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## Neuroscience as Link

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### Transactional Model

Neuroscience is a missing link that can upgrade, or even downgrade, social work and other helping disciplines. The linking will upgrade social work if neuroscience is understood within a framework that includes what I describe as the transactional model. It can downgrade, to varying extents, if neuroscientific results are not interpreted in an appropriate fashion.

Twin and opposing mistakes are overenthusiasm and underenthusiasm. To put it another way, it is like being between Scylla and Charybdis, or a rock and a hard place. On one hand, it is a mistake to overenthusiastically swing from a situation where the biological is neglected to a situation where the biological is overemphasized. It is likewise erroneous to fail to recognize the limits of positivism. On the other hand, it is also a mistake to be underenthusiastic about the insights made possible by advances in the neurosciences. Such opposing mistakes can result from simple misunderstandings (e.g., when some parents of children with schizophrenia have welcomed scientific or biological evidence that makes their children's affliction less unbearable but neglect the nonbiological understandings that are also available). More fundamentally, such mistakes occur when there is no appropriate conceptual framework—a framework like that provided by the transactional model.

The term *missing link* can be seen as symbolic of such difficulty. It is misleading, for instance, if it is assumed that in evolutionary theory there has to be a sole missing link. Similarly, it is misleading in biologically informed social work to assume that the biological is the sole cause. The missing link has excited both overenthusiasm and underenthusiasm. On the one hand, embracing the missing link can excite a sort of missionary zeal. On the other hand, the

negative fear that surrounds the idea of evolution—that is symbolized by the missing link—hardly needs illustration. Similarly, the neuroscientific revolution can evoke fears among social workers and other helping professionals as it represents challenges to entrenched ideas and practices. Some human service practitioners have given only lip service to the biological because they fear to infringe on traditional thinking and practice.

In the first two subsections, this chapter underscores aspects of the overenthusiasm and the underenthusiasm for the biological, for neuroscience talk. Then it describes and analyzes a transactional framework, which is recommended for social work to engage the missing link of neuroscience. This was first written about in relation to the teaching of human behavior in the advanced clinical curriculum of master of social work programs (Farmer, 1999). In that context, the transactional model was used to address the problem of underconcentration in our understanding of the biological aspects of human behavior. In the present context, the model is used to focus our data collection on all of the relevant domains (i.e., biological, psychological, social, spiritual, and challenge in living) for informing clinical interventions.

## Overenthusiasm

“The Pleasure Neuron: Luxury may be habit-forming and we have the MRIs (magnetic resonance imaging) to prove it.” Illustrating how brain talk has become part of enthusiastic everyday talk, this advertisement for a brand of car caught my eye (“The Pleasure Neuron,” 2005). The heroine of the advertisement is a neurosurgeon, and her weapon is neuroscience. The advertisement for the high-priced car, a Lincoln, touts the car’s audio system as inducing “a harmonious brain state, no matter how snarled the traffic.” Happy brain talk! The neurosurgeon-owner talks about how she loves the car and how the *nucleus accumbens* is a part of the brain that is important to pleasure. This particular brand of car, the neurosurgeon explains, “provides stimulation for all the senses” (p. 2). It’s stimulation for the brain, because, as she explains, the brain is the repository of all that we see, feel, think, and experience; the car is brainy.

Brain talk and brain terms are being used in our everyday lives. They have become acceptable, at least in this one advertisement for readers of the *New York Times*. Neuroscience is being used to sell luxury cars. Brain talk is now an integral part of our culture. To provide the most up-to-date and effective interventions for our clients, we need to incorporate research findings from the neurosciences into our knowledge base. As human service professionals, we also need to advocate for those particular neuroscience research questions, rather than others, that will yield understandings useful for our clients.

Although enthusiasm is desirable, overenthusiasm in brain talk can be counterproductive; however, I want to draw attention to two kinds of overenthusiasm that I think also underlies the rhetoric in the advertisement for the

high-priced car. The first is where brain talk is taken to stand in a privileged epistemological position precisely because it is science talk and the limitations of positivism are not recognized. To put it another way, a true scientific proposition is understood as having a greater claim on my assent than a true nonscientific proposition, because I have more assurance that the scientific proposition is true (a scientific fact vs. a nonscientific fact). Yet there is a failure to appreciate the consensus in the immense and well-known literature on the nature, strengths, and limitations of positivism (e.g., Boyd & Gasper, 1993). The consensus is that positivist disciplines, like those involved in neuroscience, yield explanations rather than understandings; they produce causes rather than reasons. Positivism is highly successful and useful precisely because it is designed to exclude classes of understanding, like meaning. It suggests the desirability of social workers preparing themselves with a basic understanding of philosophy of science so that they can manage this kind of overenthusiasm (see Diesing, 1991).

