

# CONTENTS



List of Illustrations	vi
Acknowledgements	viii
Introduction: The Master and His Emissary	1
PART ONE: THE DIVIDED BRAIN	15
Chapter 1 Asymmetry and the Brain	16
Chapter 2 What do the Two Hemispheres 'Do'?	32
Chapter 3 Language, Truth and Music	94
Chapter 4 The Nature of the Two Worlds	133
Chapter 5 The Primacy of the Right Hemisphere	176
Chapter 6 The Triumph of the Left Hemisphere	209
PART TWO: HOW THE BRAIN HAS SHAPED OUR WORLD	239
Chapter 7 Imitation and the Evolution of Culture	240
Chapter 8 The Ancient World	257
Chapter 9 The Renaissance and the Reformation	298
Chapter 10 The Enlightenment	330
Chapter 11 Romanticism and the Industrial Revolution	352
Chapter 12 The Modern and Post-Modern Worlds	389
Conclusion: The Master Betrayed	428
Notes	463
Bibliography	518
Index	586

## LIST OF ILLUSTRATIONS

### *Illustrations within text*

- Fig. 1.1 p. 17 Embryonic origins of the cerebral hemispheres and other brain regions
- Fig. 1.2 p. 18 The brain viewed from above, showing the corpus callosum
- Fig. 1.3 p. 21 The brain viewed from the left side
- Fig. 1.4 p. 24 Yakovlevian torque
- Fig. 2.1 p. 37 Prefrontal cortex and limbic system
- Fig. 2.2 p. 37 Diencephalon, basal ganglia and limbic system
- Fig. 2.3 p. 45 Templates copied by patients with neglect (© 2008 by Nigel J. T. Thomas)
- Fig. 2.4 p. 47 Emergence of the *Gestalt*
- Fig. 2.5 p. 48 Split-brain subjects and sense of the whole (Gazzaniga & Le Doux, 1978)
- Fig. 2.6 p. 48 Right hemisphere damage and loss of the sense of the whole (Hécaen & Ajuriaguerra, 1952)
- Fig. 2.7 p. 49 Hemisphere differences and the whole (Nikolaenko, 2001)
- Fig. 2.8 p. 78 Hemisphere differences and abstraction (Nikolaenko, 1997)
- Fig. 2.9 p. 79 Hemisphere differences and visual depth (Nikolaenko, 1997)
- Fig. 2.10 p. 79 Hemisphere differences: what we see v. what we know (Nikolaenko, 1997)
- Fig. 2.11 p. 80 Cube drawing before and after commissurotomy (Gazzaniga & Le Doux, 1978)
- Fig. 2.12 p. 82 Duck-rabbit (*Popular Science Monthly*, 1899)
- Fig. 2.13 p. 83 Necker cube
- Fig. 4.1 p. 134 *Drawing Hands*, by M. C. Escher
- Fig. 4.2 p. 160 Pyramid of values according to Scheler
- Fig. 4.3 p. 169 *Creation of Man*, by Michelangelo, fresco, 1511–12 (Vatican Museums and Galleries/Bridgeman Art Library)
- Fig. 9.1 p. 299 Bishop blessing annual fair, from mediaeval pontifical vellum (Bibliothèque Nationale, Paris, Lat 962 f.264/Bridgeman Art Library)

- Fig. 9.2 p. 300 *Ideal City*, by Luciano Laurana, oil on panel, after 1470 (Galleria Nazionale delle Marche, Urbino/Bridgeman Art Library)
- Fig. 9.3 p. 322 *Sermon in the Hall of the Reformed Community of Stein near Nuremberg*, attrib. Lorenz Strauch, c. 1620
- Fig. 10.1 p. 348 *Matière à réflexion pour les jongleurs couronnées*, by Villeneuve, 1793
- Fig. 11.1 p. 364 *The Coliseum*, by Antonio Lafréri, c. 1550 (Metropolitan Museum of Art)
- Fig. 11.2 p. 365 *The Coliseum*, by Louis Ducros, late 18th century (private collection/© Agnew's, London/Bridgeman Art Library)
- Fig. 12.1 p. 413 *Turin Spring*, by Giorgio de Chirico, oil on canvas, 1914 (private collection/Peter Willi/Bridgeman Art Library/© DACS 2009)
- Fig. 12.2 p. 416 *Woman in a Red Armchair*, by Pablo Picasso, oil on canvas, 1932 (Musée Picasso, Paris/Giraudon/Bridgeman Art Library © Succession Picasso/DACS 2009)

