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The Need for a "Psychoanalytic Psychology" in the Cognitive Science Field

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Cognitive science has incorporated seminal concepts of psychoanalysis without acknowledging this influence. This article covers psychoanalytic ideas already incorporated-implicitly or explicitly-in modern cognitive psychology, as well as ideas whose inclusion would benefit the cognitive field. These include the emphasis on mental models, mind-body interaction, unconscious processes, dual processes of thought, and naturalistic research milieus. The article discusses reasons why the psychoanalytic roots of these ideas have not been acknowledged and shows how the theories of multiple coding and the referential process provide a basis for bridging the psychoanalytic and cognitive science fields. Finally, it is argued that scientific psychology requires a subfield of psychoanalytic psychology that covers the integration of information-processing functions, including somatic and emotional processes, in the context of an individual's overall goals.

In their introductory survey of cognitive science, Simon and Kaplan (1989) cited many influences on the field:

> *Therefore, if we are to understand cognitive science, we must know what disciplines have contributed to its formation (Norman, 1981). Among these we must certainly count experimental and cognitive psychology, artificial intelligence (within computer science), linguistics, philosophy (especially logic and epistemology), neuroscience, and some others (anthropology, economics, and social psychology will also come in for comment). (p. 3)*

With all this diversity of influence, it is striking that the contributions of psychoanalysis are ignored. Freud's agenda was the construction of a theoretical device, a "psychical apparatus," which accounted for maladaptive functioning and its repair in treatment. In relying on inference from observable events to mental representations and processes, and in developing a theoretical model as a basis for such inference, Freud's enterprise was itself a "cognitive revolution" which predated the more recent one (Baars, 1986; Neisser, 1967) by about two thirds of a century. The psychoanalytic domain of investigation is, however, virtually ignored in scientific psychology today. In the century that has passed since Freud introduced his theory, the fields of academic psychology and psychoanalysis have followed divergent paths.

Cognitive psychology is taught in the universities; its principles are tested primarily in controlled laboratory settings, using techniques such as computer simulation and experimental

designs. Psychoanalysis has been taught largely in its own institutes, and in other clinical programs, insulated from general scientific scrutiny. Analysts rely primarily on the "psychoanalytic method" as practiced in their individual clinical work for verification of psychoanalytic propositions, although the deficiencies of evidence gathered by this "method" are now well understood (Bucci, 1989; Grunbaum, 1984), Psychoanalysis has made unique contributions to an understanding of human mental processes, including emotions and cognitive functions and their interaction. The cognitive revolution of psychoanalysis was far broader in some important respects than the agenda of modem cognitive science, as I show later. Conversely, the methods and findings of modem cognitive psychology have much to offer the psychoanalytic field. The separation of fields does disservice to both.

In previous writings, I have covered areas of cognitive science that are useful in providing an understanding of pathology and the processes of therapeutic change (Bucci, 1997a). In this article, I emphasize the converse direction of influence: the contributions and potential contributions of psychoanalysis to cognitive psychology. The first section covers several basic tenets of the psychoanalytic approach to information processing, including ideas that are incorporated - implicitly or explicitly - in modern cognitive psychology, as well as psychoanalytic ideas whose inclusion would benefit the cognitive fields. These include the use of mental models, the interaction of mental with somatic and emotional processes, the role of unconscious representations and processes, psychoanalysis as inherently a dual process theory, and the reliance on naturalistic research milieus. I also discuss possible reasons why the psychoanalytic roots of most of these ideas have not generally been recognized or acknowledged.

In the second section, I show how the multiple code theory (Bucci, l997a), a theory of emotional information processing that is informed by psychoanalytic concepts, provides a basis for bridging the cognitive science and psychoanalytic fields. I also point to the need for a subfield of psychology, a "psychoanalytic psychology," that covers integration of systems within the individual as they operate in adaptive functioning, their dissociation in pathology, and the means by which new integration may be brought about.

The Psychoanalytic Approach to Information Processing

The Role of Mental Models

Psychoanalysis is primarily concerned with subjective events, which are known directly only to the experiencer (and only partially even to her or him) and which can be known to others only through inferences from what is observed. Freud recognized the need for a theoretical model of the psychical apparatus as the necessary context for such inference, in precisely the sense in which cognitive psychologists apply mental models today. Freud (l895/1953b) made an early attempt to develop a neurophysiological or biological basis for his theory of the psychical apparatus, and Gill (1976) and others have also noted occasional shifts toward the neurological levels of explanation in Freud's later writings. Overall, however, the psychological level of explanation was dominant in Freud's writings throughout his life. In 1900, he wrote:

I shall entirely disregard the fact that the mental apparatus with which we are here

concerned is also known to us in. the form of an anatomical preparation, and I shall carefully avoid the temptation to determine psychical locality in any anatomical fashion. I shall remain on psychological ground. (Freud, 1900/1953a, p.536)

Throughout his subsequent writings, up to and including his final summary formulation, Freud continued to refer to the psychical apparatus as a theoretical model. He was aware of the innovative nature of his approach:

We assume that mental life is the function of an apparatus to which we ascribe the characteristics of being extended in space and of being made up of several portions - which we imagine, that is, as resembling a telescope or microscope or something of the kind, Notwithstanding some earlier attempts in the same direction, the consistent working-out of a conception such as this is a scientific novelty. (Freud, l940/1964h, p. 145).