The second kind of overenthusiasm (which I discuss at greater length) is where biological causation is understood to be total. In other words, overenthusiasm falls into the exaggeration of biological determinism. This kind of overenthusiasm is also connected with a lack of sophistication, symbolized by the rhetoric in the advertisement for the car. Social workers are used to such simplification when we hear clients saying things like, "I have schizophrenia; it's a brain disease," or "I'm depressed; it's all in my brain." How about the clinician who encounters a client who carries a diagnosis of schizophrenia and immediately assesses the person as having a brain disease? Yes, these statements are true in part, but they do not fully capture the etiology of either of these illnesses. How often do we encounter a person and think, "I wonder what kind of parents they had," or "What kind of trauma experience led them to do that?" or "Where did they get such a personality?" Each of these scenarios comes down on one side or the other of the nature and nurture dichotomy.

Let me say more about the second kind of overenthusiasm, speaking in terms of the nature versus nurture debate. For many years, those interested in human behavior have tended to form themselves into two camps of adherents, those who believe that all human behavior is the result of biology and those who argue that all behavior is the result of the sociocultural environment (the biological vs. the social sciences). There is ongoing debate on this topic. With the explosion of neuroscientific research during the past 20 years, many think that we have now entered an era of biological determinism. In other words, it is supposed that the proliferation of brain research places us exclusively on the side of nature, with little respect for the power of nurture.

Let us express the argument in terms of genes and behavior. Do people's genes make them behave in a particular way? Can people control their behavior? These fundamental questions are raised by the ELSI program of the Human Genome Project (1990-2003), noted in chapter 1. These questions are raised under the ELSI's heading of "conceptual and philosophical implications

about human responsibility, free will vs. genetic determinism, and concepts of health and disease” (U.S. Department of Energy, n.d.).

It is accurate to say that brain connections follow rules from the genes. For example, Richard Dawkins discusses the “selfish gene” (Dawkins, 1976). It is an understanding of social behavior and evolution, associated with thinkers such as George Williams (1966) and William Hamilton (1964). The basic idea of the selfish gene is that individuals do not always take actions for the benefit of other individuals. Rather, they pursue actions at the biological level for the good of their genes. Sometimes the good of the individual and the good of the genes coincide, but not always. As Dawkins puts it, “We are survival machines—robot vehicles blindly programmed to preserve the selfish molecules known as genes” (p. 21). Later, Haig (1993) indicated that the contest on behalf of genes can occur even in the human womb, as mother and fetus (whose genes are not identical) can struggle over blood sugar. He reports that the fetus secretes human placental lactogen (hPL) that blocks the effects of the mother’s insulin. Clearly, genes are important. The argument is unaffected by the reality that behaviors involve multiple genes and that there are problems in defining specific behaviors. But is that the end of the argument?

Siegel (1999) is one who argues that the term *biological determinism* is mistaken and that the opposite is much closer to the truth. He believes that the brain’s structure and function are shaped by one’s interactions with the environment, and therefore, nature and nurture is a false dichotomy. Strohmman (2003), a molecular and cell biologist, also is concerned about the overemphasis placed on biology. He notes that genes alone cause only about 2% of the total disease load in human beings (e.g., diseases such as sickle cell anemia and Duchenne muscular dystrophy), whereas 98% of human diseases (e.g., cancer and heart disease) are polygenic, multifactorial diseases. Strohmman refers to such common diseases as “diseases of civilization.” In these 98% of diseases, genes may be necessary causes, but they are not sufficient causes. Because polygenic traits and diseases are not part of a linear process (i.e., a single gene or a set of genes leading to a single disease) and there are strong environmental interactions, Strohmman argues for a move from genetic reductionism to epigenetic regulation.

