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Descartes' Error

Antonio Damasio

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About the Book

In the centuries since Descartes famously proclaimed, ‘I think, therefore I am,’ science has often overlooked emotions as the source of a person’s true being. Even modern neuroscience has tended until recently to concentrate on the cognitive aspects of brain function, disregarding emotions. This attitude began to change with the publication of *Descartes’ Error*. Antonio Damasio challenged traditional ideas about the connection between emotions and rationality. In this wonderfully engaging book, Damasio takes the reader on a journey of scientific discovery through a series of case studies, demonstrating what many of us have long suspected: emotions are not a luxury, they are essential to rational thinking and to normal social behaviour.

About the Author

Antonio Damasio is Van Allen Professor of Neurology and head of the department of neurology at The University of Iowa College of Medicine. He is a member of the Institute of Medicine of the National Academy of Sciences and a fellow of the American Academy of Arts and Sciences.

ALSO BY ANTONIO DAMASIO

The Feeling of What Happens: Body, Emotion and the Making of Consciousness
Looking for Spinoza: Joy, Sorrow and the Feeling Brain

‘Antonio Damasio is among the world’s leading neurologists, and his book *Descartes’ Error* should be crucial reading not only for neuroscientists and philosophers but lay readers too.’

New York Times Book Review

‘Rich in provocative concepts about intelligence, memory, creativity and even passion, *Descartes’ Error* is an excellent guide to the revelations of neurobiology.’

Los Angeles Times

‘Damasio’s arguments are ingenious and wide ranging…His thoughtful and modest exposition should be taken seriously. Apart from illuminating the function of parts of the frontal lobes, he has proposed a new physiological mechanism that is likely to be much investigated over the next few years. It is no mean feat to say something original and intelligible about emotion.’

Nature

‘A passionately erudite, penetrating tour through the human mind and the wondrous interplay of nervous energies that cascade and rebound among the brain’s manifold structures.’

San Francisco Examiner & Chronicle

‘A book by someone as knowledgeable about the workings of the human brain as Antonio Damasio is greatly to be welcomed…His particular target…is the dualism that splits “mind” from “brain”, but his own solution does not stop at simply saying that conscious experiences come from brain states. His view is that minds are embedded (he prefers the

term embodied) not only in brains but in all of the rest of the body. In putting the case for ceasing to regard emotions as messy complications for a purely intellectual brain and seeing them instead as an integral part of its decision-making processes, he has made an important contribution.'

New Scientist

'Damasio has written his book with the literary skill of a suspense novel and yet it offers sound, easily accessible and reliable information about what is known of the anatomy, organization and functions of the forebrain. Educated laymen curious about human biology, medical students, neurologists, other physicians and surgeons, sociologists, psychologists and anthropologists should, by all means, read this book.'

Integrative Physiological and Behavioural Science

'Damasio lays out a provocative theory…emotion is part and parcel of what we call cognition. If there is severe impairment of the emotions, we cannot have rationality.'

Washington Post

'Here at last is an attempt, by one of the world's foremost neurologists, to synthesize what is known about the workings of the human brain. It bases its arguments on a profound knowledge of the brain, rather than on a wish to redesign it as an engineer might. It deserves to become a classic.'

David Hubel, Nobel Laureate, Harvard University

'Antonio Damasio's astonishing book takes us on a scientific journey into the brain that reveals the invisible world within as if it were visible to our sight. You will never again

look at yourself or at another without wondering what goes on behind the eyes that so meet.'

Jonas Salk, Biologist

'Damasio has written an engaging, informative book that challenges the dogma that emotions interfere with wise decisions, and that places feelings in their proper role in human functioning. David Hume should be smiling.'

Jerome Kagan, Daniel and Amy Starch Professor of Psychology, Harvard University

'Antonio Damasio boldly challenges the dualisms that have dogged Western thought: Mind vs. Body, Reason vs. Feeling, Biological Explanation vs. Cultural Explanation. *Descartes' Error* allows us to glimpse, perhaps for the first time, the profound connections between regions of neural tissue, on the one hand, and the heights and depths of human experience, on the other.'

Howard Gardner, Harvard University, author of *Frames of Mind*

'A rare chance to get the first-hand thoughts of one of modern neuroscience's major thinkers. Antonio Damasio offers a revolutionary portrait of how reason and feelings come together in the mind.'