Freud's model of the mind, the metapsychology, like the models in use in cognitive psychology today, was constructed as an analogue to a physical domain. The metapsychology was an attempt to account for psychological concepts on the basis of the distribution of mental energy in the psychical apparatus, using principles of Newtonian mechanics. The energic model was retained in the structural as in the topographic theory. Although there are important differences between these two theories, both assume that mental energies derive from somatic sources, from the instincts or drives; that the psychical apparatus is inactive until stimulated; that the building up of instinctual energy produces unpleasure; and that mental activity is motivated toward reducing this instinctual energy by discharging or binding it. Both assume that language is associated with binding of energy and that nonverbal functions are associated with the more primitive component of the apparatus: in the topographic model, with the unconscious; in the structural model, with the id; and in both cases, with the primary process of thought.

The failure of the energy model as a theory of biological systems has been discussed in detail elsewhere (Bucci, l997a, Eagle, 1984; I-loll, 1985). In general, the usefulness of theoretical models of mind depends on their fit to the mental operations being modeled. As Bolt and others have pointed out, the human organism cannot usefully he construed as the kind of closed system in which the principles of energy distribution, as postulated in the metapsychology, might apply (Bolt, 1989; von Bertalanffy, 1950). For this and other reasons, many analytic theorists have advocated rejection of the energy theory (Gill, 1976; Bolt. 1976, 1989: Klein, 1976; Rubinstein, 1965; Schafer, 1976). Unfortunately, in the process, they have also rejected the general enterprise of constructing a basic psychological model for psychoanalysis. Thus, for example, Gill and Klein proposed a phenomenological or clinical theory; Rubinstein argued in favor of a neuro-physiological or "protoneurophysiological" theory; and Schafer advocated the hermeneutic approach. Freud's basic insight concerning the need for a theoretical model remains sound. The fact that

Freud's specific model has not succeeded as a basis for further theory development or for research should not be construed to mean that the enterprise of model building itself is at fault. Cognitive scientists today use a similar heuristic of basing mental models on structures derived

from other domains. The dominant approach to model building in cognitive science was based on the architecture and function of information processing in the von Neumann computer (Simon & Kaplan, 1989). This has been a productive source of hypotheses concerning human mental functions, although its limits are now being recognized to an increasing degree. Models based on neural networks are now being developed in cognitive psychology to account for aspects of mental function that have eluded classical symbolic theories (Rumelhart, McClelland, & the PDP Research Group, 1986), and additional theoretical models of body, emotion, and mind are required to carry forward both the psychoanalytic and cognitive science enterprises. As discussed further in the second section of this article, the concepts and methods of modern cognitive psychology, developmental psychology, and emotion theory, along with psychoanalytic concepts, can be used in developing such models.

Focus on Mind—Body Interaction

Freud's model concerned the functioning - and malfunctioning - of the human organism in the context of its adaptive goals. Such an account must incorporate sensory, somatic, and behavioral functions, along with cognitive and linguistic ones, This is a major respect in which the agenda of modem cognitive science has largely fallen behind Freud's approach. According to Simon and Kaplan (1989), cognitive science is primarily concerned with two classes of intelligent systems: living organisms and computers. In their recent summary of the field, they have defined cognitive science as "the study of intelligence and intelligent systems, with particular reference to intelligent behavior as computation":

> *Although no really satisfactory intentional definition of intelligence has been proposed, we are ordinarily willing to judge when intelligence is being exhibited by our fellow human beings. We say that people are behaving intelligently when they choose courses of action that are relevant to achieving their goals, when they reply coherently and appropriately to questions that are put to them, when they solve problems of lesser or greater difficulty, or when they create or design something useful or beautiful or novel We apply a single term, "intelligence," to this diverse set of activities because we expect that a common set of underlying processes is implicated in performing all of them. (Simon & Kaplan, 1989, p. 1)*

