

## **Change Your Brain, Change Your Life**

### **The Breakthrough Program for Conquering Anxiety, Depression, Obsessiveness, Anger, and Impulsiveness**

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#### ***Introduction to the Paperback Edition***

Since *Change Your Brain, Change Your Life* was first published in January 1999, my clinic, the Amen Clinic for Behavioral Medicine, has had an overwhelming response from people in the USA, Canada, and even Europe. We have seen adults, teenagers, and children as young as three years old who suffered with depression, anxiety problems, aggression, attention deficit disorder, bipolar disorder, obsessive-compulsive disorder, and post-traumatic stress disorder. Using the new imaging technology, these patients and their families were able to "see" the underlying brain problems that were driving their emotional and behavioral symptoms. Rather than blame themselves for having a weak character or a "mental illness", they were able to more clearly understand the origins of their struggles and get the right help with more targeted, more effective treatment.

All of us at the clinic have been so incredibly gratified to find that the book has had such a positive impact on people's lives. Three experiences from our clinic highlight how helpful this book has already been to many, many people, and how it might help you as well.

In early February 1999, I was sitting at my imaging computer screen reading brain scans when Dr George Lewis, one of the psychiatrists in my clinic, brought in a patient who had flown in from the Midwest to meet me. The man, in his late fifties, introduced himself to me with tears in his eyes. On January 14, he'd decided to kill himself. He'd been feeling very depressed, unable to get along with anyone, and hobbled by a terrible temper. And he had no hope that things would change, despite seeing a psychiatrist and taking medication. He was lying in bed contemplating the best way to commit suicide when by coincidence his girlfriend turned on the *Today* show while I happened to be on, discussing my book. He watched me explain the brain scans of a person diagnosed with depression and anger. He heard me say that there was hope for people who suffered from these problems, that many "psychological problems" are in reality brain problems, and that through new imaging techniques we can see many of them and create more targeted and effective treatments. This patient went out and bought the book, did the checklists, and discovered that he probably had a left temporal lobe problem (which is where his anger came from), a deep limbic system problem (causing his depression), and a prefrontal cortex problem (which gave him attentional and impulse control problems).

He decided to come to my clinic on his own. As part of our evaluation we ordered a brain SPECT study. He had predicted his own scan perfectly. He had very poor activity in his left temporal lobe, too much activity in his deep limbic system, and poor prefrontal cortex activity. We often see this scan in patients who have clinical symptoms of depression, anger,

suicidal behavior, and attentional problems. Dr Lewis put him on a combination of medications and followed him closely over the telephone. Within three weeks, this man had dramatically improved. He no longer had suicidal thoughts, his mood was more positive, and his mind felt sharper and more focused. He told Dr Lewis that we had saved his life.

In early March we heard from an Israeli woman who had bought the book in the USA while on holiday. She'd suffered her whole life from angry outbursts, cyclic depression, and attention problems. After reading the book and completing the checklists, she predicted she had a left temporal lobe problem, a limbic problem, and a prefrontal cortex problem. Doctors in Israel had told her to get counseling, and she'd already spent vast amounts of money with no benefit. She came to our clinic and saw Dr Brian Goldman, who ordered a SPECT study to evaluate her brain function. Her scan was very close to what she predicted. Dr Goldman started her on a medication regimen, along with other brain-based strategies described in this book. He then communicated with her regularly on the telephone and through e-mail. Within weeks, she reported feeling calmer, in better control of her temper, and more focused. All the counseling in the world would do her little good until her brain worked right.

Several months later I was lecturing at a teachers conference in the Northwest. A woman came up to me after one of my sessions and told me how much she'd enjoyed my book. She said that before she'd read it, she hadn't really believed in mental illness. She thought that people who suffered from depression, anxiety, or obsession were just weak-willed. The book allowed her to see people who suffer from these problems in a different light. Shortly after she finished the book, her daughter called home from college. The daughter said that she was feeling depressed and had suicidal thoughts. Before she had read the book, the mother told me, she would have told her daughter to snap out of it, to go to church and pray harder. Having read the book, she suspected that her daughter had a cingulate problem and helped her find a physician to evaluate her. Her daughter was diagnosed with obsessive-compulsive disorder, placed on medication, and made "a 180 degree" improvement. The mother told me she was grateful for the new information that helped her daughter heal and kept her from being mistreated out of ignorance.

When I first started talking about our brain imaging work in scientific circles, we were severely criticized by many people. "What do you mean, you can see mental illness? You must be crazy if you think that a functional brain imaging study has anything to say about family dynamics!" Yet, the critics are being quieted. What I talk about in this book works. In 1998 I published five peer-reviewed professional medical articles on brain SPECT imaging in psychiatry. I was honored by being asked to coauthor the chapter on functional brain imaging in the *Comprehensive Textbook of Psychiatry*, one of the most respected psychiatric texts in the world. In the spring of 1999, I was invited by the nuclear medicine community to give lectures at their meetings. I felt very honored when Dr Dennis Patton, the historian for the Society of Nuclear Medicine, introduced me at one of these meetings by saying that I was a pioneer in the brain imaging field and people would read my work for years to come.

There is no question in my mind that the most gratifying part of our research and clinical work is seeing people become more effective, more loving, and more capable by gaining more access to their own brain function. Many people have called our work cutting edge. We have affectionally said to ourselves that we were "bleeding on the cutting edge." I'm

deeply grateful for the increasing recognition of our work and I hope it continues to help others.

## Introduction

Your brain is the hardware of your soul. It is the hardware of your very essence as a human being. You cannot be who you really want to be unless your brain works right. How your brain works determines how happy you are, how effective you feel, and how well you interact with others. Your brain patterns help you (or hurt you) with your marriage, parenting skills, work, and religious beliefs, along with your experiences of pleasure and pain. If you are anxious, depressed, obsessive-compulsive, prone to anger, or easily distracted, you probably believe these problems are "all in your head". In other words, you believe your problem is purely psychological. However, research that I and others have done shows that the problems are related to the physiology of the brain - and the good news is that we have *proof* that you can change that physiology. You can fix what's wrong for *many* problems.

Until very recently, scientists could only speculate about the brain's role in our personality and decision-making skills. We did not have advanced tools to look at the functioning of the brain and thus made any false assumptions about its impact on our lives. With the advent of sophisticated brain-imaging techniques, we are not answering questions about the brain's role in behavior at a phenomenal pace, questions that have practical applicability to your life, from relationships at home and at work to understanding what makes you a unique being.

I have been involved in brain-imaging research for the past ten years. I first began studying the brain with sophisticated quantitative EEG (brain wave) studies, and in the last eight years I've used a nuclear medicine brain study called SPECT (single photon emission computed tomography), which measures cerebral blood flow and metabolic activity patterns. These last ten years have been both exhilarating and frustrating. They have been exhilarating because through these studies we now have visual evidence of brain patterns that correlate with behavior, such as tendencies towards depression, anxiety, distractibility, obsessiveness, and violence. This physical evidence of phenomena mostly thought of as a purely "psychological" in origin has revolutionized the way others and I practice psychiatric medicine. We can now show patients and their families the physical "brain" evidence of problems, helping them to be more accepting and compliant with treatment. We have more information to make more effective treatment decisions with complex cases than ever before. And we use the information from this research to educate the public on the effects of drug abuse, head injuries, and even "negative thinking" on the brain. This has been truly an amazing time.

It has also been a frustrating time because dissemination of these new insights has been slower than I would like. There is natural resistance in the scientific community to dramatic shifts in thinking. Once a scientist uncovers new information, it needs to go through a peer review process that can take years. I'm pleased that the brain-imaging work I and others have pioneered is continuing to gain acceptance from the medical and scientific community. In the meantime, the knowledge gained from this research is helping people across North America. It can help you too.

## Seeing Is Believing

I was not a brain-imaging researcher by design. After medical school at Oral Roberts University in Tulsa, Oklahoma, I did my psychiatric internship and residency at Walter Reed Army Medical Center in Washington, DC. I always believed that there was a strong connection between spiritual health and mental health. Nothing in my training dissuaded me from that idea, but little did I know that the connection could go both ways. I then did a fellowship in child and adolescent psychiatry in Honolulu, Hawaii, where I learned how stressful early beginnings could set up lifelong problems. In Hawaii I began to write about applying mental health principles to everyday life (in relationships, at work, and within ourselves). I wanted to teach large groups of people how to be more effective day to day. On the basis of my work, I was selected as a fellow in the prestigious Group for Advancement of Psychiatry and received a research award from the American Psychiatric Association.

In 1986, I wrote a program titled *Breaking Through: How to Be Effective Every Single Day of Your Life*, about identifying and overcoming behaviors that hold people back from success. The program has been extremely helpful for thousands of readers, yet many people needed more. As I worked with groups across the country and patients in my practice, using the principles in the program, many would experience very positive changes (within themselves, their relationships, and their work), but others didn't seem to get the help they needed. These "resistant" cases were very frustrating to me. I continually asked myself, what was the difference between the people who benefited from the program and those who didn't? Were some people ready to change and others not? Were some people just resistant to change because of deep-rooted psychological reasons? Was the program good for only certain personality types and not others? I searched for answers. When the answer hit me, the course I had set for my life changed.

In 1990, I was working in a psychiatric hospital in Fairfield, California (forty miles northeast of San Francisco). I was the director of the dual-diagnosis treatment unit (caring for people with both substance abuse and psychiatric problems) and saw other patients as well. One day at ground rounds, I heard Dr Jack Paldi, a local nuclear medicine physician, give a lecture on brain SPECT imaging. SPECT studies are nuclear medicine studies that measure blood flow and activity levels in the brain. Dr Paldi showed "functional" brain images of people who had problems with dementia, depression, schizophrenia, and head injuries and compared them with the images of normal brains. I wondered if the brain were the missing piece of the puzzle in my resistant patients. Perhaps, I hypothesized, the people who were struggling had brains that could not "run" the new programs I was trying to give them, much like a computer cannot run sophisticated software unless it has enough speed and memory. One of the things that amazed me about Dr Paldi's lecture was that he showed brain images before and after treatment. Treatment with medication actually changed the physical functioning of the brain! I wanted to know more.

The same week Dr Paldi gave the lecture, Alan Zametkin, MD, from the National Institutes of Health published an article in the *New England Journal of Medicine* on the use of PET (positron emission tomography) studies, in adults with attention deficit disorder (ADD). Since ADD was one of my specialties, the article really caught my interest. Dr Zametkin demonstrated that when adults with ADD try to concentrate, there is decreased activity in the prefrontal cortex, rather than the expected increase seen in normal "control"

adults. Here was physical evidence of a problem many people thought was psychological! A third event that week helped me integrate what I'd learned: I met Sally.

Sally, a forty-year-old woman, had been hospitalized under my care for depression, anxiety, and suicidal ideas. In my clinical interview with her, I discovered that she had many adult ADD symptoms (such as a short attention span, distractibility, disorganization, and restlessness). She had a son with ADD (a frequent tip to diagnosing ADD in adults). Despite her IQ of 140, she had never finished college, and she was employed below her ability as a laboratory technician. I decided to order a SPECT study on Sally. Sally's studies were abnormal. At rest, she had good overall brain activity, especially in the prefrontal cortex. But when she was asked to perform math problems (an exercise to challenge her ability to concentrate), she had marked decreased activity across her whole brain, especially in the prefrontal cortex! With that information, I placed her on a low dose of Ritalin (methylphenidate), a brain stimulant used to treat ADD in children and adults. She had a wonderful response. Her mood was better, she was less anxious, and she could concentrate for longer periods of time. She eventually went back to school and finished her degree. No longer did she think of herself as an underachiever, but rather as someone who needs treatment for a medical problem. Seeing the SPECT pictures was very powerful for Sally. She said, "Having ADD is not my fault. It's a medical problem, just like someone who needs glasses". Sally's experience led me to believe that SPECT might have a powerful application in decreasing the stigma many patients feel when they are diagnosed with emotional, learning, or behavior problems. Sally could see that the problem wasn't "all in her head". The scan and her response to medication changed her whole perception of herself.

With Sally's enthusiasm and positive response to treatment fresh in my mind, I ordered more SPECT studies on my most resistant patients. Many patients, previously "treatment failures", began to get better when I identified through SPECT the part of their brain that wasn't working and targeted treatment to that area. After that series of events in 1990, my colleagues and I began to do clinical research with SPECT on a wide variety of patients. Our research confirmed the work of others and expanded the body of knowledge in new directions, especially in the areas of violence, obsessiveness, and "difficult personality temperaments".

In doing this research, I have seen with my own eyes the brain SPECT patterns that show abnormalities that interfere with behavior. These brain abnormalities sabotage my patients' efforts to improve their lives and send interrupt signals to the changes they try to make. *I have seen how correcting (normalizing) abnormal brain function can change people's lives, even their very souls.* Person after person who had previously been a treatment failure began to improve through prescriptions targeted at optimizing the brain's physical functioning. This was such a simple concept: *When your brain works right, so can you. When your brain doesn't work right, neither can you.* The implication was profound: Various parts of the brain influence our behavior. Using SPECT studies, I was more effective at pin-pointing trouble spots and providing more appropriate interventions. Seeing these scans caused me to challenge many of my basic beliefs about people, character, free will, and good and evil that had been ingrained in me as a Catholic schoolboy.

When the physical functioning of the brain was optimized through the use of medications, nutrition, and targeted psychological exercises, people who had previously been

unable to change developed a capacity for new skills and behaviors. They developed more access to productive brain activity and more ability to make changes (even though they had always had the will to change). A major shift occurred in my thinking, uncovering new possibilities for the patients who had been "left behind".

Over the next eight years, I conducted more than five thousand brain studies. The lessons from the brain taught me that without optimal brain function, it is hard to be successful in any aspect of life, whether it is in relationships, work, schooling, feelings about yourself, or even your feelings about God - no matter how hard you try. Indeed, the first step to being successful is to understand and optimize the working patterns of the brain. By enhancing the physical functioning of the brain I also enhance my patients' potential for success in every area of their lives. First, optimize the hardware and circuitry of the brain; then put in new programs. The brain-imaging work provided insights that have revolutionized the way I understand and treat patients. These insights are the foundation of this book.

I am one of only a handful of psychiatrists in the world who are licensed in nuclear brain imaging. Currently, I am the medical director of a large neuropsychiatric clinic in northern California, forty miles northeast of San Francisco. My clinic sees approximately eight hundred patients a month for evaluation and treatment. We see patients from around the globe, and we are recognized as experts in the fields of attention deficit disorder, learning disabilities, head trauma, violence, and obsessive-compulsive disorder. Even though I am a rarity among psychiatrists, I believe what I do will be more commonplace in the years to come. It is just too helpful and too exciting to be confined to only a few clinics.

### **Focus of the Book**

The purpose of this book is to explain how the brain works, what happens when things go wrong, and how to optimize brain function. You will be introduced to five of the brain systems that are most intimately involved with our behavior and make up much of what is uniquely human.

You'll learn that the **deep limbic system**, at the center of the brain, is the bonding and mood control center. Being connected to others is essential to humanity, yet when this part of the brain is off kilter, people struggle with moodiness and negativity. You'll learn how certain smells and clear thinking soothe the activity in this part of the brain, and why spending time with positive people is essential to deep limbic health.

The **basal ganglia**, large structures deep within the brain, control the body's idling speed. When this part of the brain works too hard, anxiety, panic, fearfulness, and conflict avoidance are often the result. As I describe in the book, I inherited overactive basal ganglia, which leave me vulnerable to anxiety and nervousness. I know personally that anxiety is no fun and will give you plenty of ideas on how to settle down this part of the brain. When it is underactive, people often struggle with concentration and fine motor control problems.

The **prefrontal cortex**, at the front tip of the brain, is your supervisor, the part of the brain that helps you stay focused, make plans, control impulses, and make good (or bad) decisions. When this part of the brain is underactive, people have problems supervising themselves and also have significant problems with attention span, focus, organization, and

follow-through. Learning how to activate the prefrontal cortex in a positive way leads to better internal supervision.