Robert Ornstein, author of *The Evolution of Consciousness*

'A lucid demonstration that human emotion is as worthy of scientific investigation as motor function, language or memory…Its most important achievement is the challenge it poses to cognitive neuroscience. We may well be about to discover that the heart is after all in the head.'

Financial Times

‘An ambitious and meticulous foray into the nature of being.’

Boston Globe

‘Tap-dancing on the edge between philosophy and science, Damasio cogently rejects simplistic divisions between mind and body.’

Philadelphia Inquirer

FOR HANNA

ANTONIO DAMASIO

Descartes' Error

Emotion, Reason and the Human Brain

VINTAGE BOOKS
London

Preface

If we were alive around 1900, and were in any way interested in intellectual matters, we probably would have thought that the time had come for science to tackle the understanding of emotion in its many dimensions and answer the public's growing curiosity about it in a definitive way. In the preceding decades Charles Darwin had shown how some emotional phenomena are present in remarkably comparable ways in nonhuman species; William James and Carl Lange had advanced an innovative proposal to explain the processing of emotions; Sigmund Freud had turned the emotions into the centerpiece of his inquiry on psychopathological states; and Charles Sherrington had begun the neurophysiological investigation of the brain circuits involved in emotion. Nonetheless, the all-out attack on the subject of emotion, there and then, never came to pass. On the contrary, as the sciences of mind and brain flourished in the twentieth century, interests went elsewhere and the specialties which we loosely group today under neuroscience gave a resolute cold shoulder to emotion research. True, the psychoanalysts never forgot the emotions, and there were noble exceptions—pharmacologists and psychiatrists concerned with disorders of mood, and lone psychologists and neuroscientists who cultivated an interest in affect. Those exceptions, however, merely accentuated the neglect of emotion as a research topic. Behaviorism, the cognitive

revolution, and computational neuroscience did not reduce this neglect in any appreciable way.

By and large this was still the state of affairs in 1994 when *Descartes' Error* was first published, although the ground had already begun to shift. The book was, through and through, about the brain science of emotion and about its implications for decision-making in general and for social behavior in particular. I hoped to make my point quietly without being thrown off the stage but I had no right to expect welcome signs and an attentive audience. But I did get a welcoming, attentive, and generous audience, here and abroad, and a number of the ideas in the book have found their way into the thinking of many colleagues and of the nonspecialist public. Just as unexpected was the fact that so many readers were eager to engage in a conversation, pose questions, make suggestions, and offer corrections. In several instances I corresponded with those readers, some of whom have become friends. I learned a lot, and I still do, since hardly a day goes by without mail about *Descartes' Error* from somewhere in the world.

A decade later the situation is radically different. Not long after *Descartes' Error*, two of the neuroscientists who had been studying emotions in animals published their own books: *The Emotional Brain* (1996) by Joseph Le Doux and *Affective Neuroscience* (1998) by Jaak Panksepp. Others followed and soon neuroscience laboratories, in America and in Europe, had turned their attention to emotion research. Philosophers cultivating the subject were heard with a new attention. (Martha Nussbaum was a particularly good example of this.) And books capitalizing on the science of emotion became widely popular (Daniel Goleman's *Emotional Intelligence*, for example). Emotion is finally being given the due that our illustrious forerunners would have wished it to receive, albeit a century late.

The main subject in *Descartes' Error* is the relation between emotion and reason. Based on my study of neurological patients who had both defects of decision-making and a disorder of emotion, I advanced the hypothesis (known as the somatic marker hypothesis) that emotion was in the loop of reason, and that emotion could assist the reasoning process rather than necessarily disturb it, as was commonly assumed. Today this idea does not cause any raised eyebrows although at the time I presented the notion it startled many and was even regarded with some skepticism. On balance, the idea was largely embraced, so embraced that, on occasion, it was bent out of shape. For example, I never wrote, as was later suggested, that the assistance emotion provides to reasoning would necessarily occur nonconsciously. On the contrary, my first proposal equated somatic markers with conscious gut feelings, although I did make room for a nonconscious variety of somatic marker; nor did I regard skin conductance responses as somatic markers, but rather as indices of somatic markers. Finally, I never suggested that emotion was a substitute for reasoning, but in some superficial versions of the work it sounded as if I was proposing that if you follow your heart instead of your reason all would be well.

To be sure, on certain occasions, emotions can be a substitute for reason. The emotional action program we call fear can get most human beings out of danger, in short order, with little or no help from reason. A squirrel or a bird will respond to a threat without any thinking at all and the same can happen to a human. In effect, in some circumstances, too much thinking may be far less advantageous than no thinking at all. That is the beauty of how emotion has functioned throughout evolution: it allows the possibility of making living beings *act* smartly without having to *think* smartly. In humans, however, this story has become more complicated, for better and for worse.