From the perspective of psychoanalysis, concerned with the general functioning of the human organism in an interpersonal world, this definition leaves much of what was important in cognition and behavior out of account. To provide an adequate account of human cognitive functions and even, of the functions that Simon and Kaplan cited-the identification of "goals" and of behaviors relevant to these-the theories of cognitive science must be expanded well beyond the type of intelligence that computers share to include the study of *emotional intelligence* and the sensory and somatic functions inherent in this. Fodor and Pylyshyn (1988) recognized that the differences between computer hardware and the flesh and blood "hardware" of human systems may have implications for the organism's mental functions:

It is obvious that its (the brain's) behavior, and hence the behavior of an organism, is determined not just by the logical machine that the mind instantiates, but also by the protoplasmic machine in which the logic is realized (p.59)

They recognized that the organism's behavior is determined by the protoplasmic hardware (the body) as well as by the operating software of the logical machine (the mind). However, they did not see the hardware of the protoplasm as determining logical operations of the logical machine itself. The psychoanalytic perspective enables a more adequate formulation of human information processing, which is built on the interaction of cognitive with somatic and sensory systems. The application of this model is not restricted to clinical interactions but is required, as well, to account adequately for all types of intelligence in human beings operating in an interpersonal world. Although the body-mind interaction has been neglected in cognitive science, the study of such interactions has become increasingly dominant in neurophysiology of the emotions, as I have discussed elsewhere (Bucci, in press, Damasio, 1994).

The development of a model that will account for emotional intelligence becomes even more crucial when one is concerned with goals of which the individual may not be aware. Thus we need to distinguish situations of failure in the operation of human intelligence from situations in which the individual is in fact successful in meeting unacknowledged or unrecognized goals. In other words, we may say that people are behaving intelligently when they choose courses of action that appear irrelevant to acknowledged goals, when they produce something that is not manifestly useful or beautiful, and when they repeat actions that appear maladaptive rather than producing novel solutions. In all these instances, there may be emotional intelligence at work, but operating in relation to unacknowledged rather than explicit goals.

Inference to Unconscious Mentation

"If Freud's discovery had to be summed up in a single word, that word would without doubt have to be 'unconscious' "(LaPlanche & Pontalis, 1973, p. 474). The "psychical apparatus" that Freud constructed was intended specifically as a basis for scientific study of unconscious mental events:

Whereas the psychology of consciousness never went beyond the broken sequences which were obviously dependent on something else, the other view, which held that the psychical is unconscious in itself, enabled psychology to take its place as a natural science like any other. The processes with which it is concerned are in themselves just as unknowable as those dealt with by other sciences, by chemistry or physics, for example; but it is possible to establish the laws which they obey and to follow their mutual relations and interdependences unbroken over long stretches-in short, to arrive at what is described as an "understanding" of the field of natural phenomena in question. (Freud, l940/l964b, p. 158)

Consciousness constitutes the starting point for the investigation of the psychical apparatus,

but these conscious processes do not form unbroken sequences; there are gaps in them, We must assume, Freud argued, that there are ongoing processes that are concomitant with the conscious ones but also more complete than those, ongoing even during the gaps in the conscious processes.

The operation of mental processing outside of awareness is widely recognized in psychology today. According to current views, virtually all storage of information in long-term memory and virtually all significant information processing operate outside of the focus of awareness, in verbal and nonverbal modalities. Cognitive psychologists have developed a wide range of techniques for investigating unconscious processes and have distinguished a variety of different forms in which they may occur. *Implicit* memory (Schacter, 1987) is identified through changes in performance following experimental interventions characterized as "priming," without explicit recollection of the intervention itself. Any type of information can in principle be represented in implicit memory, including numbers, words, and other types of representations. *Procedural* or more generally *non-declarative* memory, as characterized by Squire (1992), refers to skillful behaviors or habits, including motoric, perceptual, and cognitive skills; conditioning and emotional learning and all other learning that "changes the facility for operating in the world" (p. 210). This contrasts with declarative memory, which affords "conscious access to specific past events (Squire, 1992, p. 210). Whereas conscious processing has previously been associated with intentional operations, and unconscious processing with *automatic functions* (Posner & Snyder, 1975), processing outside of awareness has been shown to include intentional and voluntary functions as well (Zbrodoff & Logan, 1986).

The pervasiveness and diversity of unconscious processes, as understood today, require that the implications of the unconscious as a psychoanalytic construct be reconsidered. The factors determining what is understood psychoanalytically as the *systemic* or *dynamic* unconscious, and the features of such processing, need to be distinguished from the general modality of processing outside of awareness. Beyond this, we may also find that it is not the dimension of awareness or lack thereof that is most significant in understanding psychic functioning, but the form and organization of thought. This change in emphasis may he seen as a revisiting of the structural model, in a new light (Bucci, in press).

