CHAPTER 12
Brain Emotional Systems and Affective Qualities of Mental Life

From Animal Affects to Human Psychotherapeutics

The further we go out into the outside universe, the closer we come to our origins, reaching back to the beginning of time. The deeper we go into the dark matter of the unconscious, the more we understand our origins and our present... the further we can predict future problems, whether of anxiety, drug addiction, or sexual impotence.

—Arthur Janov (2007, p. 17)

The goal of this penultimate chapter is to try to integrate the diverse lines of thought covered so far in order to draw out some psychotherapeutic implications of our emerging appreciation of basic emotional systems. At this level, one needs to deal with a new understanding of the BrainMind that has not yet been integrated with clinical thought. The goal here is not to give advice or make definitive claims. It is to explore the multifaceted dimensions that our new understanding of the emotional foundations of mind offers for our therapeutic endeavors—whether in the interpersonal dynamics of the consulting room (Siegel & Solomon, 2012) or on the traumatic field of life itself (Belenky, et al., 1996).

—This and the following chapter were written entirely by Jaak Panksepp in order to share a vision (along with some personal reminiscences) about how knowledge of mammalian emotions could help advance the science of biological psychiatry as well as the development of new psychotherapeutic approaches that may be quite controversial.
My viewpoint is that substantial therapeutic effects can be achieved in affective disorders by direct manipulation of primary-process emotional circuits, through psychological, somatic and physiological approaches. The more traditional view is that lasting change can only be achieved by working on emotional dynamics through the gateway of language—by dealing with individual life events through the mediation of tertiary cognitive processes. This view is, of course, accepted by all psychotherapists, but there are some who believe that, for many emotional ailments, especially those arising from early developmental problems, one also has to address more directly, the underlying emotional dynamics, and sometimes even work at nonverbal primary-process levels (e.g., Janov, 2007). While all agree that psychotherapy, as traditionally conceptualized, has to operate through the linguistic gateways of the human mind, there are reasons to believe that the next revolution in psychotherapies will emerge from new neuropsychoanalytic perspectives and more direct manipulations of the affective MindBrain functions, using multimodal approaches. To conclude this narrative, the final “Coda” chapter will frame the goals of this book in a historically relevant philosophical perspective.

A premise of this book is that the farther we go into the depth of our affective foundations—our inside universe—the closer we come to our mental origins. At some point, as we descend into ever ancient recesses of our brain, there may be nothing but unconscious neural networks creating pure behavior—organisms going hither and thither with no feelings—perhaps like undulating jellyfish riding the tides with the dimmest forms of preconsciousness. Maybe the neural networks in our spinal cords are like that: deeply unconscious. We just don’t know and have no good way to find out. But we can finally fathom the nature of primal emotional feelings—they arise from the same brain regions as unconditioned emotional actions and reactions. Understanding these processes, provides a solid foundation for additional progress. The understanding of how affective dynamics are created in mammalian brains may be the single most important scientific question for psychiatry and consciousness studies, as well as for psychotherapists who try to restore emotional balance. To put it mildly, the history of this field has been chaotic, with prominent blind alleys, such as the James-Lange neocortical readout theory of emotions, which is still at the forefront of understanding for many psychologists, although it has no sustained critical lines of research to support it. At best, it currently deserves to be a diminutive leitmotif behind the major within-brain causes discussed in this book. Many others believe emotions, indeed affective feelings, can be dynamically unconscious. Perhaps, but that may only occur if feelings are denied or repressed by excessive cognitive activities, a common disposition of the human mind, which can surely inhibit subcortical emotional turmoil to
some extent. But those pressures of mind will seep out in unexpected ways and create chaos in people's lives.

It may come as a surprise to some psychotherapists that, according to the present analysis of the ancestry of mind, the traditional construct of the unconscious (introduced by Sigmund Freud) is not completely "unconscious"—it is not totally bereft of experiences. What is deeply unconscious are the automatic learning and memory processes of the brain. The Freudian dynamic unconscious, or preconscious (he used these terms ambiguously) is supposedly partly constituted of the emotional states described in this book. But these states, when sufficiently intense, are experienced affectively, albeit not reflectively (cognitively), not only by humans, but surely by many other animals. We can now be confident that other mammals do experience their emotional arousals—although most, like newborn human infants, may not be reflectively aware that they are having such experiences. That is what the evidence now indicates, and it may be worth remembering that Freud also often claimed that the affects are never unconscious. It feels like something to be in a primal emotional state. They are raw affective experiences—special phenomenal states of mind, a unique category of qualia, that arises from the very foundation of the conscious mind.

DEVELOPMENT OF AFFECTIVE STATES AND THE EVOLUTIONARY LEVELS OF BRAIN AND MIND

Although intense primary-process emotional arousals, as they occur in mammals, are probably never un-experienced—are never unconscious—the secondary-process mechanisms of learning, the next level of control, are deeply unconscious. This bears repeating. As far as we know, learning and memory reflect neural mechanisms grinding away in deterministic ways, connecting our primal affects to world events. As a result, complex forms of consciousness emerge in higher tertiary-process brain regions—the neocortical mantle, with very different casts of mind (more purely cognitive representations of self and the world)—than those found in the ancestral, primal attentional, emotional, and motivational terrain of sub-neocortical regions, where affective states prevail. They are evolutionary solutions to anticipate the future intrinsically, without forethought, which arises from their profound influence on neocortical programming.

Our higher mental activities are profoundly cognitive, as neocortical brain regions (always in conjunction with lower BrainMind functions) construct images of the world from the diverse sensory portals that allow us to remain in contact with external events. A neuroscientifically and genetically defensible position is that the neocortex is fundamentally tabula rasa at birth—a random-access-memory type of blank slate—with most of the highly predictable functional specializations that come with
maturation being a consequence of subcortical specializations weaving predictable types of cortical "modularization" through the developmental magic of epigenesis, along with a great deal of culturally guided learning. And thereby, our autobiographical storehouses of knowledge and memories emerge, much of it under the instructive and motivational influence of the SEEKING system.

Without clear visions of how the lower affective mind and the higher cognitive mind are interfaced (very heavily in the medial cortical and subcortical basal ganglia regions: see Figures 1.1, 1.2, and 3.1), we cannot have a clear discussion about what it means to have psychologically significant problems of the mental apparatus and how new MindBrain therapies can be developed. It is likely that most behavioral and cognitive therapies work primarily because they come to regulate affects and better coordinate cognitive views with positive affects. Only recently has a rich conversation emerged about the potential utility of more direct dynamic affective therapies, where an individual's emotional life is situated front and center.

In the future we have to recognize the overwhelming evidence for the subcortical localization of affective processes, so dramatically demonstrated by localized brain stimulation work already summarized, along with remarkable brain-imaging work such as that of Damasio and colleagues (2000; see Figure 12.1). Of all the many brain changes seen in humans during emotional arousals, induced from one's own storehouse of autobiographical memories, the overwhelming proportions of arousals were subcortical as humans experienced what we would call RAGE, FEAR, GRIEF and joyfulness (PLAY?) (see Figure 12.2). If anything, cortical regions tended to shut down during emotional arousals. Clearly, to make sense of the affective brain, we simply must understand the evolutionary layering and integration of neural developments as well as, of course, the vast inter-digitations among levels of control (the nested hierarchies which I discussed in Chapter 2, see Figure 2.1).

This evolved, multoteried vision of the BrainMind has implications for psychiatric disorders and their therapies, both neurochemical and neuropsychological. Here, I will briefly explore some implications of this knowledge for understanding human emotional problems and for the development of new clinical interventions aimed at helping reestablish emotional homeostasis when the vicissitudes of life, and the affective imbalances of the MindBrain, have become exceedingly troublesome to people.

In doing this it is important to remember that animal research has told us close to nothing about the transitory flow of memories and thoughts that accompany our emotional arousals. But at the same time affective neuroscientific approaches to the mammalian mind have told us most of what we know, at a causal level, about how brains actually generate emotional feelings and about how the deeply unconscious learning and mem-
Figure 12.1. An overview of brain arousals and inhibitions when humans are experiencing four basic emotions: sadness, happiness, rage and fear, during PET scanning (based on Damasio et al., 2000). Distinct lower, subcortical brain regions exhibit arousals that are evident during each of these emotions, while cortical inhibitions (reduced blood flow) are present in various cortical areas (the quantitative data in Figure 12.2). Because the color-coded changes are difficult to see on these black and white renditions, upward arrows indicate increased subcortical arousals, and downward arrows indicate reduced regional neocortical arousals (data graciously shared by Antonio Damasio; for color figure, see Panksepp, 2011b).

-ory processes of mammalian brains actually operate. However, access to higher mental experiences in other animals remains a scientifically unmanageable problem. The vast multilayered BrainMind interactions create abundant layers of complexity in our attempts to understand mental disorder—to construct clear word-images, conceptual symbolic descriptions of psychiatric disorders and the influences of therapies used to ameliorate the destructiveness of unregulated emotions in people's lives.

The limited goal of this chapter is to explore the relevance of affective neuroscientific knowledge to selected psychotherapeutic issues, as well as at times to interject synoptic fragments of the affective views of the emo-
Figure 12.2. An overall summary of the data provided in Figure 12.1: Clearly, subcortical arousals prevailed over areas that exhibited inhibitions when humans were experiencing basic emotions. Anger showed the greatest overall percentage of neocortical arousals, but still the general asymmetrical pattern held for each emotion (data abstracted from Damasio et al., 2000).

tional mind elaborated so far. I also wish to emphasize developmental perspectives that may protect against as well as promote future emotional problems—namely how positive affects can successfully counteract negative affects. It is becoming ever clearer that emotional resilience can be advanced through childrearing practices, sustained positive interpersonal regard, as well as by diverse time-tested (e.g., psychoanalytic) and newly emerging clinical interventions throughout the life span. Of course early experiences have long been recognized as being of definitive importance in long-term mental health issues, and now the neural mechanisms are being illuminated, most dramatically through preclinical (animal) research.
Thus, affective neuroscience may be of considerable use for all psychotherapists and parents, especially those who are concerned with healthy child development. People should understand that children are born with certain affective capacities that are central for the quality of their lives (see Sunderland, 2006). Such knowledge will promote better childrearing practices, where (i) the affective life of children becomes a central issue for helping parents to know what their infants need to flourish (Narvaez et al., 2012; Worthman et al., 2010); (ii) positive attachment dynamics in families become the key to helping children thrive (Code, 2009; Hughes, 2007); and (iii) realistic visions of our emotional lives, with fulfilled potentials for mindfulness, promote positive personal transformations (Siegel, 2007, 2010).

In the previous 11 chapters we outlined key scientific issues arising from affective neuroscience, with some clinical reflections. I will now discuss (i) how an understanding of primary-process emotions must be incorporated into evolutionarily informed animal models of psychiatric disorders, (ii) how an understanding of primary affective processes provides a new foundation for psychiatric and psychological science, and (iii) how these new lines of understanding provide the basis for novel approaches for the development of biological and psychotherapeutic interventions that target the affects more directly than ever before.

Key questions I will address here include: How do raw affective experiences created within the brain relate to emotional disorders? What are the implications of this knowledge for achieving emotional homeostasis, greater feelings of well-being, and more positive outlooks on life? And of course, how can affective neuroscience research on other animals give us better knowledge about the emotional lives of human beings?

There are many novel strategies waiting to be evaluated, both clinically and preclinically (i.e., in animal models). How can we counter disorders characterized by negative affects (e.g., depression) with our increasing knowledge of positive affective systems? For instance, we can envision many new ways to use the positive affects of SEEKING and PLAY to counteract the negative affects of depression and anxiety disorders. With the discovery that we can monitor animals' emotional feelings rather directly through their affective vocalizations and their instinctual emotional tendencies, the intellectual commerce between animal research and psychiatric practice, both with regard to development of new medicinal and psychotherapeutic interventions, can be enriched. However, we should not underestimate the challenges that remain for interdisciplinary integration. Before proceeding to clinical issues, let us consider the difficulties that have prevented a fuller interpenetration of clinical and basic science issues concerning the nature of our primal emotional minds. In a phrase, the relevant neurosciences (from behavioral to molecular) currently need, but do not have, clear vision of the primary-process affective infra-
structure of the BrainMind. Indeed, for silly historical reasons, the topic of animalian emotional feelings and implications for psychiatry is rarely discussed. In psychology, most of the discourse is at the tertiary-process level, where cognitions and emotions are inextricably conflated, leading to very difficult, at times muddled, discourse in which few of the concepts are neuroscientifically anchored. More clarity can be had if we respect the hierarchical circular causal influences, first bottom-up and then top-down, that control the BrainMind (see Figure 2.3).

In many past writings, I have made the case that the primal affective foundations of the mind are profoundly biological and subcortical. The guiding principle has been that raw affects arise from the dynamics of large-scale neural networks that generate instinctual emotional behaviors rather than from the higher, self-related perceptual brain regions that mediate cognitive awareness. Primal emotional feelings go hand in hand with emotional action dynamics, constituting distinct varieties of mental experience. The resulting affective dynamics also have characteristic embodied archetypes that depend heavily on visceral bodily representation within the brain (the core SELF) that engenders primal "affective consciousness" and secondarily on autonomic arousals that can be indirectly experienced by the higher mental apparatus. Because these subcortical dynamics—large-scale analog network functions—are the primordial wellsprings of emotional life, psychotherapists need to clearly envision the nature of these psychic energies in order to more directly, and thereby more effectively, deal with complex human emotional problems in psychotherapy.

Sharing and discussing our emerging knowledge of these systems, which exist in all human brains, may, in and of itself, be a valuable therapeutic insight for those in emotional distress, who are, at times, beyond wits' end as to what is happening to them. Just telling distressed individuals that their seemingly free-floating emotional distress is "real," even when done with empathy, may simply come across as vague and insubstantial reassurance. Explaining that everyone has a discrete set of emotional feeling systems, which are distinct brain processes shared by all, and that these systems exist for good and important reasons in all mammalian brains is solid knowledge. And, as a general rule, many people would prefer being constructively informed in addition to being empathetically reassured. In the higher MindBrain, affects and cognitions can work productively hand in hand. They can also wage an all-out war. They are two very distinct aspects of our consciousness. Ultimately all psychiatric disorders are manifested at both levels. If one modifies affects, cognitions often will follow, especially with good counsel. Changing cognitions can also work, but not if the affect doesn't follow suit. The reciprocal interactions of cognitions and affects makes this difficult (see Figure 12.3).
Figure 12.3. A summary of the general patterns of neocortical and subcortical arousal changes in human brains as a function of emotional state activation. Overall, there is consistency of subcortical limbic arousals whenever emotions are aroused, with decreased neocortical arousal (summary diagram derived from Liotti & Panksepp, 2004). The upper right insert highlights an example of brain arousals exhibited by a male brain during orgasm. Practically all the arousals are in subcortical areas that are known to regulate basic male sexual behavior, as summarized in Figure 7.2. (The PET scan is provided graciously by Janniko Georgiadis and colleagues.) The lower right insert is a summary of fMRI data when people have been viewing the same emotional picture with an emotional-feeling set of mind (left) and a cognitive-analytic set of mind (right); during affective viewing there are midline frontal arousals, and lateral working-memory inhibitions, while the pattern is dramatically reversed during a more cognitive-analytic viewing of the same materials (the fMRI brain scan summaries are graciously provided by Georg Northoff).
AFFECTIVE NEUROSCIENCE AND THE DYNAMICS OF EMOTIONAL MINDS

With apologies for repeating the point, knowledge of the primary-process states generated by the seven basic emotional systems described in this book is essential to a neuroscientific and evolutionary grounding for clinical thinking about emotional disorders. Although most of the details of these systems remain to be worked out, an affective neuroscientific infrastructure has been established that permits basic emotions, and their powerful affects, to guide clinical thinking. Here, I will focus on the implications of that knowledge for affect-specific therapeutic issues, especially from developmental perspectives.

New affective balance therapies (ABTs) can now be devised for rebalancing the "heart" rather than just the "head," to put it metaphorically—an abiding goal of new ABTs should be to aim for more direct and more precise beneficial interventions within the primal affective lives of individuals. This should obviously include cognitive restructuring, but often that, by itself, is not sufficient for optimal reestablishment of affective homeostasis. To put it simply, a psychotherapist wishes to alleviate, even "cure," unpleasant problems in psychological life that promote suffering. If what has gone wrong is within recent and specific sets of life problems that have clear cognitive precipitants, then cognitive-behavioral counseling is an ideal way to proceed. On the other hand, most severe emotional problems do not simply arise from recent events. Their etiology can be traced to sustained past stressors and traumatic vicissitudes, often extending back early in life, so far back, that few explicit memory traces remain—just imbalanced emotional states and associated cognitive biases.

These early imprints can be remarkably long lasting because very stressful life experiences have left emotional systems sensitized or desensitized, with permanent, epigenetically induced high-stress reactivity and excessive primary-process negativistic feeling. We must also appreciate that events that are overwhelmingly stressful, and wonderful, to young minds may not seem so to mature adults. Similar stressors at different ages have different effects depending on critical maturational issues, as well as the genetic "susceptibility background"—the primal temperament—of each individual. The classic temperaments—choleric, sanguine, melancholic and phlegmatic—were not that far off the mark, even though our new Affective Neuroscience Personality Scales provides more objective estimates of such emotional strengths and vulnerabilities (Davis, et al., 2003; Davis & Panksepp, 2011). Similar tests need to be developed for adolescents and younger children, for they may be very helpful for teachers and guidance counselors. For instance, the profound desire of youngsters to have abundant real play in their lives is commonly underestimated.
Compelling angers and unrealistic fears need to be known. They need to be acted out. They need to be talked about, with care.

Below, I will focus on how an appreciation of primary-process cross-mammalian emotional systems may guide understanding of the role of affective experiences in the genesis of psychiatric disorders, and also guide development of new therapies to alleviate human suffering. But such issues are also of foremost concern in optimizing therapeutic relationships. Across many studies it has been found that the emotional quality of the client-therapist relationship, rather than the specific therapeutic approach taken, is perhaps the most important overall variable in the outcome of psychotherapy (Lambert & Barley, 2001). This is substantially due to the critically important need for emotionally attuned therapists to share genuinely positive social feelings with those clients who are in psychic distress. A better understanding of our intrinsic prosocial emotions may also help illuminate how affective dimensions of the psychotherapeutic processes operate. Psychotherapy may be CARE writ large. The key to an effective "therapeutic alliance" may reside in higher-order empathic resonances, the foundation of which may be the CARE circuitry of our brains, which is well attuned to the nuances of GRIEF and PLAY.

This leads to interesting questions such as the mental and bodily health consequences of many of the positive emotions. Does a therapist need to find those rare but precious moments when pain can be turned into joy? Can one fight off negative affects in the BrainMind by simply amplifying opportunities for positive emotions? So far, this strategy does work in animals (Burgdorf et al., 2011), and some of our own best ideas are now in clinical testing, with drugs that have emerged from taking the emotions of animals seriously (Moskal, et al., 2011). As we better understand these brain systems, we may be better able to devise more effective clinical interventions that allow various positive social emotions to strengthen psychological resources and help reframe troublesome memories—to reconsolidate psychic pain within the balm of positive affects.

Diverse new therapeutic insights may arise from understanding the emotional tools that evolution has given us to promote survival. Emotional disorders are invariably tied up with one or more of the basic emotional systems. Clearly, the negative emotions (RAGE, FEAR, GRIEF, and depleted SEEKING resources) are commonly encountered in psychiatric problems. Excessive positive emotions, which can also lead to problems, are equally important in framing new therapeutic approaches. Although current evidence for relationships of emotional primes to psychiatric problems is inferential, here are thumbnail sketches of some likely clinical implications, stated baldly, without extensive analysis, for each of the systems described in this book. It is impossible to sustain any crystal clarity in this narrative, since there is no generally accepted scientific nomenclature for key issues, and all systems interact with each other and higher
BrainMind functions. Thus, so much about the underlying functional details remains to be scientifically documented. Indeed, this whole chapter is offered as food for thought:

1. SEEKING urges, which participate in all emotional arousals, invigorate and guide our search for resources. Along with higher brain functions, this system energizes dimensions of life-span development that are devoted to the human search for self-identity and meaning in life. Excessive and imbalanced arousals of this system can promote a variety of addictive behaviors and lead to delusional thinking and the paranoid tendencies—a “too muchness” that often characterizes mania. When aroused, in poorly understood ways, it can promote creativity, and when excessive, florid schizophrenia and megalomania. When this system is drained of resources, anhedonia and depression ensue. Recruitment and positive utilization of this mental energy can help alleviate depression, for a while. Thus, this system figures heavily in many positive and negative psychological outcomes. On the positive side, it promotes growth-enhancing engagements with the world, and on the negative side it promotes addictions, obsessive-compulsive disorders, schizophrenia, mania when overactive, and an empty, fatigued depression when the system becomes chronically dysregulated or underactive. For instance, part of the psychological sluggishness of depression is due to excessive dynorphin-induced dysphoria that arises from suppression of SEEKING drive. In contrast, mild stimulation by opiates, or endogenous opioids, can gently stimulate this system, produce pleasurable and satisfying feelings, and inhibit various negative affects. Hence, new drugs that can antagonize dynorphin while promoting mu opioid activity, as can be achieved with buprenorphine, should be highly effective antidepressants, especially when psychic pain is prominent (Watt & Panksepp, 2009; Panksepp & Watt, 2011; and see Chapter 9).

