DACHER KELTNER • KEITH OATLEY • JENNIFER M. JENKINS

UNDERSTANDING EMOTIONS

Fourth Edition

WILEY

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FOURTH EDITION

Dacher Keltner
Keith Oatley
Jennifer M. Jenkins

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To

Natalie, Serafina

Simon, Grant, and Hannah

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PREFACE

> The strange thing about life is that though the nature of it must have been apparent to everyone for hundreds of years, no one has left any adequate account of it. The streets of London have their map; but our passions are uncharted.
>
> Virginia Woolf, *Jacob's Room*

As we present the fourth edition of *Understanding Emotions*, we are struck by how much has been learned about emotion in the past six years since we published the third edition. We are also struck by how topical emotions are today. They are the inspiration for films, for alarming trends in politics in different countries, for lesson plans in the classroom, for new emotional intelligence programs at work, and for the time-honored contemplation of what it means to live a meaningful life. It is an honor to be part of the scientific effort at understanding emotions as we try, with our varying methods and notions, to chart the human passions.

According to written and oral traditions, people have been interested in emotions for thousands of years; in most societies, they are at the center of people's understandings of themselves and others in their relationships, rituals, and public life. Great ethical, philosophical, and spiritual traditions, from Aristotle to Lao Tzu, concern themselves with the emotions, as has been observed by the historian Karen Armstrong. So too do the great artists and writers of all eras, from Shakespeare to Virginia Woolf to Toni Morrison. In the era of scientific research in psychology, we present here an approach to understanding that can enter ordinary conversation and that is based in the growing streams of scientific evidence.

In psychology, emotions have now moved into their proper place, at the center of our understandings of the human mind and of relationships in the social world. Research on emotions is not just psychology. It extends into neuroscience, cognitive science, psychiatry, biology, genetics, anthropology, sociology, economics, literature, history, and philosophy. As has been true since the first edition of this book, and our own leanings, we do our best to offer insights about emotions from many disciplines, alongside those of psychology.

In this edition, we continue to build upon the growing realization that although emotions occur in individuals' brains and bodies, they also mediate our relationships with each other, in both intimate and public ways. They support a grammar of social life. We focus on this idea even more explicitly in this edition: on the role of emotions in attachments, friendships, parent–child interactions, and intimate relationships, as well as in hierarchical and collective social structures.

Surveying the field as we have done for this edition, we note some other new trends in the field that have shaped the revision of this book. It is now quite clear that the field has moved well beyond a narrow focus on what might be called the "Basic Six"—anger, disgust, fear, sadness, surprise, and happiness—which were so central to the study of emotions 40 years ago (for summary of that science, see Lench et al., 2011). In part, this is due to the study of emotions in relationships, which led researchers to emotions like compassion, love, and desire, as well as envy and jealousy. This includes the emergence of moral psychology, and the notion that emotions are involved in moral judgments, which leads to an interest in emotions such as gratitude, guilt, and shame. There is also an increasing interest in emotion and the arts, fiction, and our narrative and scientific understanding of the world, and emotions like awe, interest,

and appreciation of beauty. We believe this interest in a broadening array of emotions, seen in studies of expression, the nervous system, development, relationships, and well-being shifts our understanding of who we are as a species, and we've done our best in this new edition to represent these changes.

In surveying the field for this edition, it is clear that the current generation of scholars has pushed the longstanding debate about how emotions might be discrete, and how they are constructed with language, in new directions. Findings are emerging that suggest how emotions may be both discrete and constructed, a theme we take up in fresh ways in different chapters in the book.

We also note the greater interest in the meaningful life through the lens of the science of emotion. Happiness, after all, is in many ways at its heart about emotion. So too are the struggles of living—depression, anxiety, loneliness, illness, sleep disruption, drug addiction, and antisocial behavior. Well-being and health often involve practices that cultivate different emotions. And so throughout this book, culminating in our last chapter, we explore the new science of a meaningful life and focus on such themes as mindfulness, empathy, gratitude, compassion, kindness, immersion in nature, and even mystical states.