From the perspective of cognitive science, we should also note an epistemological problem that was overlooked in Freud's formulation of inference from conscious to unconscious events. Analysts are directly aware only of their own conscious experiences, the observations made through the medium of their own perceptual systems. The patients' conscious experiences, the subjective representations and processes that occupy their awareness, are as 'unknowable" to the analyst directly as the contents of the patients' unconscious minds and must themselves be inferred from their utterances and behaviors. Here cognitive psychology has taken a more generalized and systematic step in the direction indicated by Freud, accounting for conscious as well as unconscious mentation as occupying the same epistemological level and as requiring similar inferential strategies.

A Dual Process Theory

Freud's focus on unconscious processes is related directly to the nature of psychoanalysis as inherently a dual process theory. The duality of the primary and secondary processes of thought

has been considered by many psychoanalytic scholars, as by Freud himself, as his most original and valuable contribution and as central to the psychoanalytic account of the mental apparatus (Freud, 1932; Jones, *1953;* McLaughlin, 1978). Here we focus on Freud's identification of distinct forms of thought rather than their differential access to awareness. A psychological theory that fails to account for this fundamental dichotomy cannot be applicable to psychoanalytic concepts, as Noy (1979) pointed out.

Freud's characterization of modes of thought that differ from standard logical forms can still he seen as a seminal contribution today. The psychoanalytic observations supporting a dual system model speak directly to current issues within the cognitive science field, providing evidence for dual or multiple processing systems rather than single-code or common-code propositional models (Bucci, 1985, 1993, l997a), The features of primary process thought are spelled out most elaborately in Freud's concepts of the dream work, the varied mechanisms by which the images of the dream are generated. His identification of the operations of the dream work constitute viable hypotheses, well ahead of their time, concerning the forms and processes of nonverbal or unattended thought. On the other hand, Freud's emphasis on the primary process as necessarily dependent on wishful cathexis and his understanding of dreams in such terms have contributed to the current widespread rejection of his approach by cognitive and dream researchers as well as by cognitive scientists.

Although the concepts of the primary and secondary processes of thought lay the groundwork for a dual format model of thought. they do not in themselves provide the systematic theory that we require. The distinctions between the primary and secondary processes arc rooted in the energy theory and are determined specifically by the postulated features of energy flow. The modes of operation of the primary process, as operating in that dream work, are associated, in Freud's system, with unbound energy seeking immediate discharge in accordance with the pleasure principle This contrasts with the bound cathexis of the secondary process, which is governed by the reality principle and operates with verbal symbols. In this system, the capacity of an image to symbolize an idea rests on the operation of freely mobile cathexis. The theory then faces a dilemma in accounting for the complex, organized, systematic features of the dream work, as Freud himself characterized these within the confines of the energy model. As Holt (1989) and others have recognized, for this and other reasons, the theory of the primary process is in "sad disarray". Systematic information processing in dreams, as well as organized unconscious fantasies in waking life, "embarrass the methodology of the classical psychoanalytic accounts (Arlow, l969).

The failure of the energy model has been discussed above. From the perspective of current research in cognitive science, we can now also see that the features and functions that Freud postulated as determined by the energic distinction fail to show the correspondence that would be expected according to the theory (Bucci, in press). Implicit or unconscious thought may be either verbal or nonverbal; it may be symbolic or subsymbolic The contents of implicit or nonverbal or subsymbolic thought may include complex, abstract scientific and mathematical concepts and many other types of ideas other than wish fulfillment in the psychoanalytic sense. Implicit and nonverbal forms of thought occur throughout normal, adult mental life, in waking states as in sleep. Explicit or conscious or verbal thought has a similarly varied range of functions, properties, and contents. In modern terms, we would say that the concepts of the primary and secondary processes lack construct validity. To retain and develop the psychoanalytic theory of thought, it is necessary that the basic concepts of Freud's dual format model be consistently redefined in the

context of current research.

The Psychoanalytic Method: A "Naturalistic "Research Design

Freud relied on the "psychoanalytic method" as necessary and sufficient for the scientific verification of psychoanalytic propositions and for the development of his general theory of the psychical apparatus. He devalued evidence from other sources, such as experimental laboratory research, even where this supported his conclusions, as indicated, for example, in his letter of 1934 to the experimentalist Saul Rosenzweig:

> *I have examined your experimental studies for the verification of the psychoanalytic assertions with interest. I cannot put much value on these confirmations because the wealth of reliable observations on which these assertions rest make them independent of experimental verification, Still, it can do no harm. (cited in Grunbaum, 1984, p. 1)*

Although Freud's claims may appear somewhat cavalier, core aspects of his methodological position remain sound. The need for naturalistic designs is now increasingly recognized within the cognitive science field, again without acknowledging the significance of psychoanalytic contributions in this regard. Yuille (1986), Neisser (1976), and others have pointed to the inability of experimental paradigms to study events as they naturally occur and. the distorted views of psychological processes that result, The need for naturalistic designs is particularly evident where interpersonal issues and emotional factors are involved.