### Plate section

1. *Album* p. XVII, by Barbara Honeywood, mid-19th century (Bethlem Royal Hospital Archives: photograph by author)
2. *Hallucinations V*, by David Chick, mid-20th century (Bethlem Royal Hospital Archives: photograph by author)
3. *Resurrection of the Dead*, St Saviour in Khora, Istanbul, early 14th century
4. *Christ and His Mother*, St Saviour in Khora, Istanbul, early 14th century
5. *Adoration of the Magi*, by Domenico Ghirlandaio, fresco, 1485 (Sassetti Chapel, Santa Trinità, Florence/Bridgeman Art Library)
6. *The Ambassadors*, by Hans Holbein the Younger, oil on panel, 1533 (National Gallery, London/Bridgeman Art Library)
7. *Seaport with the Embarkation of the Queen of Sheba*, by Claude Lorrain, oil on canvas, 1648 (National Gallery, London/Bridgeman Art Library)
8. *Landscape with Ascanius Shooting the Stag of Sylvia*, by Claude Lorrain, oil on canvas, 1682 (© Ashmolean Museum, University of Oxford/Bridgeman Art Library)
9. *Scene from 'The Last of the Mohicans' by James Fenimore Cooper*, by Thomas Cole, oil on canvas, 1826 (Fenimore Art Museum, Cooperstown, New York/Bridgeman Art Library)
10. *The Conflagration*, by Albert Bierstadt, oil on paper, late 19th century (Worcester Art Museum, Massachusetts/Bridgeman Art Library)
11. Frontispiece from *Milton: a Poem in 2 Books*, by William Blake, 1804–11 (© The Trustees of the British Museum)
12. *Large Reclining Nude*, by Henri Matisse, 1935 (Baltimore Art Gallery/© Succession H Matisse/DACS 2009)
13. *The Muse*, by Pablo Picasso, oil on canvas, 1935 (Musée National d'Art Moderne, Centre Pompidou, Paris/Giraudon/Bridgeman Art Library/© Succession Picasso/DACS 2009)
14. *La Lunette d'Approche*, by René Magritte, 1963 (Menil Collection, Houston)

# INTRODUCTION



## THE MASTER AND HIS EMISSARY

'Psychiatrist debunks the left brain/right brain myth', the headline proclaims. Always interested to learn more, I read on, only to discover that the psychiatrist in question is – myself.

This puts its finger on the nub of the matter. I don't believe in the left brain/right brain myth: I believe in discovering the truth about hemisphere difference. There can be no question that it would be foolish to believe most of what has passed into popular culture on the topic of hemisphere differences. And yet it would be just as foolish to believe that therefore there are no important hemisphere differences. There are massively important ones, that lie at the core of what it means to be a human being. It's just that we've been barking up the wrong tree.

When people object that each hemisphere is involved in everything we do, they are right. When they assume that means there are no differences, they are wrong. It is not *what* each hemisphere does, but *how* it does it that matters. Each hemisphere is involved in everything, true enough; just in a quite different way.

\*

When *The Master and His Emissary* came out in November 2009, I was hoping that a handful of people might find its thesis truly interesting. I even hoped that they might feel inspired to take the ideas further. But I anticipated that otherwise it would be largely ignored.

Partly this was because of its topic. My colleagues and mentors in the world of psychiatry and neurology had from the very outset some thirty years ago counselled me against getting involved in laterality research, since it was stigmatised within the neuroscience world due to its appropriation by pop psychology. They also warned me, correctly, that it would involve going back to the drawing board. All the things we thought we knew about hemisphere difference had been shown, one by one, to be either wrong or, at best, half-truths. That had led – in a somewhat defeatist fashion, I have to say – to its being given up as a bad job. And those who gave up reconciled themselves to the lost time and effort by proclaiming loudly their

own myth: that there are no significant hemisphere differences. I knew enough, however, to realise that there were fascinating intellectual puzzles here that were simply too important to neglect, whatever the cost in terms of career. They demanded further investigation. For example, every known creature with a neuronal system, however far down the evolutionary tree one goes, and however far back in time, has a system that is asymmetrical. Why on earth would that be, given that the world they are interacting with is not asymmetrical? I was already involved in neuroimaging research on the loss of normal brain asymmetry in schizophrenia, which was clearly bearing fruit. So I couldn't help seeing the topic as potentially of some significance.

When after twenty years of research I arrived at the point of publication of this book, I believed I would face a hostile establishment. With a few exceptions, that has not been the case, and, thankfully, some of the best-known names in neuroscience are on record as engaging seriously with the book's thesis. I also expected, of course, the usual faction of self-appointed 'myth debunkers', who would feel comfortably one-up on the gullible masses by professing that there was 'nothing in it', without the bore of acquainting themselves with the evidence before pronouncing. I imagine there have been plenty of those, but that is neither here nor there.

The other reason I did not expect the book to be widely read was because it is, I admit, in one sense, demanding. I took pains to write it as clearly as I could, but without, I hope, ever talking down to my audience, instead meeting them on a level footing to get to grips with issues in neuroscience and philosophy, though without presuming any prior knowledge. I aimed to explain what I saw in terms that any interested non-specialist reader should be able to understand. But neuropsychology and phenomenological philosophy probably aren't everyone's idea of an easy read.

\*

Ten years on, I have been genuinely astonished by the completely unforeseen extent to which it has been taken up by people in every discipline, and from every walk of life. It has already sold over 100,000 copies, and has readers all over the world. I think the reason for this must be that the structural and functional differences between the brain hemispheres which I describe have, as indeed they must, their correlates in the mind; and that we are intuitively aware of these structural and functional differences within our consciousness – but only, it seems, once they are pointed out.

One of the commonest reactions from readers has been: 'You articulated ideas that I knew to be true, but for which I had never found words. You told me something that was immediately compelling because I was, at some level, already aware of the patterns you were revealing and the associations you were making.' This cannot be due to such readers simply being familiar with the

popular left brain/right brain story, because the picture that emerges from this book is quite different from anything they would have come across previously. And it cannot be simply because there are philosophical distinctions here with which they were already familiar, regardless of any brain correlates, because the pattern of differences is not the same as those found in any conventional philosophical debate, though parts of it certainly have their reflections at different points in the history of ideas – the theme of the second half of the book.