We hope you will like this fourth edition, which continues the traditions of the earlier editions, but with new features that we hope will make it easier and more pleasurable for both instructors and students to use. In this edition, we have collaborated with people who are students or former students in particular chapters: Michelle Rodriguez and Sahar Borairi in Chapter 8, Heather Prime and Alessandra Schneider in Chapter 11, Mark Wade and Noam Binoon-Erez in Chapter 12. We are very grateful to these people; they have improved on what we would have been able to do on our own. We are also very grateful to colleagues who sent thoughts about advances in the field or read and sent us feedback and suggestions on chapters: Belinda Campos, Hugo Critchley, David DeSteno, Neha John-Anderson, Brian Knutson, Matthew Lieberman, Terry Maroney, Batja Mesquita, Randolph Nesse, Lauri Nummenmaa, Kevin Ochsner, Ira Roseman, Ryan Smith, Emiliana Simon-Thomas, Jessica Tracy, and Jeanne Tsai.

Exciting advances continue to be made in the field of emotions, and we have done our best to reflect the new currents, and we have also responded to colleagues' suggestions for updating this book.

Changes in the fourth edition include the following:

- Updated references throughout, including recent research and evidence in psychology, psychiatry, the social sciences, and the humanities, as well as in neuroscience
- Deepened attention to interpersonal and social functions of emotions, with discussions of how emotions work between people in different relationships
- More treatment of positive emotions such as love, compassion, awe, interest, and gratitude and how they help shape our relationships and well-being
- A greater focus on mind–body relations in emotion through the lens of new studies of embodiment and interoception
- A more coherent focus on studies of how emotion-related language influences emotional experience, neurophysiology, and well-being
- New discussions of contemporary research on evolution, and on genes in interaction with the environment
- A deepened focus on emotion and moral judgment
- New sections on collective emotions, meaning and well-being, mindfulness, and a sharpened focus on personal and societal costs of poverty and economic inequality

Science and the humanities both depend on entering the tradition of earlier writers. Bernard of Chartres, a scholar of the twelfth century, seems to have been the first to remark that if we can see further, now, it is because we stand on the shoulders of giants: those who have come before us. Our job as writers is to present some of what can be seen from this position, and to evaluate theories and evidence. You as a reader can then evaluate what we say in relation to what else you know. You can take part in the debate that is the social process of science and discussion, means by which understanding is increased.

This book is intended for anyone with an interest in emotions to show how far conceptualization and research have progressed toward understanding. Although some have argued that emotions are too heterogeneous for systematic study, the fact that we can write a textbook shows—we believe—that from a complex field, order, insight, and intellectual progress can emerge.

Any discussion of human emotions without a point of view would be dull and largely incomprehensible. The quantity of publications—numbering now in tens of tens of thousands—in the field makes it impossible to be exhaustive. We have therefore chosen studies that we believe are representative, hoping to convey material for you to think productively and critically about this field. As well as an overall narrative arc in the book, there is a story line for each chapter, including pivotal characters, foundational ideas, and intellectual controversies and tensions. Where there are debates we discuss them, so that you can look at the field from different points of view. But we have also worked to produce a coherent book. Although ours is not the only point of view, we think that by seeing that there is a coherent perspective in this area, you the reader will be able to agree, or to disagree, or to modify it. Knowing that any piece of evidence is not conclusive on its own but that each is a step in exploring an idea, we hope that an integrated picture will take shape for you the reader, with concepts and ideas you can modify and apply to your own interests.

We have done our best to be fair-minded in our treatment of evidence, but our knowledge is necessarily incomplete and our views are necessarily biased toward our own interests and conceptualizations. Our interests are in thinking of emotions in cognitive, evolutionary, social, and developmental terms, in understanding their role in mediating everyday social interaction, and in comprehending what goes wrong in emotional disorders. We see emotions as based on biological processes, elaborated in our close relationships, and shaped by culture. Like the skilled action when you write your signature, an emotion has a biological basis of components and constraints. It also has a history of individual development. It is only fully understandable within an interpersonal and cultural context.