Most psychosocial practitioners will recognize the term *epigenetic* from the work of Erik Erikson (1950) who borrowed the term from embryology. Erikson used the epigenetic principle to describe a child’s development as occurring in sequential stages, each of which had to be satisfactorily resolved for development to proceed normally. Strohmman (2003) describes the activity of genes as following an epigenetic path, which involves gene–gene interactions, gene–protein interactions, and all of these interacting with environmental signals. Other researchers also believe that talk of nature versus nurture is unhelpful. What is more useful is to focus on the epigenetic nature of development, where biology and experience work together to enhance adaptation (Gottesman & Hanson, 2005; Mascolo & Fischer, 2004). Although it is true that

human service professionals need to be knowledgeable about the latest research findings from the neurosciences, it also needs to be said that biology alone is not destiny, and we err if we get caught up in the biological determinism that Strohman (2003), Siegel (1999), and others have warned against.

Some researchers support the doctrine of multilevel analysis in the study of mental and behavioral phenomena (e.g., Cacioppo & Berntson, 1992). They conceptualize the social and the neurological perspectives as two ends of a continuum. Basic research needs to cut across all these levels to integrate them and prevent reductionistic analyses. So, for example, depression, schizophrenia, juvenile delinquency, and child and spousal abuse are social and neurophysiological phenomena. Bruce Wexler (2006) is among those who would view such a continuum model as understating the case. His view is that the “relationship between the individual and the environment is so extensive that it almost overstates the distinction between the two to speak of a relationship at all. The body is in a constant process of gas, fluid, and nutrient exchange with the environment, and the defining feature of each body organ is its role in these processes. The brain and its sensory processes are no exception” (p. 39).

There is also the reality of brain plasticity, to which we will return later. The brain is continually changing in response to cultural and other inputs until the moment of death. Like many other neuroscientists, Nancy Andreasen (2005) points out that, as the reader reads, the reader’s brain is changing. I am remaking my brain as I write.

We have used the term *environment* in several contexts, and perhaps a clearer understanding of this complex term will enhance our discussion. Environment denotes the total surrounding, everything that is external to the person but has actually become a part of the person. For example, family members, neighbors, and other community components such as schools are part of the environment for a particular person. There is also the distinction between what is inherited (nature) and everything else (nurture; i.e., the environmental).

In the late nineteenth century, Sir Francis Galton, the father of twin research, introduced the idea that the study of twins could help us distinguish nature from nurture or the difference between what is inherited and what comes from the environment. In their landmark study on the biological roots of schizophrenia and manic-depressive disorder, Torrey, Bowler, Taylor, and Gottesman (1994) refer to Galton and his contributions to the present-day study of mental illness. They also point out the importance of the nongenetic and environmental factors that appear to originate outside the person but can become a part of him or her. For example, genetic theories of schizophrenia have included the study of such prenatal and perinatal environmental influences as viruses, birth trauma, infections, anoxia, and stress. In their own research, Torrey et al. found a possible link between pestiviruses and schizophrenia, and obstetrical complications were an important etiological factor in at least 30% of the twins they studied who had schizophrenia. In these situations, the virus

would be considered an environmental factor, but it is also clearly a biological and nongenetic factor. Obstetrical complications (e.g., low birth weight, breech birth, use of forceps, and toxemia) are also biological events that are nongenetic and environmental risk factors for schizophrenia. Therefore, in talking about the environment and its contribution to illness, we may be referring to early exposure to a toxin and/or physical trauma at key development periods, which then interacts with biological factors to result in various anomalies (Edward H. Taylor, personal communication, January 18, 2008).

The idea that environment may not be solely a social factor may be difficult for social workers and other human service professionals to consider, but it is important that we do so. When speaking in social terms, and related to mental illness, it may be easy for the reader to assume that we are saying that environment (e.g., parents) can be the causative factor for illnesses such as autism, schizophrenia, and bipolar disorder. This is not our intent, because it is clear to this writer that such illnesses have a clear biological etiology.

Recent studies in the neurosciences point to human development and behavior as being the result of a very complex interplay between nature and nurture. So whether we are describing normal processes and outcomes or abnormal manifestations (i.e., mental illnesses and other maladaptations), it is not only simplistic but also egregiously inadequate to dichotomize this issue. It is preferable to study the interaction between nature and nurture (e.g., the interaction of gene and environment; Meaney, 2004; Siegel, 1999). The overenthusiasm of biological reductionism is, in my view, unwarranted.