The **cingulate** (pronounced *sing-u-lat*), a part of the brain that runs longitudinally through the middle part of the frontal lobes, is the part of the brain I call your "gear shifter". It allows you to shift attention from thought to thought and between behaviors. When this part of the brain is overactive, people have problems getting stuck in certain loops of thoughts or behaviors. Understanding its function will help you deal with repetitive worries. Dealing with worry, rigidity, and "overfocused" behavior in yourself or others will be easier after reading this book.

Lastly, the **temporal lobes**, underneath the temples and behind the eyes, are involved with memory, understanding language, facial recognition, and temper control. When there are problems, especially in the left temporal lobe, people are more prone to temper flare-ups, rapid mood shifts, and memory and learning problems. Optimizing this part of the brain may help you experience inner peace for the first time in your life.

It is important to note that none of these brain systems exists in a vacuum. They are intricately interconnected. Whenever you affect one system, you're likely to affect the others as well. Also, some brain researchers would separate the systems differently than I lay them out in this book, placing the cingulate system and deep temporal lobes within the limbic system. I am presenting the system we use in my clinic, which has worked so well for our patients.

Presenting and defining these five terms - prefrontal cortex, cingulate system, deep limbic system, basal ganglia, and temporal lobes - is about as technical as the book gets. Mastering these systems will give you a whole new view about why you do what you do and what you can do about it.

After I describe each brain system, I'll offer targeted behavioral, cognitive, medicinal, and nutritional prescriptions to optimize its function. These prescriptions are practical, simple, and effective. They are based on my experience with more than sixty thousand patient visits to my clinic over the past ten years, as well as the experiences and research of my colleagues.

Some people might wonder if readers should be the ones identifying and changing brain problems. My answer is an emphatic yes! I believe it benefits almost everyone to know as much about how his or her own brain works as possible. Most of the problems discussed in this book, such as moodiness, anxiety, irritability, inflexibility, and worrying, are faced by large numbers of the population. Most do not require professional help, but rather effective, brain-based prescriptions to optimize the brain's effectiveness. Since the brain controls our behavior, optimizing its function can help nearly anyone's ability to be more effective in life.

This book will also make it clear that if your ability to function in everyday life is significantly impaired (at school, at work, or in relationships), it is important to seek appropriate help from a competent professional. Letting problems fester untreated can ruin a life. But given the fact that there are over 250 different kinds of psychological therapies available in the USA, seeking the right help can be complicated and downright confusing. In

this book I will provide guidance and resources on how to seek appropriate help when it's needed.

Researching the brain has been my greatest personal challenge. In 1993, when I first started to talk at medical meetings about the discoveries we were making at our clinic, some colleagues severely criticized us, saying we could not infer behavioral patterns from brain patterns. Their lack of enthusiasm over this exciting technology bothered me, but it did not dissuade me from work. What I was seeing in the brain was real and changed the lives of many patients. But I did not like the adversarial environment of those meetings and decided to keep a low profile, expecting others would do the research. Then nine-year-old Andrew came into my clinic.

Andrew is a very special child. He is my godson and nephew. Until about a year and a half before he came to my clinic as a patient, he had been happy and active. But then his personality changed. He appeared depressed. He had serious aggressive outbursts and he complained to his mother of suicidal and homicidal thoughts (very abnormal for a nine-year-old). He drew pictures of himself hanging from a tree. He drew pictures of himself shooting other children. When he attacked a little girl on the baseball field for no particular reason, his mother called me late at night in tears. I told Sherrie to bring Andrew to see me the next day. His parents drove straight to my clinic, which was eight hours from their home in Southern California.

As I sat with Andrew's parents and then with Andrew I knew something wasn't right. I had never seen him look as angry or so sad. He had no explanations for his behavior. He did not report any form of abuse. Other children were not bullying him. There was no family history of serious psychiatric illnesses. He had not sustained a recent head injury. Unlike in most clinical situations, I knew firsthand that he had a wonderful family. Andrew's parents were loving, caring, pleasant people. What was the matter?

The vast majority of my psychiatric colleagues would have placed Andrew on some sort of medication and had him see a counselor for psychotherapy. Having performed more than one thousand SPECT studies by that time, I first wanted a picture of Andrew's brain. I wanted to know what we were dealing with. But with the hostility from my colleagues fresh in my mind, I wondered whether Andrew's problem wasn't completely psychological. Perhaps there was a family problem that I just didn't know about. Maybe Andrew was acting out because his older brother was a "perfect" child who did well in school and was very athletic. Maybe Andrew had these thoughts and behaviors to ward off feelings of insecurity related to being the second son in a Lebanese family (I had personal knowledge of this scenario). Maybe Andrew wanted to feel powerful and these behaviors were associated with issues of control. Then logic took over my mind. Nine-year-old children do not normally think about suicide or homicide. I needed to scan his brain. If it was normal, then we would look further for underlying emotional problems.

I went with Andrew to the imaging center and held his hand while he had the study performed. Andrew sat in a chair while the technician placed a small intravenous needle in his arm. Several minutes later a very small dose of a radioisotope was injected through the needle while Andrew played a concentration game on a laptop computer. Shortly thereafter, the needle was taken out of his arm and he went into the imaging room next door. He

climbed onto the SPECT table and lay on his back. The imaging camera took fifteen minutes to rotate slowly around his head. As his brain appeared on the computer screen, I thought there had been a mistake in performing the procedure. Andrew had *no* left temporal lobe! Upon quick examination of the complete study, I realized the quality of the scan was fine. He was indeed missing his left temporal lobe. Did he have a cyst, a tumor, a prior stroke? A part of me felt scared for him as I was looking at the monitor. Another part of me felt relieved that we had some explanation for his aggressive behavior. My research and the research of others had implicated the left temporal lobe in aggression. The next day Andrew had an MRI (an anatomical brain study) which showed a cyst (a fluid-filled sac) about the size of a golf ball occupying the space where his left temporal lobe should have been. I knew the cyst had to be removed. Getting someone to take this seriously proved frustrating, however.

That day I called Andrew's pediatrician and informed him of the clinical situation and brain findings. I told him to find the best person possible to take this thing out of Andrew's head. He contacted three pediatric neurologists. All of them said that Andrew's negative behavior was probably not in any way related to the cyst in his brain and they would not recommend operating on him until he had "real symptoms". When the pediatrician relayed this information, I became furious. *Real symptoms!* I had a child with homicidal and suicidal thoughts who was losing control over his behavior and attacking people. I contacted a pediatric neurologist in San Francisco, who told me the same thing. I then called a friend of mine at Harvard Medical school, also a pediatric neurologist, who told me yet again the same thing. She even used the words "real symptoms". I practically jumped down her throat; how more real could Andrew's symptoms be? "Oh, Dr Amen," the neurologist replied, "when I say 'real symptoms', I mean symptoms like seizures or speech problems." Could the medical profession really not connect the brain to behavior? I was appalled! But I wasn't going to wait until this child killed himself or someone else. I called pediatric neurosurgeon Jorge Lazareff at UCLA and told him about Andrew. He told me that he had operated on three other children with left temporal lobe cysts who had all been aggressive. He wondered if it was related. Thankfully, after evaluating Andrew, he agreed to remove the cyst.

When Andrew woke up from the surgery, he smiled at his mother. It was the first time in a year that he had smiled. His aggressive thoughts were gone, and his temperament changed back to that of the sweet child he had been before the age of seven. Andrew was lucky. He had someone who loved him paying attention to his brain when his behavior was off. With this very personal experience in my heart, I decided that I had to share our SPECT work with a larger audience, no matter how much criticism came my way. There were too many children, teenagers, and adults like Andrew who had clear brain abnormalities whom society was just writing off as bad human beings.

Now, only a few year later, the situation has come full circle. I have presented the information in this book to thousands of medical and mental health professionals across North America: in medical schools, at national medical meetings, and even at the prestigious National Institutes of Health. I have published much of this research in chapters in medical books and in journal articles. In 1996 I was invited to give the State of the Art Lecture in Medicine to the Society of Developmental Pediatrics. Clearly there is much more research to do, but many of my colleagues are beginning to see that this work can change our

understanding of why people do what they do and give guidance for a new way of thinking about and healing people hurting from detectable and correctable brain abnormalities.

This book will teach you that human behavior is more complex than society's damning labels would have us believe. We are far too quick to attribute people's actions to a bad character when the source of their actions may not be their choice at all, but a problem with brain physiology. One teenage boy, for example, who was brought in to see me for both suicidal and violent tendencies, had a temporal lobe problem that responded positively to antiseizure medication. He was not a "bad kid" after all. As he told his mother later, "I always wanted to be polite, but my brain wouldn't let me". How many "bad kids" sitting in juvenile hall would prove to be perfectly nice people with the right treatment? Sometimes people aren't being loving, industrious, cheerful, peaceful, obedient, or kind not because they wouldn't like to be, but because something is wrong with their brain, something that is potentially fixable.

When a person gets treatment that doesn't work, either because the diagnosis is wrong or the operating theory of the therapist is outdated, things get worse. People wonder, "What is wrong with me? Am I not trying hard enough? Am I not good enough? Am I not meant to be happy or well? I am even a failure at getting help for myself". I have found that most people indeed want to be better. When they struggle, it is most often not for a lack of trying, thinking, or motivation. For many people, we as professionals just didn't have the right answers.

Until recently, scientists had no sophisticated tools for evaluating a working brain. Standard brain MRI (magnetic resonance imaging) scans and CAT (computerized axial tomography scans, available since the 1980s, are anatomical studies, and although they can evaluate what a brain looks like physically, they cannot provide information on how well the brain works. EEGs (electroencephalograms) help in some cases by measuring electrical activity in the brain, but this information provides little sophisticated information on the workings of the deep structures in the brain. SPECT studies, on the other hand, show very nicely what happens in various parts of the brain when you try to activate them. With this tool, I and my colleagues around the country have been able to correlate over- and under-functioning of different brain parts with certain abnormal behaviors in patients. Also available at this time are two other sophisticated brain studies that are also very useful for studying brain function, functional MRI (fMRI) and PET (positron emission tomography). Each one has its advantages and disadvantages. At this time, in my opinion, due to cost, ease of use, and availability, SPECT is our diagnostic tool of choice.

It is important to note that having an abnormal SPECT scan is not an excuse for "bad behavior". SPECT adds to our knowledge about and understanding of behavior, but it does not provide all the answers. Many people who have difficulties in their brains never do anything harmful or destructive to others. These scans need to be interpreted in the context of each clinical situation.

Not all scientists will agree with every finding in this book. The information here is based largely on extensive clinical experience and research. The Brain Imaging Division of the Amen Clinic for Behavioral Medicine has done more brain SPECT studies for psychiatric reasons than any other clinic I know of in the world. Experience is one of the best teachers in medicine. Second, I have had the privilege of working closely with a nuclear medicine

physician, Jack Paldi, who has a passion for applying his knowledge to psychiatry. Third, we have had the use of one of the best SPECT cameras available, which provides more and better information than older cameras.

**The purpose of this book is not to encourage readers to go out and get their brains scanned. You don't need a SPECT scan to benefit from this book.** In fact, if you go to a medical center that has little experience with SPECT, the results are not likely to mean much to your doctor. My goal is to help explain a wide variety of human behaviors, both aberrant and normal, by showing the images of the brain that SPECT provides. These images make it plain that many problems long thought of as psychiatric in nature - depression, panic disorders, attention deficit disorders - are actually medical problems that can be treated using a medical model, along with the traditional psychological and sociological models. I hope that by providing new insights into how the brain works, you'll gain a deeper understanding of your own feelings and behavior and the feelings and behaviors of others. And I hope you'll use the specific brain-based "prescriptions" to optimize the patterns in the brain to help you be more effective in your day-to-day life.

## 1

*For Those Who Have Eyes, Let Them See:*

### *Images into the Mind*

What is SPECT? An acronym for *single photon emission computerized tomography*, it is a sophisticated nuclear medicine study that "looks" directly at cerebral blood flow and indirectly at brain activity (or metabolism). In this study, a radioactive isotope (which, as we will see, is akin to myriad beacons of energy or light) is bound to a substance that is readily taken up by the cells in the brain.

A small amount of this compound is injected into the patient's vein, where it runs through the bloodstream and is taken up by certain receptor sites in the brain. The radiation exposure is similar to that of a head CT or an abdominal X ray. The patient then lies on a table for about fifteen minutes while a SPECT "gamma" camera rotates slowly around his head. The camera has special crystals that detect where the compound (signaled by the radioisotope acting like a beacon of light) has gone. A supercomputer then reconstructs off line images of brain activity levels. The elegant brain snapshots that result offer us a sophisticated blood flow/metabolism brain map. With these maps, physicians have been able to identify certain patterns of brain activity that correlate with psychiatric and neurological illnesses.

SPECT studies belong to a branch of medicine called nuclear medicine. Nuclear (refers to the nucleus of an unstable or radioactive atom) medicine uses radioactively tagged compounds (radiopharmaceuticals). The unstable atoms emit gamma rays as they decay, with each gamma ray acting like a beacon of light. Scientists can detect those gamma rays with film or special crystals and can record an accumulation of the number of beacons that have decayed in each area of the brain. These unstable atoms are essentially tracing devices - they track which cells are most active and have the most blood flow and those that are least active

and have the least blood flow. SPECT studies actually show which parts of the brain are activated when we concentrate, laugh, sing, cry, visualize, or perform other functions.

Nuclear medicine studies measure the physiological functioning of the body, and they can be used to diagnose a multitude of medical conditions: heart disease, certain forms of infection, the spread of cancer, and bone and thyroid disease. My own area of expertise in nuclear medicine, the brain, uses SPECT studies to help in the diagnosis of head trauma, dementia, atypical or unresponsive mood disorders, strokes, seizures, the impact of drug abuse on brain function, and atypical or unresponsive aggressive behavior.

During the late '70s and '80s SPECT studies were replaced in many cases by the sophisticated anatomical CAT and later MRI studies. The resolution of those studies was far superior to SPECT's in delineating tumors, cysts, and blood clots. In fact, they nearly eliminated the use of SPECT studies altogether. Yet despite their clarity, CAT scans and MRIs could offer only images of a static brain and its anatomy; they gave little or no information on the activity in a working brain. It was analogous to looking at the parts of a car's engine without being able to turn it on. In the last decade, it has become increasingly recognized that many neurological and psychiatric disorders are not disorders of the brain's anatomy, but problems in how it functions.

Two technological advancements have encouraged the use, once again, of SPECT studies. Initially, the SPECT cameras were single-headed, and they took a long time - up to one hour - to scan a person's brain. People had trouble holding still that long, and the images were fuzzy, hard to read (earning nuclear medicine the nickname "unclear medicine"), and did not give much information about the functioning deep within the brain. Then multiheaded cameras were developed that could image the brain much faster and with enhanced resolution. The advancement of computer technology also allowed for improved data acquisition from the multiheaded systems. The higher-resolution SPECT studies of today can see into the deeper areas of the brain with far greater clarity and show what CAT scans and MRIs cannot - how the brain actually functions.

SPECT studies can be displayed in a variety of different ways. Traditionally the brain is examined in three different planes: horizontally (cut from top to bottom), coronally (cut from front to back), and sagittally (cut from side to side). What do physicians see when they look at a SPECT study? We examine it for symmetry and activity levels, indicated by shades of color (in different color scales selected depending on the physician's preference, including gray scales), and compare it to what we know a normal brain looks like. The black-and-white images in this book are mostly two kinds of three-dimensional (3-D) images of the brain.

One kind is a **3-D surface image**, looking at the blood flow of the brain's cortical surface. These images are helpful for picking up areas of good activity as well as underactive areas. They are helpful when investigating, for instance, strokes, brain trauma, and the effects of drug abuse. A normal 3-D surface scan shows good, full, symmetrical activity across the brain's cortical surface.

The **3-D active brain image** compares average brain activity to the hottest 15 percent of activity. These images are helpful for picking up areas of overactivity, as seen, for instance, in active seizures, obsessive-compulsive disorder, anxiety problems, and certain

forms of depression. A normal 3-D active scan shows increased activity (seen by the light color) in the back of the brain (the cerebellum and visual or occipital cortex) and average activity everywhere else (shown by the background grid).