2. RAGE looms large in societal issues when groups or individuals attempt to restrain the wishes and aspirations of others. Sustained arousal of this system leads to chronic irritability and explosive aggressive disorders. Anger is also part of everyday frustrations in human interactions when conflicting beliefs and goals clash between individuals and the larger community, even to the point of promoting schizophrenic delusions. RAGE, like all other emotions, requires the SEEKING system to be engaged. Psychotic rage is one of the hardest emotional problems to treat. As with all forms of destructive anger, males wreak most of the havoc in all mammalian species, except perhaps hyenas (because females often have more testosterone). Among humans, practically all mass murders have been perpetrated by men. Because Substance P is a clear facilitator of defensive RAGE in animal models, the pharmacological blockade of this system could prove to be a powerful antianger agent in humans, especially if it is accompanied by a reduction in RAGE-inducing frustrations in the patient’s social environment.

3. FEAR (and the resulting diverse anxieties that it generates) is the perennial companion of many. This system promotes specific phobias as a function of learning, and generalized anxiety disorders when underlying brain substrates have become chronically sensitized. This system was designed to counter predation—a defense against injury and premature death (perhaps like RAGE, thus leading to the historical conflation called the “fight or flight”
response). A progressive aspect of civilization has been the construction of safety nets against such events (from police forces and armies to healthcare systems). Now, however, with the push for individuality and libertarian independence in some nations, we are faced with increasing levels of novel, nonlethal cognitive predatory practices that rend the social fabric and erode the secure bases that support people’s lives. Hence FEAR is once again on the rise, as are the ranks of those seeking to profit from it. Clinical anxiety abounds not only among those in the population who face the insecurities of increasingly challenging daily lives, but also among those who have experienced the most intense traumas that human life holds in store. Treatment of Post-Traumatic Stress Disorder (PTSD) in our veterans’ medical centers has, lamentably, been a growth industry for many years now. Our understanding of the neural mechanisms of learning and memory is now opening the path to direct pharmacological intervention in these processes, potentially speeding the course of psychotherapy. Currently, effects of psychotherapy can be promoted by cognitive facilitators such as d-cycloserine, which actually speeds therapeutic relearning, as in exposure therapy. Successful human trials that have used d-cycloserine to promote psychotherapeutic treatment of anxiety disorders such as PTSD have been conducted within the past decade (Ganasen et al., 2010; Heresco-Levy et al., 2002; Hofmann et al., 2006). Work with animal models has also shown that it is possible to counteract fearful or traumatic memories pharmacologically to make them less psychologically troublesome (Adamec & Young, 2000; Adamec et al., 2005).

4. LUST is a common affective “companion” of young adults and eager adolescents, and it can be both a positive and negative force in human relations. Unregulated arousal of this system may participate in various anti-social behaviors, from unwanted sexual advances to predatory pursuit and stalking of objects of desire. The persistent SEEKING action urges that accompany LUST should also be recognized as vitally important for dominance relationships and determining whose will prevails in social interactions. Significantly, the quality of adolescent and adult socio-sexual behavior may be molded by the quality of early social-play relationships. The challenge is to manage these energies in ways that optimize health and well-being outcomes, rather than allowing them to be a major source of life frustrations. As this chapter was being written, it was reported in the news that a middle-aged computer programmer, extremely lonely and seething with lustful rage over his socio-sexual failures, had murdered three women and shot nine others before committing suicide at a health club in suburban Pittsburgh. In a well-planned and hence intentional act of violence against women, he acted out his frustrations at not being able to attract female sexual companionship over a period of two decades. Perhaps this lost soul had very little social play as a boy and did not learn how to approach other humans in interesting, friendly, and non-threatening ways. That the evolution of LUST and positive SEEKING could provide a primary-process platform for the evolution of CARE and PLAY is hard to believe from such inhumane actions. However, each primary emotion helps engender idiothetic higher-order personality structures that are not intrinsic to the emotional primes, highlighting the importance of learning and culture in how each is manifested.

5. CARE is the great gift of Mother Nature that helps promote lifetime resilience, and it increases the likelihood of lifelong happiness. Without CARE, humans cannot thrive interpersonally. Sociopathic and psychopathic ten-
dependencies may thrive when this motivation is deficient. And psychotherapy is virtually doomed to failure without it. The roles of endogenous opioids and oxytocin loom large in all social emotions, and it is possible that the optimal therapeutic environment needs to recruit such neurochemistries. Facilitation of opioid activity in the brain can alleviate many of the most severe forms of depression rapidly (Bodkin et al., 1995). It is possible that a substantial amount of depression is caused by diminished pleasure chemistries in the brain (Watt & Panksepp, 2009). CARE surely figures heavily in the emergence of empathy as higher BrainMind regions are molded by prosocial concerns and perspectives.

6. GRIEF signals social need. Those who do not get enough care will be subject to elevated GRIEF and psychic pain both in the present as well as later—their lives are more likely to be full of separation distress, resulting in chronic feelings of insecurity, sadness, and the inability to experience pleasure. The chronic insecurity of borderline personality disorders and social anxiety disorders may arise from this all too common negative affect. Excessive activity of the GRIEF system can promote a host of other psychiatric problems ranging from depression to social phobias and panic attacks; chronic under-activity of this system may promote maladaptive attachment styles as well as autistic and psychopathic aloofness. But above all, this system promotes feelings of sadness and grief, which can become chronic psychic pain (Panksepp, 2011a). Many common forms of depression are precipitated by neurochemical cascades initiated by such feelings and by the ensuing despair within the BrainMind (Watt & Panksepp, 2009). As noted several times already, safe opioids such as buprenorphine are much under-utilized in the treatment of depressions that do not respond well to conventional antidepressants. But there are good reasons to believe that these drugs will have optimal long-term therapeutic effects only if they are accompanied by improved social attachments, including temporary attachments to psychotherapists (whose tasks include the facilitation of new real-world perspectives on life-affirming social possibilities).

7. PLAY networks give us perhaps the most evolutionarily recent primary-process emotional urge: the urge to engage creatively and joyously in the mental world of others, to establish friendships and to learn through eager friendly competition (with repeated, adequately balanced give-and-take—winning and losing, in a manner of speaking). This process, when done with full acceptance, is often accompanied by euphoric positive affect, whereby one feels a sense of secure belonging within the social order. It is sad that this natural rambunctious behavior of young children is too often viewed as a problem by parents and other adults, leading perhaps, in situations where childhood impulsivity is most disturbing, to diagnoses such as ADHD at one phase of life and mania at another. But PLAY is also a blessing for the development of social skills. Like all the basic emotions, PLAY is an especially rich experience-expectant process that energizes a great deal of learning, ultimately serving as the driving force, along with the social emotions of GRIEF and CARE and LUST, of much of the world's artistic production. At its best, PLAY is permeated by one of the greatest joys of life: the capacity to laugh, one of nature's finest emotional gifts. And this blessing is not unique to humans. Even rats exhibit a happy laughter-type sound when they play with each other or are tickled by the playful hands of human beings, yielding
measurable brain benefits (Burgdorf et al., 2010; Wöhr et al., 2009; Yamamura et al., 2010). Primary-process social joy can be molded, with a keen sense of fun and humor, into distinct therapeutic interventions that can probably counteract chronic negative affects such as repressed RAGE, and with remarkable clinical skill, perhaps even quell the demoralizing effects of profound FEAR and GRIEF. Perhaps PLAYful joy is much underutilized in psychotherapies, especially among the young. Indeed, there are solid reasons to believe that it can be used as a daily psychic tonic for young children to help reduce the ever-growing diagnosis/incidence of ADHD in our culture. Our increasing understanding of this emotional system should figure more heavily in the discussion of diverse emotional problems, including depression, since facilitation of PLAY urges should be a key target for future therapeutic interventions.

In sum, these systems need to be considered in diverse mental health issues, only touched upon here, and their detailed neuroscientific understanding may be of foremost importance for the development of new psychiatric systematics and ever more specific BrainMind medicines. They are all brought together into a coherent symphony of bodily actions and affective possibilities through an ancestral core-SELF structure, shared homologously in all mammals. In higher brain regions, this unity can be lost as diverse idiographic tertiary process selves are engendered, providing the neural soil for dissociative identity (or multiple personality) disorders.

We must remember that at the foundation of mind, all these systems are enactive, action networks. Emotionally troubled people should be allowed to enact their energies at appropriate moments, and therapists should be trained to recognize when emotions are real, and how one can, with the understanding of the affective depths of humanity, help transform a negative affect into a positive one.

While psychotherapy must obviously continue to deal realistically with the holistic, multilitered appreciation of individual human lives, we are finally entering an era when an understanding of the nomothetic (universal) parts of the MindBrain—evidence-based primary-process affective views of the mammalian brain—can provide an understanding of the universal affective-emotional foundations for the MindBrain shared by all humans. In turn, this knowledge should provide a scientific grounding for new affectively oriented therapies that concurrently consider the interactive dynamics of body, mind, and brain. Future generations of psychotherapists will be well served by developing skills and understandings at all of these levels.

The rest of this chapter will delve into implications of such knowledge, not only for our understanding of the foundations of a positive emotional life, but for promoting psychotherapeutic healing and life-affirming cultural initiatives. An understanding of positive emotions lies at the heart of what it means to live a “good life” (Sheldon et al., 2011). As we understand more about the neurochemical coding of brain affective processes,
new ideas are bound to emerge for the treatment of excessive anger, anxieties, depressions, phobias and traumas, and perhaps even psychotic delusions (Panksepp & Harro, 2004; Watt & Panksepp, 2009). I do not claim psychotherapeutic expertise but feel it is incumbent on me to entertain various possibilities that thoughtful neuroscience can bring to the therapeutic table. I encourage clinicians to develop these ideas further.

One of the most striking and highly replicable rediscoveries of recent decades has been the remarkably powerful influences of early childhood experiences on future mental health (Heim et al., 2010). There are findings too numerous to summarize here, but they range from physical risk factors such as premature births and drug exposures (e.g., Johnson et al., 2010; Stone et al., 2010) to the quality of mother-infant and child relationships (Fearon et al., 2010; Lahey et al., 2008). Children who are abused may develop chronic anger and diverse psychosomatic symptoms. But just as in rats, abundant loving maternal attention promotes resilience and better-regulated stress responses as children grow to adulthood (Lester et al., 2007; Propper et al., 2008).

It has long been a matter of debate whether one can “cure” such patients simply by dealing with their current life circumstances. Some feel it is essential to deal more directly with the emotional traumas of the past. For instance, Art Janov’s (2007) position is that there are ways to guide people with early emotional traumas back to the sources of their implicit traumatic memories. He argues that special reliving techniques, within appropriate supportive and understanding therapeutic contexts, can permanently ameliorate the impact of those long-lasting brain changes. This would be an example of a novel ABT, but it remains to be fully documented in standardized therapeutic trials.

There is an enormous potential for the development of other novel strategies, both psychological-behavioral as well as combined somatic and neuropharmacological interventions. Development of these approaches can be guided, in part, by what we are learning about our ancient primary-process emotional systems. I will now consider how such knowledge might have useful implications for the development of new therapies but also for the evolution of psychiatric taxonomy, such as the codification of psychiatric syndromes, based directly on underlying endophenotypic emotional issues (Panksepp, 2006a).

**EMOTIONAL ENDOPHENOTYPES VERSUS SYNDROMAL THINKING IN PSYCHIATRY**

Research on the animal brain allows us to focus on primary-process or core affective issues in *neuroscientific detail*—something that is quite impossible in human research, even with modern brain imaging (which is better suited for the higher cognitive regions that interest most psy-
chologists). Animal research allows us to go to the affective core. Cross-species preclinical research allows us to arrive at ever more coherent understandings of the nature of emotional illnesses and the affective requisites of mental health. Currently we rely heavily on descriptions that try to categorize mental illness on the basis of general symptoms (i.e., the DSM-type "syndromes"). Let us briefly consider these existing diagnostic categories as they are encoded in the major handbook of psychiatry—the various successive versions of the Diagnostic and Statistical Manual put out by the American Psychiatric Association over the past half-century. Current psychiatric diagnostics are based on concepts that are passed down to us by pioneers such as Eugen Bleuler, Sigmund Freud, and Emil Kraepelin.

These conceptual psychiatric syndromes were never based on an understanding of the brain or its emotional systems. This is one reason why outdated concepts have caused increasing problems from DSM-I to DSM-IV. Many fear that the current construction of DSM-V will not be immune to those flaws (Hyman, 2007). Such problems might be alleviated if we could replace (or at least supplement) the old conceptual structures with better visions of the real psychiatry-relevant entities of the mind (e.g., the various endophenotypes of the emotional brain).

Endophenotypes are natural aspects of brain functions that can be studied at the neuroscientific level; for instance, researchers can examine responses as simple as eye-blinks, pupillary dilation or constriction, and startle reflexes (Gottesman & Gould, 2003). We know that loud noises invariably startle people and animals. However, when exposed to the same noise a second time, the startle response is less pronounced. This phenomenon, when studied with mild auditory stimuli that allow animals to prepare for much louder sounds, is known as "pre-pulse inhibition", and is often attenuated or absent in schizophrenic individuals. We can be confident that these preparatory, regulatory responses are controlled by coherent, analyzable circuits within the brain (especially basal ganglia), although we can have no such confidence for psychiatric syndromes, because those are concepts created by human insight and ingenuity.

Through affective neuroscience, endophenotypic thinking (acknowledged almost universally as an important new way of approaching psychiatric science) can include the domain of primary-process emotions. The natural emotional networks of the brain may provide the most relevant endophenotypes of all, because they go to the affective core of psychiatric matters. Further developments along these lines may help us cut through the Gordian knot that has arisen from the once-revolutionary syndromal thinking of previous eras (Panksepp, 2006a).

The current problem is highlighted best by the most prevalent psychiatric problems, including various types of depression and other mood disorders. As noted in the introduction to the Textbook of Biological Psy-
chiary (Panksepp, 2004, p. 18): "DSM-II had only 8 types" (of mood disorders), "but by DSM-III (Revised) there were 97, and according to Paul McHugh (2001), if you consider all the subcategories and specifiers in DSM-IV, one could categorize 2665 subtypes." Such complexities arise from the higher levels of Mind/Brain organization that can vary enormously among individuals. Magnification of diagnostic minutiae does not offer any clear linkages to solid brain research or therapeutic practice, and many have started to hunger for a different approach to categorizing and dealing with psychiatric problems. The possibility of building a diagnostic taxonomy around emotional endophenotypes is just one, but currently the most robust, scientifically based vision for the future of psychiatry. Among other popular approaches right now are those based on genetic underpinnings, but those linkages are not yet yielding much clarity—only susceptibility factors, and many “linkages” of unknown significance. In any event, practitioners should clearly envision the natural primal emotional systems of the mammalian brain, and they should conceptualize human emotional problems, at least partly, in those terms.

This can lead to novel types of psychiatric systematics along with new ideas for experimental psychotherapies (a few have been noted, and more will be noted later). But to achieve such progress, we also have to develop new approaches to preclinical (animal) research that are of clear psychiatric relevance, focusing on the diversity of primal affects that lend themselves to empirical evaluation. Cross-species evolutionary perspectives will be invaluable in such pursuits. For instance, one integrative idea that has permeated this book is that imbalances in the GRIEF and SEEKING systems may be major influences in the genesis of depression (Watt & Panksepp, 2009; Panksepp & Watt, 2011). The GRIEF system promotes psychic pain that characterizes depression. When SEEKING energies diminish, as they seem to do during all sustained negative emotional states, a chronic dysphoria and deep psychic fatigue and emptiness sets in, which may reflect the active inhibition of SEEKING urges, or simply the depletion of those energetic-euphoric resources.

These lines of thinking are presented because they allow totally new approaches to preclinical modeling of psychiatric disorders. For instance, in modeling depression, we may no longer need to impose massive negative stressors on animals, such as the commonly used persistent stress of social defeat, continuous variable stress or repeated unpredictable stressors. Rather we currently know enough to try to induce imbalances of specific underlying emotional networks (Wright & Panksepp, 2011). Likewise, instead of using very general and nonspecific measures of depressive affect, such as measuring despair (giving up) in forced swimming tasks, or diminished struggling of mice suspended by their tails, and so on, we can invest more wisely in direct measures of internal affective states by monitoring affective vocal responses to systematically applied
stimuli (such as tickling procedures) that probe the status of relevant positive affective systems (e.g., happy 50-kHz ultrasounds in rats), while also monitoring relevant negative affective responses (e.g., distressed 22-kHz "complaints") that can be gently induced by the application of a puff of air to the back of a rat's neck. It is truly remarkable that currently we have abundant animal models of psychiatric disorders with no serious conversation or evaluation of the affective processes within their brains. This is surely slowing progress on understanding many basic issues directly relevant to human psychiatric concerns. We can do better by taking primary-process affective circuits more seriously.

ANIMAL MODELS, PSYCHIATRIC SCIENCE, AND THE FUTURE OF DIAGNOSTICS

The coherent blending of basic affective neuroscience, psychiatric diagnostics, and clinical practice has barely begun. Although there is abundant enthusiasm for a new synthesis, solid bridges among the various possibilities remain to be built. For historical reasons, traditional preclinical research is still wedded to a behavioral model in which measurable actions and body chemistries count, but emotional feelings do not.

A behavioral approach to psychiatric research sees visually explicit symptoms (e.g., sustained immobility in the Forced Swimming Test) as the end point, the prime indicators of mental illness. Steven Hyman (2007), the former director of the National Institute of Mental Health, was especially critical of existing inadequacies of animal models used to simulate human psychiatric syndromes. But he failed to note that they may be "unsatisfactory" largely because investigators of basic neuroscience models rarely use affective concepts to guide their thinking. Because disturbing and imbalanced affective experiences serve as the triggers for many mental illnesses, the more explicit recognition of mammalian brain systems that generate affects should be helpful. If we devote more effort to studying affective changes, then our animal models may provide far better insights into what may be happening in brain systems that are prime regulators and sources of mental illness.

For better models, our primary goal should be to characterize the brain anatomies, physiologies, and neurochemistries of the unconditional primary-process emotionality of other animals by using neuroethological approaches—the neurology of natural emotional behaviors—and then to utilize that knowledge to understand the emotional imbalances of human and animal minds. By directly manipulating specific emotional circuits, one has the possibility of dissecting the most important influences on long-term mental health outcomes. One reason such furrows of understanding have not been cultivated more vigorously is that the emotional feelings of animals have been marginalized by the same scientists who are
best positioned to do substantive work on such critically important topics. Perhaps consideration of the relevant truth diagram once more (Figure 1.5) may help clarify where we should currently be in our thinking about raw affective feelings in other mammals. The evidence is overwhelming that all other mammals feel primary-process affective states intensely, but at present, relatively little work is being conducted to characterize these affective systems in preclinical models.

TOWARD AN INTEGRATION OF LEVELS OF CONTROL:
AFFECTIVE THERAPEUTIC PERSPECTIVES

In humans, it is not unusual for affectively charged thoughts that accompany emotional arousals to be rendered unconscious soon after the emotional arousals subside. In other words, the reflective ideas that are churned up in higher regions of the mind while one is intensely emotional can rapidly become cognitively unconsciousness once the affective storms have passed, often remaining dormant, until primary affects are once again re-roused. It is difficult to bring the flow of ideas and images associated with emotional arousals explicitly back into phenomenal experience once passions have subsided. This is why reestablishment of primal affects in therapeutic environments can be a rapid pathway to change. Because affects energize and guide the cognitive apparatus, clinicians can deal directly with the associated ideas and ruminations that spill forth readily, allowing therapists to directly understand maladaptive emotional patterns in action, which provide ideal moments to remodel their power over each patient's mental apparatus.