## Underenthusiasm

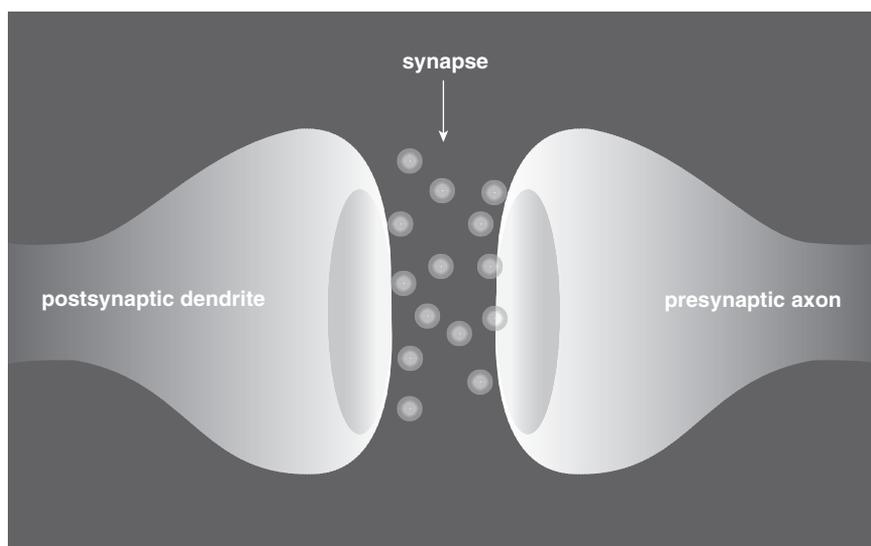
Underenthusiasm for the neuroscientific revolution is as unwarranted and as harmful as overenthusiasm. The fact is that many of the findings from neuroscience are indeed worthy of enthusiasm, and I want to illustrate this with the briefest sketch of thinking about the development of the brain itself. On the question of underenthusiasm, let's acknowledge that in the nature versus nurture debate (just mentioned), some individuals have already decided which of the two positions they favor. For example, there are studies that measure the extent to which mental health professionals assign etiological responsibility (for emotional and behavioral disorders) to parents (Johnson et al., 2000; Rubin, Cardenas, Warren, Pike, & Wambach, 1998). Many professionals still favor the nurture side of the dichotomy, which influences their work with clients and their families. For example, although we now know that the pleasure circuit in the brain (the mesolimbic dopamine pathway) and genetic

inheritance play a major role in the development of drug dependencies, some human service professionals continue to blame the drug-dependent individual for their illness. I take this to be a manifestation of underenthusiasm for the findings of the brain sciences.

As an example of neuroscientific knowledge worthy of enthusiasm, turn to a sketch (though leaving out a mass of details) of the development of the brain. Research from the neurosciences helps us to appreciate that the brain is an organ that continually grows. Until recently, the brain was conceptualized as being static once it reached maturity. This led to pessimism related to brain defects and damage. However, as a result of the neuroscience research of the past 25 years (and as mentioned earlier), we now know more about the brain's plasticity (i.e., ability to change based on experience) and that it continues to grow and develop (and decline) throughout the life course. This is important for social workers to know because it brings more realistic understanding of the results of various brain insults, an appreciation for rehabilitation efforts, and understanding about what the brain needs at various times to develop in a healthy manner. For example, there have been major changes in the way stroke victims can be rehabilitated. In the past, a 75-year-old person who had a stroke that affected the language center of the brain might be left untreated poststroke (based on ageism and the faulty belief that after early adulthood, the brain no longer can grow). Nowadays, such a person is offered aggressive remedial physical therapy, which can improve language capacity.

The brain develops in a hierarchical fashion, beginning with the more primitive regions (brainstem and diencephalon) during gestation and progressing to the more complex limbic and cortical areas during childhood. Within the first trimester after conception, the DNA, which is encoded within each cell, transmits the message for some cells to become neurons. These neurons begin to form axons and dendrites; they migrate to the appropriate neural tube location, which eventually becomes the brain, and they develop connections with each other. The actual connecting points are called synapses, and these continue to form during fetal life, a process called synaptogenesis. Also during this time, neurotransmitters such as dopamine, serotonin, and norepinephrine are manufactured, and these chemical messengers enhance communication between neurons (see Figure 3.1). By 6 months of gestational age, the traditional wisdom is that the central nervous system of the fetus has attained its total number of neurons (Shonkoff & Meisels, 2000), though the process of differentiation continues.