The current emphasis on naturalistic designs may be seen, for example, in the method of protocol analysis, an important tool in cognitive science research. In this method, subjects are asked to give continuous verbal commentaries - in effect, to think aloud - while solving problems or performing a variety of tasks. In gathering the protocol, the exact wording of the instructions given to the subjects may vary with the particular task, "but the simple instruction to talk aloud while performing the task captures the essence":

> *If subjects fall silent, the experimenter may remind them to keep talking. A non-directive prompt (for example, "Keep talking") is less likely to interrupt the normal sequence of processing than a more directive prompt (for example, "What are you thinking about?"). (Simon & Kaplan. 1989, p. 22)*

Several types of verbal reports may be generated using this procedure. The simple instruction to talk aloud naturally while performing the task is most effective in producing what Simon and Kaplan termed *direct verbalization,* in which subjects report what is in their short-term memory (in the focus of awareness) without attempting to be consistent or complete or to evaluate this material before talking. The techniques of verbal data collection include "concurrent" protocols, obtained by asking subjects to think aloud while performing the tasks, and "retrospective"

protocols, in which subjects are asked to report everything they can recall about the task immediately after completing it. As Simon and Kaplan noted, retrospective protocols are generally more susceptible than concurrent ones to reconstruction and distortion, and the danger of distortion increases with the length of delay prior to providing the retrospective report.

It seems clear that cognitive scientists have reinvented the psychoanalytic method of free association, without citing Freud *(1895/1955)* or his patient Frau Emmy von N. The task situations of cognitive science and psychoanalysis both provide quasi-experimental naturalistic contexts for collection of verbal reports, with particular procedures and limits, determined by the nature of the process being investigated. Both situations include the basic instruction to speakers to talk aloud about what is in their minds, to say whatever comes to mind without editing or evaluating this.

Cognitive scientists, like analysts, prefer to rely on concurrent reports of what is happening in the speaker's mind, in the 'here and now," rather than on retrospective descriptions. In the cognitive science research, as in psychoanalytic work, the process has generally been found to be most effective to the extent that instructions and interruptions are minimal. In both contexts, the speakers' descriptions of their mental representations and processes are not accepted as necessarily veridical but are used as a basis for inference to mental representations and processes within a theoretical framework. This contrasts with the approach of the introspectionists (Titchener, 1915) in which subjects' verbalizations were taken at face value as constituting valid representations of their own thought processes rather than as data from which inferences may be made.

There are also several major ways in which the psychoanalytic situation differs from the task conditions of cognitive research. First, the patient, unlike the subject in a cognitive study, is not given a particular problem or task. Patients are concerned with the problems that have brought them to treatment but are asked to put these aside as well. The basic rule is to say whatever comes to mind whether or not patients understand its significance with respect to the problems they have come to solve. The process of psychoanalysis itself involves the formulation and reformulation of the patient's issues; identifying the problems is part of the creative work. Second, every aspect of the data collection procedure in psychoanalysis is understood and interpreted in the context of the ongoing, developing relationship between patient and analyst. These special features, in the context of the procedural constraints, make the psychoanalytic situation uniquely suited for systematic studies of emotional information processing as it occurs in the interactions of life. The relationship is the quasi-experimental intervention that operates to arouse emotional issues: the instruction to say whatever comes to mind without focusing on a particular task enables a reporting of all manner of experience, including multiple somatic and sensory representations that may operate outside of awareness, and whose relevance is not yet understood.

Although Freud's "method" was, in many respects, well ahead of its time, we should also note the scientific problems associated with this approach. The spoken material as filtered by one observer, the analyst, cannot be the basis for systematic investigation. A sine qua non of scientific investigation is that events be publicly accessible and that observations be shared. Furthermore, this "observer" is not an observer but an involved participant in the process being studied, as we see more clearly today than was recognized in Freud's time.

These and other methodological issues are recognized in the fii1d of modern psychoanalytic

research. Rather than relying on the judgment of a single observer-participant, as in the usual case report, modern psychoanalytic psychotherapy researchers use objective records, usually audiotape recordings of a session, and transcribe and segment them; they then apply a wide range of encoding schemes in a manner that is parallel to the methodology of cognitive research. Psychoanalytic research can be seen as the psychoanalytic method in modern dress, informed by clinical insight and incorporating modern scientific constraints.