At workable moments like that, new therapeutic interventions may be applied that allow clinicians to "soften" the painful edges of past experiences through our emerging understanding of memory "reconsolidation" (see Chapter 6). When memories are retrieved, they can be modified, reprocessed, and hopefully stored away again in less disturbing forms. Indeed, there are reasons to believe that if countervailing positive emotions can be aroused at moments of emotional crisis, the long-term influences of troublesome memories may be diminished.

Before proceeding, however, let us briefly acknowledge just some of the strands of history in this field that have followed similar paths. There is the primal therapy of Arthur Janov already noted (not the "primal scream therapy" of popular, sitcom myth) and also the more conservative but highly effective and emotionally oriented process-experiential approaches of Leslie Greenberg and colleagues (see Elliott et al., 2004), as well as the short-term experiential dynamic therapies of Habib Davanloo (2005) and David Malan (1979, 1999) and others, where a main goal has been to get people to experience their "true feelings" intensely enough to allow sustained modifications.
It is becoming clear that dynamic emotion-focused approaches are generally highly effective in promoting lasting therapeutic change (Abbass et al., 2006), often yielding more lasting results than cognitive-behavioral reinterpretations and restructurings of higher mental functions. Affective experiential approaches are commonly based on the perspective that troublesome emotions can rapidly energize relevant thoughts more than cognitions can instigate relevant feelings, which can be beneficially used, at least in supportive therapeutic environments. The intense re-experiencing of emotional episodes opens up new treatment possibilities because it provides therapists an emotional “closeness,” especially within a secure therapeutic alliance, that is optimal for therapeutic change. The impact of affectively troublesome memories can be reduced by being re-framed with affectively positive perspectives.

Emotion-oriented therapies appear to work remarkably effectively because they address with immediacy the relevant primal affects—thereby bringing forth the most relevant associated cognitive materials from the higher regions of the mind. It is not unusual for clinicians to hear, “My mother has always demanded too much of me, and treated me like I was never good enough”; “I was smaller than the other children, and I still feel demeaned and insecure today”; “I have been fighting this all my life, and I still cannot forgive myself.” The personas that might emerge from such clinical storylines are readily recognizable: the resentfully obliged and dutiful child; the harried, self-doubting overachiever; the sad, frustrated, self-sabotaging ne’er-do-well. Such archetypal storylines are, of course, virtually as familiar as one’s own life story. The affects they reflect are often counterproductive for long-term emotional well-being, for they reach to the imbalanced affective foundations of people’s mental lives. But this is exactly where the work of therapy needs to be applied, hopefully modifying the sustained and affectively powerful learning patterns that have made negative states of being habitual.

AFFECTIVE BALANCE THERAPIES

Fortunately, affective issues are currently at the forefront of scientifically informed therapeutic thinking. At present, some of the most interesting discussions in psychotherapy are emerging from new interdisciplinary frontiers: (i) developmental social neuroscience (Schore, 2003a, 2003b; Siegel, 2010; Stern, 2004); (ii) an emerging neuropsychoanalysis (Solms & Turnbull, 2002); (iii) a human and cross-species affective neuroscience (Davidson, 2004; Panksepp, 1998a); and (iv) visionary perspectives on regulatory processes of the autonomic nervous system (Porges, 2009a). These approaches are finally grappling with the emotional nature of the human mind and also, at times, with the deep affective nature of the mammalian brain.
Dan Siegel said it well in the foreword to Louis Cozolino’s (2002) synthesis of clinical and neuroscientific approaches to the human mind: Clinicians, he said, immerse themselves “in the stories of individuals who come for help in feeling better... Whatever the approach, lasting change in therapy occurs as a result of changes in the human mind... which involve changes in the functions of the brain. Exactly how the mind changes during the therapeutic process is the fundamental puzzle that the synthesis of neuroscience and psychotherapy seeks to solve.” Perhaps the most critically important neuroscientific piece of the puzzle is how emotional feelings emerge from the brain and how chronic emotional feelings can change. Providing an introduction to this knowledge has been the aim of this book.

There is ever-increasing interest among psychotherapists about the neural nature of affects, their embodiment in actions, and how they interact with cognitive processes. There is intense engagement with the topic of how emotional affective states can be better used to remodel the affective well-being of people in distress (e.g., Fosha et al., 2009a). Although psychotherapy has traditionally sought to deal more with the cognitive aspects of the emotional labyrinths of individual lives, a few revolutionaries are moving the discussion toward key affective issues (e.g., Fosha, 2000; Greenberg, 2002; Greenberg & Watson, 2005; Hughes, 2006, 2007; Ogden et al., 2006; Schore, 1994, 2003a, 2003b; Siegel, 2007, 2010; Stern, 2004).

The role of insecure early social attachments is an especially prominent vector in detailed affective lives (Heim, et al., 2010). As a result, some revolutionary therapists are aspiring to retrieve the early implicit affective “memories” that have been engraved in developing neural matrices, which control primordial mind states in infants, and work with them directly by using nonverbal forms of “primal healing” to mend the residual psychological “wounds” that carry through to adulthood (Janov, 2007). Such attempts to deal directly with the earliest childhood traumas—reflected in both sensitized and desensitized emotional systems—are seeking to expunge the implicit residues of intensely experienced emotions from the memory banks of the brain. Many patients report remarkable benefits when encouraged to relive these early traumas. We need to consider how such therapeutic models might be integrated with our emerging understanding of the ancient, universal emotional principles of the mammalian brain. There are no clear answers here, but again the idea of a “reconsolidation” of past traumatic experiences in the context of therapeutic CARE, perhaps even PLAY, comes to mind.

Because we can now grasp the neurodynamics of primary-process emotions, we can envision new variants of ABTs that currently lie on the horizon. We should perhaps even consider long neglected ideas such as simply attempting to fight negative affects with the healing power of positive
ones. Possible examples include affectively oriented therapies that not only aim to get at the emotional lives of individuals directly and rapidly, but also to utilize various somatic therapies that use the qualities of the body-to-brain-to-body continuum to rapidly shift moods toward positive affect. Every emotion has such linkages. When a patient’s emotional action apparatus has become rigidly “frozen” into a negative affective state, might it not be wise for therapists to initially encourage the types of movements and body repositioning that allow the mind, brain and body to shift into different emotional states? To shift, hopefully toward more flexible positive feelings where different affective perspectives can be considered. For instance, might playful interactions, along with direct bodywork, yield more rapid progress at times than remaining just at the cognitive level of interaction (Ogden et al., 2006)? Do we need to consider all the levels of BrainMind organization, from primary to tertiary, for optimal therapeutic progress? How else could it be, if the evolutionarily more ancient affective processes guide how the higher mental apparatus operates (Figure 2.3)? We need to concurrently think about both body and brain, body and mind, to deal most effectively with emotional problems.

Nowadays, researchers and mental health professionals are increasingly interested in understanding the neuro-affective imbalances and disorders that underpin psychopathology, along with the MindBrain changes wrought by psychotherapy; these processes can be envisioned with contemporary brain-imaging and other neuroscience technologies. Since those issues are well covered elsewhere (e.g., Cozolino, 2002, 2010; Doidge, 2007), my main goal in this chapter is to focus on our emerging understanding of how affective feelings are generated and memories are consolidated within the brain to promote further advances in clinical interventions.

Although we are finally in an era where most thoughtful investigators are in agreement with Freud’s belief in the biological and affective foundations of the psyche (Freud, 1937/1968, p. 357), the kinds of fairly straightforward affective BrainMind dynamics envisioned in this book remain to be widely integrated into therapeutic thinking. This is partly because of historical barriers, some which have already been discussed. But there are many others. Indeed, Freud’s own psychoanalytic metapsychology, perhaps “enriched” by too much conceptual baggage (e.g., Oedipus complex, penis envy), could be used as an example. It was creatively constructed from limited, culture-bound clinical observations, leading to a less than favorable historical trajectory. Across the years, many problems have arisen from an excess of theoretical creativity, accompanied by too little solid understanding of the evolutionary layers of brain and mind.

The resulting Gordian knot cannot be completely untangled, but we can entertain how affective neuroscientific knowledge can serve as a new, and hopefully solid, foundation for future clinical thinking. The main
lesson is that emotions across individuals are most similar at the primary-process level; they get diversified individually through learning and memory. And at tertiary process levels they will vary most of all. Well-targeted pharmacotherapy may be most useful at the primary level, especially since that can also have strong influences on all higher levels. Behavioral therapy approaches will work optimally at secondary-process levels, and cognitive approaches may be very effective at levels of thoughts and ruminations, with effective procedures having beneficial regulatory effects all the way down. New dynamic affective balance approaches can tackle the whole package effectively.

CONSCIOUS AND UNCONSCIOUS PROCESSES IN THE BRAIN AND PSYCHOThERAPY: PUTTING THINGS IN PERSPECTIVE

Although arousals of the primary-process emotional networks of mammalian brains are intensely experienced by humans and other animals, it is especially important to recognize that the secondary processes of the BrainMind, the basic forms of learning, memory and habit formation, are among the most unconscious "mental" processes of them all. Once we understand this, then many of the bizarre and faulty views from psychology's past may be rectified. For instance, "free will" is not a figment of our imagination as too many scientists are ready to claim these days. Free will is a higher tertiary-level neurocognitive function that we use on a regular basis (and quite effectively when we are not too emotionally aroused) for planning future actions. This is brought out beautifully in the concept of "autonomy" and "self-determination" as developed by Ryan and Deci (2006). However, we cannot readily will ourselves out of underlying emotional turmoil that has been created through the consolidation of maladaptive affective patterns at primary and secondary levels of MindBrain organization. At primary-process levels of emotional processing there is no free will, there are no "controlled cognitions." Neither do the automatic secondary-process learning and memory functions, that are molded by our wild animal passions developmentally, exhibit free will. That can only emerge from well-sculpted, deeply self-reflective, cognitive attitudes.

Our primal emotional needs and bodily motivations shape who we become before we know—before we become "aware of"—what is happening cognitively, often yielding end results without our "personal" consent. Thus, it is important to recognize that our raw, affective phenomenal experience of emotions and our cognitive reflective awareness of our emotions are very different types of mental processes. For rapid therapeutic change, perhaps it is often the affective experience itself that needs to be the starting point. But affective experience has been one of the greatest problems of neuroscience, little talked about, and hence resistant to em-
Brain Emotional Systems and Affective Qualities of Mental Life

Empirical understanding . . . indeed, even to attempts at cogent scientific analyses. One of the main goals of this book has been to provide an introduction to how that can be changed.

**The Tortuous Path to Understanding Basic Emotions: Our Inherited Tools for Living**

Why has a detailed neuroscientific understanding of the mechanisms of affect generation been so slow to emerge? Partly because it could only arise from the kind of detailed brain research that is quite impossible to conduct in humans but increasingly feasible in animal models. Progress has been delayed further by traditional conservative biases against the use of primary-process mental constructs in the scientific analysis of neural controls in the analysis of both animal and human behavior. Accordingly, basic emotional networks and the affective feelings they generate have simply not received the attention they deserve. And these feelings commonly continue to be neglected by those best situated to reveal their neural infrastructure (i.e., by behavioral neuroscientists), and hence they are not as clearly evident in modern biological psychiatry discussions as they need to be.

In a sense it is tragic that most investigators interested in learning and memory who so effectively use classical fear-conditioning as their main methodology (see Chapter 5) do not yet explicitly acknowledge the existence of an unconditional FEAR system in the brains of the animals they study (Panksepp et al., 2011). The amygdala generates emotional behaviors and associated autonomic responses, but they are typically portrayed as mere unconscious motor “outputs” in animals (Davis et al., 1995, 2010; LeDoux, 1996), as opposed to affect-generating emotional systems. This shortsightedness has prevented those interested in fear-learning from envisioning that the “unconditioned fear responses”—namely arousal of the FEAR system—may be critically important for the genesis of fear-learning (see Chapter 6). As soon as we realize that this circuitry is also the locus of control for anxious feelings, we can envision how memories become fearful. Even more, we may begin to actively consider how various positive affective circuits may counteract such psychological negativity, hopefully yielding ways for troublesome memories to be reconsolidated in more acceptable affective frames of mind.

For new therapeutic advances, we need to understand how sustained arousal of the unconditioned FEAR system critically contributes to the genesis of chronic anxiety disorders (Panksepp, 1990b; Panksepp et al., 2011). New treatments for anxiety should aim to dampen the psychic influence of this system, whether by pharmacological desensitization of the FEAR system or by psychotherapeutically defusing fearsome memories. This can currently be achieved by the direct pharmacological reduction of the arous-
ability of the FEAR system, as with benzodiazepines and to a lesser extent arousal (e.g., brain norepinephrine) inhibitors—“beta blockers” such as propranolol. Such agents can reduce the impact of troubling memories that normally arouse this system, and may allow psychotherapy to strengthen the “muscles” of counteracting positive affect systems. In considering such options, it is always important to keep in mind the levels of control in BrainMind evolution: The FEAR system promotes anxiety-laden memories, resulting in troubling thoughts, that are unique from individual to individual. However, the learned anxieties that arise from the primal FEAR system are bound to be quite similar across humans and other mammals.

Because of advances in genetics and neuroscience, it is now clear that animal models can promote an accurate archaeology of many of those ancient affective principles that still control human lives. Thus, a cross-species affective neuroscience has helped elucidate the many subjectively experienced primal emotional feelings that are among the evolutionarily provided whips and carrots—the affective tethers and guides—for our endlessly complex cognitive abilities. Ultimately, much of animal and human learning is closely linked to how certain courses of action make organisms feel. Thus, the negative affective tethers that come to impair mental health need to be countered with the affectively positive guides that can promote happiness: These can range from fantastically imaginative and creative thinking (promoted by our SEEKING system) to ethical and moral decision-making (promoted by all our prosocial emotions—CARE, GRIEF, and PLAY). And if we understand the neurobiological nature of these feelings, and how they control learning, we may have the beginning of a solid neuroscience of what it means for the human mind to experience positive emotions, and hence better ways to counter emotional disorders, through explicit, affectively beneficial clinical interventions. Modern brain imaging will help in these endeavors (e.g., for overview, see Cozolino, 2010; Northoff, 2011). But at the same time, we should be realistic about the anatomical and functional limits of such techniques.

AFFECTIVE NEUROSCIENCE, BIOLOGICAL PSYCHIATRY, AND PSYCHOTHERAPY

In our current era of brain imaging, the ancient regions of the emotional brain have received less attention than neocortical functions, partly because of the greater sensitivity of the techniques for large, highly firing neural systems. The result has been a focus on the cognitive regulation of emotional processes. Relatively small, slowly firing neuronal brain regions (where chemistries released are more important than the frequencies of action potentials) are not as readily visualized by these techniques. However, these neurophysiologically "sluggish" lower brain regions are of decisive importance for our emotional lives.
As I have previously noted, the subcortical localization of basic emotional systems has been dramatically confirmed by the fact that investigators can surgically eliminate all of the neocortex at birth in various "simple" experimental animals, and the subjects grow up to be seemingly normal creatures as far as their basic sets of emotional energies are concerned. They exhibit exploratory urges and seeking behaviors, fear, anger, lust, maternal care, and playfulness. The last is especially surprising, because physical play is such a dynamically flexible behavior. Similar patterns have been observed in human children born without a neocortex (Shewmon et al., 1999; see Figure 13.2).

When adults have similar brain damage, functional impairments are much greater, perhaps largely because once primal urges are cognitively rerepresented within maturing neocortical areas, both humans and other animals come to rely ever more heavily upon those higher, developmentally programmed "software" functions. Once one has started to rely on those fine new cortico-cognitive tools for higher forms of consciousness, one cannot effectively return to simpler ways of being. Whether the neocortex has any evolutionarily based affective functions, as opposed to learning-dependent development, is currently unresolved. It can surely engender a host of emotional thoughts and behaviors. Still, it seems, the epicenters for emotional affects remain subcortical, even though ancient cortical areas such as insula can generate various specific sensory affective feelings such as disgust and pain (Craig, 2002, 2009), but surely not without participation of subcortical circuits. Orbitofrontal areas participate in many negative and positive feelings related to taste, temperature and other sensory rewards and punishments.

When the subcortical emotional powers of the human brain become tempestuous (or dysregulated beyond understanding), overwhelming and often lasting emotional problems can emerge. In humans, these are always accompanied by cognitive changes, such as emotionally entangled attributions, ruminations, all sorts of plans and worries, as well as cognitive "propositional attitudes" about how the world is organized. This fact helps to explain why, every time emotions occur in an intact MindBrain, there always seem to be precipitating cognitive reasons in the environment and cognitive consequences for the way we think and perceive the world. But affective change is foundational in most psychiatric disorders.

This view suggests that psychotherapies need to deal not only with the cognitive precipitants of emotional turmoil, but also, ever more directly, with the concurrent affective issues. Affective neuroscience suggests that some people become hyperemotional without precipitating events, because of internal brain irritations. An example is when individuals have "limbic seizures" that are caused by sensitized emotional networks (Lewis & Pincus, 1989). Severe affective imbalances can occur for purely neurobiological reasons. Such problems can be alleviated by directly manipu-
lating the brain. Cognitive interventions would be unnecessary, although wise counseling is always useful, especially with regard to the process of readjustment that Freud called “working through.”

There are also childhood traumas that leave their imprint largely on the reactivity of emotional systems, with no explicit cognitive residues (Janov, 2007). Subcortical circuits can sensitize and desensitize through experience. These may also be helped with well-targeted pharmacological interventions, perhaps without extensive time spent talking about one’s life, even though focusing on how the resulting personality traits have affected one’s life should provide useful insights. It is important to consider that therapists who have established a strong therapeutic alliance are in a position to steer patients into different and more positive emotional states by engaging with them at more primal levels. For instance when negative emotions are allowed to be expressed, but positive emotions can also be evoked by skilled therapists, it may be possible to explicitly guide patients gradually toward more positive emotional states, allowing lasting therapeutic changes to take root.

Obviously, chronic emotional pressures change the way that individuals respond and fit into the world. With the advent of numerous new drugs for various ailments, the psychopharmacology revolution has provided many examples where simply manipulating brain chemicals can have enormous therapeutic effects for those in relatively modest, but psychiatrically significant distress (Kramer, 2005). Indeed, most psychopharmaceuticals are ABTs, because, when they work well, they shift primary-process emotional responsiveness and mood in desirable directions strictly at a non-cognitive neurochemical level. But such reductions in undesired feelings, often allow cognitive perspective-taking to become more effective.

Obviously, most human emotional problems are caused by life events. Having a caring person simply listen to the full impact of emotional events, directly from the battlefield, so to speak (Belenky, et al., 1996), is therapeutic. It is known that the subjective intensity of emotions diminishes when one puts feelings into words (Lieberman, et al., 2011). Even the chronic affective problems that have arisen from explicit non-cognitive traumas are rapidly embedded in complex cognitive narratives that need to be fully communicated and explored in therapeutic conversations. As we have seen, basic affects and cognitions always form a two-way street: Emotional arousal modifies the way we think, and the way we think can modify our feelings. Much of the “everyday madness” that characterizes human relationships and tragedies needs to be dealt with on both emotional and cognitive levels. However, the sharp edges of cognitively promoted emotional dilemmas can be softened by the opportunity for “existential testimony” in the context of social support that can
promote mindfulness, which is the capacity to focus on one’s daily life with an equanimity that transcends one’s troubles (Siegel, 2007, 2010). And playfulness, applied judiciously at just the right moment, should also help.

Indeed, emotions and cognitions work so closely in the intact human MindBrain that most psychologists are loath to distinguish between the two, a viewpoint that does not withstand close bottom-up neuroscientific scrutiny. Primary-process emotions become cognitivized—enmeshed with specific conscious representations of internal and external events—through learning. Thus, in most human psychological problems, cognitions become embroiled with primary emotions to the point where they cannot be readily distinguished. Still, affective neuroscience highlights how primary-process, pre-propositional emotional energetic states have minds of their own as ancient forms of affective mentation that preceded language and thought by vast spans of evolutionary time. A clear recognition of such emotional energies, and their role in mental life, allows one to concurrently pursue therapeutic work at more fully integrated affective and cognitive levels.