Physicians are usually alerted that something is wrong in one of three ways: they see too much activity in a certain area; they see too little activity in a certain area; or they see asymmetrical areas of activity that ought to be symmetrical.

In the rest of the book, I will go into greater detail about how this remarkable technology has touched people's lives. For now, however, I will simply offer a sample of five common ways in which SPECT studies are utilized in medicine.

1. *To make early intervention possible.* Ellen, sixty-three, was suddenly paralyzed on the right side of her body. Unable even to speak, she was in a panic and her family was extremely concerned. As drastic as these symptoms were, two hours after the event, her CAT scan was still normal. Suspecting a stroke, the emergency room physician ordered a brain SPECT study that showed a hole of activity in her left frontal lobe caused by a clot that had choked off the blood supply to this part of the brain. From this information, it was clear that Ellen had had a stroke, and her doctors were able to take measures to limit the extent of the damage. CAT scans are generally not abnormal until twenty-four hours after a stroke.

2. *To evaluate the patient accurately so that future illness can be prevented.* Nancy was a fifty-nine-year-old woman suffering from severe depression that had been nonresponsive to treatment. She was admitted to a psychiatric hospital, where a SPECT study was done to evaluate her condition. Since she had not experienced any symptoms that would point to this, I was surprised to see that she had had two large strokes. Nearly immediately her nonresponsive depression made more sense to me. Sixty percent of the people who have frontal lobe strokes experience severe depression within a year. As a result of the SPECT study, I sought immediate consultation with a neurologist, who evaluated her for the possible causes of the stroke, such as plaques in the arteries of the neck or abnormal heart rhythms. He felt the stroke had come from a blood clot and placed her on blood-thinning medication to prevent further strokes.

3. *To help the physician elicit understanding and compassion from the patient's family.* When Frank, a wealthy, well-educated man, entered his seventies, he began to grow forgetful. At first it was over small things, but as time went on, the lapses of memory progressed to the point where he often forgot essential facts of his life: where he lived, his wife's name, and even his own name. His wife and children, not understanding his change in behavior, were annoyed with his absentmindedness and often angry at him for it. Frank's SPECT study showed a marked suppression across the entire brain, but especially in the frontal lobes, parietal lobes, and temporal lobes. This was a classic Alzheimer's disease pattern. By showing the family these images and pointing out the physiological cause of Frank's forgetfulness in living images, I helped them understand that he was not trying to be annoying, but had a serious medical problem.

Consequently, instead of blaming him for his memory lapses, Frank's family began to show compassion toward him, and they developed strategies to deal more effectively with the

problems of living with a person who has Alzheimer's disease. In addition, I placed Frank on new treatments for Alzheimer's disease that seemed to slow the progression of the illness.

4. *To differentiate between two problems with similar symptoms.* I first met Margaret when she was sixty-eight years old. Her appearance was ragged and unkempt. She lived alone, and her family was worried because she appeared to have symptoms of serious dementia. They finally admitted her to the psychiatric hospital where I worked after she nearly burned the house down by leaving a stove burner on. When I consulted with the family, I also found out that Margaret often forgot the names of her own children and frequently got lost when driving her car. Her driving habits deteriorated to the point where the Department of Motor Vehicles (DMV) had to take away her license after four minor accidents in a six-month period. At the time when Margaret's family saw me, some members had had enough and were ready to put her into a supervised living situation. Other family members, however, were against the idea and wanted her hospitalization for further evaluation.

While at first glance it may have appeared that Margaret was suffering from Alzheimer's disease, the results of her SPECT study showed full activity in her parietal and temporal lobes. If she had Alzheimer's, there should have been evidence of decreased blood flow in those areas. Instead, the only abnormal activity shown on Margaret's SPECT was in the deep limbic system at the center of the brain, where the activity was increased. Often, this is a finding in people suffering from depression. Sometimes in the elderly it can be difficult to distinguish between Alzheimer's disease and depression because the symptoms can be similar. Yet with pseudodementia (depression masquerading as dementia), a person may appear demented, yet not be at all. This is an important distinction, because a diagnosis of Alzheimer's disease would lead to prescribing a set of coping strategies to the family and possibly new medications, whereas a diagnosis of some form of depression would lead to prescribing an aggressive treatment of antidepressant medication for the patient along with psychotherapy.

The results of Margaret's SPECT study convinced me that she should try the antidepressant Wellbutrin (bupropion). After three weeks, she was talkative, well groomed, and eager to socialize with the other patients. After a month in the hospital she was released to go home. Before discharge she asked if I would write a letter to the DMV to help her get her driver's license back. Since I drive on the same highways she does, I was a bit hesitant. I told her that if in six months she remained improved and she was compliant with treatment, I would write to the DMV for her. Six months later she remained markedly improved. I repeated her SPECT study. It was completely normal. I wrote the letter to the DMV, and it gave her back her license!

5. *To discern when a problem is the result of abuse and remove the patient from a dangerous environment.* Betty was the most beautiful eighty-eight-year-old woman I had ever met. She was very proper and very proud. When she was young she had emigrated from England after marrying an American soldier. It was not her ninety-nine-year-old husband who brought her to the hospital to see me, however, it was her sister. Her husband, far from being supportive, angrily denied that his wife was suffering from serious cognitive problems. Yet during the evaluation process it was clear that Betty had severe memory problems; she did not know where she lived, her phone number, or her husband's name. I ordered a SPECT

study that showed a dent in the right side of Betty's frontal lobe. It was obvious to me that she had at some point suffered a significant head injury. When I asked her about it, all she could do was look down and cry; she could not give me details of the event. When I asked her sister, she reported that Betty and her husband had a stormy relationship and that he was abusive toward her. Sometimes he would grab her by the hair and slam her head into the wall. The sister wanted Betty to go to the police, but Betty said it would only make things worse.

Shortly after Betty was hospitalized, her husband began pressurizing me to send her home. He kept protesting that there was nothing wrong with her, yet I knew that Betty needed to be removed from her home environment, so I contacted Adult Protective Services. At Betty's hearing, I used her SPECT studies to convince the judge that her home held potential danger. He then ordered her to have a conservator, and she went to live with her sister.

It will be clear from these and many other stories in this book that a doctor who can give an accurate diagnosis can be the greatest friend a patient can have. By now, you may be starting to understand why this technology has so forcefully grabbed my attention.

## 2

### *Carving Knives and Tooth Fairies:*

#### *A Prelude to the Brain and Behavior*

When I first started my brain-imaging research, I decided to study the brain patterns of my own family, including my mother, my aunt, my wife, all three of my children, and myself. I wanted to see if the patterns I was seeing correlated with those of the people of whom I had the most intimate knowledge. I quickly learned that getting my own brain scanned was not an easy experience. Even with all that I have accomplished in my life, I was still very anxious about going through the procedure. What if something was wrong with my brain? What if my brain showed the pattern of a murderer? What if nothing was there at all? I never felt more naked than after my scan, when my own brain activity was projected onto a computer screen in front of my colleagues. At that moment, I would have rather been without clothes than without the covering of my skull. I was relieved to see very good activity in nearly all of my brain. I saw an area of overactivity, however, that stood like a red Christmas tree light in the right side of my basal ganglia (a deep brain structure that controls the body's anxiety level). It was working too hard. Of note, my mother (who tends to be a bit anxious) and my aunt (who has been clinically diagnosed with a panic disorder) both had the same pattern (increased activity in the right side of the basal ganglia). As we have discovered, these problems often run in families.

The little Christmas tree light made sense to me. Even though I do not have a clinical disorder, my whole life I have struggled with minor issues of anxiety. I used to bite my nails and sometimes still do when I feel anxious. I used to find it very difficult to ask for payments from patients after therapy sessions. I also had a terrible time speaking in front of large groups (of which I now love). My first appearance on television was terrible. My hands sweated so much that I unknowingly rubbed them on my pants throughout the interview. Right before my second television interview, on the nationally syndicated *Sonya Live* on CNN, I nearly had a panic attack. While I was sitting in the greenroom in the CNN studio

in Los Angeles waiting to go on the air, my mind flooded with negative thoughts. I started to predict disaster for myself: I might say something stupid. Stumble over my words. Basically make an idiot of myself in front of two million people. Thankfully, in time I recognized what was happening to me. I reminded myself, "I treat people who have this problem. Breathe with your belly. Think good thoughts. Remember the times when you were most competent. Relax; after the show is over most people are going to go back to thinking about themselves and not you anyway, no matter how good or how bad you are". I used the "Basal Ganglia Prescriptions", which I will give in chapter 6, to successfully deal with my anxiety. The interview was a delight.

I also hate conflict. This isn't surprising; any situation that triggers uncomfortable feelings, such as anxiety, causes a person with basal ganglia problems to avoid the situation. Conflict avoidance has had a negative impact on my life, and left me unable to deal with some difficult situations at school or in my professional life. As I thought about the increased activity in the right side of my basal ganglia, I realized it was a hereditary pattern (my mother and aunt had this same SPECT pattern). Knowing this has helped me to develop and *use* basal ganglia prescriptions to overcome the biological brain pattern that was subjecting me to anxiety.

### **Michelle**

Sometimes these patterns are subtle, and sometimes they are more pronounced. Here are four more examples that highlight the connection between the brain and behavior. On three separate occasions, Michelle, a thirty-five-year-old nurse, left her husband. Each time she left him within the ten days before the onset of her menstrual period. The third time her irritability, anger, and irrational behavior escalated to the point where she attacked him with a knife over a minor disagreement. The next morning, her husband was on the phone to my office. When I first met Michelle, it was several days after her menstrual period had started and things had significantly settled down. The severe temper outbursts were usually over by the third day after her period started. In my office, she appeared to be a gentle, soft-spoken woman. It was hard for me to imagine that this woman had only days before gone after her husband with a carving knife. Because her actions were so serious, I decided to perform two brain SPECT studies on her. The first one was done four days before the onset of her next period - during the roughest time in her cycle - and the second one was done eleven days later - during the calmest time of her cycle.

My colleagues and I have observed that left-side brain problems often correspond with a tendency toward significant irritability, even violence. On Michelle's brain study before the onset of her period, her deep limbic system (the mood control center) near the center of her brain was significantly overactive, especially on the left side. This "focal" deep limbic finding (on one side as opposed to both sides) often correlates with a cyclical tendencies toward depression and irritability. There was a dramatic change in her second scan taken eleven days later when Michelle was feeling better. The deep limbic system was normal!

Contrary to the beliefs of some naysayers, PMS, or premenstrual syndrome, is real. Women with PMS are *not* imagining things; the chemistry of their brain is genuinely altered and produces reactions they cannot control. The deep limbic system has a higher density of estrogen receptors than other parts of the brain, making it more vulnerable, in some women,

to the estrogen changes that occur at puberty, before the onset of menses, after a baby is born, or during menopause. Sometimes these changes can produce dramatic effects. For women like Michelle, PMS can be debilitating or even dangerous - and thus we must pay attention to it. I have seen the same general pattern in other couples I have counseled whom I saw with Michelle and her husband. During the best time of the woman's cycle, the two people get along. During the worst time, there are fighting and alienation.

I often prescribe an antiseizure medication called Depakote (divalproex) for people who have cyclic mood disorders like manic-depressive disorder. Because Michelle's SPECT findings showed an area of focal intensity in the left side of her deep limbic system (a finding I often see in someone who has a cyclic mood disorder), I put her on Depakote. It evened out her moods very nicely. We tried taking her off the Depakote after nine months, but her symptoms returned quickly. Her husband and best friend called me within the month to beg me to put her back on it. Two years on Depakote seemed to be the magic number. It was only then that Michelle was able to gradually stop taking the medication without relapse.

### **Brian**

Brian, age six, was very excited the night he lost his first tooth. His tooth was secure under his pillow in a special pouch for the tooth fairy. The next morning Brian was ecstatic when he found a dollar in the pouch. All day long he thought and thought and thought about the tooth fairy. He was so happy, in fact, that he secretly pulled out another tooth after school. His mother, who was surprised by the other tooth, went through the tooth fairy ritual again. Two days later Brian pulled out a third tooth. His mother started to worry when she saw Brian tugging at a tooth she knew wasn't loose. She told him that the tooth fairy doesn't come if you pull out your own teeth. She told him not to do it anymore. There was no tooth fairy that night. Over the next month, however, Brian couldn't get the thought of the tooth fairy out of his head and he pulled out three more teeth. His mother brought him to me for an evaluation.

In Brian's family there was a history of alcohol abuse, depression, and obsessive-compulsive disorder. Behavioral interventions were not successful in keeping Brian's hands out of his mouth. Additionally Brian was oppositional and had trouble at school. The teacher said he "always got stuck on certain thoughts" and could not pay attention to his classwork. After several months, individual therapy was not progressing. I ordered a brain SPECT study to better understand the functional pattern of Brian's brain. His study revealed marked increased activity in the top middle portion of his frontal lobes (the cingulate area, with which you will become very familiar). This part of the brain allows you to shift your attention from one thing to another. When it is overactive, people may end up getting "stuck" on certain thoughts and behaviors. Given the intense level of overactivity in this part of his brain, I put Brian on a low dose of Zoloft (sertraline - an antiobsessive antidepressant that is known to cool down this part of the brain). Within several weeks the compulsive teeth pulling disappeared and Brian was more attentive in class.

## **Marriage and the Brain**

### **The Bentleys**

The Bentley family came to see me because their two children were having problems in school. Ten-year-old Wendy was talking too much in class, not finishing her work, and frequently distracted. Seven-year-old Charles was often out of his seat, aggressive with the other boys, off task, poorly organized, and seemingly loved to be in the middle of trouble. The teachers had been telling the parents, Bob and Betsy, to seek help for Charles since preschool. During the evaluation, the parents told me they had a solid marriage with little conflict.

The children were both diagnosed with a condition known as attention deficit disorder (ADD), a genetic, neurobiological disorder that affects approximately 5 percent of children in the USA. It is characterized by a short attention span, distractibility, disorganization, and often, although not always, hyperactivity and impulse-control problems. The parents and children were educated about ADD, the teachers were involved in discussions about the children, medication was prescribed, and the parents took a parent training class to become more effective in dealing with the children at home.

After several weeks, Wendy had a very positive response to treatment. She was doing better in school, she got her homework done more quickly and accurately, and she was better able to manage her behavior in the classroom. Charles was a different story. He continued to have problems with his behavior at school and home; nothing seemed to help. During several individual sessions with Charles, I found that he was under severe stress. Despite what his parents had initially told me about themselves, they fought nearly every night and he was very worried they would get divorced. Charles told me about the yelling matches, slamming doors, and threats of leaving. "I can't think of doing my schoolwork when I'm so worried about my mum and dad getting a divorce." I discussed this information with his parents. They readily agreed that there was a lot of tension between them, but they didn't think it had anything to do with the children's problems. They had no idea how much it was bothering Charles. They agreed to come for marriage counseling once a week.

I have two couches in my office. I can tell a lot about a couple by where they sit. If they sit on the same couch there is a willingness to be close, less so if they are on different couches. This couple sat on the opposite end of each couch, as far away from each other as possible. I usually have fun when I do marriage counseling. I find it satisfying to see couples and families become closer and more loving. I help them clarify their goals in the relationship and teach them the skills they need to reach those goals. Working with Bob and Betsy, however, was anything but fun. The fury between them was often so intense that others in my clinic knew when they were in my office. For nearly nine months they talked about divorce at every session. Despite the therapy, they fought nearly every night. I wondered what kept them together.

Without clear structure and interventions from me, the sessions would take on a pattern. After they told me about the traumatic fights of the week, Betsy would bring up an issue from the past and go over and over it, despite my attempts to encourage her in a more constructive direction. She had severe problems letting go of prior events or disappointments.

She held on to grudges from many years ago, with Bob and others, and she continually brought up the same problems. Bob, on the other hand, never really seemed to pay attention. As soon as Betsy started to talk, he would look away, as if he were off in some distant place. I found myself frequently having to bring him back to the therapy session. When he entered the conversation, it was often with some snide remark. Then his attention would wander again. He reminded me of a hit-and-run driver: Cause a problem, then leave the scene.