Each person's genetic makeup provides a template for future growth; as noted in chapter 1, there are approximately 30,000 human genes, and one third are expressed in the brain. As the brain grows, it proceeds through critical periods of development (when a specific brain region is organizing and requires a specific experience at that exact time) and through sensitive periods (when



**Figure 3.1** Neurons Firing

certain experiences are most sensitive for the brain). During the last trimester of prenatal development, a major growth spurt occurs in brain tissue. This is considered to be a critical period in brain development, and at this time, it is especially important for the fetus to receive an adequate intake of protein and calories. If not, it is reported that the number of brain cells can be reduced by as much as 40%.

At birth, the human infant's brain weighs only 25% of its full adult weight. By the age of 2 years, the brain has reached 75% of its final weight (Davies, 2004). This huge growth spurt during the first 2 years of life represents increasing complexity of the central nervous system (brain and spinal cord), which is accompanied by increasing amounts of synaptogenesis and myelination of axons (the myelin sheath insulates the axon and allows for electrical signals to travel about 100 times faster). The immediate postnatal period is one of those critical periods for brain development, during which a tremendous amount of linking and wiring occurs between brain systems. For example, at birth, the brainstem (which regulates heart rate, blood pressure, and breathing) needs to be functioning for the infant to survive. Postnatally, this system begins a process of linking with the frontal cortex (where cognitive and executive functions develop) and the limbic system (the seat of attachment, affect regulation, and emotion).

At 3 months of age, more brain regions become active, and the infant can now track visually and reach for and grab objects nearby. At 8 months of age, the frontal cortex has become active and allows the infant to think about danger. This is represented by the “stranger anxiety,” which occurs among children in all cultures. At about 12 months of age, the young child is able to walk, which is a direct result of the myelination of spinal cord nerve pathways. This is a good exemplar for how knowledge about brain development is crucial for parents and other caretakers. No matter how much prodding we might do, the child is unable to walk until certain physiological processes have developed.

During this first year of life, and as discussed in chapter 4, it is reported that an important aspect of brain development is the quality of interactions between the child and the caregiver. When the interactions are mainly positive, the neural circuits involved become associated with positive affective quality. But when child–caregiver interactions are negative, the neural circuits become charged with negative affects (Shapiro & Applegate, 2000). Again, we can see how an underenthusiasm for the contributions of brain science impacts our understanding of the quality of neural circuits that develop and the ensuing quality of interpersonal relationships. This may provide an explanation for what happens to some persons who seem destined to have more negative than positive interactions with other people.

A crucial consideration is that all of the brain systems develop and store information in what is referred to as a “use-dependent” manner. In other words, neurons and synapses that are stimulated grow thicker dendrites and spines, and that strengthens the neuronal connections that are used. Synapses are created based on repetition of actions, thoughts, and behaviors (Perry, 2000). At the same time, synapses that are not used are “pruned away”—the “use it or lose it” principle. These processes are shaped by one’s genetic encoding in interaction with experience, which determines how neurons are to grow, make connections, and die (Siegel, 1999).

These are examples of the brain’s plasticity, especially active in the early years but continuing throughout life. The brain’s receptivity to environmental influences (plasticity) makes it open to the joys of positive stimuli. Unfortunately, it also makes it vulnerable to negative stimuli such as neglect, abuse, trauma, and malnutrition (Davies, 2004). This is discussed further in chapter 5.

Recognizing such contributions from neuroscience, isn’t there sufficient reason for social workers and others to be justifiably enthused about the research that brings such knowledge? We have argued here that an all-out embracing of recent neuroscience findings, or a total lack of appreciation for such findings, will impair progress in achieving new understandings and solutions to the challenges of human behavior.

## The Model

A transactional model (Farmer, 1999) can provide a conceptual map for understanding and for applying human behavior knowledge, including neuroscientific data, for the benefit of our clients. The model provides an approach for understanding the dynamic interrelationships between the biological, the psychological, the social, the spiritual, and the challenge in living. This section describes each component or each *holon* (a term described later), and it discusses how they interact with each other to provide the necessary assessment data that is required in day-to-day practice situations.

### Components

Four components make up the model. The biological domain includes what we have discussed as neuroscience; it includes genetic processes, the brain and spinal cord (Central Nervous System), and other biological systems of the body (e.g., the endocrine, digestive, respiratory, cardiovascular, and immune systems). The psychological domain consists of behavior and mental processes that involve cognition, emotion, and motivation. This includes intrapsychic processes, cognitive processes, defense mechanisms, and coping strategies. The social domain refers to interpersonal and family relationships, societal processes, and political and cultural issues and events (e.g., cultural or ethnic identity). The spiritual domain involves belief behaviors and patterns that are used to understand life's meaning, purpose, and one's connection to others and the world. These beliefs can be used in the service of coping and adaptation (Sermabeikian, 1994).