An understanding of how primary-process emotion can derail human lives should be of value for a scientific understanding of all types of psychotherapy as well as the establishment of a new basic neuroscience infrastructure to serve as a foundation for future developments in biological psychiatry (Panksepp, 2006a, 2006b; Panksepp & Harro, 2004). Thus, affective neuroscience suggests new psychotherapeutic perspectives that may complement well-established behavioral, cognitive, humanistic, interpersonal, and mindful therapeutic traditions.

**EMOTIONAL DYNAMICS AND AFFECTIVE BALANCE THERAPIES**

Psychotherapy can benefit from our increasing understanding of the emotional-instinctual action dynamics of the brain. Simply enabling people to understand such universal, shared systems in their brains may be therapeutic in and of itself. In this way, emotionally troubled individuals may confront the world with more confidence and a better understanding of the universal principles that underlie emotional state generation and regulation. Cross-species affective neuroscience not only provides a coherent structure for thinking about basic human problems, but also a concrete vision of how affect emerges from the brain. Unconditioned emotional dynamics provide a scientific way to understand how primary-process emotional feelings are actually generated in the brain.

ABTs may provide novel evidence-based ways to modify emotional feelings directly, allowing clinicians to use new psychotherapeutically
facilitated affective attitudes as a foundation for restructuring cognitive distortions and ameliorating the resulting intrapsychic stressors. Indeed, such affect-based interactions may enhance the effectiveness of the classic pharamcotherapies that revolutionized psychiatry in the middle of the last century, followed more recently by a variety of direct brain stimulation procedures, ranging from electroconvulsive shock and other forms of brain stimulation such as transcranial magnetic stimulation and deep brain stimulation (Panksepp, 2004). Some of these methods are able to directly modify the affective tone of the nervous system because they act upon the primary-process emotional networks within the subcortical regions of the brain (Coenen, et al., 2011).

Although primary-process emotional dynamics emerge from subcortical brain networks that we share with other animals, they could probably be recruited more effectively in psychotherapeutic environments than is typical in current practice. For instance, it has long been known in psychological science that one can induce emotional feelings by simulating emotional actions (Stepper & Strack, 1993). Indeed, one can rapidly get emotion-typical affective changes such as joy and sadness merely by simulating the action dynamics of laughter and crying; this can even be achieved with mental action imagery (Panksepp & Gordon, 2003). Likewise, music is a powerful way to induce emotions in ways that can be harnessed for therapeutic ends (Bernatzky, et al., 2011).

How such voluntary control over our emotional expressions, and hence affective states, can be harnessed in psychotherapeutic situations remains to be systematically studied. It seems fairly straightforward to bring these affect-specific energies to bear on all varieties of experiential psychotherapy. The incorporation of highly focused emotional exercises could contribute greatly to psychotherapeutic approaches to human problems (Ogden et al., 2006), while also providing opportunities to educate people about the primary-process aspects of their emotional lives.

To gradually master one’s own emotional dynamics in this way may help pave the path toward emotional intelligence and thereby homeostasis in a variety of situations. Pursued on a daily basis, positive emotional exercises may strengthen one’s “emotional muscles” in ways that can counteract the effects of past traumas and inoculate the emotional circuits against future adversities. For instance, when negative emotions are aroused in therapeutic environments, they could be followed on a regular basis by various positive affects—from emotionally powerful musical excerpts to bodily expressive movements, rich in positive affect. A great deal of basic science needs to be done to evaluate the efficacy of such novel techniques, both in the context of existing body therapies (Ogden et al., 2006), as well as part of an emotional education program that may help provide prophylaxis for emotional extremes that
might otherwise cascade into major psychological problems. Understanding the dynamics of one’s own emotions, as part of a comprehensive therapeutic program, may help reduce the incidence of stress-induced psychological problems.

AFFECTIVE BALANCE THERAPIES IN CONTRAST TO TRADITIONAL PSYCHOTHERAPIES

Assimilation of the complete spectrum of affective principles into psychotherapeutic practice may help recontextualize the legacy of behaviorism within psychotherapy. Behaviorism offered one precious gem to psychotherapy: behavior modification based on the rearrangement of external reinforcement contingencies. For instance, one can readily reduce undesirable behaviors by paying people to avoid their bad habits, a procedure that is currently commonly used in treating addictive urges. However, that externalist view continues to skew cognitive thinking in the field of psychology, leading to continued misconceptions of organisms as passive information-processing machines rather than emotionally proactive creatures. In contrast, a coherent vision of the affective mechanics of the mammalian mind provides a clear picture of the BrainMind infrastructure—the active, emotionally tuned interpersonal mental apparatus—which is needed as a guide to therapeutic thinking.

Still, at present, cognitive conceptions of psychopathology remain more prominent than explicit affective conceptions in clinical thinking. Although emotion regulation problems are surely connected to dysregulations in both cognitive and affective aspects of mind, perhaps our current zeitgeist encourages psychotherapists to seek a more comprehensive scientific grasp of our cognitive, rather than our affective, nature. Perhaps this is because of the more massive institutional investments that are being made in the cognitive rather than the affective neurosciences. Whatever the reason, we do not really understand much more about how the higher brain functions can weave together our cognitions than we do about how the lower brain generates emotions. We do know that the personality characteristics of therapists—no doubt especially their capacities for affective attunement—are typically more important than the specific procedures they use. It is well known that when one is feeling bad, the attention of caring others can rapidly reduce negative affect. Twelve-step programs are probably so remarkably effective, because they provide the social concern and affirmations that are needed to become reconnected to one’s potential for positive feelings. The social-affective power of other minds can help people deal effectively with negative affects, and thereby the affective terrain of the brain may provide a clearer description of the psychological forces that lie at the heart of most human psychological
problems, and the intra- and inter-personal mental dynamics that need to be recruited for optimal therapeutic effects.

Indeed, perhaps the cognitive issues that are relevant to psychotherapy remain more scientifically slippery, and harder to understand, than the underlying emotional ones. Certainly, pure cognitive benefits tend to slip away more readily than affective benefits. People can easily reach moments of apparent clarity in the midst of psychotherapy sessions only to have all that progress dissipate as they regress to their old affective habits between appointments. This may be because each of the primary-process emotions has “enslaved” large cognitive territories for self-serving purposes. If so, it is possible that attempts to achieve emotional homeostasis more directly might allow simpler and more effective routes to facilitating desired cognitive reorientations than working more strictly at the cognitive level.

The stranglehold that self-centered emotional systems (for an expansion of this concept, see Northoff & Panksepp, 2008; Panksepp, 1998a; Panksepp & Northoff, 2009) exert on cognitive processes can be overwhelmingly robust. For instance, PTSD can reflect highly aversive affects that are stirred up by simple secondary-process memories (e.g., classical conditioning as described in Chapter 6), which are often unconscious triggered (by unattended stimuli). To the surprise of many therapists, it has recently been found that rather simple cognitive-type interventions—such as eye-movement therapy to be described at the end of this chapter—which do not aspire for any deep cognitive “insights,” may help dampen the power of traumatic memories as effectively as other treatment modalities. Further, perhaps the affective storms of PTSD could be substantially diminished by therapists who know how to help patients reframe their traumatic feelings in affectively positive experiences that can be triggered easily by non-cognitive approaches. To reiterate, it is now widely recognized that memories are not as stable as most people used to think they were. As discussed in Chapter 6, every time memories are retrieved, there are opportunities to help them “reconsolidate” in less troublesome forms. Currently, this phenomenon holds out the promise that emotionally troubling memories can be reconfigured in affectively positive frames of mind with the assistance of fairly simple somatic maneuvers, and perhaps even systematic presentation of positive affective experiences such as listening to soothing, comforting, happy music.

Since all psychotherapies have to begin cognitively, and most are designed to restructure the way people think about their problems, perhaps more direct affective approaches have not been as widely considered as they should be. It is quite understandable that in species such as humans, where language mediates practically every interaction, cognitive approaches will remain preeminent in psychotherapeutic enterprises. But do we know that it is within the higher cognitive dynamics of the Brain-
Mind that the major therapeutic effects are actually generated, even as there is abundant evidence from brain imaging for higher brain changes? No one really knows, but perhaps many of the beneficial transformations actually occur implicitly within all the nested, hierarchical levels of affective-cognitive interactions in the brain (Figure 2.3). Indeed, perhaps the most lasting effects occur if the therapeutic path has been paved by changing the primary-process affective tone. If so, the work of clinical practitioners may be facilitated by more fully assimilating and utilizing the available evidence about brain emotional systems arising from affective neuroscience, and aiming to more fully utilize the most direct affective maneuvers available. Although people love to talk about the endless episodic memories that constitute their explicit minds, and psychoanalysis serves personal growth well in this way, it is by no means clear whether the cognitive or affective aspects of such interpersonal experiences are more important in providing long-term psychological relief. No doubt both are important, but I expect that without sustained affective change, the cognitive restructuring might not be as effective.

In any event, it is clear that psychotherapy is in the midst of an emotion revolution. The primal affective aspects of mind are no longer marginalized, but, rather, are recognized as the very engines of the psyche (Fosha et al., 2009a, 2009b). For instance, Greenberg and colleagues’ work in process-experiential therapy has emphasized the necessity of experiencing and expressing clearly differentiated primary emotional feelings, such as anger and fear, in the context of therapy (Elliot et al., 2004; Greenberg, 2002). The work of Foa and colleagues (1998) has demonstrated that the actual experience of fear during therapeutic sessions is essential to the success of exposure treatment for anxiety disorders. In contrast, in dealing with war-traumas, practitioners in the field find that the immediate communication and discussion of what has happened, opens the doors to immediate and palpable benefits (Belenky, et al., 1996). But the bottom line is that further progress with such novel approaches must be grounded in understanding the nature of the underlying pathogenic factors. There is insufficient space here to discuss all the major psychiatric disorders in great detail, so I have selected depression as an exemplar of how affective neuroscience thinking may be useful for further progress.

PSYCHOPATHOLOGY AND THE BRAIN WITH A FOCUS ON DEPRESSION

So what are the sources of depression within the brain? This is a hot topic of neuroscience inquiry right now, and surely lasting answers for depression must come, in part, from a much better understanding of the affective storms experienced by people as they move through the ups and
downs of life. Depression may arise when certain primary process emotional systems become chronically imbalanced. If so, we need to better understand neuroscientifically the primary-process emotional systems—the raw affective endophenotypes that exist in the brains of all mammals (Panksepp, 2006a). Each of the fundamental emotional systems can become sensitized or desensitized by repeated affective experiences. And each emotional experience can promote various forms of implicit and explicit learning as it interacts with our representations of internal and external reality. By such molding of chronic feeling-thinking patterns, people's attitudes can become rigid and negativistic, diminishing more fluid positive reasoning.

Thus feeling can become extreme in a variety of sustained ways and for many reasons. No doubt, most of what we need to know about these processes remains to be discovered. But depression, being the "common cold" of psychiatric disorders, is a key problem to focus on, especially because of its high and seemingly ever-increasing prevalence in modern societies. It is possible, of course, for the increase to be only apparent, partly driven by pharmaceutical companies which try to generate demand for their highly profitable, often marginally effective, antidepressant medications through sophisticated marketing strategies. Surely, many people throughout history have had short bouts of depression in their lives, but what is new is that up to 20% of the population currently seeks medical assistance for the symptoms. And often, medications are not provided as needed but chronically. It now seems likely that sustained use of antidepressant medications can produce sustained shifts in brain neurochemical patterns (e.g., through development of receptor supersensitivities), in ways that lead to even stronger negative feelings, when medications are terminated (for a fine overview, see Marcia Angells analysis in The New York Review of Books: http://www.nybooks.com/articles/archives/2011/jun/23/epidemic-mental-illness-why/).

But we simply do not know enough about the depressed BrainMind yet to have any definitive conclusions. As patient Andrew Solomon (2001, p. 29) put it, "Let us make no bones about it: We do not really know what causes depression. We do not really know what constitutes depression. We do not really know why certain treatments may be effective for depression. We do not know how depression made it through the evolutionary process. We do not know why one person gets a depression from circumstances that do not trouble another." Our failure to understand depression may arise, in part, from the fact that neuroscience has not yet studied the most relevant ancient affective circuits of the mammalian MindBrain closely enough.

Indeed, the discussion so far has not conceptualized which types of brain emotional systems are most strongly impacted by depression. To help remedy that, Watt and I (2009) recently provided a comprehensive
synthesis of a basic affective-social neuroscience view, with peer commentaries and extended responses, that may promote progress on this recalcitrant problem. Our proposal was that to understand depression(s), one needs to understand the psychic pain that arises from sustained separation distress—excessive and sustained arousal of the GRIEF system—one of the most important social-emotional systems of the brain. In addition, perhaps because of the sustained arousal of GRIEF, the arousability of the SEEKING system becomes diminished in depression (as noted earlier, and see Coenen, et al., 2011, as well as Panksepp & Watt, 2011; and Zelner et al., 2011).

We have already seen that the GRIEF system—concentrated in the anterior cingulate gyrus, the ventral septal nuclei, dorsal preoptic area, as well as the bed nucleus of the stria terminalis (BNST), dorsomedial thalamus, and the periaqueductal gray (PAG)—figures heavily in the generation of emotions of sadness and grief and the urge to cry (Herman & Panksepp, 1981; Panksepp et al., 1988). Brain chemistries that exacerbate feelings of distress (e.g., the release of Corticotropin-Releasing Factor) and those chemistries that powerfully alleviate distress (e.g., brain opioids, oxytocin, and prolactin) are the ones that figure heavily in the genesis of social attachments and all may play a role in the regulation of social bonding (Nelson and Panksepp, 1998) and thereby depressive affect. Helen Mayberg and colleagues (2005) have provided substantial relief from treatment-resistant depression with deep brain stimulation of the subgenual anterior cingulate, where the higher brain loci that mediate GRIEF-type ruminations can be inhibited. It is likely such brain stimulation is scrambling the neural sources of the psychic pain engendered by the GRIEF system. Indeed, the chronic overarousal of this system may be one of the major sources of depressive dysphoria.

A global shutdown of SEEKING, that characterizes the transition from "protest" to "despair", may be a pivotal BrainMind change in sustained depression. It is well established that early experiences of separation and loss predispose people to depression or can trigger a first depressive episode (Heim & Nemeroff, 1999). Also, the mechanisms that mediate attachment and separation are much more sensitive in females, who are twice as likely as males to suffer from depression. We have also known for a long time that the affectively positive opioids that regulate the brain's separation/attachment mechanisms have powerful antidepressant properties. If it were not for the addictive risks of opioid drugs, they might still be used as antidepressants the way they were before the advent of modern psychopharmacology in the 1950s. Thus, depression may, in part, reflect diminished activity of those natural brain chemicals that make us feel good when we are safely and securely attached to others (see Chapter 9). In part, depression may reflect the failure of our natural endogenous opioids to provide an adequate sense of security—in
short, loving social-attachment bonds are a primal form of addiction (Panksepp, 1981a).

As noted earlier, a safe, nonaddictive antidepressant drug (the mixed opiate receptor agonist/antagonist, buprenorphine) is currently available (Bodkin et al., 1995), albeit double-blind, placebo-controlled trials to test its efficacy remain to be conducted. Still it is a "safe opioid", and, at low doses, buprenorphine can directly counteract psychic pain. It will not be severely addictive, unlike most opioids, because as doses are increased the agent exerts opioid antagonistic effects. It is to be expected that such agents may also be quite effective in reducing suicidal ideation. Further study of the GRIEF system should yield various new medications for disorders ranging from depression to social phobias. However, such translational research into clinical issues will only be effective if we realistically entertain the nature of the underlying affective processes.

Although these opioid-driven attachment systems may be pivotal in depression, there may be many associated mechanisms that mediate the various depressive subtypes. For example, the dynorphin-facilitated shutdown of dopamine-driven appetitive systems (when an individual mentally "gives up" in despair) may form an independent etiological mechanism in a subset of cases (Knoll & Carlezen, 2010). Another type of depression may arise from the emotions associated with material loss—especially the feeling of defeat that arises in dominance encounters as organisms compete for resources (Panksepp, Moskal et al., 2002).

Parenthetically, in the most extreme emotional circumstances, precipitous arousal of the separation-distress system may be one of the underlying causes for panic attacks (Panksepp, 2006a; Preter & Klein, 2008). Our understanding of the psychobiology of social attachments, which has largely arisen from work on these neurochemistries, also links up with a preliminary understanding of childhood disorders such as autism. It is possible that some children with this condition may be socially aloof because they are addicted to their own self-released opioids, as opposed to those activated by significant others (Panksepp, Lensing et al., 1991). More recently, the idea of an oxytocin component to autism has been entertained (Panksepp, 1992b to Green & Hollander, 2010).

If this analysis is correct, then we need vigorous new research efforts into the brain mechanisms of attachment and separation distress (the GRIEF system), as well as their role in the etiology, mechanisms, treatment, and prevention of depression. Just like traditional behavioral neuroscience research, such investigations would cover the full gamut of methodologies from the genetic and molecular levels, through anatomy and chemistry, to functional imaging, brain stimulation, and drug trials (Watt & Panksepp, 2009). However, according to this research model, special emphasis would be placed on the integration of psychological and neurological approaches (Panksepp & Watt, 2011).
As already noted, modern preclinical research, with a few exceptions, continues to focus on psychiatrically relevant external symptoms, while ignoring the importance of affects (and the brain systems that generate emotions). For example, investigators who target fearfulness rarely discuss the nature of the FEAR circuitry, focusing instead on the conditioning of anxiety-like behavior and, more recently, on how their work may relate to resolving PTSD symptoms (Davis et al., 2010). Researchers may not even consider the GRIEF system when discussing the sources of anxiety, but they have discovered a new form of “anxiety” in rats that is integrated by part of the “extended amygdala” called the BNST. However, it has long been known that this is the brain area where one can easily evoke separation calls in animals; thus their discovery may have been of this social emotional response rather than just a variant of the traditional fear response. There are two distinct anxiety-type systems in the brain, FEAR and GRIEF, and they both promote negative feelings. If we do not distinguish these two “anxiety”-promoting systems, we may succumb to many errors in thinking and therapeutics. At present, analyses of mammalian brain emotional systems, with attempts to model psychiatric disorders in light of affective circuit imbalances, remain rare (Panksepp, 2010b).

EMPATHIC AFFECTIVE NEUROSCIENCE:
VIEWS ON SELECTED CULTURAL PRACTICES

A better understanding of emotional brain systems also points the way to promoting better childrearing practices and hence functioning societies. The implications for childhood thriving that may arise from prolonged breastfeeding, mothers and infants sleeping together, and the importance of abundant early childhood physical play have recently been extensively discussed (e.g., Narvaez et al., 2012) as has the quality of marital relationships for the mental health of children (Code, 2009).