We write about emotions largely in the Western tradition. This does not imply universality of Euro-American assumptions; we present a lot of cross-cultural comparisons. At the same time, we imagine that most of our readers will be members of, or will be conversant with, the Western tradition. We believe that, by characterizing and identifying with this tradition, the ideas and findings about emotions that have substance within it can be seen clearly. We, and others, can then both form understandings based in that tradition and also understand better other culturally distinctive ways of thinking.

As well as a general introduction to the area, the book is designed for use as a textbook for a course on emotions for second- to fourth-year undergraduates, or for students at the MA/MSc or PhD level, and we hope, for interested readers more generally.

Most textbooks in psychology nowadays are compendia of many things to be remembered and a few to be conceptualized. By contrast, Richards (1925) said that a book is “a machine to think with” (p. 1). We have written our book to invite your thinking. Our conclusions make up a narrative thread. But by offering you sufficient evidence, from which we make suggestions, we hope to make it possible for you to draw your own conclusions.

The 14 chapters of this book can be covered in semester-long courses at the rate of one a week, perhaps with one or two chapters left out according to the judgment of the instructor. For full-year courses, each chapter can be divided. Throughout, we keep in mind both the issue of prompting

understandings of emotions and practical applications in clinical psychology, psychiatry, health care, education, and issues of organizations. We envisage that many instructors who use the book will supplement it with readings that they provide. At the end of each chapter, we offer some suggestions for further reading, typically reviews and books.

We have tested our ideas and coverage by going to conferences, and attending to the currents of publications in the field, which has its own journals, its international societies for research, its review volumes, its handbooks. One of us (DK) continues to keep the material of this book in register with students in his undergraduate course of emotions at the University of California, Berkeley. All three of us use the material presented here in our courses and lectures.

An Instructor's Manual with lecture notes and teaching tips is available upon request.

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Perspectives on Emotions

PART I

Approaches to Understanding Emotions

1

Photo Credit: *The Expression of the Emotions in Man and Animals* by Charles Darwin, 1872

FIGURE 1.0 Young girl in a hat, from Darwin (1872)

> Why is every critical moment in the fate of the adult or child so clearly colored by emotion?
>
> *(Vygotsky, 1987, p. 335)*

CONTENTS

Introduction

After winning an Academy Award for his movie *Up,* Pixar director Pete Docter was searching for a fresh subject for his next film. What captured his imagination was something close to home: the emotional fluctuations that he saw in his 11-year-old daughter Elie, who was experiencing her transition to adolescence. Adolescence is a notoriously emotional time. The delights and joys of childhood come to be replaced by doubts, anxieties, and self-consciousness. It is not uncommon for preadolescent girls to experience such feelings. As Pete Docter watched his daughter go through emotional changes of this kind, he arrived at the subject of his next film—the emotions.

To understand his new subject more deeply, Docter immersed himself in the science of emotion you are about to study (and reached out to one of the authors of this book (D.K.), to serve as a scientific consultant for the film). He read the previous edition of the book you are just beginning to read. He pored over scientific articles. He asked questions such as: How many emotions are there? Why do we feel emotions such as sadness or anger? What are the subtle ways in which we express emotions? How do emotions shape how we perceive the world? When we remember an emotional event in the past, how much of that recollection is faithful to what happened? The scientific answers to the aforementioned questions became a foundation of his film, *Inside Out*.

Inside Out is about the emotional turmoil that Riley, an 11-year-old girl, experiences as she and her family move from Minnesota to San Francisco. It is a traumatic move, as so many are. Riley must leave behind her best friend, joyful times of ice-skating with her parents, and the passion of her childhood—her hockey team. She moves into a spooky Victorian house in San Francisco, that, without the family's furniture, fills her dreams with ghosts. Alone, she must make her way at a new school and the navigate judgments of middle-school girls, who can be contemptuous critics of character. What is unique, though, about *Inside Out* is that alongside Riley and her parents, the central characters in the film are five emotions in Riley's mind—Anger, Disgust, Fear, Joy, and Sadness (see Figure 1.1).