Two caveats should be noted. One is about spirituality. The role of religion and spirituality in social work remains controversial, as it is tainted by the pre-professional era of social work when religion was very much in the forefront. With social work's increasing professionalization, we have attempted to relegate spiritual influences to the background. However, it is clear that the clients of social workers often seek help for problems that involve their religious or spiritual beliefs. And even if it is not immediately obvious, many persons have a spiritual identity that is important to them and should not be ignored or overlooked. In doing an assessment, it is a good idea to be open to spiritual aspects and the role that they may play in the person's adaptation to their world and ability to cope with it. Note that spiritual in the transactional model is not the same as religion; however, it does not exclude the religious. It could be that a better term might be the sublime or the poetic; but spiritual is perhaps more easily understood. We also suppose that the spiritual domain may not always be a factor that guides or drives behavior. In contrast, the biological, psychological, and social domains are prominently evident in human transactions and behavior.

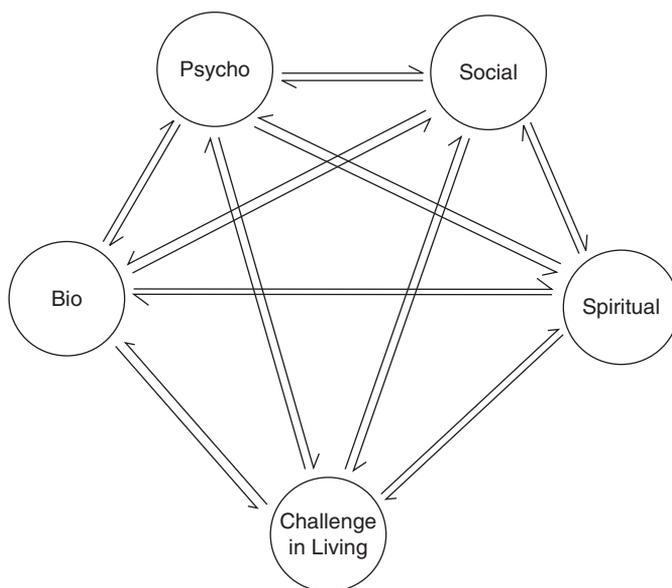
The second caveat is about the number of components. The number of components—biological, psychological, social, spiritual, and challenge in living—could be extended. Some might wish to include the ethical as an additional component for instance, rather than including it under spiritual. The intent of the transactional model is not to limit the perspectives but to capture the diversity of approaches in understanding and helping human beings.

The *challenge in living component* refers to the client's reason for seeking the helping professional or human service agency. The challenge is understood as broader than a presenting problem, and it includes what is known about the challenge and the client's experience of it. It can be understood as a perception of a real-world situation that has biological, psychological, social, and spiritual components. The challenge in living is not necessarily a diagnosis of a physical or mental condition, and it could also be applied to a group of persons. For example, coping with heart disease would be a challenge in living that is experienced by many people. The category of *challenge in living* provides the practitioner with a way to conceptualize something that challenges a person, group, or community, but which is not necessarily a specific mental health term or category.

Such challenge-in-living situations can be conceptualized narrowly or broadly, and the human service professional should use a broad conceptualization to address all the components of the model. This can be illustrated by considering any challenge in living with demographic characteristics such as gender, race, ethnicity, and class. A challenge in living, such as women's problems with substance abuse, could be perceived narrowly as involving only the biological (metabolic differences). Perceived more broadly, such challenges could involve varying degrees of the four aspects: biological, psychological (e.g., rationale for substance abuse among women), social (e.g., loss of appropriate treatment programs for women, especially those who belong to minority cultures or ethnic groups), and spiritual (e.g., effects on spiritual wholeness resulting from the oppression of women over many millennia). In such a broader conception of a challenge, a delimiting demographic would not have an orthogonal location as only one aspect. Rather, it would involve multiple and (as discussed below) simultaneous characteristics and roles in various locations of the model.