Just how different this picture is from the familiar left brain/right brain story can be judged from the simplest of observations. It is, for instance, just not true that the left hemisphere is unemotional, perhaps a bit boring, but at least down-to-earth and reliable: in fact the left hemisphere is more likely than the right hemisphere to get angry, or dismissive, jump to conclusions, become deluded, or get stuck in denial. Equally it's not true that the right hemisphere has no language (it usually has no speech, a different matter): it understands many of the subtlest and most important elements of language better than the left. Nor is it true that the left hemisphere cannot deal with visual imagery: in certain respects it very clearly can. Maths and science are not primarily dependent on the left hemisphere, but draw in different respects on both hemispheres. And, no, the left brain is not male, nor the right brain female.

The hemisphere hypothesis transcends and replaces, and is not a perpetuation of, the old dichotomies: reason v. feeling, rationality v. intuition, 'system I v. system II', male brain v. female brain. Each hemisphere plays its part on either side of each of those dichotomies.

Trawl the internet and you will find all kinds of misinformation. Some of it is on popular 'teach yourself psychology' websites, some on the websites of management gurus. One of my favourites is this list, a slide I sometimes use in lectures with the attached health warning in the title, '**Right and ... WRONG!**'

#### **LEFT BRAIN FUNCTIONS**

uses logic  
 detail oriented  
 facts rule  
 words and language  
 present and past  
 math and science  
 can comprehend  
 knowing  
 acknowledges  
 order/pattern perception  
 knows object name  
 reality based  
 forms strategies  
 practical  
 safe

#### **RIGHT BRAIN FUNCTIONS**

uses feeling  
 "big picture" oriented  
 imagination rules  
 symbols and images  
 present and future  
 philosophy & religion  
 can "get it" (i.e. meaning)  
 believes  
 appreciates  
 spatial perception  
 knows object function  
 fantasy based  
 presents possibilities  
 impetuous  
 risk taking

Although there is nothing unusual here, and it is actually one of the more nuanced such summaries on the web, the nuances don't help – because they are wrong. There is only one pairing here that is broadly correct. All the others are false, sometimes so badly so that they represent the inverse of what is known to be the case.

And as for conventional philosophical debate, just how different the thesis of this book is, taken as a whole, from any existing patterns can be gauged from the fact that no-one to my knowledge has even seen, let alone forged a philosophical position on the basis of, the commonalities between, for example, realism, the appreciation of uniqueness, music and time, a sense of humour, a capacity for reading body language, sustaining attention and the fight-or-flight mode; or between unreasonable optimism, manipulation, disembodiment, literalism, and preoccupations with detail, theory and body parts. Put like that, they sound, improbably random assortments of characteristics, not corresponding to any pre-existing philosophical world views. Yet, after reading the book, and once the bigger picture is painted, the reader will, I hope, see exactly how these elements go to form a coherent picture, one that falls into two coherent parts: a picture that also illuminates our situation here in the West today, as those who have read the book seem readily to understand.

This suggests to me that since the patterns that emerge from the neuroscience behind the book seem familiar to readers, they can do so for one reason only: namely, that they correspond to intuitions that the human mind has about its own way of working, and its consequent structuring of reality.

Nor are the elements ones that I would or could have come up with according to any preconceived theory of my own that I might have had. They simply came of immersing myself for twenty years in the field and its literature and pondering what emerged. In order to see the pattern, I needed to take in the broadest range of material; in order to examine and substantiate the detail, I needed to look closely at myriad discrete findings.

The sheer variety of people who have responded to and taken up my ideas also helps, at least in my own mind, to support the thesis that the world is structured according to hemisphere differences, since, if I am right, it ought to apply to human experience across the board. So, as well as many positive responses from the world of neurology, psychiatry, psychology, and philosophy, I have had enthusiastic responses from some areas which initially surprised me (only in the sense that I know relatively little about them), such as the worlds of economics, finance, and the law: and I have been delighted, but less surprised, by warm responses from artists, musicians and therapists, and from the world of teachers, priests and doctors.

Occasionally people who ought to know better make sweepingly dismissive

pronouncements on the whole topic of hemisphere difference. What they are attacking, however, when one looks more closely, are what they themselves describe as ‘caricatures’, ‘popular beliefs’, and so on. After one such gleeful romp, the authors accept that,

the left and right halves of the brain do function in some different ways, but these differences are more subtle than is popularly believed. (For example, the left side processes small details of things you see, the right processes the overall shape.)<sup>1</sup>

Ah, yes – indeed. But why should ‘subtle’ mean unimportant? Indeed why would processing ‘small details of things’ versus processing the overall shape not have a whole raft of consequences? And, of course, it does. The quote, by the way, comes from publicity surrounding a book called *Top Brain, Bottom Brain*, which involved a number of caricatures all of its own, so one can understand the drive to get the inconvenient hemisphere story out of the way.