FIGURE 1.1 Characters from *Inside Out.*

Inside Out dramatizes two central insights about the emotions that are contained within its title. The "Inside" of *Inside Out* refers to how emotions shape the inner workings of our minds and identities. If you watch *Inside Out* you'll notice how the five emotions vie for control over a console in Riley's mind, and once in charge, if only for a second or two, they arrange how Riley perceives her present circumstances. For example, in one scene, when Riley's dad offers to walk with her on her first day of school, Disgust, played by Mindy Kaling, rejects this mortifying possibility, prompting Riley to politely decline her dad's offer. Emotions also guide how Riley thinks about the past. In one of the more poignant scenes in the film, Sadness, played by Phyllis Smith, adds a blue tint to Riley's joyous, yellow-hued memories of her idyllic childhood in Minnesota. Emotions shape the workings of our minds.

The "Out" of *Inside Out* refers to how emotions guide our behavior in the social environment. For example, Anger, played by Lewis Black, drives Riley to compete fiercely when playing hockey and to storm upstairs after a temper tantrum directed at her parents. Sadness prompts thoughtful, wise action, guiding Riley to comfort her imaginary friend Bing Bong when he has lost the wagon in which they had played during Riley's childhood. At the end of the film, Riley reunites with her parents after a brief attempt at running away. If you watch this scene closely enough, you will see how emotional embraces and sighs are at the heart of their shared affection. Emotions shape our social lives.

Inside Out went on to win an Academy Award in 2016 and made it into most lists of best-films-of-the-year. But in important ways its influence is more enduring; it would offer a new view of what emotions are to a worldwide audience and one in keeping with the science of emotion that you will explore in this book. For over 2,000 years, some thinkers have argued that our emotions are irrational and destructive. The more noble reaches of human nature are attained, this reasoning continues, when we control our passions with our reason. In this book, as in *Inside Out,* we arrive at a different view. Emotions are vital to adapting to the social environment. They shape how we perceive the world and guide important courses of action, such as committing to a romantic partner, fighting for justice, or consoling a friend. Emotions are the very foundation of our sense of identity, our moral judgment, and our relationships. They are vital to our pursuit of the meaningful life. To lay a foundation for these ideas, let's first look at how the study of emotion emerged. As we do, we will take on a particularly vexing question: what is an emotion?

What Is an Emotion? First Ideas

We have all experienced emotions, and in this sense we know what they are. But emotions are difficult to define in precise terms. In fact, such difficulties are rather usual. We all know what a tree is, even though we don't know its proper definition. We all have a sense of beauty or justice, but when pressed to define such concepts often fail to find the exact language. It's one of the wonderful properties of language to be able to refer to things even when we don't know exactly what we mean (Putnam, 1975). To arrive at a useful definition of something as complex as emotion, you need a good theory. With the help of this book, we hope you will formulate your own good theory of emotion.

Let's begin to characterize emotion, so that we can agree upon roughly what we are talking about. An emotion is a psychological state that relates an event, usually out there in the world, but sometimes in the mind, to what Nico Frijda (e.g., 2007) called a **concern.** It prepares the person for action. What this makes clear is that one central component of an emotion is an internal experience, a state that reflects a present context relevant to the person's goals (Lazarus, 1991). A result is that, as Sylvan Tomkins (whose work we discuss later in this chapter) has said: the emotion gives **priority** to one goal over others. It gives that goal, or concern, urgency. If you are crossing the road, and nearly get run over, your concern for self-preservation takes priority: you are motivated by fear. The urge is to jump back onto the curb. If you fare well on a test you've