Such issues extend through the life span, in ways too complex to cover here. However, let me consider a most common issue that faces everyone—the death of a loved one. What are the most effective ways to grieve? With the rapidly shifting tides of modern cultures, excellent examples of how to navigate such life passages are less and less evident. Traditionally family members have coped in the context of community support. While this also remains a central feature of grieving in modern societies, the practice has changed and weakened in many ways. In traditional societies, the

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2It should be noted that a great deal of wonderful work on the details of the unconditional mammalian FEAR system has emerged from several laboratories in Brazil, most prominently from investigators working with Frederico Graeff (e.g., Del-Ben & Graeff, 2009) and Marcus Brandão (Brandão et al., 2005).
safety nets of perceived community support were often much stronger than they typically are today. Although many of the outward forms of mourning remain intact, the affective support that people obtain in modern cultures, with the gradual narrowing of "communities," has often become more fragile. The social flux that characterizes so many individualistic modern cultures has depleted the level of overall social support many individuals feel in the midst of mourning. Here is a vivid description by Ellen Dissanayake of how the tragic passage of life can be structured to sustain one's social connections and to obtain needed emotional support from an extended "family":

Traditional ceremony and custom... play a much larger part in the life of a Sri Lankan than in ours. After a person dies in Sri Lanka, the mourners arrive during the course of the day at the home where the deceased is lying in an open coffin on a table in the living room, surrounded by flowers. The bereaved family members greet each visitor at the door, breaking down in sobs with each new arrival as they talk about the circumstances of the death and the merits of the deceased. The guest enters the house and joins other guests; they chat quietly with each other about any subject (we heard discussions about movies, business, and political matters); and after a decent interval, they leave. Eventually the family and close friends go to the place of cremation or burial where Buddhist monks join them and recite the appropriate āvata texts—reflections on birth, death, decay, and reincarnation. Three days after the disposition of the body, the family and priests hold an alms-giving ceremony; other alms-giving in memory of the deceased occur after three months, one year, and at yearly intervals thereafter. We realized that this kind of formalized handling of grief, with regular, community-sanctioned opportunities to weep and express one's loss at greater and greater intervals of time, gave to the bereaved a sort of patterned program to follow, a form that could shape and contain their feelings. Instead of having to suppress their grief and sense of loss in the interests of being brave or "realistic," or having to release it haphazardly or in solitude, the bereaved is enabled—compelled—by the ritual of mourning to acknowledge and express it publicly, over and over again within a preordained structure. The temporal structure of the mourning ritual, simple as it is, assures that thoughts and feelings about one's loss will be reiterated at prescribed times. Even if one might not consciously have proper mournful feelings, the custom of successive alms giving ensures that these feelings are elicited. The prescribed formal ceremonies become the occasion for the extended social network publicly expressing their sorrow. (2003, pp. 19–20)

This is a societal form of affect "therapy." These progressions highlight how a traditional culture has learned to deal with our ever-present sorrows with grace, compassion, and solidarity. People in traditional societies commonly care deeply about each other's lives, and this allows for individuals who have experienced loss to progress through the stages of grieving, and thereby to be less likely to descend into depression. It is also hard to imagine how psychotherapy could yield successful outcomes in the absence of a fundamental sense of attachment between clinician
Brain Emotional Systems and Affective Qualities of Mental Life

and patient. Thus, the quality of the therapeutic relationship has long been recognized as a key to effective treatments.

This view was advanced by Carl Rogers (1902–1987), a humanistic therapist, through his concept of unconditional positive regard (Rogers, 1961, 1980). If therapists cannot assume a stance wherein they can empathize with the psychic pain of others, there can never be that sense of trust that is critically important for the healing touch. Without that trust, the foundation of the ever-present and wonderful “placebo effect”, the endogenous opioid mediated feeling of social support, cannot take hold in the patient’s mind. Without genuine empathy, which should lie at the core of every therapeutic interaction, there will always be a residue of suspicion, a feeling of being manipulated, as opposed to the deep acceptance that opens the portals for positive change—for feelings of redemption and salvation. Compassion (as in spiritually present counseling: Brammer, 2011) may be critically important for the caretaking stance that is essential for effective therapy.

TOWARD A SYNTHESIS OF AFFECTIVE NEUROSCIENCE AND THERAPEUTIC PRACTICES

The above perspectives may currently be the minority view in biological psychiatry, but I believe that they reflect a natural and reasonably structured way to relate neurobiological causes to the foremost emotional concerns of psychiatry and experiential, emotion-focused therapies. Indeed, sensitive clinicians are coming to realize how such conceptual maps, experimental inquiries, and neuroscientific findings can inform their efforts (Valliant, 2008). Although this may not always have been clear in my recitation of many preclinical facts in earlier chapters, my overall hope is that an evidence-based understanding of how primal affects are engendered in the MindBrain will promote clinical thinking. Such approaches may also eventually allow us to better envision the nature of emotional problems in future psychiatric diagnostic schemes, where thinking needs to be restructured along the lines of emotional endophenotypes rather than artificial syndromal thinking (Panksepp, 2006a). At the same time, it is clear that research on primary-process emotions in biological psychiatry remains in its early stages.

Obviously, psychotherapists do not need to be told that emotional dysregulation is the key problem afflicting their patients. This is self-evident. And many therapists currently recognize that optimal progress will only be achieved if they engage sincerely with patients’ emotional dynamics, and to work creatively and sensitively to facilitate the restructuring of patients’ affective lives, without neglecting that humans are also fundamentally cognitive beings. So far, this sort of multidimensional therapeutic work remains more of an art than a science. Just as in the skilled playing
of a musical instrument, clinicians need solid, rigorous, and practiced techniques, as well as broad-based knowledge of relevant, empirically founded theory, to support the flights of inspiration and breakthrough engagements that mark true clinical artistry. The more psychotherapeutic practice is grounded in affectively sound thinking and technique, the more consistently effective it should become. The structures of affective neuroscience can help clinicians become more systematic in their methods, moment to moment and day to day, and thereby less dependent on serendipity and clinical intuition.

Children, in particular, become more responsive to therapeutic help if one keeps their real affective concerns in focus during clinical interactions. For better treatment of their social-affective disorders, we probably would be wise to consistently recruit their PLAY energies. There is a jester in all of us. (Thank goodness, for it can make play out of work—including, at times, psychotherapeutic work.) Like all primal emotional urges, the impulse to PLAY emerges from networks below the neocortex. However, it is becoming clear that the act of playing has remarkable effects on the cortex, programming it to become fully social, with many changes in gene expression that are allowing us to envision new treatments for depression (Burgdorf et al., 2010, 2011). As long as ludic energies are well used in clinical practice, clinical interventions are bound to move ahead positively as fast as possible.

For instance, shared laughter may index therapeutic moments of great value. If a therapist, in the midst of dealing with very difficult life circumstances, is able to promote a positive affect, even to the point of laughing with a client, might new discoveries in memory research, such as reconsolidation, be brought to bear on the attempt to more permanently soften the painful edges of life? All memories are labile when they are retrieved. They tend to return to their semipermanent "storehouses" and to carry along the most recent affective structuring of experience. According to this view, the capacity of a therapist to shift a client from negative feelings and despair to periods of positive affect, before moving on to other issues, should serve as a vehicle for ensuring that those negative memories have lost some of their power over clients’ feelings about themselves and their life circumstances.

Thus, perhaps the positive affect of PLAY is as important for adults as it is for children. The capacity for emotional resilience is increased by direct physically playful engagements. Those real-life interpersonal delights are seldom used in traditional psychotherapy, even with children. It is impossible for children to play without moving their bodies. Of course adults can have fun with just verbal interactions, but one must wonder whether it might not be useful for therapists to focus on the body and encourage clients who are very tense to assume different bodily postures,
from sitting in a chair, to sitting on the floor, to standing and perhaps engaging the therapist with various nonaggressive emotional gestures (an approach that I have seen demonstrated by Pat Ogden and colleagues (2006), who incorporate sensorimotor aspects into their psychotherapeutic approaches). Because primary-process emotions are all about dynamic movements, perhaps such therapeutic flexibility might open emotionally expressive "doors" for genuine playful social interactions with abundant long-term therapeutic impact.

In short, we need to learn how to wrap agonizing negative, even traumatic, memories within new, positive affective "wrappings"—a possibility that new memory research, especially on reconsolidation, as already noted, coaxes us to consider. Perhaps there is no better way to soften troubling memories than to evoke positive emotional arousals soon after the reliving of intensely negative emotional memories. If the therapist is able to move their interactions with patients gracefully into a positive affective, or playful, space, would the memory reconsolidate in a less painful way? If our vision of learning is correct (see Chapter 6), namely that new, unconditioned primary-process emotional states regulate the learning process (with a bottom-up control of information consolidation), we should be able to provide new affective-contextual variables for old memories originally laid down in negative affective states. I would predict that the painful, splintered edges of past memories can be "sanded down" in order to allow positive affect to recontextualize troublesome memories. My colleagues and I have already observed such effects in preclinical studies: Play after stress can diminish depressive responses; indeed, if one tickles a rat after it has been exposed to a fearful situation, the power of the negative affect can be diminished.

Of course, in using such strategies, one must remember that the genuine experience of play can also evoke negative emotions, that is especially common in childhood play. In our attempt to evaluate the utility of play interventions in young children (Scott, 2001), we found that problematic behaviors could be minimized if addressed immediately, gently, with a return to play as being the reward. Also, there are bound to be many special problems to be confronted in work with previously traumatized children, but we anticipate that social joy, if it can be facilitated in such children within an atmosphere of trust, can have substantial benefits above and beyond the efficacy of more cognitive therapies (Panksepp & Scott, 2012). In order to achieve such goals, there still needs to be abundant research, as well as training of therapists in the art of facilitating natural physical play in the context of social safety.

Any therapist who can capture the therapeutic moment in mutually shared joy episodes will have brought the client to the very doorstep, the wellspring of happy living. To the extent that the patient can remain
there, in both body and mind, one may have offered one of the greater emotional gifts that psychotherapy can ever provide. PLAY should have a very special place in psychophysical therapies, from childhood to old age. Of course, since there is also the dark side of humor, where someone ends up being the butt of a joke, humor as a form of play can be a double-edged sword. Thus, therapists must be ready to identify emerging crises and deal with them in the present moment.

There are also therapeutic possibilities in the manipulation of the CARE and GRIEF systems. These are the Janus-faced twins of social attachments. Expressions of distress in infants arouse a mother’s urge to nurture. In more general contexts, we feel a natural compassion for the suffering of others. Deep subcortical emotional resonance, including deep empathy when others are in distress, appears to be a natural property of the mammalian brain. Indeed, perhaps therapists need to be especially adept at using their cortical “mirror-neuron” systems to promote affectively meaningful contacts and interpretations. In other words, their bodies need to resonate and harmonize with the emotional states of their patients, as opposed to simply being an unexpressive “talking head.”

It will be interesting to see how chemical agents derived from the shared chemistries of the CARE and GRIEF systems, including safe opioids (e.g., buprenorphine) and oxytocin, can eventually be used therapeutically. These are most probably the brain chemistries that facilitate our capacity to create positive intersubjective spaces with others. Medicinal use of such social chemistries may one day allow clinicians to selectively enhance the prosocial emotional feelings that promote therapeutic progress. Supplementing the therapeutic situation with nurturant activities may increase the release of endogenous opioids, oxytocin, and prolactin. However, supplementation with such hormones—for example, intranasal oxytocin before a session in couples therapy—might also enhance therapeutic flow by allowing both members of the couple to work more effectively in the present moment.

The vast amount of social-attachment research and the brain mechanisms of social pain have been well summarized by Macdonald and Macdonald (2010). In addition to the socially induced soothing effects of brain opioids, oxytocin in the brain has now been shown to mediate trusting behaviors in economic decision-making and perhaps the capacity to read other minds more sensitively (Pincus et al., 2010). Such changes in the tertiary-process aspects of the mind may largely arise from the fact that oxytocin diminishes separation anxiety and loneliness; in other words, it promotes confidence (Panksepp, 2009c). In preclinical models it can reverse some of the deleterious and depressive effects of social isolation (Grippo et al., 2009). It is to be expected that, with help from this natural chemical, people who are overly timid, who suffer from "social phobias," may feel more comfortable interacting with others.
SUMMARY

Affective neuroscience aspires to clarify the actual primary-process affects that exist in the mammalian MindBrain. The triangulation method—integrating evidence from behavioral, neural and mental analyses—is straightforward and not reliant on conjecture. I hope it provides a more stable platform for further study of foundational issues that need to guide clinical thought, psychiatric research, and the development of new affect-focused therapeutic practices. Using this approach, preclinical investigators can focus their efforts on specific and hopefully relevant emotional brain networks as opposed to vague behavioral indicators of psychiatric disorders. Because the organization and functions of emotional systems can be studied and evaluated in a wide variety of species and in well-controlled experimental situations, affective neuroscience aspires to provide a more coherent empirical base for thinking about primary-process emotions than has so far been available. It also allows us to see why most of our thoughts, our cognitions, are so dramatically anchored by our affective states. Feelings came first in MindBrain evolution.

This is not to deny that most psychotherapeutic relationships have to also be negotiated at the cognitive level. Thus, primary-process affective neuroscience has not yet provided solid evidence for how the emotional powers of the mind need to be dealt with in therapeutic environments. However, it provides an alternative vision, hopefully a clear one, of how diverse negative affects may contribute to distress and suffering and how positive affects can be better used to counteract negative affects. Such principles may better contextualize optimal therapeutic practice and theory than earlier visions of affective life, where no solid neuroscience-base was available.

At the very least, in order to understand the core nature of emotional feelings, we must recognize the pre-propositional affective processes that emerge early in BrainMind development, and how they can exist independently of the enormous complexities of higher mental processes in humans. During early infancy, primary-process affective states are not enmeshed with the cognitive and linguistic processes with which they always interact later in life. By understanding the extremely plastic neurobiological nature of our cognitive apparatus (Doidge, 2007), which is dynamically and developmentally constructed largely from affectively laden life experiences, we are in a better position to understand how we might undo troublesome higher affective programming, some of which has epigenetically become part of the maladaptive hardware of the brain.

We should note that the distinction between cognitive and affective processes made throughout this book is still rather novel, even unpopular in certain quarters of contemporary cognitive and neural sciences. A majority of investigators interested in emotions, many of them arriving
from language-based constructivist traditions in psychology, claim that we cannot draw meaningful and useful distinctions between cognitive and emotional processes. However, at a primal neural level that is possible, and is an essential stepping stone for future neuroscientific progress.

Still, emotions and cognitions are so interactive that distinctions become difficult at the top of the brain—within the learned tertiary-process functions of neocortical networks. But they can be easily distinguished at subcortical primary-process BrainMind levels. This in no way seeks to deny the importance of understanding how the cognitive and affective realms interact, especially for psychotherapy, and other dynamic systems theories of mental qualities (e.g., see Lewis, 2005).

To recap, cognitions are those brain information-processing functions that are integrally linked to the sensory-perceptual portals of the mind, while raw emotions and affects reflect some of the most important within-brain organizing principles. The cognitive aspects are more closely linked to the programming of each individual's higher brain development, while the raw emotions and affects represent the ancestral, inherited tools for living. Although the interaction of emotion and cognition is inextricably interwoven in the unique puzzle of each individual's higher mind, we must be able to envision cognition and emotion as different, albeit interconnected, types of mental processing. Anatomically speaking, they are as distinct and interactive as our hearts and skeletal muscles. In order to think clearly about foundational issues, we must consider the unique contributory aspect of such distinct levels of control within the brain (Cromwell & Panksepp, 2011).

This penultimate chapter has been geared toward all those in the helping professions who have been drawn to understanding the foundations of the human mind—our elemental mammalian affective nature—and how this knowledge may relate to increasing our understanding of a variety of human psychiatric problems. We can anticipate that a closer study of emotional-affective networks will eventually yield knowledge that will be helpful in the service of those whose lives have been ensnared by emotional distress. In the final chapter, I will elaborate on the philosophical implications of this knowledge for understanding some long-standing scientific dilemmas, as well as some concluding thoughts about the nature of human consciousness and the animal mind.

Epilogue: Recent Personal Experiences with PTSD, EMDR, and Reconsolidation

It is especially important for future researchers to clarify how certain emerging psychotherapeutic interventions work to modify the emotional tone of the brain. I recently underwent a personal experience with a novel form of psychotherapy—the procedure called Eye Movement
Desensitization and Reprocessing (EMDR)—that has become popular during the past few decades, but is not universally accepted, for the treatment of PTSD and other dissociative states in which intense emotion-laden memories are compartmentalized, almost dissociated from the rest of the mind, rather than being integrated within a unified, emotionally well-functioning personality. Here, I present an account of my personal experiences with this therapy along with some hypotheses as to why this form of trauma-therapy may work so effectively.

* * *

As an introduction, let me just note that I have had my share of traumas in my life. The first “big item” was during 1944 when I nearly died at 1 year of age, after being scalded on my lower body while my family fled Estonia in advance of the Red Army. Those traumatic infantile memories are probably still partly alive, somewhere in the recesses of my brain, albeit diminished and, from the perspective of my explicit cognitive memories, totally unconscious. Still, such an experience surely left some kind of affective residue, perhaps reflected in a constitutional tendency toward anxiety and excessive worry, perhaps depression. Indeed, abundant evidence indicates that early traumas can increase the severity of the incidence of adult PTSD and future depressions (for a summary, see Watt & Panksepp, 2009). However, I fortunately have the kind of temperament, call it courage, to muscle through hardships.

My most recent traumas were related to a series of increasingly harsh cancer therapies that I was receiving, across a full year, while working on this book. While being treated at a world-class institution in Seattle—fondly known as the ‘Fred Hutch’—Dr. Sandra Paulsen (author of Looking Through the Eyes of Trauma and Dissociation [2009]) kindly offered me several sessions of treatment with EMDR (Dr. Paulsen has also contributed illustrations to this volume: Figures 1.7 and 5.1). She was interested to see if I, with my affective neuroscience perspectives, could shed some light on why EMDR has produced such robust therapeutic effects in numerous patients over the years. She guided me through a sampler of EMDR therapies for infantile as well as cancer traumas.

Let me establish a medical context for all of this. After almost 10 years of remission, I was once again in treatment for a malignancy of the lymphatic system—a non-Hodgkin’s lymphoma. Back in 1998, a fist-size tumor was discovered in my lung thanks to a routine X-ray prior to double hernia repair. This helped explain the heaviness I had felt in my chest for many years. But because no cardiologist had found anything wrong, I had rationalized it as a residue of profound chronic grief following the death of my daughter Tiina (on Good Friday, 1991). Perhaps my core SELF, which is embedded in cardiovascular control systems, was experiencing
persistent pangs of GRIEF. Wrong. Those chest symptoms disappeared following cancer treatment, suggesting it was largely the massive tumor pressing on my pericardium.

But before I headed onto the right track for a cure, there was a profound shock! When the initial pathology report on my tumor biopsy arrived, the young surgeon who had discovered it sat my wife and me down and informed us that, at best, I had a year to live. Indeed, his diagnosis of a small-cell carcinoma of that size statistically mandated that my days were numbered. Fortunately, after a month of profound worry (during which I was setting my affairs in order), pathologists at the Mayo Clinic correctly rediagnosed the tumor as a small-cell lymphoma, which, with great relief, I henceforth dubbed a “wimpoma,” having learned it was treatable. Although my first oncologist was already offering me various harsh chemotherapies, at the end of an informative discussion of treatment options, I asked the key question: “Doc, have you ever treated this kind of lymphoma before?” With a shy shrug, he replied, “No.” With a friendly nudge, I promptly shared my heartfelt wish: “Well, I sure would like to be treated by someone who has.” He smiled back, and cordially tapped my shoulder, saying “Good choice!” Across the span of 6 weeks of daily radiation, the tumor was successfully treated at the University of Michigan Hospital oncology unit, where I was the last patient of Allen Lichter, who later retired as the dean of the medical school to assume a leadership role at a medical foundation in Washington, DC.

The recurrence of my lymphoma in 2007—with the same type of tumor, but concentrated in the stomach—suggested a totally new flareup of the same disease (indeed, my contact doctor, Oliver Press, was interested enough to do molecular biology comparing this and the previous malignancy, but it turned out not to be a residue of the previous tumor). This time, however, the troublesome tissue—the new clone—had already disseminated, and invaded my bone marrow. My wife, as fate would have it, was diagnosed at that same time with a different non-Hodgkin’s lymphoma. We had recently moved to Pullman, Washington, so that I could join the Veterinary College at Washington State University. We were both soon beset by a host of medical issues, heralded by a near fatal pneumonia with sepsis, which kept me in intensive care “at the brink” for 5 days. Then my first chemo cycle failed miserably. Then I went through several courses of much more aggressive “combo” chemotherapy, known ominously as R-CHOP, which produced a partial remission. Unfortunately, within 6 months, my disease had advanced well beyond the stage discovered at diagnosis, suggesting it had rapidly become resistant to conventional chemotherapies. If not treated with a stronger therapy soon—namely a stem-cell transplant—two doctors independently gave me the gloomy prognosis of having no more than a year and a half to live. As fate
would have it, my wife, Anesa, had achieved full remission with R-CHOP, but she also suffered a relapse within 6 months.

We decided it was wise for both of us to seek treatment at the Seattle Cancer Care Alliance, where stem-cell transplants had been perfected. We had great confidence in the expertise and experience of the entire medical staff, while at the same time we faced the considerable stress of relocating for an extended medical leave. As I completed the first draft of this book in the spring of 2009, I also had just completed 4 months of treatment that had included several minor and one major life-threatening side effect (an antibiotic resistant “superbug”). I was in partial remission, but the residue was mopped up with focal stomach radiation. My wife had also achieved full remission. Throughout this journey she served as my full-time caregiver, because no one is admitted to the transplant clinic without someone ready to assist at every hour of the day. Together we survived multiple runs to the emergency ward for me, and also one for her. I thank her for the devotion and courage she showed throughout. For me there had been half a dozen successive treatment regimens, increasingly aggressive, with ever more fatigue and various forms of physical discomfort. Overall, the experience was mildly traumatic, to say the least, and I was eager to see if psychotherapy, especially EMDR, might provide some benefits.