The real story of hemisphere difference is indeed a subtle and complex one, hence the scope of this book, but it is one that is entirely coherent. I am confident that claims that there is little difference between the hemispheres will soon appear not just dated and out of touch, but quite simply untenable. In the last decade, there has been a plethora of findings that further substantiate the hemisphere hypothesis, some of it in areas where there were only hints at the time of writing this book. The growth of such literature is gratifying, and it is impossible to ignore. More studies now are reporting results in terms of lateralisation, so awareness is increasing, though it certainly could increase further and faster with advantage. Some kinds of research can be misleading: for a range of reasons, as one research team reflects, ‘neuroimaging studies may especially fail to shed light on hemispheric lateralization’.<sup>2</sup> That is because they may fail to find real differences by not adequately discriminating or by aggregating data in certain ways. But a coherent body of some 5,000 independent pieces of research that I am now aware of does shed light on hemispheric lateralisation in such a way as to support the hypothesis advanced in this book.

One development, over the last ten years since publication, has been an increasing respect for the capacities of the right hemisphere. It is no longer treated as having cognitive skills ‘vastly inferior to those of a chimpanzee’, as one of the giants in the field, Michael Gazzaniga, once put it.<sup>3</sup> In fact recent

---

<sup>1</sup> Kosslyn SM & Miller GW, *Time*, 29 November 2013

<sup>2</sup> Marinsek N, Turner BO, Gazzaniga M et al, ‘Divergent hemispheric reasoning strategies: reducing uncertainty versus resolving inconsistency’, *Front Hum Neurosci*, 2014, 8, 839 (7)

<sup>3</sup> Gazzaniga MS, ‘Right hemisphere language following brain bisection: a twenty year perspective’, *American Psychologist*, 1983, 38(5), 525–37 (536)



research from Gazzaniga's own lab shows it to be the more reliable and insightful partner, and another recent study collating the areas of damage associated with a drop in IQ following a stroke showed them to be almost entirely in the right hemisphere of the brain.<sup>4</sup>

I don't want it to be possible, after reading this book, for any intelligent person ever again to see the right hemisphere as the 'minor' hemisphere, as it used to be called, still worse the flighty, impetuous, fantastical one, the unreliable but perhaps fluffy and cuddly one, and the left hemisphere as the solid, dependable, down-to-earth hemisphere, the one that does all the heavy lifting and is alone the intelligent source of our understanding. I might still be to some extent swimming against the current, but there are signs that the current may be changing direction.

\*

There are a number of points I could wish to have made more clearly in the text of this book had I been aware at the time of writing of the potential for misconception. Let me address them briefly now, if I may.

I do not mean to suggest that the brain *causes* human experience. Clearly there is a correlation between the brain and human experience. A discussion of what we can know of the nature of that correlation would take me too far from the purposes of this preface. However my position in brief is that the nature and structure of the brain must be reciprocally related to the nature and structure of consciousness, but does not necessarily give rise to it (rather than, say, transduce it). It might, or it might not.

I also did not mean to imply that the changes in cultural balance were due to there having been gross changes in our brains over the time periods in question (the last 2,500 years). Given that we are evolving creatures, it is bound to be true that our brains have changed at some level, since our brains both mould, and are in turn moulded by, the culture in which we live. But that is not my point. What I suggest is that nowadays we use – draw on the potential of – our brains differently from the way in which we have used them at different periods in the past, periods which also differ from one another in this same respect. An analogy might be this. For a considerable while I might find myself listening to a selection of radio stations. If, with time, I find I am listening to one radio station only, that does not imply my having a new radio set, just that I am using the options made possible by the existing set in a more limited way.

Nor do I suggest that the causes of such cultural shifts can be reduced to neuroscience. There are many causative factors in play when cultures change,

---

<sup>4</sup> Barbey AK, Colom R, Paul EJ et al, 'Architecture of fluid intelligence and working memory revealed by lesion mapping', *Brain Structure and Function*, 2014, 219(2), 485–494

including sociological, psychological, environmental, epigenetic, technological, economic and political factors, all of which are interconnected. In a causal nexus one can privilege one over the rest if one wishes to do so, and interpret the changes in one way or another. However I am not attempting to answer the question of what *causes* changes: just of what patterns are discernible when such changes occur, and how those patterns relate to the possible takes on the world afforded to us by the brain's bihemispheric structure. Doing so gives us insight into those situations – I believe we are in one now – where the balance is lost. It helps us see what it is we are missing.

An argument sometimes brought against the existence of hemisphere difference is that under normal circumstances each hemisphere is always active to some extent. This seems to me scarcely an argument at all – no-one could dispute the fact for an instant. It does not however prove that the two hemispheres' roles are the same. Both the scrub nurse and the surgeon are important members of the surgical team, and work together, at the same time, on the same task: an operation becomes hazardous in the absence of one, and impossible in the absence of the other. They work well together not because they have the same role, but precisely because they have different ones.

Naturally a hemisphere is not an undifferentiated whole, but encompasses many regions of interest: there is a lot of detail about localisation in the book (often, for simplicity's sake, in the endnotes) for those who wish to know more. And differences between frontal and posterior cortex, as I point out, are particularly important. But, equally, we now realise we need to think much more in terms of widely distributed networks, rather than, as we used to do, primarily in terms of 'modules'. The hemispheres are vastly more connected within themselves than they are connected to one another, though of course interhemispheric information transfer is still important. Each hemisphere forms a complex system, and all parts of each hemisphere are prolifically interconnected, so that a change in a part can alter the whole. The greatest division in the brain is that between the two hemispheric systems, which leads to their capacity for relatively independent function. So, as in life, we need both to focus on detail and yet see the whole.