In this context, psychoanalytic researchers have also been concerned with the effects of research procedures on the clinical processes that are being studied as well as the inadequacy of research methods for addressing some aspects of clinical work. The effects of observation on the behavior that is being observed need to be considered in cognitive as in psychoanalytic research, and psychoanalytic research can help in our understanding of these effects.

As clinicians and researchers alike also recognize. the verbal protocol is only a partial record of the interactions that occur in a session, and may leave crucial aspects of expression and interaction out of account. In this context, for example, process notes and session notes, although possibly unreliable taken by themselves, can contribute significant behavioral observations missing from the verbal records, as well as observations concerning the analyst's own state, which impinges on the work, The integration of clinical and research perspectives has promoted awareness of the multiple channels of expression and communication that are used, and research methods that enable integration of multiple recording procedures in a reliable manner are being developed.

Summary: Comparison of the Psychoanalytic and Cognitive Science Agendas

Freud's scientific strategy, like that of cognitive science and all modern science, depended on inference from observable events to hypothetical constructs within a theoretical framework or nomological network. Mental and emotional events, as they figure in a scientific theory, have the same status as particles, the "big bang," black holes, or life in the Bronze Age; all are theoretical entities that cannot he directly observed and that have their existence as defined in relation to other concepts and to observable events. From its beginnings, psychoanalysis has been built on the interaction of sensory, somatic, and emotional experience with cognitive and linguistic functions, and psychoanalysis has gone beyond cognitive science in its recognition of the multiple channels of experience and expression and the structure and function of unattended thought. The psychoanalytic situation, with its fundamental rule and its controlled interpersonal setting, constitutes a unique naturalistic research milieu for study of these questions.

On the other hand, the promise of psychoanalysis as a theory of mind and a research milieu has not been fulfilled. While Freud's goal was the development of a theoretical model as a basis for inference that is central to psychoanalytic work, the necessary scientific procedures of theory development and revision have not taken place. To demonstrate the contribution of psychoanalytic concepts to the field of information processing, we need a theoretical framework that makes these concepts coherent and consistent and amenable to empirical investigation.

The multiple code model has been constructed as such a theoretical framework, a general theory of emotional information processing that accounts for adaptive as well as maladaptive

functions and that may be applied to an understanding of pathology and its repair in treatment. In the next section, I briefly outline the application of multiple code concepts to some central psychoanalytic ideas and show how these applications may help to build a bridge between psychoanalysis and cognitive science.

A Multiple Code Theory of Emotional Information Processing: Bridging the Gap

The multiple code theory incorporates three major ways in which humans represent and process information: *subsymbolic, symbolic imagery,* and *symbolic verbal* codes. Subsymbolic processing is systematic processing that occurs in analogic formats on continuous, implicit dimensions. Such processing is complex to define and to model but familiar to us all. (The type of processing I term subsymbolic has features of "connectionist" or parallel distributed processing systems based on properties of neural nets and modeled by the mathematics of dynamical systems (Rumelhart et al., 1986)). Systematic subsymbolic processing, operating in sensory, motoric, and somatic modalities, underlies the toddler's learning to walk and to climb, the tennis player's capacity to anticipate and return the ball, the wine taster's ability to recognize the qualities of different varieties and different vintages, and the analyst's sensing of patients' inner states. All these processes occur in specific sensory - somatic modalities rather than in abstract form, and are based on features that cannot be explicitly identified but are systematic nonetheless. In operating without explicit intention or direction, subsymbolic processes and representations are often not directly experienced or may be experienced as in a sense "outside of oneself," outside of the domain of the self over which one has intentional control. Subsymbolic formats are dominant in emotional information processing, as we shall see, and provide a systematic way to account for what we know as empathy, intuition, and unconscious communication (Bucci, in press).

In contrast to subsymbolic processing, symbols are discrete entities with properties of reference and generativity. This means that they refer to entities outside of themselves and may be combined to generate infinite varieties of new forms. Symbols may be images or words. (Models based on symbolic processes have been dominant in cognitive science from its beginnings [Simon & Kaplan, 1989]. The classical information-processing models, based on the architecture of the von Neumann computer, with short-term and long-term memories and modality specific buffer zones, are based on sysbol systems). Language has been assumed to be the primary medium of psychoanalysis (the "talking cure"), although it is not the primary medium of thought and certainly not of emotion.