Reasoning does what emotions do but achieves it knowingly. Reasoning gives us the option of thinking smartly *before* we act smart, and a good thing too: we have discovered that the emotions alone can solve many—but not all—the problems posed by our complex environment and that, on occasion, the solutions offered by emotion are actually counterproductive.

But how did the complex species evolve the smart reasoning system? The new proposal in *Descartes' Error* is that the reasoning system evolved as an extension of the automatic emotional system, with emotion playing diverse roles in the reasoning process. For example, emotion may increase the saliency of a premise and, in so doing, bias the conclusion in favor of the premise. Emotion also assists with the process of holding in mind the multiple facts that must be considered in order to reach a decision.

The obligate participation of emotion in the reasoning process can be advantageous or nefarious depending both on the circumstances of the decision and on the past history of the decider. The issue of circumstances is well illustrated by the story with which Malcolm Gladwell opens his book *Blink* (2005). The curators of the Getty Museum concluded that a certain Greek sculpture was the real thing in the context of their desire to add the piece to the collection. A number of external experts, on the other hand, judged the piece to be a fake based on their gut feeling of rejection upon seeing it for the first time. Emotions of different kinds participated in these two different judgments at different stages of the reasoning process. There was a rewarding and pervasive desire to endorse the object for some; and there was the immediately punitive and thoroughly conscious gut feeling that something was amiss for others. In neither case, however, did reason operate alone, and that is the critical point I made in *Descartes' Error*. When emotion is entirely left out of the reasoning picture, as happens in certain neurological

conditions, reason turns out to be even more flawed than when emotion plays bad tricks on our decisions.

The somatic marker hypothesis postulated from its inception that emotions *marked* certain aspects of a situation, or certain outcomes of possible actions. Emotion achieved this marking quite overtly, as in a “gut feeling,” or covertly, via signals occurring below the radar of our awareness (examples of covert signals would be neuromodulator responses, such as those of dopamine or oxytocin, which can change the behavior of neuron groups that represent a certain choice). As for the knowledge used in reasoning, it too could be fairly explicit or partially hidden, as when we intuit a solution. In other words, emotion had a role to play in intuition, the sort of rapid cognitive process in which we come to a particular conclusion without being aware of all the immediate logical steps. It is not necessarily the case that the knowledge of the intermediate steps is absent, only that emotion delivers the conclusion so directly and rapidly that not much knowledge need come to mind. This is in keeping with the old saying which tells us that “intuition favors the prepared mind.” What does the saying mean in the context of the somatic marker hypothesis? The quality of one’s intuition depends on how well we have reasoned in the past; on how well we have classified the events of our past experience in relation to the emotions that preceded and followed them; and also on how well we have reflected on the successes and failures of our past intuitions. Intuition is simply rapid cognition with the required knowledge partially swept under the carpet, all courtesy of emotion and much past practice. Clearly I never wished to set emotion against reason, but rather to see emotion as at least assisting reason and at best holding a dialogue with it. Nor did I ever oppose emotion to cognition since I view emotion as delivering cognitive information, directly and via feelings.

The evidence that formed the basis for the somatic marker hypothesis emerged over several years from the study of neurological patients whose social conduct had been altered by brain damage in a specific sector of the frontal lobe. The observations in those patients eventually led to another important idea in *Descartes' Error*: the notion that the brain systems that are jointly engaged in emotion and decision-making are generally involved in the management of social cognition and behavior. This notion opened the way for connecting the fabric of social and cultural phenomena to specific features of neurobiology, a connection supported by powerful facts.

The publication of *Descartes' Error* is responsible for a related discovery. Parents of young men and women who resembled our adult-onset frontal patients in some aspects of their social behavior wrote to me wondering, quite perceptively, whether the troubles of their now grown up children might be due to brain damage too. We found out that it was, as reported in the very first studies on this issue, which were published in 1999. These young adults had suffered frontal brain damage early in their lives, a fact that had either not been known to the parents or had not been connected with their manifestly abnormal social behavior. We also discovered a fundamental way in which the early-onset cases differed from the adult-onset cases: the early-onset patients appeared not to have learned the social conventions and ethical rules that should have governed their behavior. Whereas the adult-onset patients knew the rules but failed to act according to them, the early-onset case had never learned the rules to begin with. In other words, while the adult-onset cases told us that emotions were required for the deployment of proper social behavior; the early-onset cases showed that emotions were also needed for mastering the know-how behind proper social behavior. The implications of this fact for

understanding the possible causes of disordered social conduct are barely beginning to be appreciated.