I do say clearly in the book that differences between hemispheres are not absolute, but, since I have been misunderstood on the point, perhaps I should emphasise it again. Very few differences ever are absolute, especially in the living world. There is overlap, but that does nothing to undermine the essential difference. On that point, I find the example of Indonesia and Iceland helpful, two countries that are very different from one another in a host of ways, many of which can be linked in part to differences of temperature. Yet it is still true that the warmest annual temperature recorded in Iceland is higher than the lowest annual temperature recorded in Indonesia. There is, in other words, overlap: we

should not expect absolute differences in order for the differences to be substantial, even dramatic, as in the case of those two countries.

A couple of related points are worth making. I have heard it said that ‘the hemispheres are more like than they are unlike’. It’s hard to know exactly what this phrase means; but whatever it means, sometimes in life it is the differences that count. Donald Trump and Albert Einstein are undoubtedly ‘more like than they are unlike’. An old banger and a new Ferrari are both cars, with internal combustion engines, and are in that sense much more alike than not. But when I am buying one, I am interested in their differences.

Nor am I ‘dichotomising’. Nature got there before me, beginning with a remarkable physical division at the core of the brain, which she has since made more robust through mechanisms of interhemispheric inhibition. Some dichotomies are valid, such as those between plants and animals (despite there being at the microscopic level some overlap). Others, between, say, good and bad drivers, are not: that is not a true dichotomy, just a continuous spectrum. Recognising valid differences between two elements of a system is not to ‘dichotomise’. Some people fear dichotomies are simplistic. But it is also simplistic to reject a perfectly valid dichotomy just because you happen to have a thing against dichotomies when they occur.

It has been commented that the hemispheres work ‘in the same way’, referring to neural pathways. But this is to neglect phenomenological experience. The visual systems of the cat and the mouse are highly similar, but they each ‘see’ the world in a different way. Thus the visual pathways of each human brain hemisphere are technically similar, though their ‘vision’ of the world phenomenologically is not. There are significant differences between Fox News and Al Jazeera, but if we focus on the mechanics of studio lighting, cabling, cameras, TV signal transmission, cathode ray tubes, plasma/LED screens, etc, we are looking in the wrong place. We will find no differences and solemnly conclude there are none. Wrongly.

Finally some people feel that I have gone ‘well beyond the facts’, that I have somehow simply ‘gone too far’. Whether I have taken things too far depends on many things, including the extent of the various hemisphere differences, whether there is any pattern or overall meaning to those differences, and the context in which you view them. If you don’t know the extent of the differences (and very few people do), and if at the same time you can’t see the overall picture (viewing the differences as just so much lab data, not something with significance for what it means to be a living person), then – yes, it’s been taken too far. If you *do*, however – then scarcely far enough. My experience has been that, where this objection has been made, the problem lies in my having dared to link brain science with the history of ideas. This may simply express a discomfort felt by too many scientists at ‘straying’ into the realms of philosophy

and cultural history. But until about seventy years ago, scientists would have been educated in, and seen science as part of, a whole world picture in which it played just one part; it would have seemed obviously distorted to them to view science in isolation from the rest of the human endeavour. In any case, when science is dealing with how consciousness brings the experienced world into being, it is simply not possible to avoid philosophy, including the history of cultures and ideas. They must be an important part of the picture.

So much for the use I have made of the data I have presented. But there is a further legitimate concern to be addressed, the extent and representativeness of the data themselves. It has been said by one or two critics that I 'must' have 'cherry-picked' the data, in other words ignored or passed over data that do not suit my argument. This is not an unreasonable suspicion to have when confronting any large work that presents a coherent overall picture. It is also the easiest of things to say and the hardest of things to counter, since it cannot be disproved; the only response must be, 'All right, you look at the same extent of evidence that I did, and show me *where* you think I have cherry-picked – then we can have a sensible conversation. We might still disagree, but if I missed something that changes the story I am happy to take it into account.' This is one reason I have been as careful as I could to give chapter and verse for every assertion I make, and why the bibliography is an important part of the book; I am grateful to Yale for reinstating it in full, as it was in the original hardback, in this new edition. In science you can be as perfunctory as you like as long as you are saying what everyone else is saying, but if you are saying something different, you need, reasonably enough, to be as explicit about your evidence and as empirically based as possible. That way you are open to challenge, and that is how science progresses.

Incidentally, I could have no interest whatever in a picture I had made up myself. That would mean I had not made contact with a reality outside myself, but simply created a pointless fantasy. I have sought to be true to whatever *is*. I have been impassioned to discover the picture that is already there, given in the structure of our selves, our brains and our minds. If I have got it wrong, and I may well have in places, it will not be because I have knowingly misrepresented the data. Many times the data have led me to change an assumption, or expand a view, to reconfigure the picture and to become aware of something I otherwise would never have seen. Anomalies are often the path to a new understanding. I have also come across some anomalies that do not outweigh the other evidence available in the field. Every scientist has this to contend with, especially in the life sciences, where there will never be 100 per cent agreement on anything. The question must always be, does an 'aberrant' finding force a rethink, or would that be to lose a grip on what the rest of the findings suggest?