In my EMDR session, Dr. Paulsen first used an “early trauma” protocol designed to deal with implicit infantile memories. However, I was unable to access any explicit memories of infantile trauma (perhaps I could have, using Art Janov’s revolutionary approach—see his 2007 book on Primal Healing), so we proceeded to the standard EMDR protocol that she had devised for dealing with cancer trauma issues. Most who have gone through arduous medical procedures, with the many iatrogenic side effects—that is, the additional medical problems induced by the treatment itself—have much to complain about. I certainly did.

My mind was full of fresh and troublesome memories from the autologous stem-cell transplant, during which I experienced blood and gastrointestinal infections by super-bugs. These led to frequent hospital visits and more failed antibiotic treatments than I wish to recall, requiring more diagnostic tests than I would ever want to repeat. This led to the repeated removals and reimplantations of my surgically placed intravenous Hickman Line (a catheter positioned near my heart, which, if it works well, obviates the need for endless venous punctures) for fear it might be the source of infection, followed by two PICC lines (peripheral intravenous chronic catheters), that all too often had to be pulled out, due to leaking and other problems. Eventually, my blood infection was brought under control with a solid month of the self-administration of intravenous infusions of Meropenem three times per day. I was also fed up with medically
induced emotional side effects—from profound daily fatigue and apathy, to many 4 A.M. wakenings in terror (why, at such wee hours of the morning, does negative affect usually prevail?), often with the fear that I might lose my wife, my life, and the chance to finish this book if the last available antibiotic failed to kill the gram-negative super-bug before it killed me. Indeed, I was ready to sample some EMDR.

The therapeutic effects of EMDR for trauma were discovered by Francine Shapiro (2001, 2002). Treatment consists of a systematic retrieval of traumatic memories, followed by therapist-guided lateral eye movements to defuse the affective intensity of such memories. It has been reported that the power of traumatic memories fades with the bilateral repetition of various simple attentional activities. Indeed, instead of lateral eye movements, one could focus on an alternate tapping of the knees, or listening to tones first in one ear, then the other (in other words, different types of bilateral stimulation). Dr. Paulsen and I decided to use a straightforward “standard EMDR” approach. As she put it, we would try “to clear out any unresolved disturbance about the cancer diagnosis itself, the treatment (including iatrogenic effects), and disturbances such as fury at the medical profession, the insurance industry etc., fear for loved ones, fear of death, or anything else that put emotional obstacles in the way of clear sailing.”

The several hours I spent with Sandra were eye-opening (not to mention “eye-moving”) experiences: She had me systematically retrieve emotional feelings related to my cancer treatment (not at all hard to do), after which she promptly had me follow a row of lights flashing back and forth on a bar about the length of a yardstick. While my self-induced emotional feelings were clear and distinct, not hard to retrieve through a stockpile of autobiographical memories, as soon as I started to move my eyes, the feelings faded promptly. This was replicated time and again with different feelings: anger, anxiety, grief, and so on. It always worked very rapidly. In other words, as soon as I shifted into an external sensory-attentional framework, as a result of the bilateral eye stimulation, the intensity of affect melted like butter on a hot skillet (but without the sizzle). If done repeatedly, this type of therapy is claimed to defuse traumatic memories as rapidly and effectively as any other psychotherapy ever devised. Although that needs more empirical evaluation, the EMDR struck me as a rather direct ABT. At this point in time, no one fully knows what is happening in the brain (van der Kolk, 2006), but however it works, EMDR can be profoundly helpful.

So what is occurring in the brain during EMDR therapy? Why would such a simple procedure produce such dramatic emotional benefits? Let me share some theoretical speculations about how it may work. There are quite a few untested theories floating about, and I am often asked what my favorite viewpoint might be. The point I usually raise is that the ex-
ploratory eye movements represent a basic primate SEEKING response. Such scanning movements are organized in the deep layers of the superior colliculi, just above the PAG, which is the most important brain region for elaborating all of the primary-process emotions (with more negative emotions being concentrated in the dorsal PAG, closer to the eye-movement circuits, while more positive networks are situated ventrally). There are neural connections downward from the eye-movement regions, especially to the dorsal negative affective regions of the PAG. If they turn out to be largely inhibitory (e.g., perhaps full of GABA), we may have a ready explanation for why negative affect would rapidly diffuse with the onset of exploratory eye movements. They may actively inhibit some of the most distressing neural circuits in our brains. Of course, there are many other possibilities—from cognitive refocusing, limited attentional resources, top-down regulation of emotions, and so on (that is the nature of scientific possibilities for every observation)—but none of these have yet been cashed out in terms of critical evidence.

Why would the affective benefits be lasting, with traumatic memories affectively "softened," albeit not forgotten? There are quite a few untested theories floating around, but here the concept of "memory reconsolidation" may again play a role (see Chapter 6) as it has for many possibilities discussed in the main part of this chapter. First, the EMDR therapist typically establishes an "island of safety" within which traumatic memories can be systematically reprocessed. For instance, in the psychotherapist Katie O'Shea's EMDR protocol, clients are (i) first instructed how to set aside unresolved emotional material in an "imaginary container," then (ii) trained to "access the ability to feel safe in safe situations," such as the therapeutic alliance, and finally (iii) to use EMDR to "reset automatic Emotional Circuits to a healthy level of response" (2009, p. 290). In other words, the EMDR situation may allow one to access affects associated with traumatic memories and then to recontextualize them, fairly rapidly, within a realm of safety.

This last possibility is consistent with the intriguing discovery of "reintegration" or "reconsolidation" in recent basic learning and memory research. Abundant preclinical work with animal models has now shown that memories that are retrieved tend to return to their memory banks with modifications (Nader & Einarsson, 2010). If such memory modifications can be at a primary-process affective level, one can readily understand how cognitive information about past traumatic events is no longer suffused with negative affect. In other words, the emotional sting has been extracted and the affective "inflammation" has been soothed by gradually recontextualizing the affectively negative memory within feelings of safety.

Of course, this is currently just a theory as opposed to demonstrated neuroscientific fact. Indeed, most of what we know about the benefits of
psychotherapy currently remain in that category, even though there are increasing numbers of brain-imaging studies that have shown how various therapies—cognitive-behavioral, psychoanalytic, and interpersonal—may change the balances of affective arousal within brain regions that are known to control emotionality (Cozolino, 2002, 2010; Doidge, 2007). 

In contrast, the view advanced in this book about the "locus of control" of primary-process emotions and the fact that other mammals experience similar emotions are based on a mountain of facts. Anyone who does not believe such conclusions has the responsibility of explaining all that data some other way. I strongly urge the many behavioral neuroscientists who still do not believe animals have emotional feelings, to not just argue against the conclusion, as most are prone to do, but to experimentally negate the data on which the conclusions are based. That is how science works, but for some reason, on this topic, opinion has long ruled over facts. Because of that, I have recently chosen to write a series of frank papers in 2011 about the need for behavioral neuroscience to get real about the emotional feelings of other animals (e.g., Panksepp, 2011b, 2011c).
CHAPTER 13

Coda

Philosophical Reflections:
Can We Go From Mice to Men and Back Again?

When they (my elders) named some object, and accordingly moved towards something, I saw this and I grasped that the thing was called by the sound they uttered when they meant to point it out. Their intention was shown by their bodily movements, as it were the natural language of all peoples: the expression of the face, the play of the eyes, the movement of other parts of the body, and the tone of voice which expresses our state of mind in seeking, having, rejecting, or avoiding something. Thus, as I heard words repeatedly used in their proper places in various sentences, I gradually learnt to understand what objects they signified; and after I had trained my mouth to form these signs, I used them to express my own desires.

—St. Augustine (343–430), epigraph to Wittgenstein’s Tractatus
emotional intonations may be the gateway to language acquisition (Panksepp, 2008b; Panksepp, 2009/2010).

In St. Augustine’s reflections above, used by the philosopher Ludwig Wittgenstein as an epigraph for his *Tractatus*, we find an intuitive grasp of brain processes that learn to reflect the world—the role of mirror neurons in refining language and social understanding (Iacoboni, 2009b; Rizzolatti & Sinigaglia, 2008). St. Augustine reflected on those mysterious affective states of mind behind our innate tendencies to have, to reject, and to avoid aspects of the world—our raw emotional “intentions in action” (see Figure 1.4). Few modern scholars of the mind have envisioned the importance of our innate affective feelings for the kinds of cognitive creatures that we become (but see Davies, 2011), as we grow into our species-typical predilection to acquire language (for a summary, see Panksepp, 2008b, 2009/2010).

David Hume (1711–1776), the naturalistic philosopher who wrote the renowned *Enquiry Concerning Human Understanding* (1748/1910) on the heels of his *Treatise of Human Nature* (1739), was a prominent partisan of the affective view of intentionality. He advanced the view that human behaviors are strongly influenced by emotional feelings, a view that lay largely dormant in his era of rationalism, through many centuries (see McGilchrist, 2009), until Damasio resurrected it pointedly in his *Descartes’ Error* (1994). But Damasio advanced his own potential error at that time: namely, that human feelings arise largely from higher brain functions. We have already noted that as we finish this book, Damasio has fully reconsidered that perspective in his fourth book, *Self Comes to Mind* (Damasio, 2010), where he endorses a deeper subcortical evolutionary view about the origins of mental life, not unlike the one developed here and elsewhere, (Panksepp, 1982, 1998b, but until recently he did not fully accept that raw affects are already fully developed in subcortical brain regions. In his new view, he does.

Still, the majority of neuroscientists and psychologists remain silent, agnostic, or in denial about the subcortical sources of mind. They use rewards and punishments to train—to reinforce—their animals, in abundant studies on learning. But many still seem to believe, as did our behaviorist forebears, that animals feel nothing—that the brain mechanism of affective feelings do not contribute to the processes of learning and memory. Human research has long suggested otherwise. The evidence from animal research has also long supported the opposite conclusion. But at present, the silence in cross-species brain science is deafening about the role of affective experiences in controlling animal behaviors.

Why most neuroscientists choose to remain silent about the affective feelings of the animals they study is a mystery to “outsiders,” . . . but the answer is simple: Research thrives successfully on the ruthlessly reduc-
tionistic principle that brain mechanisms and behavior count but that mental activities in the brains of animals do not. That is where the funding is. This bias has long been detrimental to our scientific understanding of human emotions and a scientific appreciation of the roots of mental life by the intellectual community at large. It also leaves most citizens—who could benefit from a better understanding of diverse affective feelings and of how ancestral emotions control their higher intentions—more baffled about their minds than they deserve to be in this postmodern age.

Clearly, emotional feelings have evolved. As Darwin surmised in the Descent of Man (p. 127), differences in the mental lives of mammals are ones “of degree and not of kind.” Our emotional feelings have a long evolutionary history, and the ancestral roots for these feelings are still shared by many living species. This is good news for science, and it should be a good news for humans as well. This kind of knowledge can resituate our species in the framework of mental lives that preceded us, while respecting our vast, and surely unique, ability for cognitive depth. This concluding chapter aims not only to provide a conceptual synopsis of this book but also to deal forthrightly with cultural resistance, inside and outside brain science, to recognize the importance of understanding the raw emotional experiences of other animals for understanding the sources of our own feelings.

To contextualize the many strands of evidence summarized in this book, let us recall how Jeremy Bentham (1748–1832), the father of utilitarianism, suggested we envision human feelings. He stated that “utility” reflects “that property in any object, whereby it tends to produce benefit, advantage, pleasure, good, or happiness . . . or . . . to prevent the happening of mischief, pain, evil, or unhappiness” and reinforced it with “Nature has placed mankind under the governance of two sovereign masters, pain and pleasure. It is for them alone to point out what we ought to do, as well as to determine what we shall do” (Introduction to the Principles of Morals and Legislation, 1779/1879, p. 1). Clearly, then, as should have been clear to all behaviorists, the “property in any object” they use to reward animals routinely works because of its capacity to evoke positive feelings. And would it not be the same for “punishments” although, as with many feelings that mediate rewards, there are a large variety of negative affects? If there is no so-called mind-dust in the universe (a phrase coined by William James to suggest that nonliving matter may contain some kind of proto consciousness), then the inanimate material world, when it coalesced into complex life a billion-some years ago, found the solution for signaling intrinsic values that support life. This property was affective experience, constructed completely from neural activities. Mind arose with certain types of neural circuit activities, probably going back at least to the ancient networks that created organismic emotional coherence deep in the brain.
At present, we can be confident that mammalian brains have many intrinsic affective values, still shared, in kind if not the precise form, by humans and all other mammals, as well as birds, and probably many other types of creatures as well. However, few neuroscientists or psychologists know (or study) how affects are constructed in mammalian brains, largely because of the polarizing effects of behaviorism and more recently because of the failure of the psychologically oriented research community to acknowledge, perhaps even appreciate, the importance of animal models for addressing the nature of consciousness. This must surely be due to the still deafening silence that animal brain researchers maintain on the topic. However, answers to some of our most urgent questions in psychiatry must come from the use of “preclinical” models of affective states, arising from emotional systems’ order and disorder.

The BrainMind is clearly an evolutionarily layered organ, grounded on affects, where major passages are still evident in brain organization—the more ancient functions are concentrated in lower and more medial brain regions, and the more recent ones are in higher and more lateral regions. Within an evolutionary framework, animal brain research can provide the most profound guidance in understanding the foundations of human feelings. Indeed, with such work, we may eventually come to understand how human affective experiences arise from mammalian brain dynamics. This is not to suggest that animals develop the sophisticated cognitive-affective sentiments of humans, nor do they ruminate about their misfortunes the way we do, but we should come to recognize that the primary-process affects, genetically built into animal BrainMinds in their raw form, are not all that different from the ones that come to guide the affective proclivities of human brains. Sadly, the seemingly endless conceptual debates in human psychology and philosophy often drown out the empirical signals that neuro-evolutionarily sensitive animal research has long provided: All mammals are intensely affective creatures.

THE MOST IMPORTANT QUESTION IN NEUROSCIENCE?

To consider the philosophical issues alluded to above in practical and clinical terms, I would again pose the following question to all neuroscientists and biological psychiatrists interested in the mind: What is the most important question in all of neuroscience? Surely there would be a vast diversity of answers ranging from the molecular nature of memory to the neural “computations” that mediate cognitions, with an occasional vote for the nature of free will. Perhaps many biological psychiatrists would currently cast their hopes with specific brain and genetic substrates for psychiatric disorders, with a few votes for the nature of conscious experience. I would cast my vote for: “How are raw affective experiences created in the brain?” Why is this so important? The answer could help to
clarify the foundational nature of experience in general (i.e., primary-process consciousness), as well as the diverse affective disturbances that human souls can suffer (Solms & Panksepp, 2012).

Thus, for depression, I would specifically ask: "Why does depression feel so bad?" Why does depression hurt? Why is it so psychologically painful? What does it mean to experience social pain (MacDonald & Jensen-Campbell, 2011)? Few neuroscientists have been willing to ask such questions, but some working hypotheses have been garnered from affective neuroscientific perspectives on primary-process emotionality, based on John Bowlby's seminal view that the arousal of GRIEF—the acute psychological distress engendered by separation from maternal CARE—if prolonged, leads to the sustained despair that is the gateway to depression (Panksepp & Watt, 2011; Watt & Panksepp, 2009). Likewise, addictions are sustained not only by positive feelings, but also by the potential for strong negative feelings that build up internally, as one seeks pleasure through mind-altering drugs (Kassel, 2010). Through the clarification that laboratory rats have a distinct set of affectively positive vocalizations, we can now use these measures as direct indicators of where animal minds are in an “affective space,” and this can provide novel understandings of addictions, depression, and general well-being (Brudzynski, 2010; Burgdorf et al., 2007; Knutson et al., 2002; Panksepp, Knutson et al., 2002; Zellner et al., 2011).

Psychologists, who rarely take deep neuroevolutionary perspectives on the nature of mind, are beginning to accept that certain aspects of positive and negative affects are part of the evolved physical landscapes of the human mind (Lambie & Marcel, 2002). Even some diehard social constructivists and those who ascribe to dimensional visions of emotions, a robust force in current academic psychology, are ready to accept a biological foundation for human feelings (Barrett, 2006; Russell, 2003, 2009). However, such investigators of human emotions do not readily accept the evidence for any more highly resolved affective life than feeling good or bad at the primary-process level.

The general failure of the psychological science community to recognize the primary-process emotional aspects of brain organization (there are exceptions: e.g., Buck, 1999; Izard, 2007) leave many debates like this unanchored by neural considerations, and thus restricted largely to very difficult and intrinsically confusing tertiary-process considerations: Those higher levels of mind are surely largely socially constructed, leading to great idiographic variety. But animal brain research indicates that there must also be many inborn feelings in human brains, not only because of the empirical evidence discussed in this book, but also because that would be a wise way for evolution to build brains.

If primary-process affects have any evolutionary function at all, besides simply guiding learning, it is to intrinsically anticipate future survival
needs. For instance, if affects provide immediate unconditional "valua-
tive" guidance of behavior, then it would be most useful to have accurate
affective signaling of diverse internal states and external stimuli that
threaten survival as well as those that promote satisfying, even happy, liv-
ing. Of course, this is not to deny that some primary-process emotions
may cut across various affects (e.g., especially the desire- and interest-
generating urges of the SEEKING system), nor do we suggest that higher
brain functions could not further parse affective feelings and meanings in
uniquely human ways. A complex human reflective-affective conscious-
ness emerges with learning and thought. Given the hierarchical systems
that are present at many levels of BrainMind evolution, many of the com-
plexities are instantiated in the nested hierarchies of BrainMind functions,
where the lower affective brain functions become re-represented in
higher functions. With time and education, the higher functions develop
recursive supervisory (executive) control over emotional expressions (see
Chapter 2, Figure 2.3).

But at their core, primal affects are internal valuative processes that
promote survival. Existentially, they are brain processes that make our ex-
periences important to us, not only in terms of survival but in terms of
everyday values. They are the rewards and punishments—the uncondi-
tioned stimuli and responses—that behaviorists use to mold animal learn-
ing to almost any form they wish, except when they try to go against the
strongest instincts of animals. For instance, it is next to impossible to train
rats to run backwards down a maze for food. Across the years, many of
my students who came in with behavioristic biases have tried but failed.
That is because rats were designed, through evolutionary selection, to
pursue the fruits of the world with their noses rather than with their butts.

What would our lives be without the great variety of emotional feel-
ings, from love to hate, that color the fabric of our days with meaning—
from the everyday joys and torments to the subtle, at times sublime, af-
fective richness of great music, dance, theater, and other arts? Our
affective lives coax us to treasure and detest various events and objects of
the world, many of which would have no psychological depth, no pro-
foundness, without our affective capacities. Thus, whatever basic values
do exist in this human psychological world of ours, they reside inside hu-
man brains, and to a substantial degree, in the ancestral minds we inher-
ited from earlier animals.

Our core values arise from the evolved emotions—and incentive-res-
sponsive properties of many ancient networks of our brains—especially
those concentrated in the medially situated subcortical brain regions that
all mammals share, in homologous networks of complexity, because of
their common ancestry. These primal powers of the mind become con-
ected to secondary life experiences through learning. Of course, if we
humans did not have emotional feelings, we would not bother to seek
them in the brains of other animals. But in pursuing such issues scientifically, across species, modern affective neuroscience finally assures us that we are not just indulging in idle anthropomorphism (as if reality is situated in the lower right quadrant of our truth diagram, Figure 1.5). This makes the study of comparative neurophenomenology—the study of the internal psychological contents of MindBrains—a critically important scientific undertaking, across species (Panksepp, 1999). In other animals, affective states are the easiest contents of their minds to study, because the neural circuits that engender emotional actions (not just “responses”) are easily observed and are intimately intertwined with animals’ emotional feelings. This allows a dual-aspect epistemology, whereby observable behaviors can be used as proxies for hidden feelings (Panksepp, 2005b).