## Interactions

The transactional model depicts the relationship between the model's five components (see Figure 3.2) in terms of a circular cause-effect-cause perspective, rather than a linear stimulus-response perspective. General systems theory (Seeman, 1989); the ecological model (Germain, 1978); the person-in-environment perspective (Saleebey, 1992); and the concepts of stress, coping,



**Figure 3.2** Transactional Model for Understanding Neuroscientific Data

and adaptation (Aldwin, 1994) lend theoretical foundations (indicated below) to the model.

The way in which the arrows in Figure 3.2 connect each component (domain) is done to make two main points. First, the simultaneous, interactive interrelationships between the five elements inevitably result in a continual reshifting of the boundaries between the elements. Consider the challenge in living as exemplified by heart disease. As the biological aspects of the illness progress, a person might become psychologically more despondent. This increased despondency may adversely affect significant others in the person's environment (social relationships) so that they also become more pessimistic. The significant others' attitudes may change the psychological boundary by making the patient feel even greater despair. Alternatively, the psychological boundary will shift in the other direction if significant others refuse to feel pessimistic, bolstering the patient with any newly prescribed medicine and making a positive difference in the disease process (spiritual dimension).

Second, moving to a transactional way of thinking from a reductionist or interactionist perspective reflects a paradigmatic change in our way of thinking about health and illness. Aldwin (1994) distinguishes between physiological reductionism, interactionism (where entities interact with each other with

no resultant change), and transactionism. Reductionism would show one set of entities being reduced to, or explained in terms of, another. For example, any one or more of the five aspects could be reduced to the physiological or biological aspect. An example of such reductionism is the disease model of illness, which conceptualizes an illness as resulting only from an external agent like a virus or from faulty genes. The transactional model's nonlinearity and dual-direction arrows are intended to rule out this reductionist stance. Interactionism would show several entities interacting and affecting each other but remaining unchanged by the interaction. The paradigmatic shift of the model occurs by drawing attention to the intimate and important involvement of the social, biological, psychological, and spiritual components, especially how they influence each other and evolve as a result. Seeing the domains as evolving as a result of their transactions with each other leads to a truly transactional stance.

Each component of the transactional model is described as a holon, which reflects the idea that each entity or system (i.e., bio-psycho-socio-spiritual challenge in living) is simultaneously a part and a whole (Anderson & Carter, 1984). Each entity faces two directions at once: related inward toward its own parts and outward to the system of which it is a part. For example, looking at the bio system as a holon, we can see that the biological can be a whole entity unto itself. In fact, some with a biological perspective would view human behavior only from this vantage point. But to give the biological system real meaning for use in practice, it should be seen as one part of the total picture. Behavior is not determined by one holon but by the interaction and mutual causation of all the systems and subsystems. So the bio is also part of the psychological, social, and spiritual domains.

Let's consider how we might use the transactional model in our practice. An example of a challenge in living (how the helping professional becomes involved) could be represented by an adolescent male who has recently immigrated to the United States from Central America and is becoming involved in a Latino gang. Rather than seeing his recent emigration as the sole stimulus for his response of getting into trouble via gang membership, the transactional model enables the practitioner to examine the following: (a) the mutual and interacting interrelationships between emigration that affect his sense of self (psychological factor), (b) his intense relations with other gang members from his country of origin (sociocultural factor), (c) the antisocial behavior of gang criminality (possibly a learned behavior), and (d) changing hormone levels in his developing body (biological factor). Each of these factors is unique but contributes to the situation at hand, and each must be addressed by the practitioner, while keeping in mind that all elements are not necessarily equal. For instance, in this example, the effects of emigration on a young boy's developing sense of self (psychological domain) and his very close relationships with other gang members who are from his same country or neighborhood of origin (social factor) are likely to weigh more heavily than the other relevant

factors. As we use our understanding of an open system, we can see that all the component parts of this young man's situation are in dynamic interaction with each other. And the resolution or management of this challenge will require attention to these transactions, encouraging the practitioner to search for the varying degrees of biological, psychological, social, and spiritual components in the proposed solution.

Another example is a client who complains of depression and "not being able to accomplish anything." As we gather data about this person in the situation, we find that one's spiritual sense of life and the world has an impact on the depressed mood. Based on this spiritual aspect, the person experiencing depression will respond to social events in a particular way. One's cultural identification may also influence such response. At the same time, the biological aspects of depression (e.g., insufficient amount of serotonin in the brain) could affect the psychological and mental processes such as thinking. These processes might also have an effect on the spiritual life of the person. As a result of looking at the transactions among and between these four variables, we arrive at a more complex—and more helpful—understanding of this person who is experiencing depression. The transactions among the variables will point us in the direction of what needs to be done to improve this person's overall life situation.