In writing the book I drew on a vast body of literature. Not even a team of

researchers could easily have provided a comprehensive review, detailing every single study, in just one part of it, unless that part were fairly limited, never mind across the whole field. To be fair, no one has suggested I should have drawn on *more* literature, and some kind of selection is agreed to be inevitable. The question then becomes, how unrepresentative are the inevitably incomplete data? When it comes to the human brain, things are rarely if ever cut and dried, and people will differ in what they would have chosen to emphasise. However, I have tried always to be true to an emerging consensus in any one area, though no consensus is ever absolute; and where there was considerable support for an opposing view, I indicated it. Originally such moments of qualification were in the text itself, but my editor wisely thought I should put most such excursus into the endnotes, for fear of the reader's losing the thread of the argument. I think this was good advice. I have carried on reading and discussing with colleagues for a further ten years, and nothing I have read leads me to change the substance, or even, except in one or two small points, the detail of what I wrote. New evidence continues to fit with the hypothesis. None of the many pieces of evidence can be by itself conclusive, but their convergence across a variety of aspects of human psychology has become increasingly persuasive. Much of this material is incorporated in my current writing, in which I am providing, at least in certain limited areas (which is all that can be humanly achieved), a more nearly comprehensive review of the literature.

Is there a value in trying to view hemisphere difference, not just as a mass of unrelated technical details, but as a coherent picture, at the level of human meaning? This seems to me the important question. To sustain any coherent vision requires one to make an attempt to span fields of knowledge, and as human knowledge expands exponentially, the task becomes *ipso facto* more difficult. Should we therefore abandon the attempt? Certainly we must conclude that attempting such a synthesis is something that scientists with respectably constrained vision can from now on never attempt. However with luck some will be foolhardy enough to try, since the constrained vision is not – absolutely not – a feature of science, but of the nature of the contemporary science establishment. As no less a figure than the great evolutionary biologist and palaeontologist George Gaylord Simpson, one of the founders of the so-called modern synthesis of Darwinian evolution with Mendelian genetics, the crowning achievement of 20<sup>th</sup> century biology, wrote:

Science, truly to be such, must centre not on descriptions and names but on principles – that is, generalizations, theories, relationships, interconnections, explanations about and among the facts.<sup>5</sup>

---

<sup>5</sup> Simpson GG, 'Biology and the nature of science', *Science*, 1963, 139(3550),

Although I am not aware of having been criticised on these grounds, I should forestall a possible misunderstanding. I could understand someone reasonably enough expressing the view that this is a hypothesis that cannot be falsified. That is, however, not the case. While it cannot be falsified by any one experiment, it can certainly be falsified. Parts of it could be more easily falsified than the whole, but even the whole could be falsified.

It might be helpful, simply for the purposes of argument, to contrast here the theories of Freud with those of Darwin. Both had hypotheses that have proved enormously influential on subsequent thought. Neither of their hypotheses can be straightforwardly falsified, but for different reasons.

Freud has provided us with a body of concepts and a manner in which they are related that is not falsifiable at all, because no empirical observations could distinguish between his theory and any competing theory: the status of his work, then, is like that of a philosophy, in that it provides a more or less convincing account of experience, and does not depend on scientific data one way or the other to carry that conviction. You take it or leave it, depending on whether it makes better sense of your experience than any competing model – which *doesn't* mean that it is not valuable: we may find that it reconfigures our knowledge in a way that is richer than the one to which we are accustomed, and leads to the explanation of otherwise puzzling observations.

Darwin, by contrast, has provided us with a hypothesis that relates intimately to observations in relation to which empirical data are indeed relevant, notwithstanding the fact that no single experiment can possibly prove or disprove his hypothesis. To quote the Darwinian George Gaylord Simpson again:

The most striking example [of a theory that cannot be definitively proved or disproved] is the most important of all biological theories: that of organic evolution. Although some quite limited predictions can be deduced from the theory, the theory was not in fact established by prediction and is not sufficiently tested by it. An enormous number of observations enormously varied in kind are all consistent with this theory, and many of them are consistent with no other theory that has been proposed. We therefore can and, if we are rational, must have an extremely high degree of confidence in the theory ...<sup>6</sup>

Of course I make no claim to be a Freud or a Darwin, but I do see clearly that my hypothesis is more like Darwin's in this respect than Freud's. It certainly can act as a philosophical model that reconfigures our knowledge in a way that I believe

is richer. But it is derived from, and can be tested against empirical, experimental observations. The hypothesis could be seen as an aggregate of more local hypotheses, each of which can be tested against empirical evidence and which can each be abandoned if they do not stand up to the findings. Enough such negative findings would invalidate the overall hypothesis, at least in its current form. Alternatively, it might turn out that at least some observations ‘enormously varied in kind are consistent with this theory, and many of them are consistent with no other theory that has been proposed’. That is my belief.