After nine months of "marital therapy" going nowhere, Charles was getting worse. One day after seeing him for an individual session, I called his parents into my office. "Look," I said, "both of you are trying really hard to make this work. Yet it is *not* working. The tension at home is damaging your kids, especially Charles. Either you should get an amicable divorce and give yourselves and these kids some peace, or let me scan your brains and see if I'm not missing a biological piece to your marriage puzzle." They agreed to get the set of brain studies.

As I looked at their brain scans with the experience of seeing them as a couple for nine months, the results made perfect clinical sense to me. In fact, I was irritated with myself that I hadn't done it earlier. The cingulate part of Betsy's brain was extremely overactive, causing her to be unable to shift her attention and to become tenaciously locked on to certain thoughts or ideas. Her brain was causing her to go over and over the same material. Bob, on the other hand, had a normal brain pattern at rest, but when he performed a concentration task, the front part of his brain, which should increase in activity during concentration, completely shut down. This meant that the harder he tried to pay attention to Betsy, the more his attention wandered. He often sought conflict as a way to stimulate his own brain. Bob's symptoms and his brain study clearly indicated he had ADD like his kids (ADD is usually a genetic disorder).

It was not clear to me that this couple's problems existed, at least in part, on a biological level. I needed to optimize their brain biology if the therapy was going to do any good at all. I placed Betsy on Prozac (fluoxetine). Prozac, like Zoloft, decreases overactivity of the cingulate and allows people to shift their attention more freely between topics and become less stuck on thoughts and behaviors. I think of these medications as "lubricants" for the brain's shifting mechanism. I put Bob on Ritalin, which is a stimulant medication that helps children and adults with ADD concentrate, stay on task, and be less impulsive. I'm sure there are some people who would strongly object to marital therapy through the use of medication, but in this cases I believed it was essential.

Three weeks after the couple was on medication, there was a dramatic shift in the relationship. My first clue came when they sat on the same couch, next to each other. The second clue was that Betsy had her hand on Bob's leg (a very hopeful sign). They reported that the medications had made a big difference. Betsy stopped nagging and "beating ideas to death". Bob started to pay more attention and be less conflict-driven. There were no more hit and runs. He became more thoughtful. To my delight, with their brains working in more normal ways, they were able to utilize our marital therapy. They spent regular time together, agreed on their parenting strategies together, and even resumed making love on a more regular basis. As Betsy and Bob did better, so did Charles. How many marriages end in divorce or chronic unhappiness because of brain patterns that interfere with intimacy? Later I'll devote a whole chapter to relationship and the brain.

## Willie

Willie was the kind of guy who got along with everyone. An A student, he had a college scholarship waiting for him, and his future seemed altogether promising - until his head collided with the dashboard when his car accidentally hit a guardrail. Although Willie felt dazed, he seemed to be okay by the next day. Three months later he got into another accident when he swerved to avoid hitting a dog that had run out into the street. His head hit the windshield very hard, and this time he had to be sent to an emergency room. After examining Willie, the doctor told him he had nothing to worry about; he had only a minor concussion. In the months that followed, however, Willie found that the "minor concussion" was wreaking havoc with his life. Normally a friendly person, he found himself suddenly losing his temper at the smallest things. His whole attitude and demeanor began to change. Where he had once been patient, he now had a short fuse. Where he had once been amiable and calm, he was not always angry. His irritability and constant flares of temper began to alienate his friends and family.

The brunt of his anger came to rest on his college roommate and strangely began to center around food. Inexplicably, Willie's appetite was changing. In just three months, he had put on seventy pounds, and he was hungry all the time. He seemed to be devouring every morsel of food in the house. When his roommate finally got fed up with Willie eating all the groceries and asked Willie to eat only the food he bought himself, Willie felt that by depriving him of the food needed, his roommate was trying to hurt him. Willie was consumed with negative, paranoid thoughts about this person who was "trying to take the food out of his mouth". In his mind, the only way to protect himself against this enemy was to hurt the enemy. One afternoon he took a huge meat cleaver and a butcher knife and waited at the front door for the man who used to be his friend. "He was going to be instantaneously dissolved", Willie later told me.

Yet even as he was gripped by paranoia, some part of Willie's mind was still sane. He saw himself, as if from above, standing behind the door and holding these weapons. He knew he was out of control and that he had to stop himself before it was too late. He went to the telephone and called a friend, who gave him my telephone number, and the immediate crisis was averted.

Willie described for me his two accidents and the severity of his personality changes. I immediately ordered a brain study. As I expected, the study showed abnormalities. Two areas were working too hard: One was in his left temporal lobe, where dysfunction is often associated with paranoia and violence. The second was the top, middle section of the frontal lobes (cingulate area), again, the part of the brain that allows a person to shift attention freely from one thing to another. When this part of the brain is overactive, people get stuck in thought spirals. The minute I saw Willie's brain study, it clearly explained for me the changes that had been occurring in his personality: paranoia, fiery temper, and negative thoughts about his roommate, which he couldn't turn off.

The next step was clear. I prescribed medication to alleviate his symptoms: an antiseizure medication for the temporal lobe abnormality and an antiobsessive antidepressant to help him get "unstuck" from negative thoughts. After several weeks of treatment, the results were dramatic. Willie began to regain his sense of humor and to reconnect with his

friends and family. At the time of this writing, it has been six years since his two accidents. Now on medication to control the trauma-induced brain problems, he is one of the nicest human beings you will ever meet.

The brain is the seat of feelings and behavior. Your brain creates your world - a radical statement about ordinary thinking. Yet it is your brain that perceives and experiences. Everything begins and ends in the brain. How our brains work determines the very quality of our lives: how happy we will be, how well we'll get along with others, how successful we will be in our profession. The brain likely influences how close or how distant we feel from God. The patterns of our brain predispose what kind of husband or wife we will be, whether we will fail in school, be irritable with out children, or have the ambition to strive toward our goals.

Most of us are not a short fuse on a stick of dynamite like Willie before treatment or Michelle during the worst time of her cycle. We do not use meat cleavers or carving knives to deal with others who irritate us. Most of use are warm, kind, reasonable people who want to form meaningful relationships and be successful in our day-to-day lives. When our brain patterns are normal and balanced, we are generally able to do all these things. When behavior becomes abnormal, however, as in the cases mentioned above, often there is something the matter with the patterns in the body's computer - the brain. These case histories demonstrate that *the actual physical patterns of our brain have a dramatic impact on how we think, we feel, and behave from moment to moment*. Only recently have we discovered how to recognize those patterns and how to treat them with both behavioral and medical prescriptions.

Unfortunately, there are many professionals who lack sophisticated information on how the brain actually works. They believe the behavior of their patients is primarily the result of environmental stress or conditioning and do not consider the possibility that it may be based on abnormal brain physiology. Willie, for example, could have talked to a therapist about his toilet training until the end of the millennium and it would not have helped him. I believe that we need a more holistic approach to psychotherapy. I believe that we need to understand the role of brain physiology along with other factors such as stress or conditioning before we can design successful treatments for people.

In chapters 3, 5, 7, 9, and 11 I am going to teach you about five different brain systems. Understanding these brain systems will help you understand yourself and others in a totally new way. The activity in these systems provides the basis for much of the behaviors we call human. Each of these chapters will begin with a description of the functions and general locations of each part of the brain. I'll then discuss how each area contributes to everyday behavior as well as to certain medical disorders, such as depression or anxiety. Each of these five chapters will close with a checklist to help you identify yourself or loved ones who may fit into certain categories. In chapters 4, 6, 8, 10, and 12. I'll discuss specific healing and optimization prescriptions.

## *Looking Into Love and Depression: The Deep Limbic System*

### **Functions of the Deep Limbic System**

- *sets the emotional tone of the mind*
- *filters external events through internal states  
(creates emotional coloring)*
- *tags events as internally important*
- *stores highly charged emotional memories*
- *modulates motivation*
- *controls appetite and sleep cycles*
- *promotes bonding*
- *directly process the sense of smell*
- *modulates libido.*

The deep limbic system lies near the center of the brain. Considering its size - about that of a walnut - it is power-packed with functions, all of which are critical for human behavior and survival. (I use the term "deep limbic system" to differentiate it from the classic term "limbic system", which also incorporates the cingulate gyrus and deep temporal lobes, which will be covered in separate chapters. In this definition, the deep limbic system includes the thalamic structures, and hypothalamus, along with the immediate surrounding structures. As I mentioned in the introduction, I have simplified the five brain systems discussed in the book. All of these systems are much more complex and interconnected than presented. Clinically, we have found these divisions helpful to explain much of the behavior we have seen.) From an evolutionary standpoint, this is an "older" part of the mammalian brain that enabled animals to experience and express emotions. It freed them from the stereotypical behavior and actions dictated by the brain stem, found in the older "reptilian" brain. The subsequent evolution of the surrounding cerebral cortex in higher animals, especially humans, gave us the capacity for problem solving, planning, organization, and rational thought. Yet in order for these functions to have an effect in the world, one must have passion, emotion, and the desire to make something happen. The deep limbic system adds the emotional spice, if you will, in both positive and negative ways.

This part of the brain is involved in setting emotional tone. When the deep limbic system is less active, there is generally a positive, more hopeful state of mind. When it is heated up, or overactive, negativity can take over. This finding actually surprised my colleagues at the clinic and me at first. We thought that excessive activity in the part of the brain that controlled emotion might correlate with enhanced feelings of all kinds, not solely

negative ones. Yet we noticed, again and again, that when this area was overactive on SPECT, it correlated with the subject's depression and negativity. It seems that when the deep limbic system is inflamed, painful emotional shading results. New research on depression from other laboratories around the world has borne this out.

The emotional shading provided by the deep limbic system is the filter through which you interpret the events of the day. It colors events depending on your emotional state of mind. When you are sad (with an overactive deep limbic system), you are likely to interpret neutral events through a negative filter. For example, if you have a neutral or even positive conversation with someone whose deep limbic system is overactive or "negatively set", he or she is likely to interpret the conversation in a negative way. When this part of the brain is "cool" or functions properly, a neutral or positive interpretation of events is more likely to occur. Emotional tagging of events is critical to survival. The valence or charge we give to certain events in our lives drives us to action (such as approaching a desired mate) or causes avoidance behavior (withdrawing from someone who has hurt us in the past).

PMS, discussed in the last chapter, is a classic example of this emotional shading principle. As mentioned, in our study of PMS within five to ten days before the onset of menstruation, the deep limbic system becomes inflamed or more active with the drop in hormones. This deep limbic activation colors events in a more negative way. A friend's wife has a fairly severe case of PMS. He tells me that during the first week of her cycle, she looks at him with love and affection, and almost anything he does seems to be right. She is more loving and affectionate. Ten days before her period, things are dramatically different. She doesn't want to be touched. She "has a different look", which he describes as a combination of a scowl and a "don't mess with me" look. Little he does is right. She emotionally colors most events in a negative way. Then, a few days after her cycle starts, she's back to being more positive, loving, and affectionate.

The deep limbic system, along with the deep temporal lobes, has also been reported to be involved in storing highly charged emotional memories, both positive and negative. If you have been traumatized by a dramatic event, such as being in a car accident or watching your house burn down, or if you have been abused by a parent or a spouse, the emotional component of the memory is stored in the deep limbic system of the brain. And if you have won the lottery, graduated magna cum laude, or watched your child's birth, those emotional memories are stored here as well. The total experience of our emotional memories is responsible, in part, for the emotional tone of our mind. The more stable, positive experience we have, the more positive we are likely to feel; the more trauma in our lives, the more emotionally set we become in a negative way. These emotional memories are intimately involved in the emotional tagging we impose on the day's events.

The deep limbic system also affects motivation and drive. It helps get you going in the morning and encourages you to move throughout the day. Overactivity in this area, in our experience, is associated with lowered motivation and drive, which is often seen in depression. The deep limbic system, especially the hypothalamus, controls the sleep and appetite cycles of the body. Healthy sleep and appetite are essential to maintaining a proper internal milieu. Both of these components are often a problem with limbic abnormalities.

The deep limbic structures are also intimately involved with bonding and social connectedness. When the deep limbic system of animals is damaged, they do not properly bond with their young. In one study of rats, when the deep limbic structures were damaged, mothers would not feed and nurture the young but would drag them around the cage as if they were inanimate objects. The deep limbic system affects the bonding mechanism that enables you to connect socially with other people; your ability to do this successfully in turn influences your moods. We are social animals. When we are bonded to people in a positive way, we feel better about ourselves and our lives. This capacity to bond then plays a significant role in the tone and quality of our moods.

The deep limbic system also directly processes the sense of smell. The olfactory system is the only one of the five sensory systems that goes from the sensory organ to directly where it is processed in the brain. The messages from all the other senses (sight, hearing, touch, and taste) are sent to a "relay station" before they are sent to their final destination in different parts of the brain. Because your sense of smell goes directly to the deep limbic system, it is easy to see why smells can have such a powerful impact on our feeding states. The multibillion-dollar perfume and deodorant industries count on this fact: beautiful smells evoke pleasant feelings and draw people toward you; unpleasant smells repel them.

I learned about the limbic-smell connection firsthand when I was sixteen years old and dating the woman who became my wife. She was a good Catholic girl. As a typical hot-blooded teenager, I was extremely interested in physical affection. One night I ran out of aftershave and borrowed my brother's English Leather. When I picked her up for our date, I noticed a difference. I had a car with a bench seat in front. Usually she sat in the part of the seat nearest to the passenger door. That night she sat in the middle part, next to me. She took my hand before I reached for hers. She came close to me before I moved toward her. She was cuddlier and more affectionate than before. Needless to say, from then on English Leather was the only scent I wore.

Bonding, smells, sexuality, and the deep limbic system are intimately connected. Napoleon once wrote to Josephine to ask her not to bathe for two weeks before he came home from a battle. He wanted her scent to be powerful, because it excited him sexually. It is likely that positive, sexual smells cool the limbic system and intensify our mood for love. Deep limbic overactivity, often associated with depression, frequently results in decreased sexual interest. For many years, I have hypothesized that decreased sexual activity is associated with increased deep limbic activity and more vulnerability to depression.

I studied this phenomenon in an adult male who had problems with depression and increased activity in his deep limbic systems on SPECT. I asked him to make passionate love with his wife. I then rescanned him within an hour. His limbic activity was significantly decreased. Orgasm has been described as a mini-seizure of the limbic system and tends to release or lessen deep limbic activity. Sexuality is good for the bonded human brain.

Whenever a person is sexually involved with another person, neurochemical changes occur in both their brains that encourage limbic, emotional bonding. Yet limbic bonding is the reason casual sex doesn't really work for most people on a whole mind and body level. Two people may decide to have sex "just for the fun of it", yet something is occurring on

another level they might not have decided on at all: Sex is enhancing an emotional bond between them whether they want it or not. One person, often the woman, is bound to form an attachment and will be hurt when a casual affair ends. One reason it is usually the woman who is hurt most is that the female limbic system is larger than the male's. One likely consequence is that she will become more limbically connected.

I once treated a patient named Renee who had a high sex drive. She was not sexually satisfied by her husband. For years, other men flirted with her and she remained faithful, until one day she decided, out of pure frustration, to have an affair with a coworker. From the outset, they agreed that they were going to have friendly sex, just for fun, just for the pleasure, and in the first two months that seemed to work. Then Renee felt herself wanting to see him more often. She tried to get him to meet with her twice a week instead of once a week, as they had originally agreed. Instead of responding positively, her lover pulled away. The more attached she became, the more detached he became. Although Renee and her lover had been on the same wavelength in the beginning, in the end she had changed and he hadn't, and she felt used. It is important to understand how your body and psyche work. In this case, Renee would have been wise to realize that her limbic system was not quite as open to casual sex as she wanted to be. She would have been better off to stay with her husband and work things out sexually with him, rather than to pick a casual acquaintance for a sexual liaison.