The three systems, with different contents and different organizing principles, are connected by the referential links, which enable us to symbolize and verbalize our emotional experience and to understand and resonate to the words of others. Building on the work of Paivio (1971, 1986), Kosslyn (1987), and others, I have introduced the concept of the *referential process* as the mechanism by which the multiple components of the human information-processing system are connected (Bucci, 1984, 1997a). The basic mechanism of the referential process, the mechanism of transformation from subsymbolic information to nonverbal and then to verbal symbols, may he seen in parallel form in the child's development of the symbolizing function and the analytic patient's connecting of emotional experience to words, The infant forms an image of mother on the basis of multiple ever-changing appearances, producing an enduring prototypic image - we

may say a memory schema - that enables recognition of mother in the many varied contexts and forms in which she appears; this enduring discrete entity can then be named. Similarly, the analytic patient begins with arousal of subsymbolic emotional experience, which is gradually connected to imagery and language. Prototypic images and episodes constitute the "lingua franca" of the nonverbal representational system, enabling the connection of multiple subsymbolic representations to one another and to words.

Emotions are defined, within the multiple code theory, as memory schemas built up through repetitions of interactions with significant other people, from the beginning of life. The emotion schemas are represented as prototypic events that share a common subsymbolic core of sensory, visceral, somatic, and motoric experience. They incorporate our expectations of others and of ourselves: how others will act towards us in particular circumstances, how we are likely to act and react, and how we are likely to feel. One cannot directly report the finely varying states of the subsymbolic components of the schema, but one can describe instances of the prototypic events in which these processes figure. In the narratives of such instantiations, the emotion schemas can he told.

Within the emotion schema, any component that is activated has the potential to activate other elements, so that language or imagery may activate traces of sensory or visceral experience or action, or the converse may occur. Like all memory schemas, the emotion schemas determine how one perceives the world and are themselves changed by new perceptions. Like all memory schemas, they may operate within or outside of awareness.

The formulation of the emotion schemas as memory schemas is built on Bartlett's (1932) early notion of memory schemas and is compatible with current information-processing approaches to emotion theory (Lang, 1994; Scherer, 1984) as well as current research on the neurophysiology of the emotions (Damasio, 1994; LeDoux, 1989). Stem's (1985) concept of representations of interactions that have been generalized refers essentially to prototypic episodes as described here. The concept of emotion schemas is also compatible with Kernberg's (1990) definition of affects as incorporating symbolic representational, motoric, and visceral components. Freud's concept of transference may itself be seen as a precursor of the concept of the emotion schema:

> *It must be understood that each individual, through the combined operation of his innate disposition and the influences brought to hear on him during his early years, has acquired a specific method of his own in his conduct of his erotic life, that is, in the preconditions to falling in love which he lays down, in the instincts he satisfies and the aims he sets himself in the course of it, This produces what might be described as a stereotype plate (or several such), which is constantly repeated - constantly reprinted afresh - in the course of the person's life, so far as external circumstances and the nature of the love-objects accessible to him permit, and which is certainly not entirely insusceptible to change in the face of recent experiences. (Freud, 1912/1958, pp. 99-100)*

The "Vicious Circle" of Pathology

In adaptive functioning, the emotion schemas are adjusted constantly and flexibly in

interpersonal interactions throughout life. More differentiated expectations of others and oneself and new response patterns are formed as schemas are activated in new contexts and as one's own capacities develop.

Some emotion schemas, however, may represent unbearable contingencies, threatening to overwhelm the self: 'unmanageable conflicts of response patterns (as in wishing 'to destroy the person one desires) or unbearable expectations of abandonment or loss. When such a schema is aroused, for any reason, even in the absence of an actual precipitating event, the painful sensory and and somatic components are also aroused. These components operate in trace form but are painful nonetheless, and they carry the prospect of future catastrophic events, which the person will then work to avoid. One can generally not regulate bodily activation directly. Most of us do not know how to regulate our blood pressure or heart rate or other arousal systems. One can, however, turn attention away from the triggering imagery by distracting oneself or redirecting attention in some way. Repression and other defensive operations may be defined in this context.

While avoidance may appear to control the emotional arousal, the individual pays a high price. The painful subsymbolic sensory and visceral components and tendencies toward action continue to operate, at least in trace form, but now without emotional meaning and without capacity for symbolic regulation. The individual may seek to find meaning, conscious or unconscious, for the bodily activation: in some cases as having an independent somatic source, as in somatization; in other cases as displaced to related but different objects where the perceived connection does not threaten the self. When this happens repeatedly, the emotion schema may then be reconstructed in this dissociated or distorted form.

The occurrence of symptomatology and the imperviousness of pathological schema to new experience may be accounted for on the basis of the fundamental dissociation within the emotion schema and the distorted attempts at repair. The response of avoidance is self-reinforcing; each time the schema is evoked, the painful somatic and sensory experience is evoked as well. In avoiding the people, events, or places associated with a painful schema, in reality and in imagination, individuals can then not take in potential new information about themselves and others; they cannot learn that the dreaded expectations will not materialize in reality. The "vicious circle" of pathology (Strachey, 1934/1963) can be understood in these terms (Bucci, l997a, 1997b, in press).