studied hard for, your concern for being esteemed by others is made salient: you feel pride, and may be inclined to tell your parents, or, in worse moments, show off to your friends in hubris (Tracy, Weidman, Cheng, & Martens, 2014). As these examples illustrate, emotions relate events to our personal concerns, and prepare us, as Nico Frijda has argued, to act in response to events in the environment (Frijda, 1988, 2007; Scarantino, 2017a). Emotions, then, are states triggered by events related to our concerns and that motivate action. So, rather than thinking that emotions are irrational, psychologists now tend to think of emotions as being locally rational: they help us deal adaptively with concerns specific to our current social context, concerns, for example, over safety, fairness, agency, being esteemed and respected, moral virtue, and feeling connected to trustworthy others, that define our identities (Brosch & Sander, 2014; Solomon, 2007). An emotion gives **urgency** to a specific concern, and orients us to specific kinds of action.

Our characterization of emotion also highlights how social these states are; they mediate, or connect, the individual's pressing concerns with potential courses of action within the social environment (Frijda, 2007; Keltner & Haidt, 1999; Scarantino, 2017a; van Kleef, 2016; van Kleef, Cheshin, Fischer, & Schneider, 2016). When we feel angered by a friend's sarcastic comment, our concern over being valued is given urgency, and points to courses of action to undo the friend's critique. Emotions are relational in many ways. Expressions of emotion guide specific interactions that make up your day (Keltner & Kring, 1998; Scarantino, 2017b). Think of the last time you flirted or soothed a struggling friend. What might come to mind as you do this are emotional expressions—a coy glance, laughter, a comforting embrace, or compassionate word accompanied by tender prosody. Emotions help us form and engage in our relationships. Who do we choose to spend our lives with? How do we feel about members of our family? Who are our friends? Why do we worry when separated from someone to whom we're very close? Emotions connect our context-specific concerns with possible courses of action in the social environment.

What's the interpersonal equivalent of an emotion giving priority to a concern? It's that an emotion is a kind of commitment to another (Aubé, 2009; Frank, 1988). When we love someone, even if the love is brief, and even if it is not spoken about as love, we commit ourselves to that other, at least for a while. We make the other's concerns our own, be it in sex, or in childrearing, or in cooperating as soldiers or nurses do in situations when life is in peril. When we are angry with someone, we commit ourselves to seeing the matter through, to a resolution, or to a parting.

Emotions, then, are subjective and intrapersonal, but also powerfully social and interpersonal. Let's now examine how these ideas have precursors in thinkers of the past.

Nineteenth-Century Founders

Modern ideas about emotions can be thought of as derived from Charles Darwin, William James, and Sigmund Freud; here's how their ideas have been influential.

Charles Darwin: The Evolutionary Approach

> *Our descent, then, is the origin of our evil passions!! –*
> *The Devil under form of Baboon is our grandfather!*
>
> Charles Darwin, *notebook* (Gruber & Barrett, 1974, p. 289)

In 1872, Charles Darwin (see Figure 1.2), the central figure in modern biology, published the most important book on emotions yet written—*The Expression of the Emotions in Man and Animals* (1872). Earlier, in *On The Origin of Species* (1859), he had described how all living things have evolved to be adapted to their environments. Knowing this you might imagine that Darwin