As mentioned above, current research has demonstrated that females, on average, have a larger deep limbic system than males. This gives females several advantages and disadvantages. Because of their larger deep limbic brain, women are more in touch with their feelings, and they are generally better able to express their feelings than men. They have an increased ability to bond and be connected to others (which is why women are the primary caretakers of children - there is no society on earth where men are primary caretakers of children). Females have a more acute sense of smell, which is likely to have developed from an evolutionary need for the mother to recognize her young. Having a larger deep limbic system leaves a female somewhat more susceptible to depression, especially at times of significant hormonal changes such as the onset of puberty, before menses, after the birth of a child, and at menopause. Women attempt suicide three times more often than men. Yet men's suicide attempts are successful three times more often than women's, in part because they use more violent means (women tend to use overdoses with pills while men tend to either shoot or hang themselves), and men are generally less connected to others than are women. Disconnection from others increases the risk of completed suicides.

The deep limbic system, especially the hypothalamus at the base of the brain, is responsible for translating our emotional state into physical feelings of relaxation or tension. The front half of the hypothalamus sends calming signals to the body through the parasympathetic nervous system. The back half of the hypothalamus sends stimulating or fear signals to the body through the sympathetic nervous system. The back half of the hypothalamus, when stimulated, is responsible for the fight-or-flight response, a primitive state that gets us ready to fight or flee when we are threatened or scared. This "hardwired response" happens immediately upon activation, such as seeing or experiencing an emotional or physical threat: The heart beats faster, breathing rate and blood pressure increases, the hands and feet become cooler to shunt blood from the extremities to the big muscles (to fight or run away), and the pupils dilate (to see better). This deep limbic translation of emotion is

powerful and immediate. It happens with overt physical threats and also with more covert emotional threats. This part of the brain is intimately connected to the prefrontal cortex and seems to act as a switching station between running on emotion (the deep limbic system) and rational thought and problem solving using our cortex. When the limbic system is turned on, emotions tend to take over. When it is cooled down, more activation is possible in the cortex. Current research shows a correlation between depression and increased deep limbic system activity and shutdown in the prefrontal cortex, especially on the left side.

### **Problems in the Deep Limbic System**

- *moodiness, irritability, clinical depression*
- *increased negative thinking*
- *negative perception of events*
- *decreased motivation*
- *flood of negative emotions*
- *appetite and sleep problems*
- *decreased or increased sexual responsiveness*
- *social isolation.*

The problems in the deep limbic system (as in all the other systems) generally correspond to their functions. Do you know people who see every situation in a bad light? That pessimism actually could be a deep limbic system problem because, as mentioned, when this part of the brain is working too hard, the emotional filter is colored by negativity. One person could walk away from an interaction that ten others would have labeled as positive, but which he or she considers negative. And since the deep limbic system affects motivation, people sometimes develop an "I don't care" attitude about life and work; they don't have the energy to care. Because they feel hopeless about the outcome, they have little willpower to follow through with tasks.

Since the sleep and appetite centers are in the deep limbic system, disruption can lead to changes, which may mean an inclination toward too much or too little of either. For example, in typical depressive episodes people have been known to lose their appetites and to have trouble sleeping despite being chronically tired, and yet in atypical depression they will sleep and eat excessively.

There are three problems caused by abnormalities of the deep limbic system that warrant their own sections: bonding disruption, mood disorders, and PMS.

### **Bonding Disruption**

Bonding and limbic problems often go hand in hand. One of the most fundamental bonds in the human universe is the mother-infant bond. Hormonal changes shortly after childbirth, however, can cause limbic or emotional problems in the mother. They are called the "baby blues" when they are mild, and postpartum depression or psychosis when they are severe. When these problems arise, the deep limbic system of the mother's brain shows abnormal activity. (The phenomenon has been detected in animals as well as humans.) In turn, significant bonding problems may occur. The mother may emotionally withdraw from the

baby, preventing the baby from developing normally. Babies who experience "failure to thrive", for instance, or who have low weight or delayed development, often have mothers who are unattached emotionally.

In such cases, the abnormal activity of the mother's deep limbic system causes developmental problems for the baby. Conversely, problems in the deep limbic system can be caused by outside events that disrupt the human bonding process. This can occur at any stage in life. Here are three of the most common.

## **Death**

The death of a parent, spouse, or child causes intense sadness and grief. In these familial relationships, there is often a tight neurochemical bond (from the myriad of stored emotional memories and experiences). When it is broken, the activity of the deep limbic system is disrupted. Many who experience grief say the pain actually feels physical. This sensation is not imaginary. Grief often activates the pain centers in the brain, which are housed near the deep limbic system.

It is interesting to note that the people who had a good relationship with the person who died often heal their grief much more easily than those whose relationship with the deceased was filled with turmoil, bitterness, or disappointment. The reason is that a positive relationship is associated with good memories, and remembering and reprocessing these memories helps in the healing process. When people who had a bad relationship think back on it, they have to relive the pain. In their mind, they are still trying to fix what was wrong, to heal the wound, but they can't. In addition, the guilt they carry with them impairs the healing process. Donna is a case in point. Donna and her mother had had a stormy relationship, fighting constantly over things that seemed insignificant in and of themselves. Yet in spite of their problems, the year after her mother's death was the hardest of Donna's life. Her husband could not understand the force of her grief; all he had ever heard her do was complain that her mother was selfish and uninterested in her. What he failed to understand was that Donna had to grieve not only over her mother's death, but also over the fact that now she would never have the mother-daughter bond she had always wanted. Death had ended all her hopes.

Losing a spouse or lover is traumatic in a different way from losing any other loved one. Once you have made love with a person on a regular basis, death can be extraordinarily painful because the deep limbic connection has been broken. The spouse has become part of the chemical bond of that part of the brain, and it takes times for that bond to dissolve. Your deep limbic system misses the person's touch, voice, and smell.

Deep limbic connection doesn't depend only on sexual intimacy. Another often-overlooked "deep limbic loss" is the loss of a family pet. Many people become as attached to their pets as they do to the significant people in their lives. Pets often give unconditional love and connect with our innermost caring selves. I have often felt that holding one of my cats or petting my dog during a scan would have a positive "limbic cooling" effect. Unfortunately, while I was writing this chapter my dog, Samantha, died of cancer. The sadness in my family was great, with many tears, especially from my daughters and wife. We all had problems sleeping, no one felt like eating, and anything that reminded us of Samantha

would quickly bring up tears and feelings of intense sadness and loss. I have known some pet owners who became so depressed after a pet died that they felt suicidal and even paranoid. Appreciating this significant grief is often necessary to healing.

### **Divorce**

Divorce can be a source of the most severe kind of stress it is possible for a human being to experience. For many, it actually causes more anguish to lose a spouse through divorce than it does through death. As stated above, people who are "limbically connected" have a very powerful bond, and I believe this phenomenon may be one of the major reasons women cannot leave abusive men. They have had their children with these men, shared their beds and their homes with them. To break that bond, which is at the core of their brain, causes a severe rupture that can make the woman feel fragmented, as if she were not quite whole without the man. She may be plagued by sleep and appetite problems, depression, irritability, and social isolation. I once treated a woman who was married to a controlling, angry man whom she could never please. On the day he told her he was leaving her for another woman (causing her a severe limbic injury), she became so depressed that she put her head in the oven and turned on the gas. Fortunately she was rescued and taken to the hospital. It wasn't until her deep limbic system began to heal and she could feel her own autonomy that she realized she didn't even like her husband, and in any case, it certainly wasn't worth killing herself over a man who cheated on her.

Even the one who initiates a separation suffers distress and often goes through a period of depression, because the "chemical limbic bonds" break for everyone involved in the separation. The one who is walking out the door may fail to realize this and not anticipate the grief period that will likely follow. For some, divorce is so devastating that it can trigger enormous anger and vengefulness. In fact, I have never seen two people more cruel to each other than those going through a messy divorce. They lose all sense of fairness and rationality and do everything possible to hurt each other. What ignites such negative responses? Breaking the chemical connection activates the deep limbic system. People become not only depressed and negative but also oversensitive, taking every little thing the wrong way. Anger quickly follows. They know they have to separate, and unconsciously they use the anger and aggression as a way to do it.

### **The Empty Nest Syndrome**

When children leave home, parents often feel intensely sad and bereft. Many lose their appetites and have trouble sleeping. Something is missing. This may be confusing because the parents remember how arduous it was struggling through the growing pains of their offsprings' adolescence, and they assumed it would be a relief when the teenagers were finally out of the house and off to their own lives. (It has been suggested that the discordant nature of the parent-child relationship during adolescence may be nature's way of helping parents and teens make the transition from the close bond of childhood to the total independence of young adulthood.) Yet no matter how difficult those adolescent years were for both sides, a tremendous bond still exists, and breaking it is stressful.

I once treated a man who developed a clinical depression after his only daughter left home for college. Even though he was happily married, enjoyed his work, and was otherwise

healthy, he felt sad, cried easily, had trouble sleeping, became more irritable, and had concentration problems - all symptoms of depression. Another woman I treated whose two sons went off to college one year after the other became so depressed and felt so lonely and unimportant that she resorted to having an affair as a way to deal with her pain. She lost her marriage over the affair, became suicidal, and almost lost her life.

## **Depression**

Lack of bonding and depression are often related. People who are depressed often do not feel like being around others and consequently isolate themselves. The social isolation tends to perpetuate itself: The more isolated a person becomes, the less bonding activity occurs. This worsens the depression and increases the likelihood of further isolation.

Depression is known to be caused by a deficit of certain neurochemicals or neurotransmitters, especially norepinephrine and serotonin. In my experience, this deficit can cause increased metabolism or inflammation in the deep limbic system, which in turn causes many of the problems associated with depression. You may have noticed in this chapter how, along with all the other symptoms of deep limbic system disruption, depression seems to be a common factor. Because the deep limbic system is intimately tied to moods, when it is overactive the ensuing problems with depression snowball and affect all the other deep limbic system functions.

Ariel came to see me because she had been experiencing symptoms of depression for over two years. She was tired, suffered from sleeplessness and negative thinking, had no motivation, and had begun to have suicidal thoughts. The symptom that was most difficult for her husband, however, was her complete loss of interest in sex. He was ready to leave her because he thought she wasn't interested in him anymore as a man. Why else, he thought, had it been such a long time since she had wanted to touch him?

After I had her brain scanned, I was not surprised to find that her deep limbic system was on double time. Giving this information to her husband was a powerful tool in helping him to view the situation objectively: His wife was neglecting him not because she didn't like him but because something was off balance in the chemistry of her brain. Most important of all, the problem was rectifiable.

Increased activity in the deep limbic system is part of a pattern that is often responsive to antidepressants, but sometimes people are averse to being put on medication. Ariel was one of them. She had gotten caught up in the medial blitz of 1991, when the hair-raising topic of the news and the talk shows was that Prozac was a dangerous drug that could cause you to kill your mother! I believe this sensationalism was completely irresponsible, especially since it scared many people who suffered from depression, a very treatable illness, and prevented some of them from seeking the help they needed. The fact that medication can cause side effects should not be a blanket deterrent to its use; in many, many cases, the pluses far outweigh the minuses. If you are skeptical about this, consider the following fact: People on antidepressants may experience constipation or an upset stomach, but suicide (often the result of untreated depression) is the eighth leading cause of death in the USA.

Ariel decided against the use of medication. She followed the deep limbic prescriptions (behavioral changes that affect the chemistry of the brain) offered in the next chapter, which I developed specifically to treat depression. Through them she was successful in overcoming her depression. However, the nonmedication prescriptions do not work for everyone and some people may need medication. Let me emphasize the point: Depression is treatable. Please seek help from a qualified professional if you are suffering. Help is out there for you.

### **Leigh Anne**

Here is another example of deep limbic dysfunction. Leigh Anne came to see me fifteen months after the birth of her first child. Several weeks after her child was born, she began experiencing symptoms of nausea, social withdrawal, crying spells, and depression. Three months later she sought help through psychotherapy. But her condition did not improve. Her depression progressed to the point where she became unable to care for her daughter. Desperate to function as the good mother she wanted to be to her child, she came to see me. After diagnosing her with major depression I placed her on Prozac and began seeing her in psychotherapy. Her symptoms remitted after several weeks, and after several months Leigh Anne wanted to discontinue treatment. She associated taking Prozac with a course of action for a "depressed person". She did not want to see herself in that light or be stigmatized by that label. For several months after stopping she had no adverse reaction. Then her symptoms returned.

When she came to see me again, Leigh Anne still didn't want to believe that anything was "wrong" with her, and was still resistant to going back on medication. After I ordered a brain study to evaluate her deep limbic system, I was able to point out to her the marked increase in activity in that area of her brain. It provided me with the evidence needed to convince her to go back on Prozac for a while longer.

This case illustrates an important point: It has been my experience as well as that of many other psychiatrists that a patient does not necessarily have to stay on medication forever just because he or she has started it. However, with certain medications, like Prozac, a minimum period of treatment is necessary before it can successfully be terminated. If a depressed patient is willing to stay on the medication for long enough, about two years in this case (the time period varies from person to person), there is a greater chance that it can be discontinued with no return of symptoms.

### **Manic-Depressive Disorder**

#### **Sarah**

Sarah was fifty-three years old when she was admitted to the hospital under my care. The month before, her family had had her committed to another psychiatric hospital for delusional thinking and bizarre behavior - she had actually ripped out all the electrical wiring in her home because she heard voices coming from the walls. In addition to the above symptoms, she was barely getting any sleep, her thoughts raced wildly, and she was irritable. Her doctor had diagnosed manic-depressive disorder (a cyclical mood disorder) and placed her on lithium (an antimanic medication) and an antianxiety medication. After responding well, she was sent home. But Sarah, like Leigh Anne, did not want to believe that anything

was wrong with her, and she stopped taking both medications. Her position was actually fortified by some members of her family who openly told her she didn't need pills, that doctors prescribe them only to force patients into numerous follow-up visits. Yet their advice was ill advised, for within weeks of stopping the treatment, Sarah's bizarre behavior returned. This was when her family brought her to the hospital where I worked. When I first saw Sarah, she was extremely paranoid. Believing that everyone was trying to hurt her, she was always looking for ways to escape from the hospital. Again her thoughts were delusional; she believed she had special powers and that others were trying to take them from her. At times, she also appeared very "spacy". In an attempt to understand what was going on with her for myself, and to convince her that at least part of her problems were biological, I ordered a SPECT study.

Carrying this out did not prove easy. Our clinic tried to scan her on three separate occasions. The first two times she ripped out the intravenous line, saying we were trying to poison her. The third time was a success because her sister stayed with her and calmed her down by talking her through the experience. While the study revealed an overall increase in activity in the deep limbic system, I found more intensity on the left side of her scan (focal increased deep limbic uptake) and a markedly patchy uptake across the cortex. In other words, some areas showed increased activity and some showed decreased. My experience told me that cyclic mood disorders often correlate with focal areas of increased activity in the deep limbic system specifically as well as a patchy uptake across the surface of the brain in general.

For Sarah's family, this was powerful evidence that her problems were biological, so that when she refused medication, they were not willing to encourage her to take it. After she accepted their advice, her behavior normalized again. Once I knew she was feeling better, more in control, I showed her the brain studies. Through a better understanding of the problem she was able to agree to follow-up visits and to stay on her medication.

Sometimes I'll rescan a patient several months after the first time to see what difference the medication has made on the physiology of his or her brain. Although Sarah's new study showed a vast improvement from her earlier one, I still noticed an area of increased activity in the left temporal lobe, and Sarah was still complaining of symptoms of spaciness. I changed her medication to Depakote, which is primarily used as an antiseizure medication but has also been used for manic-depressive disorder. Not only did her psychotic symptoms remain in remission, but the spaciness disappeared as well. Five years later, a small dose of Depakote helps Sarah lead a normal life.