The postscriptum of *Descartes' Error* contained an idea which pointed to the future of neurobiological research: the mechanisms of basic homeostasis constitute a blueprint for the cultural development of the human values which permit us to judge actions as good or evil, and classify objects as beautiful or ugly. At the time, writing about this idea gave me hope that a two-way bridge could be established between neurobiology and the humanities, thus providing the way for a better understanding of human conflict and for a more comprehensive account of creativity. I am pleased to report that some progress has been made toward building that sort of bridge. For example, some of us are actively investigating the brain states associated with moral reasoning while others are trying to discover what the brain does during esthetic experiences. The intent is not to reduce ethics or esthetics to brain circuitry but rather to explore the threads that interconnect neurobiology to culture. I am even more hopeful today that such a seemingly utopian bridge can become reality and optimistic that we will enjoy its benefits without having to wait another century.

Antonio Damasio, 2005

Introduction

ALTHOUGH I CANNOT tell for certain what sparked my interest in the neural underpinnings of reason, I do know when I became convinced that the traditional views on the nature of rationality could not be correct. I had been advised early in life that sound decisions came from a cool head, that emotions and reason did not mix any more than oil and water. I had grown up accustomed to thinking that the mechanisms of reason existed in a separate province of the mind, where emotion should not be allowed to intrude, and when I thought of the brain behind that mind, I envisioned separate neural systems for reason and emotion. This was a widely held view of the relation between reason and emotion, in mental and neural terms.

But now I had before my eyes the coolest, least emotional, intelligent human being one might imagine, and yet his practical reason was so impaired that it produced, in the wanderings of daily life, a succession of mistakes, a perpetual violation of what would be considered socially appropriate and personally advantageous. He had had an entirely healthy mind until a neurological disease ravaged a specific sector of his brain and, from one day to the next, caused this profound defect in decision making. The instruments usually considered necessary and sufficient for rational behavior were intact in him. He had the requisite knowledge, attention, and memory; his language was flawless; he could perform calculations; he could tackle the

logic of an abstract problem. There was only one significant accompaniment to his decision-making failure: a marked alteration of the ability to experience feelings. Flawed reason and impaired feelings stood out together as the consequences of a specific brain lesion, and this correlation suggested to me that feeling was an integral component of the machinery of reason. Two decades of clinical and experimental work with a large number of neurological patients have allowed me to replicate this observation many times, and to turn a clue into a testable hypothesis.[1]

I began writing this book to propose that reason may not be as pure as most of us think it is or wish it were, that emotions and feelings may not be intruders in the bastion of reason at all: they may be enmeshed in its networks, for worse *and* for better. The strategies of human reason probably did not develop, in either evolution or any single individual, without the guiding force of the mechanisms of biological regulation, of which emotion and feeling are notable expressions. Moreover, even after reasoning strategies become established in the formative years, their effective deployment probably depends, to a considerable extent, on a continued ability to experience feelings.

This is not to deny that emotions and feelings can cause havoc in the processes of reasoning under certain circumstances. Traditional wisdom has told us that they can, and recent investigations of the normal reasoning process also reveal the potentially harmful influence of emotional biases. It is thus even more surprising and novel that the *absence* of emotion and feeling is no less damaging, no less capable of compromising the rationality that makes us distinctively human and allows us to decide in consonance with a sense of personal future, social convention, and moral principle.

Nor is this to say that when feelings have a positive action they do the deciding for us; or that we are not rational beings. I suggest only that certain aspects of the

process of emotion and feeling are indispensable for rationality. At their best, feelings point us in the proper direction, take us to the appropriate place in a decision-making space, where we may put the instruments of logic to good use. We are faced by uncertainty when we have to make a moral judgment, decide on the course of a personal relationship, choose some means to prevent our being penniless in old age, or plan for the life that lies ahead. Emotion and feeling, along with the covert physiological machinery underlying them, assist us with the daunting task of predicting an uncertain future and planning our actions accordingly.