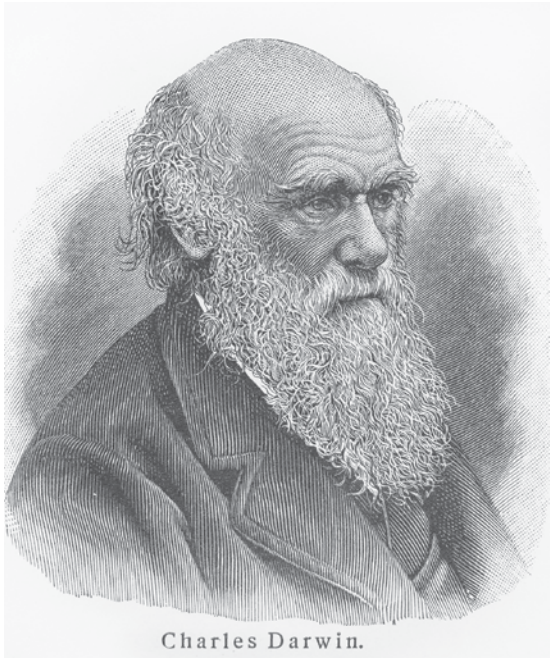

Photo Credit: Nicku/Shutterstock

FIGURE 1.2 Drawing of Charles Darwin.

would have proposed that emotions served functions in our survival. Indeed many psychologists and biologists assume that this is what he said. But he didn't. His argument was both closer to common sense and more subtle than anything that we might commonsensically believe.

Darwin began writing notes on his observations of emotions in 1838. At that time, the accepted theory was that God had given humans special facial muscles that allowed them to express uniquely human sentiments. A central tenet of Darwin's theory, however, was that humans are descended from other species: we are not only closer to animals than had been thought, but we ourselves are animals of a certain kind. Darwin gathered many observations, which would have enduring effects on the contemporary study of emotion (Darwin 1872/1998).

In his book on emotions, Darwin asked two broad questions that still guide emotion researchers (Hess & Thibault, 2009; Shariff & Tracy, 2011). First, how are emotions expressed in humans and other animals? Table 1.1 is a taxonomy of some of the **expressions** Darwin described.

The second question Darwin asked is where do our emotions come from? He argued that emotional expressions derive largely from habits that in our evolutionary or individual past had once been useful (for criticism, see Fugate et al., 2014). Darwin proposed that emotional expressions are based on reflex-like mechanisms, and some of them occur whether they are useful or not. They can be triggered involuntarily in circumstances analogous to those that had triggered the original habits. His book brims with examples of such actions: of tears that do not function to lubricate the eyes, of hair standing on end in fear and anger to no apparent purpose, and so on (see Figure 1.3).

For Darwin, expressions showed the continuity of adult human emotions with those of lower animals and with those of infancy. Because these expressions occur in adults "though they may not . . . be of the least use," they had for Darwin a significance for evolutionary thinking rather like that of fossils that allow us to trace the evolutionary ancestry of species. He thought emotional expressions were like the appendix, which is a small organ that is part of the gut but seemingly has no function. Darwin proposed that this is evidence that we

Table 1.1 Emotional expressions discussed by Darwin (1872), the bodily systems used, and the type of emotion which was expressed

Expression	Bodily system	Emotion example
Blushing	Blood vessels	Shame, modesty
Body contact	Somatic muscles	Affection
Clenching fists	Somatic muscles	Anger
Crying	Tear ducts	Sadness
Frowning	Facial muscles	Anger, frustration
Laughing	Breathing apparatus	Pleasure
Perspiration	Sweat glands	Pain
Hair standing on end	Dermal apparatus	Fear, anger
Screaming	Vocal apparatus	Pain
Shrugging	Somatic muscles	Resignation
Sneering	Facial muscles	Contempt
Trembling	Somatic muscles	Fear, anxiety

Source: Oatley (1992).

Photo Credit: *The Expression of the Emotions in Man and Animals* by Charles Darwin, 1872

(a)

Photo Credit: *The Expression of the Emotions in Man and Animals* by Charles Darwin, 1872 / Wellcome Collection

(b)

FIGURE 1.3 Two of Charles Darwin's photographs, sneering and crying: (a) Plate IV No. 1; (b) Plate 1 No. 1.

are descended from prehuman ancestors in whom this organ had a use. He argued that many emotional expressions have the same quality: for instance that sneering, in which we partially uncover the teeth on one side, is a behavioral vestige of snarling, and of preparing to bite. This preparation was functional in some distant ancestor, but is so no longer. Though we sometimes make mordant and cutting remarks, adult human beings do not now generally use the teeth to attack (although in the United States about a third to a half of preschool children have been bitten by fellow preschoolers!).