Sarah's case illustrates one of the most clinically significant problems in people diagnosed with manic-depressive illness. This disorder is usually quite responsive to medication. The problem is that when people afflicted by the disorder improve, many feel so normal they do not believe they ever had a problem to begin with. It is difficult for people to accept that they have to keep taking medication when they think they no longer have a problem. Yet as we have seen, prematurely stopping medication actually increases the chances of relapsing. Through the use of brain studies I have been able to decrease the relapse rate of my patients by demonstrating graphically the biological nature of their disorders and the need to treat them as such - a great asset in encouraging patients to cooperate in their own

healing. In addition to that, brain studies have helped me persuade patients to stop blaming themselves for their symptoms.

## **PMS**

In the last chapter I discussed Michelle's case of clear (and dangerous) PMS. It was a deep limbic problem. Over the past years we have scanned many women with PMS just before the onset of their period, during the most difficult time of their cycle, and then again a week after the onset of their period. Most often when PMS is present we see dramatic differences between the scans. When a woman feels good, her deep limbic system is calm and cool. When she feels bad right before her period, her deep limbic system most often is hot!

I have seen two PMS patterns, clinically and on SPECT, that respond to different treatments. One pattern is focal increased deep limbic activity that correlates with cyclic mood changes. Hotter activity on the left side of the deep limbic system is often associated with anger, irritability, and expressed negative emotion. Increased activity on the right side of the deep limbic system is often associated with sadness, emotional withdrawal, anxiety, and repressed negative emotion. Left-side abnormalities are more a problem for people with whom the woman interacts (because of her outwardly directed anger and irritability), while right-side overactivity is more an internal problem. Focal deep limbic findings, worse during the premenstrual period, often respond best to lithium or anticonvulsant medications, such as Depakote, Nerontin (gabapentin), Lamictal (lamotrigine), or Tegretol (carbamazepine). These medications tend to even out moods, calm inner tension, decrease irritability, and help people feel more comfortable in their own skin.

The second PMS pattern that I have noted is increased deep limbic activity in conjunction with increased cingulate gyrus activity. The cingulate, as we will see, is the part of the brain associated with shifting attention. Women with this pattern often complain of increased sadness, worrying, repetitive negative thoughts and verbalizations (nagging), and cognitive inflexibility. This pattern usually responds much better to medications that enhance serotonin availability in the brain, such as Zoloft, Paxil (paroxetine), or Procaz (see cingulate medications in chapter 10, "Cingulate System Prescriptions").

## Deep Limbic Checklist

Please read this list of behaviors and rate yourself (or the person you are evaluating) on each behaviour listed. Use the following scale and place the appropriate number next to the item. Five or more symptoms marked 3 or 4 indicate a high likelihood of deep limbic problems.

0 = never

1 = rarely

2 = occasionally

3 = frequently

4 = very frequently

1. Feeling of sadness
2. Moodiness
3. Negativity
4. Low energy
5. Irritability
6. Decreased interest in others
7. Feelings of hopelessness about the future
8. Feelings of helplessness or powerlessness
9. Feeling dissatisfied or bored
10. Excessive guilt
11. Suicidal feelings
12. Crying
13. Lowered interest in things usually considered fun
14. Sleep changes (too much or too little)
15. Appetite changes (too much or too little)
16. Low self-esteem
17. Decreased interest in sex
18. Negative sensitivity to smells/odors
19. Forgetfulness
20. Poor concentration.

***Enhancing Positive Thought Patterns and Strengthening Connections:***

***Deep Limbic System Prescriptions***

*Finally, brethren, whatever is true, whatever is honorable, whatever is right, whatever is pure, whatever is lovely, whatever is of good repute, if there is any excellence and if there is anything worthy of praise, let your mind dwell on these things.*

*-Philippians 4:8*

As discussed in chapter 3, the deep limbic system processes our sense of smell, stores highly charged emotional memories, and affects sleep and appetite cycles, moods, sexuality, and bonding. To heal deep limbic system problems, we need to focus on a number of diverse prescriptions: accurate thinking, the proper management of memories, the connection between pleasant smells and moods, and building positive bonds between oneself and others. The following prescriptions, geared toward healing deep limbic system problems, are based on my own personal clinical experience with patients, as well as general knowledge about how the mind/body works.

**DL Prescription 1: Kill the Ants**

Our overall state of mind has a certain tone or flavor based largely on the types of thoughts we think. When the deep limbic system is overactive, it sets the mind's filter on "negative". People who are depressed have one dispiriting thought following another. When they look at the past, they feel regret. When they look at the future, they feel anxiety and pessimism. In the present moment, they're bound to find something unsatisfactory. The lens through which they see themselves, others, and the world has a dim grayness. They are suffering from *automatic negative thoughts*, or ANTs. ANTs are cynical, gloomy, and complaining thoughts that just seem to keep marching in all by themselves.

ANTs can cause people to be depressed and fatalistic. "I know I won't pass that test on Tuesday." This kind of thinking makes for a self-fulfilling prophecy: If someone has already convinced himself that he won't pass, he probably won't study very hard and he won't pass the test. If you are depressed all the time, you don't expect good things to happen, so you don't try very hard to make them happen. The internal distress caused by melancholy thinking can make you behave in ways that alienate others, thus causing you to isolate yourself further. On the other hand, positive thoughts and a positive attitude will help you radiate a sense of well-being, making it easier for others to connect with you. Positive thoughts will also help you be more effective in your life. As you can see, what goes on in your mind all day long can determine whether your behavior is self-defeating or self-promoting.

Here are some other examples of typical ANTs:

*"You never listen to me."*

*"Just because we had a good year in business doesn't mean anything."*

*"You don't like me."*

*"This situation is not going to work out. I know something bad will happen."*

*"I feel as though you don't care about me."*

*"I should have done much better. I'm a failure."*

*"You're arrogant."*

*"You're late because you don't care."*

*"It's your fault."*

Healing the deep limbic system requires healing moment-to-moment thought patterns. Unfortunately, there is no formal place where we are taught to think much about our thoughts or the challenge the notions that go through our head, even though our thoughts are always with us. Most people do not understand how important thoughts are and leave the development of thought patterns to chance. Did you know every thought you have sends electrical signals throughout your brain? Thoughts have actual physical properties. They are real! They have significant influence on every cell in your body. When your mind is burdened with many negative thoughts, it affects your deep limbic system and causes deep limbic problems (irritability, moodiness, depression, etc). Teaching yourself to control and direct thoughts in a positive way is one of the most effective ways to feel better.

Here are the actual step-by-step "thinking" principles that I use in my psychotherapy practice to help my patients heal their deep limbic systems.

### **Step 1**

*Realize that your thoughts are real:*

- *You have a thought.*
- *Your brain releases chemicals.*
- *An electrical transmission goes across your brain.*
- *You become aware of what you're thinking.*

Thoughts are real, and they have a real impact on how you feel and how you behave.

### **Step 2**

*Notice how negative thoughts affect your body.*

Every time you have an angry thought, an unkind thought, a sad thought, or a cranky thought, your brain releases chemicals that make your body feel bad (and activate your deep limbic system). Think about the last time you were mad. How did your body feel? When most people are angry, their muscles become tense, their hearts beat faster, their hands start to sweat, and they may even begin to feel a little dizzy. Your body reacts to every negative thought you have.

Mark George, MD, from the National Institute of Mental Health, demonstrated this phenomenon in an elegant study of brain function. He studied the activity of the brain in ten normal women under three different conditions: when they were thinking happy thoughts, neutral thoughts, and sad thoughts. During the happy thoughts, the women demonstrated a cooling of the deep limbic system. During the sad thoughts, he noticed a significant increase in deep limbic system activity - powerful evidence that your thoughts matter!

### **Step 3**

*Notice how positive thoughts affect your body.*

Every time you have a good thought, a happy thought, a hopeful thought, or a kind thought, your brain releases chemicals that make your body feel good (and cool your deep limbic system). Think about the last time you had a really happy thought. How did your body feel? When most people are happy, their muscles relax, their hearts beat more slowly, their hands become dry, and they breathe more slowly. Your body also reacts to your good thoughts.

### **Step 4**

*Notice how your body reacts to every thought you have.*

We know from polygraphs or lie detector tests, too, that your body reacts to your thoughts. During a lie detector test, a person is hooked up to equipment that measures hand temperature, heart rate, blood pressure, breathing rate, muscle tension, and how much the hands sweat.

The tester asks question, like "Did you steal that car?" If the person did steal the car, his body is likely to exhibit a "stress" response. His hands get colder, his heart goes faster, his blood pressure goes up, his breathing gets faster, his muscles get tight, and his hands sweat more.

The reactions take place almost immediately, whether he says anything or not. Remember, the deep limbic system is responsible for translating our emotional state into physical feelings of relaxation or tension. Now the opposite is also true. If the subject did not steal the car, it is likely that his body will experience a "relaxation" response. His hands will become warmer, his heart rate will slow, his blood pressure will go down, his breathing will become slower and deeper, his muscles will relax, and his hands will become drier.

Again, almost immediately, his body has reacted to his thoughts. This happens not only when you're asked about telling the truth - your body reacts to *every* thought you have, whether about work, friends, family, or anything else.

## Step 5

*Think of bad thoughts as pollution.*

Thoughts are very powerful. They can make your mind and your body feel good, or they can make you feel bad. Every cell in your body is affected by every thought you have. That is why when people get emotionally upset, they frequently develop physical symptoms, such as headaches or stomachaches. Some physicians think that people who have a lot of negative thoughts are more likely to get cancer. If you think about good things, you will feel better.

A negative thought is like pollution to your system. Just as pollution in the Los Angeles Basin affects everyone who goes outside, so, too, do negative thoughts pollute your deep limbic system, your mind, and your body.

## Step 6

*Understand that your automatic thoughts don't always tell the truth.*

Unless you think about your thoughts, they are automatic; "they just happen." But even if your thoughts just happen, they are not necessarily correct. Your thoughts do not always tell the whole truth. Sometimes they even lie to you. I once treated a college student who thought he was stupid because he didn't do well on tests. When his IQ was tested, however, we discovered that he was close to a genius! You don't have to believe every thought that goes through your head. It's important to think about your thoughts to see if they help you or hurt you. Unfortunately, if you never challenge your thoughts, you just "believe them" as if they were true.

## Step 7

*Talk back to ANTs.*

You can train your thoughts to be positive and hopeful, or you can allow them to be negative and upset you. Once you learn about your thoughts, you can choose to think good thoughts and feel better, or you can choose to think bad thoughts and feel lousy. That's right, it's up to you! You can learn how to change your thoughts, and you can learn to change the way you feel.

One way to learn how to change your thoughts is to notice them when they are negative and talk back to them, as I'll explain below. When you just think a negative thought without challenging it, your mind believes it and your body reacts to it. When you correct negative thoughts, you take away their power over you.

## Step 8

### *Exterminate the ANTs.*

Think of these negative thoughts that invade your mind like ants that bother you at a picnic. One negative thought, like one ant at a picnic, is not a big problem. Two or three negative thoughts, like two or three ants at a picnic, become more irritating. Ten or twenty negative thoughts, like ten or twenty ants at a picnic, may cause you to pick up and leave. Whenever you notice these automatic negative thoughts, or ANTs, you need to crush them or they'll ruin your relationships, your self-esteem, and your personal power. One way to crush these ANTs is to write them down and talk back to them. For example, if you catch yourself thinking, "My husband never listens to me," write it down. Then write down a rational response, something like "He's not listening to me now, maybe he's distracted by something else. He often listens to me." When you write down negative thoughts and talk back to them, you take away their power and help yourself feel better. Some people tell me they have trouble talking back to these negative thoughts because they feel that they are lying to themselves. Initially they believe that the thoughts that go through their mind are the truth. Remember, thoughts sometimes lie to you. It's important to check them out before you just believe them!

Here are nine different ways that your thoughts lie to you to make situations seem worse than they really are. Think of these nine ways as different species or types of ANTs. When you can identify the type of ANT, you begin to take away to power it has over you. I have designated some of these ANTs as red, because they are particularly harmful. Notice and exterminate ANTs whenever possible.

*ANT 1: "Always/never" thinking.* This happens when you think something that happened will "always" repeat itself, or that you'll "never" get what you want. For example, if your partner is irritable and she gets upset, you might think to yourself, "She's always yelling at me", even though in reality she yells only once in a while. But just the thought "She's always yelling at me" is so negative that it makes you feel sad and upset. It activates your limbic system. All-or-nothing words like *always*, *never*, *no one*, *every one*, *every time*, *everything* are usually wrong. Here are some examples of "always/never" thinking:

*"He's always putting me down."*

*"No one will ever call me."*

*"I'll never get a raise."*

*"Everyone takes advantage of me."*

*"You turn away every time I touch you."*

*"My children never listen to me."*

"Always/never thinking" ANTs are very common. If you catch yourself thinking in these absolutes, stop and make yourself recall examples that disprove your all-or-nothing attitude.

*ANT 2 (red ant): Focusing on the negative.* This occurs when your thoughts reflect only the bad in a situation and ignore any of the good. For example, I have treated several professional speakers for depression. After their presentations, they had the audience fill out

an evaluation form. If one hundred forms were returned and two of them were terrible but ninety were outstanding, which ones do you think the speakers focused on? Only the negative ones! I taught them to focus on the ones they liked a lot more than the ones they didn't like. It's important to learn from others, but in a balanced, positive way.

Your deep limbic system can learn a powerful lesson from Eleanor Porter's book *Pollyanna*. In the book, Pollyanna went to live with her aunt after her missionary parents died. Even though she had lost her parents, she was able to help many "negative people" with her attitude. She introduced them to the "Glad Game", looking for things to be glad about in any situation. Her father had taught her this game after she experienced a disappointment. She had always wanted a doll, but her parents never had enough money to buy it for her. Her father sent a request for a secondhand doll to his missionary sponsors. By mistake, they sent a pair of crutches. "What is there to be glad about crutches?" they thought. Then they decided they could be glad because they didn't have to use them. This very simple game changed the attitudes and lives of many people in the book. Pollyanna especially affected the minister. Before she came to town he preached hellfire and damnation, and he did not seem to be very happy. Pollyanna told him that her father said that the Bible had eight hundred "Glad Passages", and that if God mentioned being glad that many times, it must be because He wants us to think that way. Focusing solely on the negative in situations will make you feel bad. Playing the Glad Game - looking for the positive - will help you feel better. I'm not suggesting you view the world through rose-colored glasses, only that you actively seek to find the positive to give more balance and optimism to a world you experience too often as negative.

*ANT 3 (red ant): Fortune-telling.* This is where you predict the worst possible outcome to a situation. For example, before you discuss an important issue with your partner, you predict that he or she won't be interested in what you have to say. Just having this thought will make you feel tense. I call fortune-telling a red ANT because when you predict bad things, you help make them happen. Say you are driving home from work and you predict that the house will be a wreck and no one will be interested in seeing you. By the time you get home you're waiting for a fight. When you see one thing out of place or no one comes running to the door, you're more likely to explode and ruin the rest of the evening. Fortune-telling ANTs really hurt your chances for feeling good. Remind yourself that if you could see the future, you'd be a lottery billionaire by now.

*ANT 4 (red ant): Mind reading.* This happens when you believe that you know what other people are thinking even when they haven't told you. Mind reading is a common cause of trouble between people. I tell people, "Please don't read my mind, I have enough trouble reading it myself!" You know that you are mind reading when you have thoughts such as "She's mad at me". "He doesn't like me". "They were talking about me". I tell people that a negative look from someone else may mean nothing more than that he or she is constipated! You can't read anyone else's mind. You never know what others are really thinking unless they tell you. Even in intimate relationships, you cannot read your partner's mind. When there are things you don't understand, ask about them to clarify them. Stay away from mind-reading ANTs. They are very infectious.

*ANT 5: Thinking with your feelings.* This occurs when you believe your negative feelings without ever questioning them. You tell yourself, "I feel this way, so it must be so".

Feelings are very complex and often based on powerful memories from the past. Feelings sometimes lie to you. Feelings are not always about truth. They are just feelings. But many people believe their feelings even though they have no evidence for them. "Thinking with your feelings" thoughts usually start with the words "I feel". For example, "I feel as if you don't love me". "I feel stupid". "I feel like a failure". "I feel nobody will ever trust me". Whenever you have a strong negative feeling, check it out. Look for the evidence behind the feeling. Do you have real reasons to feel that way? Or are your feelings based on events or things from the past? What's true, and what's just a feeling?