The Therapeutic Process in Psychoanalysis

Psychoanalytic treatment is designed to permit activation of such dissociated and distorted emotion schemas in a context where they can be tolerated, examined, and reconstructed. If one can connect back to the subsymbolic sensory and somatic components of the schema, one can gradually enable opening of the schema and its reconstruction. This is what we mean by structural change.

On the basis of the sequence of the referential process as outlined above, we have identified three stages in the process of verbalizing emotion schemas in free association. Optimally, the stages operate iteratively, in a deepening cyclical pattern, in the course of a session and in the course of treatment.

The process begins with activation of an emotion schema, usually a dissociated schema dominated by its subsymbolic sensory and somatic components, whose emotional meaning the patient does not recognize. Patients may avoid the symbolic elements of the schema, if they recognize them as such, but the context constrains them to go on, to continue verbalizing and symbolizing whatever they can: bodily feelings, vague images, whatever comes to mind.

The conversion of the subsymbolic to the symbolic format operates first in the nonverbal system. The patient thinks of an event, an image, a memory, a dream, which may seem irrelevant but which is associated with the emotion schema. The discrete images and episodes, including memories of the past and events of the here and now, can then be translated into words and described in narrative form.

The power of free association can be seen most clearly here. The apparently trivial or irrelevant images and episodes that come to mind are likely to be peripheral symbolic components of the emotion schema. These are permitted into awareness even when the initial objects of the dissociated schema are avoided - precisely because they are avoided - so that the patient does not recognize the emotional meaning of what he or she says. The subsymbolic elements of the dissociated schema may be connected to words by this means. The narrative of the connecting phase reveals the patient's emotion schema as it currently exists - as it has been retrieved from memory or played out in the here and now. The power of the relationship may be seen here - in providing both objects that enable the schema to be symbolized and an environment in which the potentially unbearable feelings can be safely touched.

In the third phase. the patient, with the analyst, reflects on the images and stories that have been told. The analyst may. take the lead at this stage. Optimally, new connections are made - within the patient's emotion schemas and between patient and analyst - which permit the cycle to begin anew at a deeper level. Now the patient can begin to understand the emotional meaning of her or his narrative in new terms.

Here is where the possibility of breaking the :vicious circle" is found. The old story in a new interpersonal context is potentially a new story, not just a retelling. The somatic elements of the activated schema occur in the session in modulated form. The event is represented in a code that is shared; the tools of logical differentiation and generalization can be intentionally invoked. The connections of the displaced object to the activated memory schema can be recognized; the differences in one's own capacities and in the situation in which the activation occurs can be recognized as well. The person of the analyst, and the therapeutic context, constitute prototypic imagery in the here and now that may be entered newly into the schemas, Thc analytic relationship potentially plays the same role in the reconstitution of the schema that the caretaker and the earlier context played in its initial development.

Operational Indicators of the Referential Process: A Framework for Research

The concepts of the multiple code theory, the referential process, and the emotion schemas lay the necessary groundwork for the use of the psychoanalytic situation in research. Each of the stages of the referential process has a set of external indicators in language and behavior associated with it, as I have discussed in detail elsewhere (Bucci, 1993, 1995, l997a; Bucci &

Miller, 1993). Using these operational indicators, as defined within the theoretical framework of multiple coding, we can make inferences from the observable events of the treatment to the processes occurring within the speaker's mind. This research method, in effect, relies on the type of "indirect indicators" to which Freud (1937/1964a) referred, but with the scientific constraints of modern psychological research. As the research proceeds, the multiple code theory, like all scientific models, can be continuously changed and revised.

Conclusions: Toward the Integration of Fields

Academic psychology has traditionally been divided into separate disciplines such as social, developmental, cognitive, and experimental psychology, with subcomponents or specializations within each, including areas such as perception, motivation, learning, memory, and psycholinguistics. We need to recognize, however, that functioning within each of these areas depends on integration with other systems, including systems of somatic and emotional processes, in the context of the individual's overall goals, and cannot be understood in isolation. I would suggest that a field of psychoanalytic psychology should be recognized (or developed) whose domain of investigation includes the integration of processing systems as these operate in adaptive functioning, as well as their dissociation in pathology, and also includes the processes by which new integration or reintegration can be brought about. Intrinsic to such a field is investigation of the interaction of the individual with the interpersonal world, from the level of intimate relationships to the broader structures of society.

Scientific psychology requires such a field, and the psychoanalytic situation provides a unique setting for such investigation. The underlying goals and organizing patterns of an individual's life, as told in one's narratives and played out in the relationship, emerge in psychoanalysis as in no other context. Cognitive scientists and analysts both need to realize the scientific potential of this approach.

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