Beginning with an analysis of the nineteenth-century landmark case of Phineas Gage, whose behavior first revealed a connection between impaired rationality and specific brain damage, I examine recent investigations of his modern counterparts and review pertinent findings from neuropsychological research in humans and animals. Further, I propose that human reason depends on several brain systems, working in concert across many levels of neuronal organization, rather than on a single brain center. Both “high-level” and “low-level” brain regions, from the prefrontal cortices to the hypothalamus and brain stem, cooperate in the making of reason.

The lower levels in the neural edifice of reason are the same ones that regulate the processing of emotions and feelings, along with the body functions necessary for an organism’s survival. In turn, these lower levels maintain direct and mutual relationships with virtually every bodily organ, thus placing the body directly within the chain of operations that generate the highest reaches of reasoning, decision making, and, by extension, social behavior and creativity. Emotion, feeling, and biological regulation all play a role in human reason. The lowly orders of our organism are in the loop of high reason.

It is intriguing to find the shadow of our evolutionary past at the most distinctively human level of mental function, although Charles Darwin prefigured the essence of this finding when he wrote about the indelible stamp of lowly origins which humans bear in their bodily frame.[2] Yet the dependence of high reason on low brain does not turn high reason into low reason. The fact that acting according to an ethical principle requires the participation of simple circuitry in the brain core does not cheapen the ethical principle. The edifice of ethics does not collapse, morality is not threatened, and in a normal individual the will remains the will. What can change is our view of how biology has contributed to the origin of certain ethical principles arising in a social context, when many individuals with a similar biological disposition interact in specific circumstances.

Feeling is the second and central topic of this book, and one to which I was drawn not by design but by necessity, as I struggled to understand the cognitive and neural machinery behind reasoning and decision making. A second idea in the book, then, is that the essence of a feeling may not be an elusive mental quality attached to an object, but rather the direct perception of a specific landscape: that of the body.

My investigation of neurological patients in whom brain lesions impaired the experience of feelings has led me to think that feelings are not as intangible as they have been presumed to be. One may be able to pin them down mentally, and perhaps find their neural substrate as well. In a departure from current neurobiological thinking, I propose that the critical networks on which feelings rely include not only the traditionally acknowledged collection of brain structures known as the limbic system but also some of the brain's prefrontal cortices, and, most

importantly, the brain sectors that map and integrate signals from the body.

I conceptualize the essence of feelings as something you and I can see through a window that opens directly onto a continuously updated image of the structure and state of our body. If you imagine the view from this window as a landscape, the body “structure” is analogous to object shapes in a space, while the body “state” resembles the light and shadow and movement and sound of the objects in that space. In the landscape of your body, the objects are the viscera (heart, lungs, gut, muscles), while the light and shadow and movement and sound represent a point in the range of operation of those organs at a certain moment. By and large, a feeling is the momentary “view” of a part of that body landscape. It has a specific content—the state of the body; and specific neural systems that support it—the peripheral nervous system and the brain regions that integrate signals related to body structure and regulation. Because the sense of that body landscape is juxtaposed in time to the perception or recollection of something else that is not part of the body—a face, a melody, an aroma—feelings end up being “qualifiers” to that something else. But there is more to a feeling than this essence. As I will explain, the qualifying body state, positive or negative, is accompanied and rounded up by a corresponding thinking mode: fast moving and idea rich, when the body-state is in the positive and pleasant band of the spectrum, slow moving and repetitive, when the body-state veers toward the painful band.

In this perspective, feelings are the sensors for the match or lack thereof between nature and circumstance. And by nature I mean both the nature we inherited as a pack of genetically engineered adaptations, and the nature we have acquired in individual development, through interactions with our social environment, mindfully and willfully as well as not. Feelings, along with the emotions

they come from, are not a luxury. They serve as internal guides, and they help us communicate to others signals that can also guide them. And feelings are neither intangible nor elusive. Contrary to traditional scientific opinion, feelings are just as cognitive as other percepts. They are the result of a most curious physiological arrangement that has turned the brain into the body's captive audience.

Feelings let us catch a glimpse of the organism in full biological swing, a reflection of the mechanisms of life itself as they go about their business. Were it not for the possibility of sensing body states that are inherently ordained to be painful or pleasurable, there would be no suffering or bliss, no longing or mercy, no tragedy or glory in the human condition.

At first glance, the view of the human spirit proposed here may not be intuitive or comforting. In attempting to shed light on the complex phenomena of the human mind, we run the risk of merely degrading them and explaining them away. But that will happen only if we confuse a phenomenon itself with the separate components and operations that can be found behind its appearance. I am not suggesting that.

