious or unconscious levels, and Downing's (2003)body work may be needed to reach meanings at other biopsychological levels. And because I believe that we have not identified all the ways that a therapist or a patient comes to reach certain levels of meaning, there will be meanings that may be available to one or the other that are not apprehended and cannot be formulated yet produce change.

There also is the somewhat vicious clinical implication of complexity-governed selection: The selective force of complexity operates moment-to-moment to maximize coherence and complexity of the individual's state of consciousness and, like natural selection, it is blind to the state the system is moving toward. As a consequence, complexity is not necessarily adaptive in either the short or the long run (adaptation being an appropriate adjustment to external or internal circumstances) because increasing complexity hardly equals successful adaptation. For example, an individual may stay in a destructive relationship or have a self-debilitating sense of place in the world because these may be the only ways in which to maintain or perhaps increase complexity in the moment. These are solutions in the moment, but in the long run they may lead to the preclusion of engagement with the social world or other ways of being in the world that could be expansive. In these patients, dissipation and terror are a

constant threat and the need for the therapist and the patient to co-create mutual strategies to modulate these affective states is essential. More generally, complexity-governed selection as a moment-by-moment process adds to our understanding of how patients persist in living in an experiential world filled with

sadness and fear that cuts them off from the world and themselves, and may ultimately lead to generating non-linear techniques for inducing change. For example, with her patients Alexandra Harrison uses repetition of the same interactive sequence for prolonged periods to demonstrate that sudden state changes can emerge from "repetition of the same" (Harrison, 2003) [and Chapter 33].

Conclusion

I believe the theoretical perspective presented in this book addresses a host of other questions: What are the different types of meaning-making processes? Is meaning and its making and the remembrance of the past actually a multileveled, biopsychological process as I argue, or is meaning only in the mind? What induces us to change? What is the nature of psychological change and what principles govern it? What is the relation between meaning-making and mutual regulation? Why and how are relationships so important to human development? What makes relationships unique, and is there such a thing as a prototypical (attachment) relationship? What makes us stay in a painful relationship? What principles govern our moment-to-moment actions versus our developmental pathway over a lifespan?

How many of these questions and others the MRM and the Dyadic
Expansion of States of Consciousness Model can help us answer will be yours to
judge. Certainly, these models will not answer all of these questions but I think
they will provide purchase on many of them. Importantly, rather than being
purely descriptive in nature, the biopsychological instantiation of these ideas in
dynamic systems theory will, I think, allow us to make deductions about how
people experience and live in the world and how they change both themselves
and their relation to world.

If I experience too much certitude about this, it likely emerges I feel I have
found a secure base in the Norton Series on Interpersonal Neurobiology. This
series is at the dynamically forming critical edge of developmental psychology,
relational neurosciences, therapeutic processes, and dynamic systems theory.
The editors have scaffolded me to talk about, explore, and co-create emergent
understandings out of the creative messiness embedded in my ideas of self- and
mutual regulation, reparation, meaning-making, states of consciousness, and
their expansion. Of course, that is the simple goal of the book: to present these
ideas, explore them, and encourage us together—virtually, and hopefully at times
together, in real time and space—to co-create a more coherent and complex
understanding of these ideas, and of ourselves in the world.

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