Introduction

This book is about how to reach inside your own brain to create more happiness, love, and wisdom. It explores the historically unprecedented intersection of psychology, neurology, and contemplative practice to answer two questions:

- What brain states underlie the mental states of happiness, love, and wisdom?
- How can you use your mind to stimulate and strengthen these positive brain states?

The result is a practical guide to your brain, full of tools you can use to gradually change it for the better.

Richard is a neurologist and I'm a neuropsychologist. While I've written most of the words here, Richard has been my long-time collaborator and teaching partner; his insights into the brain from his thirty years as a physician are woven into these pages. Together we've founded the Wellspring Institute for Neuroscience and Contemplative Wisdom; its website, www.wisebrain.org, offers many articles, talks, and other resources.

In this book you'll learn effective ways to deal with difficult states of mind, including stress, low mood, distractibility, relationship issues, anxiety, sorrow, and anger. But our main focus will be on positive well-being, psychological growth, and spiritual practice. For thousands of years, contemplatives—the Olympic athletes of mental training—have

studied the mind. In this book we'll take the contemplative tradition we know best—Buddhism—and apply it to the brain to reveal neural pathways to happiness, love, and wisdom. No one knows the full nature of the brain of a Buddha or of any other person. But what is increasingly known is how to stimulate and strengthen the neural foundations of joyful, caring, and deeply insightful states of mind.

HOW TO USE THIS BOOK

You don't need any background in neuroscience, psychology, or meditation to use this book. It weaves together information and methods—like an operating manual for your brain combined with a toolbox—and you'll find the tools that work best for you.

Because the brain is fascinating, we've presented a good deal of the latest science about it, including numerous references in case you want to look up these studies yourself. (But to avoid this turning into a textbook, we've simplified the descriptions of neural activities to focus on their essential features.) On the other hand, if you're more interested in practical methods, it's fine to glide over the science parts. Of course, psychology and neurology are both such young sciences that there's a lot they don't understand yet. So we haven't attempted to be comprehensive. In fact, we've been opportunistic, focusing on methods that have a plausible scientific explanation for how they light up your neural networks of contentment, kindness, and peace.

These methods include some guided meditations. The instructions for these are deliberately loose, often including language that's poetic and evocative rather than narrow and specific. You can approach these in different ways: you might just read and think about them; you might bring parts of them into any meditative practices you are already doing; you might work through them with a friend; or you might record the instructions and do them by yourself. The instructions are just suggestions; pause as long as you like between them. There is no wrong way to do a meditation—the right way is what feels right to you.

A word of caution: This book isn't a substitute for professional care, and it is not a treatment for any mental or physical condition. Different things work for different people. Sometimes a method may stir up uncomfortable feelings, especially if you have a history of trauma. Feel

free to ignore a method, discuss it with a friend (or counselor), change it, or drop it. Be kind to yourself.

Last, if I know one thing for sure, it's that you can do small things inside your mind that will lead to big changes in your brain and your experience of living. I've seen this happen again and again with people I've known as a psychologist or as a meditation teacher, and I've seen it in my own thoughts and feelings as well. You really can nudge your whole being in a better direction every day.

When you change your brain, you change your life.

chapter 1

The Self-Transforming Brain

The principal activities of brains are making changes in themselves.

—Marvin L. Minsky

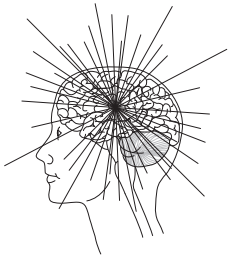
When your mind changes, your brain changes, too. In the saying from the work of the psychologist Donald Hebb: when neurons fire together, they wire together—mental activity actually creates new neural structures (Hebb 1949; LeDoux 2003). As a result, even fleeting thoughts and feelings can leave lasting marks on your brain, much like a spring shower can leave little trails on a hillside.

For example, taxi drivers in London—whose job requires remembering lots of twisty streets—develop a larger hippocampus (a key brain region for making visual-spatial memories), since that part of the brain gets an extra workout (Maguire et al. 2000). As you become a happier person, the left frontal region of your brain becomes more active (Davidson 2004).

What flows through your mind sculpts your brain. Thus, *you can use your mind to change your brain for the better*—which will benefit your whole being, and every other person whose life you touch.

This book aims to show you how. You'll learn what the brain is doing when the mind is happy, loving, and wise. And you'll learn many ways to activate these brain states, strengthening them a bit each time. This will give you the ability to gradually rewire your own brain—from the inside out—for greater well-being, fulfillment in your relationships, and inner peace.