To discover that a particular feeling depends on activity in a number of specific brain systems interacting with a number of body organs does not diminish the status of that feeling as a human phenomenon. Neither anguish nor the elation that love or art can bring about are devalued by understanding some of the myriad biological processes that make them what they are. Precisely the opposite should be true: Our sense of wonder should increase before the intricate mechanisms that make such magic possible. Feelings form the base for what humans have described for millennia as the human soul or spirit.

This book is also about a third and related topic: that the body, as represented in the brain, may constitute the indispensable frame of reference for the neural processes that we experience as the mind; that our very organism rather than some absolute external reality is used as the ground reference for the constructions we make of the world around us and for the construction of the ever-present sense of subjectivity that is part and parcel of our experiences; that our most refined thoughts and best actions, our greatest joys and deepest sorrows, use the body as a yardstick.

Surprising as it may sound, the mind exists in and for an integrated organism; our minds would not be the way they are if it were not for the interplay of body and brain during evolution, during individual development, and at the current moment. The mind had to be first about the body, or it could not have been. On the basis of the ground reference that the body continuously provides, the mind can then be about many other things, real and imaginary.

This idea is anchored in the following statements: (1) The human brain and the rest of the body constitute an indissociable organism, integrated by means of mutually interactive biochemical and neural regulatory circuits (including endocrine, immune, and autonomic neural components); (2) The organism interacts with the environment as an ensemble: the interaction is neither of the body alone nor of the brain alone; (3) The physiological operations that we call mind are derived from the structural and functional ensemble rather than from the brain alone: mental phenomena can be fully understood only in the context of an organism’s interacting in an environment. That the environment is, in part, a product of the organism’s activity itself, merely underscores the complexity of interactions we must take into account.

It is not customary to refer to organisms when we talk about brain and mind. It has been so obvious that mind

arises from the activity of neurons that only neurons are discussed as if their operation could be independent from that of the rest of the organism. But as I investigated disorders of memory, language, and reason in numerous human beings with brain damage, the idea that mental activity, from its simplest aspects to its most sublime, requires both brain and body proper became especially compelling. I believe that, relative to the brain, the body proper provides more than mere support and modulation: it provides a basic topic for brain representations.

There are facts to support this idea, reasons why the idea is plausible, and reasons why it would be nice if things really were this way. Foremost among the last is that the body precedence proposed here might shed light on one of the most vexing of all questions since humans began inquiring about their minds: How is it that we are conscious of the world around us, that we know what we know, and that we know that we know?

In the perspective of the above hypothesis, love and hate and anguish, the qualities of kindness and cruelty, the planned solution of a scientific problem or the creation of a new artifact are all based on neural events within a brain, provided that brain has been and now is interacting with its body. The soul breathes through the body, and suffering, whether it starts in the skin or in a mental image, happens in the flesh.

. . .

I wrote this book as my side of a conversation with a curious, intelligent, and wise imaginary friend, who knew little about neuroscience but much about life. We made a deal: the conversation was to have mutual benefits. My friend was to learn about the brain and about those mysterious things mental, and I was to gain insights as I struggled to explain my idea of what body, brain, and mind

are about. We agreed not to turn the conversation into a boring lecture, not to disagree violently, and not to try to cover too much. I would talk about established facts, about facts in doubt, and about hypotheses, even when I could come up with nothing but hunches to support them. I would talk about work in progress literally, about several research projects then under way, and about work that would start long after the conversation was over. It was also understood that, as befits a conversation, there would be byways and diversions, as well as passages that would not be clear the first time around and might benefit from a second visit. That is why you will find me returning to some topics, every now and then, from a different perspective.

At the outset I made my view clear on the limits of science: I am skeptical of science's presumption of objectivity and definitiveness. I have a difficult time seeing scientific results, especially in neurobiology, as anything but provisional approximations, to be enjoyed for a while and discarded as soon as better accounts become available. But skepticism about the current reach of science, especially as it concerns the mind, does not imply diminished enthusiasm for the attempt to improve provisional approximations.

Perhaps the complexity of the human mind is such that the solution to the problem can never be known because of our inherent limitations. Perhaps we should not even talk about a problem at all, and speak instead of a mystery, drawing on a distinction between questions that can be approached suitably by science and questions that are likely to elude science forever.[3] But much as I have sympathy for those who cannot imagine how we might unravel the mystery (they have been dubbed "mysterians"[4]), and for those who think it is knowable but would be disappointed if the explanation were to rely on something already known, I do believe, more often than not, that we will come to know.