What might be examples of such observations, in the case of the theory explained in this book? Let’s start from some really basic questions about the brain, that, fundamental as they are, have not to my knowledge been satisfactorily addressed by any other theory. Why is the brain, an organ that exists *only* to make connections, divided? Why is it asymmetrical in so many measurable respects, both structural and functional, and why does its functioning seem to *depend* on its being asymmetrical? And why is the major connection between the two cerebral hemispheres, the corpus callosum, getting proportionately smaller, and functionally more inhibitory, rather than larger, and functionally more facilitatory, with evolution? These indisputable observations are not addressed as satisfactorily by any alternative theories of which I am aware. But far more important than any of these, important as they nonetheless are, is that *there is no alternative theory that makes sense as a whole of a large number of established hemisphere differences*. We have no overarching theory that covers so many of the facts. They are otherwise simply treated as a random assortment of findings, inviting a shrug when the questions why such individual differences exist, and how they make sense together, are asked. But, to me, for a scientist not to ask precisely these questions betrays an astonishing lack of intellectual curiosity, to say the least.

The explanatory power of the hemisphere hypothesis is greater than any alternative I know of; and, as for the difference-deniers, they can’t even get to first base. When a better theory is developed that covers as many findings, I will be the first to welcome it. That is how understanding evolves.

I take comfort from the words of Max Planck:

New scientific ideas never spring from a communal body, however organized, but rather from the head of an individually inspired researcher who struggles with his problems in lonely thought and unites all his thought on one single point which is his whole world for the moment.<sup>7</sup>

---

<sup>7</sup> Max Planck, Report on the 25<sup>th</sup> General Assembly of the Kaiser Wilhelm Association for the Advancement of the Sciences, 10-11 January 1936, 5

I caused some confusion by remarking at the end of the book that, while I thought it unlikely I would be shown to be wholly wrong, it would be remarkable if I were shown to be right in every respect. I followed that commonplace observation with words to the effect that, in the worst possible case, the hemisphere distinction at least provided a valuable metaphor, metaphor being how we come to understand the world. That has led some literal-minded people to assume that I do not believe in my own thesis, and that I think the decades spent investigating the neuroscience were irrelevant. It will hardly surprise you to learn that I am not of that view at all.

I have, though, sometimes been asked how essential brain science is to a critique of the modern world picture which is valid in its own terms. There are a number of answers to that point.

First, in place of a list of unconnected observations about a culture or society, and a series of problems requiring a comparable list of unconnected solutions, the recognition of hemispheric differences provides for the first time a way of seeing the picture as a coherent whole. It shows the problems as necessarily interconnected consequences of espousing a certain 'take' on the world. Incidentally, if I am right that we are currently in thrall to the left hemisphere's view, one of the consequences would be, precisely, an inability to see the whole rather than a heap of disparate elements, together with a relative inability to understand what is happening, rather than simply document it, and attempt, as best one can, to find a series of *ad hoc* solutions.

Second, and following from this, it suggests that the best way to *address* such shortcomings as we identify will be not so much by piecemeal strategies, necessary as they are bound to become at some level, as by opening our eyes to the limitations of the view of the world which underlies them, the view which, as a society, we appear to adopt as our default. It is the aim of this book to do precisely that. We don't need a lot more quick fixes. We need a shift in the paradigm.

Third, by showing that the left hemisphere, which underwrites the fragmented vision, is both literally more limited in what it can see, and less capable of understanding what it *does* see, than the right – and, to cap it all, is less aware of its own limitations – it gives the reader good reason to reappraise the left hemisphere's world view, wherever it can be identified as such.

But there exists a fourth, most important, consideration. The book is not just a societal critique, but aims to achieve more: to add to an understanding of brain function, and to add thereby to our understanding of our own minds; to give us a means of evaluating ways of thinking that, apparently equally rational, may sometimes be in conflict. It aims to help us better understand one aspect of what it is to be a human being – not, I repeat in offering a *causative* mechanism, as such, but in offering a descriptive, phenomenological, model anchored in the



science of the brain.

Understanding hemisphere difference offers a perspective on the structure of mind which is not available merely by introspection. If in everyday life we were aware of the discrepancies in the view, or 'take', on the world each hemisphere offers, it would render the immediate business of survival impracticable. For this reason nature has taken care that these discrepancies should not be part of our everyday awareness. Even on sustained introspection, we can be only indirectly aware of the fact that reality is constructed from two incompatible world views. This fact becomes manifest, however, in the disputes of philosophers and theologians over the ages about the very nature of reality. By such indirect routes we become aware of fundamental irreconcilables in the world, irreconcilables so marked that they have led philosophers, time and again, to conclude that we are 'citizens of two worlds' – though those worlds were never fully articulated. The last fifty years has brought the means to carry out painstaking observations of brain function, and the changes in the lived world of the individual whose function is altered. With that comes the knowledge that those 'two worlds' the philosophers intuited are each underwritten by one hemisphere of the brain.

Finally, it would appear to be a literal truth that, as a society, we are becoming more like individuals with right hemisphere deficits. Anecdotal evidence from the teaching profession suggests that between a quarter and a third of children as old as five to seven are now having to be taught how to read the human face, something that until recently would have been necessary only in the case of children with autism. And about a third of all children now have difficulty in carrying out tasks that a decade ago virtually every child in a mainstream school would have been able to do easily – tasks that depend on sustained attention. Add to that research suggesting that young people today are less empathic than children thirty to forty years ago. If a neuropsychologist had to choose three things to characterise most clearly the functional contribution of the right hemisphere, they would most probably be the capacity to read the human face, the capacity to sustain vigilant attention, and the capacity to empathise.