Darwin traced other expressions to infancy: crying, he argued, is the vestige of screaming in infancy, though in adulthood it is partly inhibited. He described screaming in young babies and gave an argument for the function of closing the eyes and the secretion of tears to help protect them when this occurred. When adults cry they still secrete tears, but adult tears no longer have a protective function. One of Darwin's most interesting suggestions is that patterns of adult affection, of taking those whom we love in our arms, are based on patterns of parents hugging young infants.

For Darwin, our emotions link us to our past: to the past of our species and to our own infancy. He provided descriptions of facial expressions, and he argued for the universality of such expressions, a claim we shall take up in Chapter 4. He gave a perspective on the question of how beneficial emotions are that is reflected in the quotation at the head of this section. Might we be better off if we could rise above bestial passions, which emerged in a prehuman phase of in our evolution? Only toward the end of his book does Darwin write:

> The movements of expression in the face and body, whatever their origin might have been, are in themselves of much importance for our welfare. They serve as the first means of communication between the mother and her infant; she smiles approval, and thus encourages her child on the right path, or frowns disapproval. We readily perceive sympathy in others by their expression . . . The movements of expression give vividness and energy to our spoken words.
>
> (Darwin, 1872/1998, p. 359)

So, despite his reservations and the pressing nature of his evolutionary argument, Darwin thought that emotions have useful functions, they help us navigate our social interactions. And that is a hypothesis we pursue in this book.

Significant Figure: Charles Darwin

Charles Darwin's mother died when he was eight. At the age of 16, Charles was sent by his father to Edinburgh University to study medicine, but he would skip classes to collect specimens along the shores of the Firth of Forth, developing his strong interest in natural history. In despair about the failure of his son's medical studies, his father next sent him to Cambridge to study theology. Again, young Darwin was not fully engaged with his courses: he was more interested in collecting beetles and in hunting. He obtained an ordinary BA in 1831, and seemed headed for a life as a country parson with the hobby of natural history. He had not been idle at Cambridge, however. He had won the esteem of a number of scientists, and, at the age of 22, through a fortuitous turn of events, he was appointed naturalist on the *Beagle*, a British Navy ship with a mission to chart coastlines in South America. Two years after his return from his five-year voyage, Darwin proposed to a cousin, Emma Wedgewood and, a few months later, they started a long and generally happy marriage. Darwin was a bit of hypochondriac, and after he and his wife had settled in a house in a village outside London, he seldom went out, except to health spas to take cures.

The couple had 10 children, two of whom died in infancy. Charles and Emma were devoted parents, and the death of their daughter Annie at age 10 was devastating for both of them (and deepened Darwin's thinking about the evolution of sympathy). Although evolution is often seen as in conflict with religion, Charles did not see his discoveries and theory as incompatible with his Christian beliefs. But the death of Annie did make him doubt the existence of God.

From 1837, Charles's notebooks show him struggling to understand the change of one species into another. He proceeded slowly, and it wasn't until 1859 that his book *On the Origin of Species* appeared.

From 1838 onward, Charles's notebooks reflect a growing interest in emotional expressions in humans, as well as in nonhuman species, with many visits to the zoo. He enlisted others to make observations for him. He realized the importance of cross-cultural study. He was one of the first researchers to use questionnaires: he sent a set of printed questions to missionaries and others who could observe people all round the world, asking them to observe particular expressions. He received 36 replies. He was one of the first to use photographs for research. He used both naturalistic and posed expressions of emotion (such as the one at the head of this chapter) to make scientific arguments. Darwin's 1872 book on expression is the foundation of the study of emotions. His 1877 paper in the journal *Mind*, in which he describes observations of his infant son William's emotional and cognitive development, is one of the first contributions to developmental psychology. (Biographical information from Bowlby, 1991; Gruber & Barrett, 1974).