*ANT 6: Guilt beating.* Guilt is not a helpful emotion, especially for your deep limbic system. In fact, guilt often causes you to do things you don't want to do. Guilt beatings happen when you think with words like *should*, *must*, *ought*, or *have to*. Here are some examples: "I ought to spend more time at home". "I must spend more time with my kids". "I should have sex more often". "I have to organize my office". Because of human nature, whenever we think that we *must* do something, no matter what it is, we often don't want to do it. It is better to replace "guilt beating" with phrases like "I want to do ...", "It fits with my goals to do ...", "It would be helpful to do ...". So in the examples above, it would be helpful to change those phrases to "I want to spend more time at home". "It's in our best interests for my kids and me to spend more time together". "I want to please my spouse by making wonderful love with him (or her) because he (or she) is important to me". "It's in my best interest to organize my office". Guilt isn't productive. Get rid of this unnecessary emotional turbulence that holds you back from achieving the goals you want.

*ANT 7: Labeling.* Whenever you attach a negative label to yourself or to someone else, you stop ability to take a clear look at the situation. Some examples of negative labels are "jerk", "frigid", "arrogant", and "irresponsible". Negative labels are very harmful, because whenever you call yourself or someone else a jerk or arrogant, you lump that person in your mind with all of the "jerks" or "arrogant people" that you've ever known and you become unable to deal with him reasonably as a unique individual. Stay away from negative labels.

*ANT 8: Personalizing.* Personalizing occurs when you invest innocuous events with personal meaning: "My boss didn't talk to me this morning. She must be mad at me". Or "My son got into an accident with the car. I should have spent more time teaching him to drive. It must be my fault". There are many other reasons for others' behavior besides the negative explanations an abnormal limbic system picks out. For example, your boss may not have talked to you because she was preoccupied, upset, or in a hurry. You never fully know why people do what they do. Try not to personalize the behavior of others.

*ANT 9 (the most poisonous red ant): Blaming.* Blame is very harmful. When you blame something or someone else for the problems in your life, you become a passive victim of circumstances and you make it very difficult to do anything to change your situation. Many relationships are ruined by people who blame their parents when things go wrong. They take little responsibility for their problems. When something goes wrong at home or at work, they try to find someone to blame. They rarely admit their own problems. Typically, you'll hear from them statements like:

*"It wasn't my fault that ..."*  
*"That wouldn't have happened if you had ..."*  
*"How was I supposed to know ..."*  
*"It's your fault that ..."*

The bottom-line thinking in the "blame game" goes something like this: "If only you had done something differently, I wouldn't be in the predicament I'm in. It's your fault, and I'm not responsible".

Whenever you blame someone else for the problems in your life, you become powerless to change anything. The "blame game" hurts your personal sense of power. Stay away from blaming thoughts. You have to take personal responsibility for your problems before you can hope to change them.

### *Summary of ANT Species*

1. ***"Always/never" thinking:*** *thinking in words like always, never, no one, everyone, every time, everything.*
2. ***Focusing on the negative:*** *seeing only the bad in a situation.*
3. ***Fortune-telling:*** *predicting the worst possible outcome to a situation.*
4. ***Mind reading:*** *believing that you know what others are thinking, even though they haven't told you.*
5. ***Thinking you with your feelings:*** *believing negative feelings without ever questioning them.*
6. ***Guilt beating:*** *thinking in words like should, must, ought, or have to.*
7. ***Labeling:*** *attaching a negative label to yourself or to someone else.*
8. ***Personalizing:*** *investing innocuous events with personal meaning.*
9. ***Blaming:*** *blaming someone else for your own problems.*

### **DL Prescription 2: Kill The Ants / Feed Your Anteater**

Your thoughts really matter. They can either help or hurt your deep limbic system. Left unchecked, ANTs will cause an infection in your whole bodily system. Whenever you notice ANTs, you need to crush them or they'll affect your relationships, your work, and your entire life. First you need to notice them. If you can catch them at the moment they occur and correct them, you take away the power they have over you. When a negative thought goes unchallenged, your mind believes it and your body reacts to it.

ANTs have an illogical logic. By bringing them into the open and examining them on a conscious level, you can see for yourself how little sense it really makes to think these kinds of things for yourself. You take back control over your own life instead of leaving your fate to hyperactive limbic-conditioned negative thought patterns.

Sometimes people have trouble talking back to these grossly unpleasant thoughts because they feel that such obvious age-old "truisms" simply must be real. They think that if they don't continue to believe these thoughts, they are lying to themselves. Once again, remember that to know what is true and what is not, you have to be conscious of the thoughts and have an intelligent perspective on them. Most negative thinking is automatic and goes unnoticed. You're not really choosing how to respond to your situation, it's being chosen for you by bad brain habits. To find out what is really true and what is not, you need to question it. Don't believe everything you hear - even in your own mind!

I often ask my patients about their ANT population. Is it high? Low? Dwindling? Or increasing? Keep control over the ANTs in order to maintain a healthy deep limbic environment.

Whenever you notice an ANT entering your mind, train yourself to recognize it and write it down. When you write down automatic negative thoughts (ANTs) and talk back to them, you begin to take away their power and gain control over your moods. Kill the ANTs by feeding your emotional anteater.

The "kill the ANTs/feed your anteater" exercise is for whenever you feel anxious, nervous, depressed, or frazzled.

Here are some examples of ways to kill these ANTs:

ANT	ANT Species	Kill the ANT
You never listen to me.	"Always/Never" Thinking	I get frustrated when you don't listen to me, but I know you have listened to me and will again.
The boss doesn't like me.	Mind Reading	I don't know that. Maybe she's just having a bad day. Bosses are people, too.
The whole class will laugh at me.	Fortune-telling	I don't know that. Maybe they'll really like my speech.
I'm stupid.	Labeling	Sometimes I do things that aren't too smart, but I'm not stupid.
It's your fault we have these marital problems.	Blaming	I need to look at my part of the problem and look for ways I can make the situation better.

Your turn:

EVENT: Write out the event that is associated with your thoughts and feelings.

### **DL Prescription 3: Surround Yourself With People Who Provide Positive Bonding**

Have you ever picked up a container that had ants crawling on it? Within seconds they've crawled onto your body and you are hurriedly trying to brush them off. If you spend a lot of time with negative people, the same thing will happen. You may walk into a room in a buoyant mode, but before long their ANTs are going to rub off on you. Their ANTs will hang out with your ANTs and mate! That's not what you want - so surround yourself with positive people as much as possible.

Look at your life as it is now. What kind of people are around you? Do they believe in you and make you feel good about yourself, or are they constantly putting you down and denigrating your ideas, hopes, and dreams? List the ten people you spend the most time with. Make a note of how much they support you and the ways in which you would like to be supported more.

In my second year of college I got the bright idea that I wanted to go to medical school. I was on the speech team, and one day I told my speech coach about my dream to become a physician. The first thing out of her mouth was that she had a brother at Michigan State who hadn't made it into medical school. "And", she added, "he was much smarter than you are". The message was clear: You don't have a chance. Making a big decision like that was hard enough to do with encouragement; the disheartening comment from the coach was a blow to my confidence I did not need. I went home with my spirits considerably dampened. Later that evening when I told my father what had happened, he just shook his head and said, "Listen, you can do whatever you put your mind to. And if I were you, I wouldn't spend much time with that coach".

If you think of life as an obstacle course, it is easy to see that the fewer obstacles in the road, the better. Negative people present unnecessary obstacles for you to overcome because you have to push your will to succeed over their doubts and objections and cynicism. Spending time with people who believe you'll never really amount to anything will dampen your enthusiasm for pursuing your goals and make it difficult to move through life in the direction you want to go. On the other hand, people who instill confidence in you with a can-do attitude, people whose spirits are uplifting, will help breathe life into your plans and dreams.

It cannot be overemphasized how contagious the attitudes of others are and how much hidden influence they can exert. The reason so many people feel good about attending a positive-thinking seminar is that they have been in a room full of people who were all reaffirming the best in one another. But let one of those people go home and walk into a house where someone makes fun of his efforts and says he's wasting his time and will never get anywhere anyway, and watch how fast the positive efforts of the seminar wear off!

When you spend a lot of time with people, you bond with them in certain ways, and as I mentioned earlier, the moods and thoughts of others directly affect your deep limbic

system. If you go out with someone for dinner and after the first half hour you're beginning to feel bad about yourself when you have dinner with this person, you are not imaging it; your deep limbic system is actually being affected by him or her. Deciding that you don't want to spend time with people who are going to have an adverse effect on you doesn't mean you have to blame them for the way they are. It simply means that you have the right to choose a better life for yourself.

I believe that limbic bonding is one of the key principles behind the success of support groups like Alcoholics Anonymous. For years, clinicians have known that one of the best ways to help people with serious problems like alcoholism is to get them to connect with others who have the same problem. By seeing how others have learned from their experiences and gotten through tough times in positive ways, alcoholics can find the way out of their own plight. While gaining information about their disease is helpful, forming new relationships and connections with others may be the critical link in the chain of recovery. The same can be said about people with other disease, such as cancer. Stanford psychiatrist David Spiegel demonstrated the effectiveness of support groups for women with breast cancer. Those who participated in a support group had survival rates significantly higher than those who didn't. How our deep limbic system functions is essential to life itself. Spend time with people who enhance the quality of your limbic system rather than those who cause it to become inflamed.

#### **DL Prescription 4: Protect Your Children With Limbic Bonding**

In a study published in *The Journal of the American Medical Association* in 1997, researcher Michael Resnick, PhD, and colleagues at the University of Minnesota reported that teenagers who felt loved and connected to their parents had a significantly lower incidence of teenage pregnancy, drug use, violence, and suicide. So important is the bonding between children and parents that it overrides other factors traditionally linked to problem behavior, such as living in a single-parent home or spending less time with a child. The article concluded that the degree of connection (limbic bonding) that teenagers feel with parents and teachers is the most important determinant of whether they will engage in risky sexual activity, substance abuse, violence, or suicidal behavior.

A study published in *USA Today* in the late 1980s reported that "on average, parents spend less than seven minutes a week talking with their children". It is not possible to "limbically bond" and have much of a relationship in such little time. Children need actual physical time with their parents. Think about the times your parents spent positive one-on-one time with you. Did that make you feel important, special?

Some parents complain that their children are too busy or are not interested in spending time with them. When this happens, I recommend that parents force the issue with their kids, telling them that they're important to them and that they need to spend time with them. Of course, the way in which you spend time with them is critical. If you spend the time lecturing or interrogating them, neither of you will find it very enjoyable and both of you will look for ways to avoid contact in the future.

Here is an exercise that I've found extremely powerful in improving the quality of time you have with your child. The exercise is called "special time". Special time works. It will

improve the quality of your relationship with your child in a very short period of time. Here are the directions for special time.

*1. Spend twenty minutes a day with the child doing something that he or she would like to do. It's important to approach the child in a positive way and say something like "I feel we have not had enough time together and you're important to me. Let's spend some special time together every day. What would you like to do?" It's important to remember that the purpose of this time is to build the limbic bond and relationship with your child. Keep it as positive as possible.*

*2. During special time there are to be no parental commands, no questions, and directions. This is very important. This is a time to build the relationship, not discipline difficult behavior. If, for example, you're playing a game and the child starts to cheat, you can reframe her behavior. You can say something like "I see you've changed the rules of the game, and I'll play by your rules". Remember, the goal of special time is to improve the relationship between you and your child, not to teach. Of course, at other times, if the child cheats it is important to deal straightforwardly with it.*

*3. Notice as many positive behaviors as you can. Noticing the good is much more effective in shaping behavior than noticing the bad.*

*4. Do much more listening than talking.*

I once received a phone call from a friend of mine who complained that his eighteen-month-old daughter did not want anything to do with him when he came home from work. He told me that he thought it must be "one of those mother-daughter things" and that she'd probably grow out of it. I told him that it probably mean he wasn't spending enough time with his daughter and that if he did special time with his daughter she would become much more open and affectionate with him. My friend took my advice. He spent twenty minutes a day doing something that his daughter chose (usually playing with blocks in her room). He spent the time listening to her and feeding back what he heard her say. Within three weeks, his daughter's behavior dramatically changed. Whenever my friend would come home from work, his daughter would run to hug him, and she would hang on his leg all evening.

Remember, spending actual physical daily time with your child will have a powerfully positive effect on your relationship and protect your child from many of the problems in life.

### **DL Prescription 5: Build People Skills to Enhance Limbic Bonds**

It has been shown that enhancing emotional bonds between people will help heal the limbic system. In one large study in which patients were treated for major depression, the National Institutes of Health compared three approaches: antidepressant medication, cognitive therapy (similar to my ANT therapy), and interpersonal psychotherapy (enhancing relationship skills). Researchers were surprised to find that each of the treatments was equally effective in treating depression; many people in the medical community think that the benefits of medication far outweigh the benefits of therapy. Not surprising was the fact that combining all three treatments had an even more powerful effect. So not only were pharmaceuticals and professional therapists helpful, but patients played a significant role in helping each other.

How you get along with other people can either help or hurt your limbic system! The better you get along with those around you, the better you will feel.

I teach my patients the following ten relational principles to help keep their deep limbic systems (and the limbic systems of those they love) healthy and rewarding:

1. Take responsibility for keeping the relationship strong. Don't be a person who blames his or her partner or friends for the relationship problems. Take responsibility for the relationship and look for what you can do to improve it. You'll feel empowered, and the relationship is likely to improve almost immediately.

2. Never take the relationship for granted. In order for relationships to be special, they need constant nurturing. Relationships suffer when they get put low on the priority list of time and attention. Focusing on what you want in a relationship is essential to making it happen.

3. Protect your relationship. A surefire way to doom a relationship is to discount, belittle, or degrade the other person. Protect your relationships by building up the other person.

4. Assume the best. Whenever there is a question of motivation or intention, assume the best about the other person. This will help his or her behavior to actually be more positive.

5. Keep the relationship fresh. When relationships become stale or boring, they become vulnerable to erosion. Stay away from "the same old thing" by looking for new and different ways to add life to your relationships.

6. Notice the good. It's very easy to notice what you do not like about a relationship. That's almost our nature. It takes real effort to notice what you like. When you spend more time noticing the positive aspects of the relationship, you're more likely to see an increase in positive behavior.

7. Communicate clearly. I'm convinced most of the fights people have stem from some form of miscommunication. Take time to really listen and understand what other people say to you. Don't react to what you think people mean; ask them what they mean and then formulate a response.

8. Maintain and protect trust. So many relationships fall apart after there has been a major violation of trust, such as an affair or other form of dishonesty. Often hurts in the present, even minor ones, remind us of major traumas in the past and we blow them way out of proportion. Once a violation of trust has occurred, try to understand why it happened.

9. Deal with difficult issues. Whenever you give in to another person to avoid a fight, you give away a little of your power. If you do this over time, you give away a lot of power and begin to resent the relationship. Avoiding conflict in the short run often has devastating long-term effects. In a firm but kind way, stick up what you think is right. It will help keep the relationship balanced.

10. Make time for each other. In our busy lives, time is often the first thing to suffer in our important relationships. Relationships require real time in order to function. Many couples who both work and have children often find themselves growing further apart because they have no time together. When they do spend time together, they often realize how much they really do like each other. Making your special relationships a "time investment" will pay dividends for years to come.

### **DL Prescription 6: Recognize The Importance of Physical Contact**

The deep limbic system not only is involved in emotional bonding, it is also involved in physical bonding. Actual physical touching is essential to good health. It would probably surprise some people to know that there are couples who can go for ten years and longer without touching each other. I have seen them in my practice, and they invariably show such deep limbic system problems as irritability and depression. It is only after I help them correct their nontouching behavior that their depressive symptoms improve.