Because the transactional model encourages social workers to perceive challenges in living broadly in a context that has bio-psycho-social-spiritual components, one might expect that I am saying that the solution set of problem-solving activities also has the same components. No, the transactional model does not preclude the model user from focusing on particular components of the challenge of living (e.g., on the biological). However, the model does encourage the user to recognize the limits of a single-component approach. It encourages the user to conceptualize the challenges and the solution responses as a simultaneous and interactive series of exchanges. As challenge and solution response mutually affect one another, it suggests an ongoing interactive series or dance.

One more example may demonstrate how the transactional model can be used in clinical practice and how all of the elements of the model do not need to contribute equally to the situation or its resolution. We start with a challenge in living (in this case, an inability to support oneself and to live independently as an adult). This challenge is presented to a case manager who works at a community services board in a medium-size city. After an initial interview, it becomes clear that the 45-year-old male client has been homeless or near-homeless for several months since his mother kicked him out of her home due to his drug use. During the interview, the case manager begins to suspect some kind of mental illness, as the client has great difficulty telling his story and explaining why he is in need of housing, food, and clothing. His vagueness, irritability, and apparent response to voices which the case manager does not hear lead to an initial diagnostic impression of a psychotic disorder. Once

previous records are accessed, it is determined that this client has a history with the community services board and has been known by staff there for at least 5 years. How shall the case manager and client dyad proceed?

Refer to Figure 3.2, the *Transactional Model*, which depicts the various domains that need to be addressed to work with this client and help him address his very dire situation. Knowing that this client has a serious and persistent mental illness (probably one of the schizophrenias), the biological domain takes precedence. Based on research findings, the case manager assumes that there is some brain involvement in the client's illness, though the exact brain impairment is unknown. One of the immediate treatment goals would be to assist the client in meeting with a psychiatrist to evaluate the need for psychotropic medication. Again, we know that in some cases, hallucinations and cognitive impairment can be helped by antipsychotic medication. If the client is willing to take prescribed medication, this would have an impact on the other domains. For example, if an antipsychotic was taken, the client's irritability and judgment might be improved, which would enhance his ability to relate to other people and participate in his own treatment. The client's alleged drug use needs to be addressed and can be understood as a biological problem and a social issue. This might entail long-term treatment and include detoxification and/or referral to a Twelve-Step Program. Or perhaps the drug use was a result of lack of treatment for a chronic mental illness, and once the illness is treated, the other substances are not necessary. At this point, it is not known why the client was using street drugs (perhaps to self-medicate his psychotic symptoms; perhaps to fit in with others), but his use created serious problems in the relationship with his mother. Another treatment goal will be to contact the mother to determine what level of social support she (and perhaps other family members) can provide. So the social aspects might be second in the hierarchy of issues to address. Lack of housing and income also need to be addressed immediately (also at the top of the hierarchy) because these are presenting problems; but again, they are intricately related to the biological domain. Until the major mental illness is treated, only bandages can be applied to temporarily fix the housing and income crises.

The psychological domain also comes into play here as we try to assess the role that stress has played in the current situation. Being kicked out of his mother's house would no doubt be quite stressful, and then there is the recent stress of living on the streets and looking for food at homeless shelters and other feeding sites. All of this has contributed to greatly lowered self-esteem. From the initial information gathered by the case manager, there are no data to be placed in the spiritual component. However, this could change at any time and as further information is elicited from this client. By using the transactional model to help us conceptualize this person in his situation, we can see how, when psychotic symptoms are medicated, the client's judgment and his relationship with his mother can improve. Improved judgment makes it more possible for him to accept temporary housing in a shelter and begin the process

of applying for Supplemental Security Income based on his disability. So the challenge in living becomes less of a crisis as the biological domain changes and as the social domain is enhanced. If the client's relationship with family members is positively changed as a result of improved mental functioning, the psychological component also is changed. This is of course a very optimistic picture, and in reality, it is quite possible that the client will be unable to follow through with adherence to medications; as a result, he might remain homeless, without funds, and alienated from his mother and family. In this situation, it would seem that the biological is clearly at the top of the hierarchy and is the first component that needs changing, due to the nature of schizophrenia.

Let's now turn to neuroscience and attaching and bonding.