Your Brain—Basic Facts



- Your brain is three pounds of tofu-like tissue containing 1.1 trillion cells, including 100 billion *neurons*. On average, each neuron receives about five thousand connections, called *synapses*, from other neurons (Linden 2007).
- At its receiving synapses, a neuron gets signals—usually as a burst of chemicals called *neurotransmitters*—from other neurons. Signals tell a neuron either to fire or not; whether it fires depends mainly on the combination of signals it receives each moment. In turn, when a neuron fires, it sends signals to other neurons through its transmitting synapses, telling them to fire or not.
- A typical neuron fires 5–50 times a second. In the time it takes you to read the bullet points in this box, literally quadrillions of signals will travel inside your head.
- Each neural signal is a bit of information; your nervous system moves information around like your heart moves blood around. All that information is what we define broadly as the *mind*, most of which is forever outside your awareness. In our use of the term, the "mind" includes the signals that regulate the stress response, the knowledge of how to ride a bike,

personality tendencies, hopes and dreams, and the meaning of the words you're reading here.

- The brain is the primary mover and shaper of the mind. It's so busy that, even though it's only 2 percent of the body's weight, it uses 20–25 percent of its oxygen and glucose (Lammert 2008). Like a refrigerator, it's always humming away, performing its functions; consequently, it uses about the same amount of energy whether you're deep asleep or thinking hard (Raichle and Gusnard 2002).

- The number of possible combinations of 100 billion neurons firing or not is approximately 10 to the millionth power, or 1 followed by a million zeros, in principle; this is the number of possible states of your brain. To put this quantity in perspective, the number of atoms in the universe is estimated to be "only" about 10 to the eightieth power.

- Conscious mental events are based on temporary coalitions of synapses that form and disperse—usually within seconds—like eddies in a stream (Rabinovich, Huerta, and Laurent 2008). Neurons can also make lasting circuits, strengthening their connections to each other as a result of mental activity.

- The brain works as a whole system; thus, attributing some function—such as attention or emotion—to just one part of it is usually a simplification.

- Your brain interacts with other systems in your body—which in turn interact with the world—plus it's shaped by the mind as well. In the largest sense, your mind is made by your brain, body, natural world, and human culture—as well as by the mind itself (Thompson and Varela 2001). We're simplifying things when we refer to the brain as the basis of the mind.

- The mind and brain interact with each other so profoundly that they're best understood as a single, co-dependent, mind/brain system.

AN UNPRECEDENTED OPPORTUNITY

Much as the microscope revolutionized biology, in the past few decades new research tools such as functional MRIs have led to a dramatic increase in scientific knowledge about the mind and brain. As a result, we now have many more ways to become happier and more effective in daily life.

We have probably learned more about the brain in the past twenty years than in all of recorded history.
—Alan Leshner

Meanwhile, there's been a growing interest in the contemplative traditions, which have been investigating the mind—and thus the brain—for thousands of years, quieting the mind/brain enough to catch its softest murmurs and developing sophisticated ways to transform it. If you want to get good at anything, it helps to study those who have already mastered that skill, such as top chefs on TV if you like to cook. Therefore, if you'd like to feel more happiness, inner strength, clarity, and peace, it makes sense to learn from contemplative practitioners—both dedicated lay people and monastics—who've really pursued the cultivation of these qualities.

Although "contemplative" may sound exotic, you've been contemplative if you've ever meditated, prayed, or just looked at the stars with a sense of wonder. The world has many contemplative traditions, most of which are associated with its major religions, including Christianity, Judaism, Islam, Hinduism, and Buddhism. Of these, science has engaged Buddhism the most. Like science, Buddhism encourages people to take nothing on faith alone and does not require a belief in God. It also has a detailed model of the mind that translates well to psychology and neurology. Consequently, with great respect for other contemplative traditions, we'll draw particularly on Buddhist perspectives and methods.

Anything less than a contemplative perspective on life is an almost certain program for unhappiness.
—Father Thomas Keating

Imagine each of these disciplines—psychology, neurology, and contemplative practice—as a circle (figure 1). The discoveries being made at that intersection are only just starting to show their promise, but scientists, clinicians, and contemplatives have already learned a great deal about the brain states that underlie wholesome mental states and how to activate those brain states. These important discoveries give you a great ability to influence your own mind. You can use that ability to reduce any distress or dysfunction, increase well-being, and support spiritual practice; these are the central activities of what could be called the *path of awakening*, and our aim is to use brain science to help you travel far and well upon it. No book can give you the brain of a Buddha, but by better understanding the mind and brain of people who've gone a long way down this path, you can develop more of their joyful, caring, and insightful qualities within your own mind and brain as well.

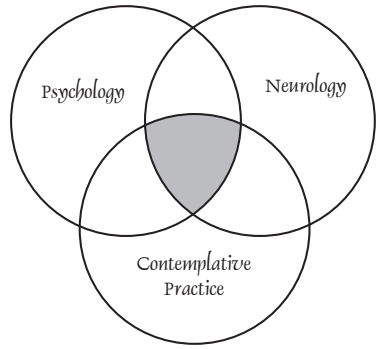


Figure 1
The Intersection of Three Disciplines

The history of science is rich in the example of the fruitfulness of bringing two sets of techniques, two sets of ideas, developed in separate contexts for the pursuit of new truth, into touch with one another.

—J. Robert Oppenheimer