Physical connection is also a critical element in the parent-infant bonding process. The caressing, kissing, sweet words, and eye contact from the mother and father give the baby the pleasure, love, trust, and security it needs to develop healthy deep limbic pathways. Then a bond or connectedness between the parents and the baby can begin to grow. Without love and affection, the baby does not develop appropriate deep limbic connectedness and thus never learns to trust or connect. He feels lonely and insecure, and becomes irritable and unresponsive.

Touch is critical to life itself. In a barbaric thirteenth-century experiment, German Emperor Frederick II wanted to know what language and words children would speak if they were raised without hearing any words at all. He took a number of infants from their homes and put them with people who fed them but had strict instructions not to touch, cuddle, or talk to them. The babies never spoke a word. They all died before they could speak. Even though the language experiment was a failure, it resulted in an important discovery: Touch is essential to life. Salimbene, a historian of the time, wrote of the experiment in 1248, "They could not live without petting". This powerful finding has been rediscovered over and over, most recently in the early 1990s in Romania, where thousands of warehoused infants went without touch for sometimes years at a time. PET studies (similar to SPECT studies) of a number of these deprived infants have shown marked overall decreased activity across the whole brain.

Bonding is a two-way street. A naturally unresponsive baby may inadvertently receive less love from its parents. The mother and father, misreading their baby's naturally reserved behavior, may feel hurt and rejected and therefore less encouraged to lavish care and affection on their child. A classic example of this problem is illustrated by autistic children. Psychiatrists used to label the mothers of autistic children "cold"; they believed the mother's lack of responsiveness caused the autism. In recent times, however, it has been shown in numerous research studies that autism *is* biological and preceded any relationship. The mothers of autistic children in their studies started out warm, but actually became more reserved when they did not get positive feedback from their children. The kind of love that is critical to making the parent-infant bond work is reciprocal.

Love between adults is similar. For proper bonding to occur, couples need to hold and kiss each other, say sweet words, and make affectionate eye contact. It is not enough for one side to give and the other to passively receive. Physical manifestations of love need to be reciprocated or the other partner feels hurt and rejected, which ultimately causes the bond to erode.

Intimate relationships require physical love in order to flourish. The entire relationship cannot consist of two people sitting in their respective corners having a lively conversation about the stock market (even if they both adore the stock market). An intimate relationship is missing something essential for human beings if there is not enough physical contact. Without that element, eventually love will sour, causing one person to withdraw and perhaps look for love elsewhere.

Reporting in a *Life* magazine cover story on touch, writers George Howe Cold and Anne Hollister cite numerous incidents of the healing power of touch: "Studies have shown massage to have positive effects on conditions from colic to hyperactivity to diabetes to migraines, in fact, every malady TRI (Touch Research Institute, in Miami, Florida) has studied thus far". They report that "Massage, it seems, helps asthmatics breathe easier, boosts immune function in HIV-positive patients, improves autistic children's ability to concentrate, lowers anxiety in depressed adolescents, and reduces apprehension in burn victims about to undergo debridement... Even in the elderly, elders exhibited less depression, lower stress hormones, and less loneliness. They had fewer doctor visits, drank less coffee, and made more social phone calls".

Touch is essential to our humanity. Yet, in our standoffish, litigious society, touch is becoming less and less frequent. Touch your children, your spouse, your loved ones regularly. Giving and receiving massages on a regular basis will enhance limbic health and limbic bonding.

### **DL Prescription 7: Surround Yourself With Great Smells**

Your deep limbic system is the part of your brain that directly processes your sense of smell. That is why perfumes and wonderful-smelling soaps are attractive and unpleasant body odors are repellent. In the British Journal *The Lancet*, a study was reported on the benefits of aromatherapy using the oil from lavender flowers. When used properly, lavender oil aroma helped people to feel less stressed and less depressed. It also enhanced sleep. In aromatherapy, special fragrances are used in a steam machine, in the bath, on the pillow, and in potpourris. These fragrances can have an appreciable effect on people's moods. However, there is a difference between ingesting the substance and smelling it. When you ingest something, it goes to the stomach and is processed by the digestive system. (Moreover, many essential oils, including lavender, are dangerous if ingested.) A smell, however, activates the olfactory nerves, which go directly to the deep limbic system.

Consider cinnamon, used for cooking in a number of countries throughout the world. Being of Lebanese descent, my mother used to put cinnamon in many dishes she would bring to the table, including stuffed grape leaves, one of my favorites. When I recently told her that the scent of cooked cinnamon is considered a natural aphrodisiac for men, she put her hand

on her forehead and said, "That's why I have seven kids, your father would never leave me alone".

Many people have noticed that certain smells sometimes bring up very strong, clear memories, as if the whole feeling and sense of the original event were coming back to them. There is a good reason for that: Smell and memory are processed in the same area of the brain. Because smells activate neurocircuits in the deep limbic system, they bring about a more complete recall of events, which gives one access to details of the past with great clarity.

Smells have an effect on moods. The right smells likely cool the deep limbic system. Pleasing fragrances are like an anti-inflammatory. By surrounding yourself with flowers, sweet fragrances, and other pleasant smells, you affect the working of your brain in a powerful and positive way.

### **DL Prescription 8: Build a Library of Wonderful Memories**

Because the deep limbic system stores highly charged emotional memories, some of the memories are bound to be disturbing. One common tool for therapists has been to get clients to scan the past for negative memories so they can reprocess them. Unfortunately this form of treatment can be misguided, especially for people who are truly depressed. Depressed people have selective memories. They tend to recall only things that are consistent with their mood. Because they have inflamed deep limbic systems, their mood is negative, and everything they remember is negative. The whole process of recollection makes their lives look like one long bad dream and convinces them that they are justified in being depressed. Therapists sometimes recognize this tendency in clients and interpret it to mean that the patient is somehow invested in being miserable. But there is another explanation that has to do with how the mind/body works.

Whenever you remember a particular event, your brain releases chemicals similar to those released when you originally input impressions of the event. Consequently, remembering brings back a similar mood and feelings. If the memory is of your puppy getting hit by a car, it will put you in a melancholy mood. People whose bonding with their parents was tentative at best, or who had a lot of painful childhood experiences, already have a chemical imprint on the brain that is negative. They will tend to take in new events in a negative way. Whenever someone looks at them the wrong way, it triggers the same chemical patterns in the brain that are common to their early experience. They also tend to dismiss someone smiling at them and not see it as a positive expression because positive information is not consistent with their experience.

This pattern is difficult to change because it sets up a whole way of viewing life: The early patterns continually predispose the people toward taking things in such a way as to prove to themselves that they live in a negative universe. To change the pattern, they actually have to change their brain chemistry by remembering positive things. By calling up pleasant memories, they can tune in to mental states that are healthier. The brain then takes on the same chemical patterns that were inputted at the time the healthy events occurred. Because doing this is such a healing process, I encourage those who have lost a loved one to practice it. When someone dies, recalling the fights and the power struggles keeps the pain going

because it sets up a negative mood that is self-perpetuating. By continually remembering the bad things, the emotional filter gets set to actually keep out the good memories. This tends to focus us on the unfinished business instead of the real love that we shared for many years.

For those of use who do not have to battle depression on a daily basis, we may still find ourselves in states more negative than our lives actually warrant. When unfortunate things do happen, we might go on thinking about them for longer than is helpful to solve the problem. In order to balance the bad memories and heal the deep limbic part of our brain, it is important to remember the times of our life that were charged with positive emotions.

Make a list of the ten happiest times in your life. Describe them for yourself in detail, using as many of the five senses as possible. What colors do you remember? What smells were in the air? Was there music? Try to make the picture come alive. In a metaphorical sense you are going through the library shelves of daily experience and looking for the right book.

If you have been involved in a long-term relationship with someone, recollecting the history of your happy times together will enhance the bond between you. Positive memory traces actually encourage behaviour that strengthens the bonds. Encouraging affirming thoughts in yourself - in other words, by recalling your partner's caress, how he or she was helpful to you this week, a look or gesture that was particularly touching - will tune you in to a positive feeling, which in turn will dispose you to act lovingly. It might remind you to call your wife during the day, or to remember what special gift you could give your husband on his birthday that will make him especially happy, or help both of you be supportive when times are tough.

### **DL Prescription 9: Consider Limbic Medications**

Clinical depression, manic-depressive disorder, and severe PMS are more difficult problems than the garden variety most people experience in the form of bad moods. The deep limbic prescriptions I have mentioned so far may not be effective enough to help the more seriously affected person live a happy, functional life. For complete healing to take place, the addition of antidepressant medication or appropriate herbal treatment may be needed. A sure sign that the prescribed medications are really treating the depression is that the deep limbic system activity normalizes. Whenever limbic activity normalizes, there is a corresponding decrease in the patient's symptoms.

In recent years, new antidepressants have entered the market that have a wider application and often have fewer side effects than the original antidepressants. Some of the new pharmaceuticals have the additional benefit of affecting the subclinical patterns the rest of us are more likely to experience at some time in our lives, such as moodiness and negativity. The appendix contains information on current antidepressant medications that include the brand name, generic name, and dosage range. In treating clinical depression, it is important to use enough medication for a long enough period of time. Often, antidepressants take from two to four weeks to become effective. It is essential to work closely with your doctor on this; stopping medication suddenly can have serious repercussions.

Saint-John's-wort is an herbal treatment that has also been shown to have a positive impact on depression and a cooling influence on deep limbic structures. It has been used in Europe for many years and it is the most commonly prescribed antidepressant with the fewest side effects. For adults I recommend 500 milligrams two times a day of Saint-John's-wort, containing 0.3% hypericin. Even though Saint-John's-wort has fewer side effects than traditional antidepressants, it is not without side effects altogether. Some people become sun-sensitive and become more easily sunburned. Some get acne. Also, I had one patient who developed a seriously slow heart rate after taking it for a month. I believe if you are taking Saint-John's-wort for depression, you should do it under the supervision of a psychiatrist.

For the best results with all my patients, however, I often combine the use of medications with the deep limbic prescriptions described in this chapter.

### **DL Prescription 10: Try Physical Exercise**

Physical exercise can be very healing to the deep limbic system. It releases endorphins that induce a sense of well-being. The deep limbic system has many endorphinic receptors. Exercise also increases blood flow throughout the brain, which nourishes it so that it can function properly. Think about what blood flow and nourishment do for the rest of your body. A body that is constricted or emaciated doesn't feel good. The same is true for the brain. Good blood flow resets the deep limbic system to a healthy level, which in turn favorably affects the person's mood.

People who exercise regularly report a general sense of well-being that those who lead a sedentary lifestyle do not experience. They have increased energy and a healthy appetite, they sleep more soundly and are usually in a better mood. Over the years I have found it useful to prescribe physical exercise to depressed patients. This is even more important for people who are unable to tolerate antidepressant medication. Instead of taking medication, some are able to treat themselves, under their doctor's supervision, with a program of strenuous exercise, which makes them feel just as good as something from the pharmacy.

In the fast pace of modern life - long work hours, rush-hour commutes, two-parent working families - it is important to remember how essential exercise and personal care are to good health; don't let them be left out. Technology has worked against us in some ways because many of the advances in the past twenty years have reduced and even eliminated physical activity and exertion from our daily lives. In the movie *LA Story*, Steve Martin runs out of his house, jumps in his car, drives ten yards to his neighbor's house, hops back out, and knocks at his neighbor's door. A bit of an exaggeration, perhaps, but think of how many times we could walk to the neighborhood store to get a newspaper but instead decide to save time and drive. This inactive lifestyle is causing our bodies to lose their efficiency; in other words, they don't burn fat as they should. Experts in nutrition, physiology, and medicine all agree that a program of physical exertion on a continuing basis is required to maintain low body fat, a strong and healthy heart, and well-toned muscles.

A good exercise program will pay limbic dividends as well:

1. Exercise gives you more energy and keeps you from feeling lethargic.
2. Exercise increases metabolism, will help keep your appetite in check, and will therefore keep your weight down.
3. Exercise helps to normalize melatonin production in your brain and enhances the sleep cycle.
4. Exercise allows more of the natural amino acid tryptophan to enter the brain, enhancing mood. Tryptophan is the precursor to the neurotransmitter serotonin, which has been found to be low in many depressed patients. Tryptophan is a relatively small amino acid, and it often has to compete with larger amino acids to cross the blood channels into the brain. With exercise, the muscles of the body utilize the larger amino acids and decrease the competition for tryptophan to enter the brain. Exercise makes you feel better.

A lot of people grumble and complain when they're told to get more exercise. They find exercise time-consuming and boring. My advice is to keep trying different activities until you find the one that suits you. Find out what you like best. But make sure you get some form of regular workout (walking, running, cycling) on a daily basis, and an aerobic workout (which increases your heart rate and the flow of oxygen to your muscles) three times a week for at least twenty minutes a shot. Many people make the mistake of thinking that the sport they play as a hobby fulfills their exercise quota, yet the truth is that it depends on the sport. I once treated an obese man by outlining a nutrition and exercise program for him. Several weeks into it, he complained he wasn't losing any weight. When I asked what kind of workout he was getting, he told me he played two whole rounds of golf a weeks. I had to point out to him that walking around a golf course would not give him the level of activity he needed because it wasn't continuous - a golfer has to keep stopping to hit the ball. With a surprised look on his face, he said: "Wait a minute, Doc. I don't walk and stop to hit the ball. I get out of the cart, hit the ball, and then get back in the cart. That's a lot of activity, hopping in and out of that cart!"

### **DL Prescription 11: Watch Your Limbic Nutrition**

Over the past decade there has been significant research on food, nutrients, and depression. The results surprise many people. We have been inundated by nutritional experts and news reporters who tell us we should eat low-fat, high-carbohydrate diets. "Low fat" is everywhere. Unfortunately, low fat is not the complete answer. In two studies in the *American Journal of Psychiatry*, men who had the highest suicide rates had the lowest cholesterol levels. Our deep limbic system needs fat in order to operate properly. Certainly, some fats are better for us than others, such as the omega-3 fatty acids found most prevalently in fish. Protein is also essential to a healthy "deep limbic diet". Proteins are the building blocks of brain neurotransmitters. Low levels of dopamine, serotonin, and norepinephrine have all been implicated in depression and mood disorders. It is essential to eat enough protein in balanced amounts with fats and carbohydrates. Too much protein for some people may actually restrict the amount of "brain proteins" that cross into the brain. Not enough protein will leave you

with a brain protein deficit. The richest sources of protein are lean fish, cheese, beans, and nuts.

Low serotonin levels are often associated with worrying, moodiness, emotional rigidity, and irritability (a combination of deep limbic and cingulate problems). To enhance serotonin levels, eat balanced meals with complex carbohydrate snacks (such as whole-grain crackers or bread). Exercise can be a tremendous help along with nutritional supplementation. The amino acid L-tryptophan, which was recently reapproved by the Food and Drug Administration, is an option. L-tryptophan is a naturally occurring amino acid found in milk, meat, and eggs. I have found it very helpful for patients to improve sleep, decrease aggressiveness, and improve mood control. In addition, it does not have side effects, which gives it a real advantage over the antidepressants. L-tryptophan was taken off the market a number of years ago because one contaminated batch from one manufacturer caused a rare disease and a number of deaths. The L-tryptophan itself actually had nothing to do with the deaths. I recommend L-tryptophan in doses of 1,000-3,000 milligrams taken at bedtime. There have been some recent studies with inositol, from the B vitamin family, which you can get from a health food store. In doses of 12-20 milligrams a day it has been shown to decrease moodiness and depression. Check with your doctor before taking these or any other supplements.

Low norepinephrine and dopamine levels are often associated with depression, lethargy, trouble focusing, negativity, and mental fuzziness. To enhance norepinephrine and dopamine levels, it is better to have protein snacks (such as meat, eggs, or cheese) and to avoid simple carbohydrates, such as bread, pasta, cakes, and candy. Also, I often have my patients take natural amino acids such as tyrosine (1,000-1,500 milligrams a day) for energy, focus, and impulsivity control, and DL-phenylalanine (400 milligrams three times a day on an empty stomach) for moodiness and irritability. Again, check with your doctor if you want to try these supplements.