Still, affective feelings are thoroughly subjective, and no physical science has yet accepted the existence of any subjectivity in the hidden recesses of the material world. Despite Darwin’s (1872) seminal acceptance of animals’ feelings in *The Expression of Emotions in Humans and Animals*, the reign of behaviorism and logical positivism early in the twentieth century has imposed a severe, century-long constraint on the scientific discussion of whether other animals have affective feelings that guide their behaviors. At the experimental level, especially in brain research, that conversation has barely been re-engaged (e.g., Mendl et al., 2010; Panksepp, 2010a).

As a result of the marginalization of animal feelings, a neuroscience of basic human values (i.e., affective states) became disconnected from relevant animal models that had the power to empirically address such issues and that would have illuminated the nature of our own emotional feelings. Despite modern brain imaging, the foundational neural mechanisms of such feelings cannot yet be studied in any causal detail in human beings, even though correlational analyses strongly indicate we can be confident that the major sources of control are subcortical (e.g., Damasio et al., 2000; Northoff et al., 2009), in ancient brain regions we share with other animals (Panksepp, 1982, 1998a). Now, with the ever-increasing acceptance of evolutionary views in the mind sciences, animal models can begin to fill the many gaps in our understanding of the primary-process affective foundations of human minds.

Currently, the functional details of human “mind flesh” and how it generates internal, subjectively experienced feelings must be inferred from imprecise measures—namely, subjective self-reports coupled with modern functional brain imaging, which finally support the basic emotion view (Vytal & Hamann, 2010). However, it has recently been noted that the correlations between brain and psychological changes using such techniques are quite consistently and suspiciously high (see Vul et al., 2009, with six commentaries). Because of the massive amount of averaging needed to make functional sense of the data, many of the observed brain-
psychology relationships may be due, in large part, to statistical artifacts that emerge in correlational analyses when data are pooled before computing correlation coefficients, a bias that stymied my own work in energy-balance regulation for a while (Panksepp, 1973).

Regrettably, and despite our scientific hubris, our impressive human brain-imaging tools in this area still resemble Galileo’s spyglass more than the Hubble space telescope. Modern functional brain imaging largely provides evidence about regions of interest in the brain that deserve detailed experimental scrutiny. Such fine scrutiny is next to impossible to achieve in human research. But the techniques can give us statistical estimates of how various brain regions are working together (correlations in regional blood changes that yield statistical estimates of connectivity maps), which can be related to actual connectivities. Recent refinements allow the visualization of major tracts in the brain (pathways connecting brain regions) by using diffusion tensor imaging (DTI), which can even highlight what surgeons may have been doing to emotional networks during the era of refined psychosurgery—for example, converging evidence suggests that antidepressant neurosurgeries may have been amplifying the positive feelings of the SEEKING system (Schoene-Bake et al., 2010). This suggests that direct stimulation of the SEEKING system should exert antidepressant effects (see Schlaepfer’s and Coenen’s work below).

Some of the available causal tools in humans (for instance, psychopharmacological interventions and deep brain stimulation [DBS]) can be linked to psychological processes by correlations to subjective state changes. Recently, strong antidepressant effects have been observed in patients who had not responded to many other treatments, during localized deep brain stimulation (DBS) in the anterior cingulate region, especially Brodmann Area 25 (Mayberg et al., 2005), which is the affective headwater of the GRIEF system (see Figure 9.1). Presumably the DBS of Area 25 disrupts functioning of the GRIEF system, providing rapid relief from depressive psychological pain. Using DBS in the anterior reaches of the SEEKING system (the nucleus accumbens) has yielded similar effects. For instance, Thomas Schlaepfer and colleagues (2009) report the following:

After switching the stimulation on, one patient . . . spontaneously reported that he realized that he was in Cologne, that he never visited the famous Cologne Cathedral, and he planned on doing this in the immediate future, which he indeed did the day following the operation. Asked about depressive symptomatology, he did not report any acute subjective changes. A second patient’s immediate (60 s) reaction to stimulation was quite similar; she did not report any acute changes in depressive symptomatology but spontaneously mentioned that she wished to take up bowling again (a favorite pastime of hers 12 years ago, before onset of her depression). She noted, “This would be quite pleasurable.” These immediate and unprompted behavioral responses demonstrate a sharp increase in exploratory motivation, consistent with the accumbens’ role in reward-seek-
ing behaviors. This is especially noteworthy given these patients’ severe lack of motivation during their long depressive episode.

As already noted, we can now estimate how various distinct psychosurgical techniques that were utilized in past treatments of human mental disorders (for instance, treatment-resistant depressions) may yield benefits in individuals who have not received relief from other treatment. The effects seem to be due to convergent influences on hedonic pathways such as the medial forebrain bundle of the SEEKING system, providing another reasonable target for treatment-resistant depressions (Coenen et al., 2011; Schoene-Bake et al., 2010). Of course, experimental research questions such as this can only be piggybacked secondarily, with strict informed consent, on previously prescribed medical treatment strategies. Still, to develop such novel psychiatric tools, feasibility studies need to be conducted.

Techniques that are available for animal brain research, including electrical and chemical brain stimulation of specific neural systems, along with very detailed measures of regional brain chemistries, including gene expression profiles, are vastly more precise for guiding novel causal studies (Burgdorf et al., 2010). Because animals can’t talk about their experiences, however, too many investigators believe we will never have access to their subjective minds. As argued throughout this book, such long-term (almost century-long) biases are demonstrably off the mark, so long as we recognize that the “rewards” and “punishments” obtained by artificial stimulation of specific brain regions are proof that certain brain changes matter to animals.

An appreciation of our mental emergence from a dim ancestral animal past, coupled with an understanding of the subtle ways of evolution, strongly suggests that many other animals have affective survival values that are quite similar to our own. Thus, the sources of our primal emotional feelings are easiest to clarify through cross-species affective neuroscience. We must remember how much experimental work on our fellow animals has promoted medical advances of great importance for bettering human lives. Without animal research on insulin, tens of millions of children would have died prematurely during the past century. Animal research can illuminate the basic principles of the neural mechanisms that govern our primary affects and related secondary-process learning mechanisms. Psychology, psychiatry, and psychotherapy will be changed, and enriched, when more scholars begin to work on these issues that are so directly germane to the problem of consciousness and human and animal well-being. There are reasons to believe that we can even re-envision the foundations of our cultural institutions, ranging from philosophical to religious perspectives (Davies, 2011; Thandeka, 2005; also see the symposium on the philosophy of affective neuroscience in the Journal of Consciousness Studies [Panksepp, Asma, et al., 2012]).
THE ANCESTRAL SOURCES OF CONSCIOUSNESS

The goal of this book was to provide an overview of our knowledge of these primal animal an substrates for the human spirit, and implications for helping humans, leaving out many details that could further supplement the general arguments. We have not fully discussed how ancient emotional systems interact with the higher cognitive abilities of humans, in the context of recognizing that evolution has yielded a branching bush of, at times, increasingly complex living beings, rather than a ladder of ascent. At present, we have less precise knowledge about these important interactions than about raw emotional processes and simple forms of learning such as classical and instrumental conditioning. However, it is surely our vast cerebral “thinking cap”—our extensive cortico-cognitive apparatus—that distinguishes us mentally from our animal ancestors. That adds layers of complexity that cannot be readily addressed with animal models (e.g., Harman-Jones & Winkleman, 2007; Northoff et al., 2011).

As mammalian cerebral mantles enlarged and became more complex, our cognitive consciousness expanded accordingly, yielding higher (e.g., tertiary-process) forms of consciousness (Damasio, 1999), as well as a self-centered claim that language-based rationality is the foundation of human consciousness (Fogelin, 2003; McGilchrist, 2009). As discussed in Chapter 11, these “extended” forms of cognitive consciousness remain inextricably tethered to the more ancient, affective forms of being. An alternative view, not yet supported by existing neuroscience, is that cognitive consciousness emerged fundamentally from first-order capacities to perceive the external world, with no critical linkages to affective feelings. That view seems plainly wrong, because when the subcortical affective substrates are largely destroyed, so are all forms of consciousness (Panksepp, 2005b, 2007a). Language is our most unique cerebral skill, but even that emerges through emotional guidance. Through language, however, we can uniquely study the extended tertiary-process cognitive-affective consciousness of humans. And this is why there continues to be enormous growth in descriptive (i.e., nonneuroscientific) emotion studies in psychology (Davidson et al., 2003; Lewis et al., 2008).

Damasio states that “extended consciousness is a bigger subject than core consciousness and yet it is easier to address scientifically” (1999, p. 201). We agree, even though that science is bound to be less mechanistic, and hence less informative, at least as far as causal issues are concerned. Because of the ease of study, however, approaches to the study of emotions that have their basis in various uses of human language tend to implicitly hinder the study of primary-process core affective consciousness in animals, just as strictly behaviorist views have tended to do. Research funding, and hence rapid progress, requires consensus in the scientific community. There is none when it comes to our primal animal
emotions. Thus, little explicit neuroscientific work is being done on the emotional feelings of animals (with potentially profound implications for understanding human feelings), especially when compared to the renaissance of research on human emotions. The more ancient and foundational levels of such questions are being woefully neglected in the western intellectual tradition, even though these aspects are of great importance for revealing the nature not only of human emotional feelings but also the associated psychiatric disorders that afflict so many human lives.

I would suggest, in line with Damasio, that at this moment in Mind-Brain science, the topic of core affective consciousness is hard to empirically study in humans. But for substantive progress on many core issues that concern psychologists, it may now be more critically important to understand the primary-process evolutionary sources of human and animal feelings, rather than the extended cultural consciousness that gets so much attention. Many leaders within this field may not see it this way, but I believe they have not thought through the issues for all relevant neuroevolutionary perspectives, such as primary to tertiary levels of analysis. Indeed, if the primary-process affective gifts of nature are the brain functions upon which our complex human mental apparatus still rests, it would be tragic to neglect the opportunities available to understand our deeper nature, which simply can’t be illuminated as readily through human studies.

Although human beings may be justified in having considerable pride in the special qualities of our extended cognitive consciousness—such as our capacity to speak symbolically, which has created culture, civilizations, and our rich and detailed mental life—we have no robust ways of understanding the affective foundations of our own minds. That can only be revealed by studying comparable processes within other animals. Many of our higher mental functions are more like “tools of consciousness”—fully grounded and totally dependent on the integrity of subcortical processes described in this book. Thus, we are wise to cherish our perceptual apparatus—especially our acute hearing and vision—but if they are lost, we “only” lose many treasured contents of consciousness, while remaining fully conscious beings. Some components of the more ancient perceptual apparatus, namely our vestibular senses, are rarely experienced explicitly until they are injured. We would be wise to recognize that a scientific study of core affective consciousness in animals provides avenues, perhaps the only paths, to understanding that ancestral mind that supports our higher mental apparatus.

Because of this, our focus throughout this book has remained on the nature of primary-process affective forms of consciousness in animals without attempting to discuss the possible emotion-laden thoughts that may also exist in their tertiary-process minds—processes that are much harder to study in animals (Mendl et al., 2010; commentary by Panksepp,
2010a). We need to open up and invigorate the ongoing discussion about the nature of animal minds that was sealed—supposedly forever closed—by the behaviorist juggernaut almost a century ago. The behaviorists’ vision, perhaps appropriate for their times, has now proved to be short-sighted in the era of neuroscience. It led to a premature discarding of the primary-process affective mind simply because the tertiary-process cognitive mind could not be studied well in animals. And their choices were made too easy because of the many premature uses of mentalistic concepts to explain animal behaviors by the intellectual descendants of Darwin (Romanes, 1882).

The residue of those decisions persists in our universities, in robust but incalculably negative ways, to this day. As behavioral neuroscientists choose to be constrained by those old behavioristic concepts, scrubbed free of affect (e.g., “the reward system” and “reward prediction error”—see Chapter 3), there continues to be a tradition of practically no forthright discussion of affective processes in animals by neuroscientists. Emotional feelings have come to be scorned even by those who should know better. Rigorous scientists do not wish to see their work brushed off as anthropomorphism (Figure 1.3). But the preponderant weight of neuroscientific evidence indicates that those entities of the world called “rewards” and “punishments” are in fact constituted by affective changes within the brain. Indeed, the unconditioned emotional response systems of the brain that control the coordination of a symphony of emotional actions are not unconscious. Those brain networks are the very source of emotional feelings. That small shift in perspective could do much to enliven how we use preclinical models of psychiatric disorders. We live in an era where the widely used scientific concept of “reinforcement” should be seen as potentially little more than a shorthand summary term for the complex way that core affects—the unconditioned stimuli and unconditioned responses of animals—operate in the midst of the fluctuating events of the world. The pervasive procedure of reinforcement is highly effective, but the process of reinforcement remains an assumed, rather than a demonstrated, function of the brain. Now, “reinforcement” is widely assumed to be a real brain process, but it may turn out to be little more than the phlogiston of behavioral analysis (see footnote 2 in Chapter 3) that has gradually been accepted as a description of reality.

Because the Pandora’s Box of the animal mind was sealed several generations ago, an adequate discussion of animal emotional functions remains to be fully engaged, especially by those in the academic community best situated to do the necessary research. Had the debate been opened up among neuroscientists in a timely manner (at least by the 1970s), as some earnestly tried to do in cognitive ethology (e.g., Donald Griffin, 1915–2003), we might be in a better position now to address the subjective aspects of ancestral affective minds in both humans and other animals.
In any event, the cognitive forms of consciousness—that is, thoughts about our specific circumstances in the world that integrate declarative and autobiographical memories—are intrinsically harder to study mechanistically than core affects, especially in animals. One simple reason is that, as far as we know, specific cognitions do not have the clear-cut neural pathways that primal emotions have. Further, neurochemical codes for the core affects include a host of neuropeptides that regulate specific affects (Figure 13.1). That fact is a blessing for cross-species predictions. Future neuropeptide research should be able to test whether those neural controls can produce comparable affective changes in both

**Figure 13.1.** The timeline of the discovery of major neuropeptides that participate in various brain functions related to the control of behavior and various emotional and motivational processes. Progress was slow in the beginning (see the dotted line) but sped up enormously around 1970. The numbers inside squares indicate the number of amino acids in each of these neuropeptides (from Panksepp, 1998a; adapted with the permission of Oxford University Press).
animals and humans; these types of effects have already been well validated with oxytocin and social feelings (see Panksepp, 1992, 2009c; Pincus et al., 2010).

In other words, the abundance of neurochemical coding of affects, as compared to cognitions, allows a rich commerce in predictions to flow across the solid neuroscience bridge from animal brain to human mind research, and back again. In contrast, all our cognitions ride more strictly along dynamically changing glutamatergic excitatory transmissions, sculpted by GABAergic inhibitory guidance mechanisms. In addition, cortical cognitions and perceptions also surely require more complex and rapid neuronal firing patterns than do subcortical core affective feelings. The massively complex neurodynamics that control cognitions are bound to vary much more from species to species. That would make a neuroscientific understanding of higher mental processes a far more difficult problem than the cross-species study of evolutionarily conserved primary-process affects.

Although thoughts about thoughts, mediated by propositional language—so well developed in mature humans—surely do not exist in most other animals, we know of no way to rule out such possibilities. It is possible that other mammals think more in terms of internal perceptual images, which may better reflect ancestral forms of animal memory and thought (Grandin, 2005). But that is hard to evaluate except through the correlates of global brain imaging (e.g., PET scans). Good causal research is currently next to impossible to conduct. Thus, we must hold off on any firm conclusions concerning homologies at the tertiary-process level of human and animal cognitions. On the other hand, basic secondary-process learning mechanisms that underlie conditioned behaviors, largely unconscious neural mechanisms, allow very effective cross-species translations (LeDoux, 1996, 2007).

However, there is no evidence that such conditional controls add much diversity to the types of affective feelings that animals experience, because learning just modifies the intensity as well as the temporal and spatial expression of emotions. For instance, as conditioned responses come to replace unconditioned responses (UCRs), it is to be expected that affect diminishes substantially. The critically important UCR mechanisms of the brain may be essential not only for generating affect, but for providing the “glue”—the “reinforcement”—whereby conditioned stimuli come to evoke conditioned responses (see Chapter 6).

Likewise, an understanding of primary-process affects and associated conditioning processes may be of critical importance for our own tertiary-process, self-reflective tendencies, although we currently have no clear scientific data on how that happens. Obviously, all our higher mental complexities—from the conduct of science to philosophy, psychoanalysis, and the arts—require us to keep in mind many symbolic, language-
based memories as well as vast patterns of past and future possibilities. We know of no animal with comparable cerebral skills, but we do know that many other animals are quite smart in their own ways (Romanes, 1882, to Griffin, 2001) and that they are surely vibrant affective creatures. This gives us very special responsibilities for the way we conduct our research and for the way that we care for all animal life. The implications of this knowledge for animal-welfare issues are vast (Bekoff, 2000; Grandin, 2005; McMillan, 2005).

THOSE EVER-PRESENT COGNITIVE-AFFECTIVE INTERACTIONS

We have intentionally not dwelled on the nature of our highly resolved perceptual-cognitive mental apparatus. In doing so, we do not deny the importance of our unique extended consciousness in making us fully and deliberatively human. Our goal has been to open up intellectual space for a realistic and effective scientific confrontation with the ancestral sources of human passions by cultivating a view that exhibits full respect for the emotional lives of other animals. I have no wish to diminish the many important differences that each species of animal and each unique human being and human culture brings to the rich banquet of mental existence in this world of ours. I have primarily sought those general principles of mind that still bind us to each other . . . like an extended family that needs to review its shared ancestral treasures. There are now many empirical findings that support the views I have advanced, and there is much more to be unearthed.

The widespread claim that affects are just a variant of cognitions seems little more than a word game to me, even though I certainly accept that the many valenced (good and bad) feelings of the nervous system are always interacting with cognitions (imagination, learning, memory, thoughts) within the full complexities of most human and animal minds. The same can be said for attention and primal motivation (e.g., thirst and hunger) and indeed for all the ancestral faculties of the mind. Just like the organs of the body, everything inside us interacts. The first lesson that I learned in neuroscience is that the frequency-specific ripples of a stroboscopic visual signal entering the eye can be measured in practically every corner of the brain. This does not mean that in our pursuit of real progress in understanding vision we should not distinguish the visual system from the auditory system, or from other brain sensory systems.

For those who insist that affects and cognitions are totally conflated in the human MindBrain (which would probably include most psychologists and philosophers these days), I would suggest they consider their arguments not only from their perspective, but also the bottom-up perspectives advanced here. When we look down on mental life from a cortico-
cognitive pedestal, yes, everything interacts. However, if we understand that cognitions are often “handmaidens” (or emissaries for the affects) such conflagrations no longer work. Positive emotions, which so far cannot be “computed” in any meaningful way, can directly promote bottom-up facilitation of positive affective homeostasis, or a restoration of well-regulated mental balance, when humans are beset by negative feelings. Top-down cognitive skills also effectively serve to seek out a large variety of positive affects that can counteract negative feelings.

Thus, here is the critical question: Do cognitions and affects operate by very similar neuronal principles, and in the same regions of the brain? The evolutionary bottom-up view preferred here gives us more than three good reasons to insist that primary-process affects have an independent existence that goes back much further in MindBrain evolution than the brain processes typically subsumed by the concept of cognition:

1. The emotional-affective presence of animals and humans remains remarkably intact after they lose their prime cognitive territories—their neocortex—early in life.

2. To this question, “Are there major neurophysiological differences between the premier territories of cognitive processing (i.e., the thalamic-neocortical axis) and those enriched in emotional-affective processing (i.e., the subcortical and cortical midline systems, or SCMS [see Northoff & Panksepp, 2008], traditionally called the extended limbic system)?” The answer is yes. Just in terms of firing rates of neurons, cognitive-somatic territories are enriched in very highly firing neurons (e.g., hundreds of action potentials per second), while the affective-visceral ones abound in very slowly firing neurons (e.g., it is hard to find many that fire more than ten times a second).

3. There is no place in the normal neocortex or thalamus where you can stimulate a local region of the brain and consistently get the same cognition or thought over and over again (albeit Penfield demonstrated that one can obtain stereotyped perceptual phenomena by stimulating certain temporal lobe regions that border on the limbic system). By contrast, it is easy to find places within the SCMS where one can repeatedly stimulate the same brain locations and get the same affective states.

The ancient MindBrain substrates for emotional affects are not only governors of how we behave, but they also prompt us to dwell on the complexities of our lives as we navigate social worlds. More than anything, the distinction between affects and cognitions, interwoven as they are in the intact brain, allows us to grant that other animals also have experiences along the full spectrum of intrinsic survival values. They have
affectively experienced states of the nervous system that are not terribly dissimilar to our own.

The recognition of this fact gives us a special responsibility to do our research with an abiding sensitivity, with deep respect and concern for the animals we sacrifice to obtain such knowledge (McMillan, 2005). Regrettably, a fuller understanding of the human condition and its emotional travails cannot be developed without scientific work on the relevant brain systems in animals. This conclusion is inextricable from the fact that they are sentient beings, and their affective capacities arise from the same type of neural soil as we have. Humans may be abundantly more "rational," and more "reflective" about their states of mind, but mammals all experience emotions affectively. And as the clinical studies of Merker (2007) and Shewmon et al. (1999) have revealed, those feelings arise from very deep regions of both human and animal brains (Figure 13.2). Obviously, we humans can dwell on the existential aspects of our lives more deeply than any other species. After all, we can speak and think symbolically. But this does not give us privileged access to raw affective experiences. What a terribly empty and lonely world it would be if we humans

![Image](image_url)

Figure 13.2. The emotional response of an anencephalic child to a baby being placed on her lap (top). The type of brain dysgenesis of such children (bottom) (data from Merker, 2007; I thank Bjorn Merker for use of the photographs. Radiographs reprinted with permission of the American College of Radiology (ACR Learning File, Neuroradiology, Edition 2, 2004). No other representation of this material is authorized without expressed, written permission from the American College of Radiology).
were the only conscious creatures within the inextricably interwoven fabric of life. What a wonderful relief it is when we realize that there are bubbles of consciousness wherever our fellow animals roam the earth.

THE LOSS OF "MEANING" DURING THE TWENTIETH CENTURY

Early in the twentieth century behavioral science lost its connection to the intrinsic values of our mental apparatus. Along with remarkable advances in physics, astronomy, chemistry, and brain sciences during the twentieth century, the prevailing scientific view emerged that human existence, just as physical science had affirmed for the material world, is value-free, or inherently meaningless. Many psychologists, especially behaviorists, assumed that was the only correct way to proceed in our studies of both mice and men. Subjectively experienced states of the nervous system were discarded from scientific discussions, albeit not from intellectual debates. Academic psychology thereby became alienated from affective feelings. The cold hard evidence harvested from animal bodies and their behaviors was all that mattered.

To a substantial extent, this was reflected in intellectual life at large. The classic "existentialist" position was that little of intrinsic value is the birthright—the "essence"—of each individual, and people have to generate meaning afresh by the lives they lead every day. Life was intrinsically absurd, with no more meaning than people constructed within their own existence. On one hand, this engendered nihilism; on the other, it encouraged the view that all "meaning" was created by each person. This may well be true for the tertiary aspects of mind, where mirror neurons, empathy, and fellow feelings have to be infused into neocortical matrices by culture, education, learning, and individual development. But it does not well describe the affective tools that evolution has built into the lower reaches of our mental apparatus (Panksepp & Northoff, 2009).

With the emergence of scientific analyses of behavior and the mind, remarkably simple and effective ways to study learning and memory were developed. One could use any old neutral signal—a tone, a flash of light, a tap on the shoulder so to speak—as the CS (conditioning stimulus) and then follow it with an electric shock or some equally potent UCS (the unconditioned stimulus, or stimuli), and within a handful of trials animals would begin to flee and freeze and poop, with their blood pressure rising as their hearts pitter-pattered, just from the presentation of the CS. All this only worked because so many UCSs were capable of producing so many UCRs, which were profoundly important instinctual functions of the nervous system. These same UCSs could be used to train animals to do any of a variety of things in "instrumental conditioning" (e.g., running mazes) or operant (e.g., lever-pressing) procedures. It all worked like
clockwork, but was this because animals were “just” machines? Or did all this happen because evolution had built primal affective experiences into the neural matrices of many UCS and UCR networks of the brain? Scientists simply regarded animals as unfeeling machines. Largely left unstudied were the instinctual UCRs, which, at least in the realm of emotions (e.g., the FEAR system), are essential for fear-conditioning to proceed as effectively as it does.

An often forgotten historical note is that few of the scientists who studied all the environmental parameters of conditioning, and eventually the brain mechanisms of emotional conditioning, paused to intensively study the nature of their experimental subjects’ UCRs. Of course, that would have been difficult in the heyday of behaviorism, for it would have required considerable knowledge of the nervous system and intensive brain research. It might also have required scientists to entertain the realistic possibility that UCRs were constituted, in substantial part, by affective primary-process changes within a BrainMind. And thus, the various MindBrain consequences of UCRs that these scientists used to train their animals, under the rubric of “rewards and punishments,” were never conceptualized as provoking raw affective states evolutionarily embedded within the nervous system. After Thorndike’s Law of Affect was transformed into a Law of Effect (i.e., the “satisfactions” and “discomforts” of the world were transformed into “rewards” and “punishments”; see Chapter 2), the scientific conversation about emotional feelings in animals almost ceased.

Now that we know that most unconditional stimuli that are used in experimental animal psychology derive their power from the fact that they evoke not only objective behavioral changes but also subjectively experienced affective changes within the brain (i.e., various distinct types of emotional UCRs), it is of utmost importance to develop clearer visions, and more affectively focused research programs, in order to unravel the nature of the many affective “instincts” of the brain. But that is now more difficult than it should be, for even the word “instinct” fell into disrepute during that era of ultra-positivism. Also, for contemporary scientists to shift their research priorities, there needs to be a societal shift in “reinforcement contingencies,” specifically, the magnanimous sources of research funding (e.g., the National Institutes of Health and National Science Foundation) need to encourage a more flexible neuropsychological approach to the study of animal emotions, especially on the many affective UCRs of animal brains. If we do not do that, we will never know how human emotions evolved. That has yet to happen, so few scientists speak

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1The computer revolution promoted the notion that deeply biological minds could be computed on silicon platforms—a vision that prevailed in the new cognitive sciences and seems alive and well in many other corners of the academy (see Panksepp, 2008c).
frankly (and in evidence-based ways) about the affective states that other creatures experience. If we understood these primal emotions, we would also have a better way of conceptualizing the psychological and motoric coherence of organismic actions, and we could thereby better understand how the core-SELF and the whole brain works as a unit.

Although the breadth and depth of our human consciousness has been widened enormously by the intellectual potentials of our enlarged brains and cultures, we are, in fact, inheritors of ancient biological values that constitute the very ground of meaning within our minds. Regrettably, this affective ground of meaning can be difficult to talk about. Thus, our greatest recent gift, the discovery of language, is both a blessing and a curse. Besides bringing us beautiful songs, poems, and other literature, it is also ideally designed for sowing disagreement, dissension, and the marginalization of other humans, along with our shared animalian nature. The primary aspects of mind cannot be understood simply through the use of words. This understanding requires neuroscientific inquiries that do not reject the mental attributes of ancient brain functions. Twentieth-century philosophy was not often of much assistance in breaking through the cultural resistances that are finally leading to neuroscientific progress in understanding mental dynamics. Ludwig Wittgenstein's influential philosophy gives us a window to the dilemma that has prevented progress in understanding the mental life of humans and especially other animals.

THE AGONY OF WITTGENSTEIN: MAN'S SEARCH FOR MEANING

During the past century, many sought human meaning in the way we use words. While the poets and composers demonstrated how well we could artistically symbolize our deepest longings, joys, and despairs, others sought the grounding of our being and meaning within the logic of language. Ludwig Wittgenstein (1889–1951) proceeded along that path in his search for the ultimate logic of language. In his Tractatus Logico-Philosophicus, he sought to provide a definitive statement about how the structure of language was related to the structure of the world. This manifesto consists of seven propositions, with a host of subpropositions. The most relevant for our discussion of emotions is Proposition 6.5:

When the answer cannot be put into words,
neither can the question be put into words.
The riddle does not exist.
If a question can be framed at all, it is
also possible to answer it.

If one applies this rule to the affective topics covered in this book, the question is can there be a credible scientific answer about the nature of
emotional feelings? I believe that this can finally be achieved, but only because of recent advances in neuroscience. We have now learned enough about the intricacies of the remarkable brain to envision how mind emerges from neurodynamics, constructed in close association with bodily states and environmental conditions. In a subproposition (6.52), Wittgenstein goes on to assert:

We feel that even when all possible scientific questions have been answered, the problems of life remain completely untouched. Of course there are then no questions left, and this itself is the answer.

In the epistemology of emotions, one could suggest that this is an assertion of profound skepticism about the possibility of ever addressing the deepest aspects of nature, such as affective consciousness. Indeed, there are scholars who believe that it is impossible to study the source of our basic values scientifically. But the brain sciences of Darwin’s day, not to mention Wittgenstein’s, were primitive in comparison to what we now have. The closest Wittgenstein ever came to acknowledging feelings was in his cryptic outline of mental propositions in 6.522:

There are, indeed, things that cannot be put into words. They make themselves manifest. They are what is mystical.

In short, his logic of language could not deal with affective mysteries. Wittgenstein summed up his views in the Tractatus in his introductory remarks as well as his final standalone seventh proposition: “What can be said at all can be said clearly, and what we cannot talk about we must pass over in silence.” Emotional feelings were, in his time—during the era of behaviorism in psychology—among those “mystical” aspects of the world that lay outside the realm of propositional logic, beyond words, impenetrable to science. Such spooky aspects of mind seemed to lie forever outside coherent scientific analysis. To this day, it is still not widely recognized that this kind of scientific understanding is now possible, or that it must be critically linked to identifying the brain processes that create our emotional feelings and values (Panksepp, 1998b; Russell, 2003).

Soon after finishing his “definitive” statement on the linguistic foundations of knowledge, Wittgenstein recognized that his world system was deeply flawed. He spent the rest of his tortured emotional life probing how meaning emerged from the incredibly flexible ways we use words. In his second renowned book, Philosophic Investigations (1953/1967), on which he labored for 20 years, published 2 years after his death, Wittgenstein made almost a 180-degree shift away from the starkness of the Tractatus, and he started to probe how we create meaning out of the infinite variety of “language games.”
His intellectual legacy was to leave us with a view of mental life where meaning was a flexible manifestation of how we play with words. This has remained one of the hallmarks of postmodern culture, as well as of the trajectories of emotion research in the social sciences—a study of how we use words and how we semantically construct emotions. Only recently have scholars working in that tradition entertained the idea that there is a deeper neurobiological reality to emotional feelings—that, at the very least, there are natural mechanisms for the dimensions of positive and negative affects within the brain (Russell, 2003). This is progress, but it is short of the mark when it comes to primary-process emotional systems. Perhaps dimensional theories of emotion work best at the tertiary-process level, where the varieties of our affective lives are translated in simplified emotional concepts that can facilitate research (Zachar & Ellis, 2012; also see the special issue of Emotion Review [2011] that Jim Russell and colleagues have edited to better capture what “basic” emotion theorists are talking about). In any event, basic emotion and dimensional views of emotions can work well together if they reflect different levels of Mind-Brain organization (Panksepp, 2007d). As already noted, robust evidence for basic emotions does exist from modern human-brain imaging (Vytal & Hamann, 2010).

As one ponders human nature, it seems that ultimately few in mind science can resist the siren-song attractions of naturalism. Even Wittgenstein, in the aforementioned second book, remarked how “the human body is the best picture of the human soul” (Part II, p. 178). It is just such a vision—with a focus on the “body” represented within the brain—that we have independently sought in order to understand how the primary-process emotional systems actually create feelings within mammalian brains (Panksepp, 1998b).

Damasio’s theorizing is progressing along this path, shifting gradually away from the cortical sources of our feelings to the recognition that emotional-affective processes arise from deep subcortical regions. As I concluded this book, I was pleased that Damasio’s (2010) views, as was previously noted, are shifting closer to my own. I trust many will follow this wise scholar. In Self Comes to Mind, he recognizes the diverse subcortical affective networks of the brain, where through evolution, the primal mind arose from (or with) the primal SELF. Varieties of ancient emotional, homeostatic, and sensory affects are intrinsic functions of the brain, triggered and modulated by various bodily inputs (Denton, 2006). However, only the emotional affects are of profound importance for a scientific psychiatry yielding, I hope, better conceptualizations of what clinicians need to achieve through psychotherapy.

It is ironic that Wittgenstein was personally so close to, yet intellectually so far from, an understanding of preverbal mentality tethered to ancient BrainMind realities. As is so movingly depicted in his choice of an
epigraph for his second book—from St Augustine’s *Confessions* (section 1.8; see the beginning of this chapter)—language emerges, in part, from a child’s affective engagements with the social world. Out of Wittgenstein’s confusions about the fundamental nature of the mind, and what we can and cannot understand through neuroscience, he wrought an excessively relativistic view of human nature and human interactions, quite appropriate for tertiary-process regions of the human MindBrain. But this incomplete vision currently prevents psychology from becoming a whole science that fully seeks to understand the true evolutionary undergirding of mental life.

Perhaps it goes back to the difficult and prolonged process whereby we learn to speak. Attuned human intersubjectivity, which is central to the language-acquisition enterprise, includes the rhythmic nonverbal social signals—a natural body language—that is related to the “seeking, having, rejecting, or avoiding” of worldly objects that can become the targets of our “own desires.” Human existence is not just a matter of sensory associations, even though those associations eventually fill our mental landscape to a point where, at times, we recognize little else. It should be kept in mind that even though the expansive human neocortex is a relativistic organ of the kind that Wittgenstein envisioned, it is not the subcortical terrain we share with all other mammals. The vast computational spaces of our neocortex are quite empty of psychological content at birth, and practically everything it eventually comes to know—*noetic* and *auto-noetic consciousness*, in Endel Tulving’s terms (see Vandekerckhove & Panksepp, 2009)—is learned. That is not the case below the neocortex, where our *anoetic* consciousness, without understanding, resides.

Our ancestral brains contain special types of meaning based on genetic inheritance; the potentials for raw feelings are built into the instinctual (i.e., inherited) neural action apparatus of the body. And there are many varieties of those feelings. Some are closely linked to sensory inputs from the outside (the pleasures and displeasures of sensation), others are linked to internal bodily inputs to the brain (e.g., hunger, thirst, and their satisfactions), and yet others that reflect the action dynamics are evolutionarily built into the brain, at least in raw form. All of these tools for living are plastic to a degree; they can be strengthened and weakened by experiences. These raw feelings are closely linked to our intrinsic urges to reach out into the world in certain ways and to respond to the archetypal challenges we encounter. They do not have higher order intentionality (i.e., “intentions to act”) but they do have intrinsic intentionality (“intentions in action”; see Panksepp, 2003a, Figures 1.4 and 1.8). Feelings are what make us active organisms as opposed to simply passive information-processing machines.

Many may agree that emotional feelings are the roots of our earliest human communications. But many still regard them as a variant of sen-
sory rather than motor processes, that is, more passive (i.e., the feeling of what happens—probably a tertiary-process viewpoint) than active (i.e., By God, I’m going to make this happen!—a primary-process perspective). In fact, emotional feelings and consciousness itself may be premised as much on motor-action processes as on sensory-perceptual ones (see Chapter 12). Our perceiving minds as well as our ancestral affective minds appear to be anchored in action coordinates, which are the various instinctual emotional actions that we can easily recognize across mammalian species. The central role of the instinctual action apparatus has traditionally been marginalized in the analysis of emotional feelings and consciousness. It is often seen simply as an “output” of the nervous system rather than as a complex integration process. As Darwin suggested, emotionally expressive actions provide coherent images of our basic emotional nature. Our earliest engagements with the world are spontaneously active. Just look at any infant, any child, any young vertebrate: SEEKING lies at the foundation of all of their aspirations.

AFFECTIVE OPTIONS AND OPINIONS

We are faced with a stark choice. Either we and other animals are inheritors of a variety of intrinsic values, representing the affective potentials of our brains or we are nonfeeling zombies who can be studied as pieces of machinery. Which option do we choose? How we answer this question in neuroscience will determine what type of knowledge, and perhaps what kind of culture, we will create.

Let us not underestimate the magnitude of the scientific problem before us. All aspects of consciousness emerge in animal and human brains as the result of the interactions of widespread neuronal networks. There is no single circuit or “center” for consciousness, even though there are critical convergence points (Sukhotinsky, et al., 2007). As I have long argued, the PAG may be the most important location in the brain, because it is richly connected to both higher and lower brain functions. It is a Grand Central Station for our affective life, and it is essential for the primal integration of diverse emotional experiences. It sends its tentacles far into the lower and higher regions of the brain. Much of this kind of “dark energy” in the brain is not easily visualized with modern brain-imaging technologies (Zhang & Raichle, 2010), but with the right tasks, remarkable images can be generated (Mobbs et al., 2009).

The PAG and its related brain-stem networks are essential for the construction of the higher mind, where distributed but specialized network models of the brain are more realistic than highly predetermined modular specializations, as many evolutionary psychologists are prone to assume. When we begin to envision the myriads of neurons and neural networks, with their seemingly endless neurochemistries, influencing each
other in multiple re-entrant loops of activities—feeding upon each other and themselves—and generating diverse global field dynamics that are presently almost impossible to measure, we are humbled, at the outset, by the complexity of the task of deciphering how the BrainMind actually works in detail. But if we want to make ourselves, we have to proceed down this path, step by step. Understanding how the brain generates primal emotional feelings may be the most solvable—the "simplest"—problem in consciousness studies.

Consciousness is surely not a single global property of the brain in action. It has a long evolutionary history that goes back to ancient systems that encode brain and body states that are essential for survival. Psychologically, those "ancestral voices of the genes" that arise from the neuro-dynamics of a variety of intrinsic brain systems are experienced as raw feelings or primitive affective states. We have focused on other mammals (and some birds; see Bernroider and Panksepp, 2011) largely because the neuroanatomical and neurochemical homologies are quite striking, allowing credible cross-species generalizations.

The issue of consciousness among invertebrate species is a more difficult issue because of diminishing neural similarities. But as we previously mentioned, even crayfish (basically large insects) exhibit conditioned place preferences for drugs that humans abuse and that other mammalian species find rewarding (Huber et al., 2011; Nanthaniel et al., 2009, 2010; Panksepp & Huber, 2004). Thus, it is wisest to remain open-minded about these issues in the "lower" species and to see where the predictions lead us. But there is a core dilemma in neuroscience. In mind science, we would like to understand large-scale processes—the "wholes"—but neuroscience is best at studying small discrete phenomena, or the "parts" of the "wholes." Because of this tendency, we are very susceptible to mixing up the two, yielding mereological fallacies, namely part–whole confusions (Bennett & Hacker, 2003). And currently neuroscience is giving so many parts—so many brain mechanisms—but what functions they perform in the mind, the "whole," is more difficult to decipher.

Scientists would like to understand the world, but they know that their techniques are much better at studying the parts of nature rather than its composite wholes. Different people have different solutions to this dilemma. A common one is to focus on rather narrow problems (out of sheer necessity, this is favored by scientists), where one begins to see each leaf on a tree ever more clearly, but then they all too often lose sight of both the trees and the forests. Most are bound to pay heed to Rene Descartes' (1596–1650) third rule of science in his Discourse on Method: "To think in an orderly fashion when concerned with the search for truth, beginning with the things which were simplest and easiest to understand, and gradually and by degrees, reaching toward more complex knowledge, even treating, as though ordered, materials which were
not necessarily so." Or, as Einstein is reputed as saying, "Simplify, but not more than is necessary" (emphasis added). That is the path we have taken here in our attempt to understand affective consciousness in humans.

Living brains, along with their minds—the invisible manifestation of their network-level neurobiological functions—reflect a delicate balance, as yet poorly understood, among vastly interacting neural circuits that work in and for living bodies and that respond to the challenges of the world by creating desired circumstances and avoiding those that are harmful. Emotional feelings are the experienced affective manifestations of such interactions; they are the subjective qualities of mind, aspects of which can finally be studied systematically, in detail, in other creatures. Thereby, we can begin to neuroscientifically understand our own minds. That understanding cannot be achieved without studying the relevant processes in other animals. Just as with the other success stories in biological science that have heralded medical progress, understanding has been guided, every step of the way, by findings from animal research. As Charles Darwin recognized, the knowledge we gain will have profound implications for understanding the human condition. As a species we still have much to learn about ourselves. What are we waiting for?