I am sometimes asked why, if the left hemisphere 'take' on the world is less insightful, it has come to dominate the way we think. And if this has happened not just once, but three times, as I believe, in Western history, how do I account for that fact? These are good questions.

I think there are, again, several reasons why this characteristic entrenchment occurs, and indeed is likely to occur whenever a civilisation passes its peak. All of them, to some degree illustrate the self-reinforcing, recursive nature of the left hemisphere's world, a world subject to positive feedback.

First, the left hemisphere view is designed to aid you in grabbing stuff. Its

purpose is utility and its evolutionary adaptation lies in the service of grasping and amassing 'things'. As such it is seductive. It is probably for this reason that Eastern cultures which used to be more balanced in their outlook are now adopting the current Western model of the world with such enthusiasm, and appear set, very sadly, on outdoing the West at its own pernicious game. It is my view that we should be learning from them, not they from us. In the case of the Greeks, the Romans and the post-Enlightenment West, the decline of civilisation has been associated, not just with more left-hemisphere ways of thinking, but appropriately with forms of military or economic imperialism, and a consequent overextension of administration, a coarsening of values, and a failure of vitality, vision and integrity.

Second, the left hemisphere view offers simple answers. Its mode of thinking prizes consistency above all, and claims to offer the same mechanistic models to explain everything that exists. This thinking is common to those who espouse naïve reductionist science ('scientism'), enthusiasts for technological solutions to what are complex human problems, and designers and implementers of bureaucratic systems. When this sort of thinking encounters a problem in reconciling apparent irreconcilables – for example, matter and consciousness – it simply denies that one element or the other exists. That's very convenient.

Third, the left hemisphere's world view is easier to articulate. The left hemisphere is the speaking hemisphere: the right hemisphere has literally no voice. The attempt to make the implicit explicit radically alters its nature: as a result, finding the language to put across the way of being of the right hemisphere is simply harder than doing so for the naturally explicit left hemisphere. The left hemisphere relies on concatenations of serial propositions and the literal aspects of language to make meaning explicit; by contrast, metaphor and narrative are often required to convey the implicit meanings available to the right hemisphere, and in a left-hemisphere-dominated culture metaphors and narratives are disregarded as myths and fables or, at worst, downright lies. We live in an era where articulating and making explicit are of increasing importance and are treated as a mark of truth, and their inverse treated with increasing suspicion. Partly this is another sign of the 'move to the left hemisphere' that I am describing, but that is not the only reason for it: it is also necessitated by large-scale movements of populations with different languages and cultures, as well as the sheer size of modern urban societies, in which one can no longer rely on much that was once taken for granted in smaller and more closely knit communities. The implicit has, now, to be made explicit. The catch is that in becoming explicit it is no longer the same thing at all.

Fourth, since the Industrial Revolution, but particularly in the last fifty years, we have created a world around us which, in contrast to the natural world,

reflects the left hemisphere's priorities and its vision. Today all the available sources of intuitive life – the natural world, cultural tradition, the body, religion and art – have been so conceptualised, devitalised and 'deconstructed' (ironised) by self-consciousness, explicitness and the systems and theories used to analyse them, that their power to help us see intuitively beyond the hermetic world that the left hemisphere has set up has been largely drained from them. For many, TV screens and computers supplant direct face-to-face experience of reality. The cerebral and the abstract – for example, management and its systems – have become more highly valued than the hands-on task that management exists to serve, with the odd effect that the higher you rise in your craft, skill or profession, the more you will be removed from its performance in order to manage it. A century ago, the physical environment was for most of humanity that of the natural world, with its rhythms and cycles, its organic, ever-growing and ever-changing, interdependent life, a world to which it seemed intuitively obvious that we belong; now it has been replaced for many by an unyielding, inert, confrontational environment of non-living surfaces, straight lines, concrete masses and largely generic shapes, which are widely experienced as alienating. The result is that the left hemisphere's world has become externalised, so that when the counterbalancing tendency of the right hemisphere to check with the real world of experience is brought into play, it is already subverted: the world 'out there' is already colonised by the left hemisphere's vision. There is a self-reflexive hall of mirrors at work, where logic seems to lead back to a solution within the system itself, rather than a need to break out of it.

Fifth, built into the relationship between the hemispheres is that they have a different take on everything – *including on their own relationship*. Neurological research reveals a consistent picture of how the two hemispheres contribute to the richness of experience. Essentially this is that the right hemisphere tends to ground experience; the left hemisphere then works on it to clarify, 'unpack', and generally render the implicit explicit; and the right hemisphere finally reintegrates what the left hemisphere has produced with its own understanding, the explicit once more receding, to produce a new, now enriched, whole. Note that the two ways of attending are both necessary and, strictly speaking, incompatible, at least at the same level and at the same time.

This could be thought of as similar to the way a performer learns a piece of music. First he or she is attracted to the piece as a whole and has a sense of how it works overall; then the piece is taken apart, its harmonic structure analysed, certain passages of notes practised repeatedly, and so on; but, finally, all that must be banished from the performer's mind if the performance is not to be hobbled and stilted. This is not to deny the importance of the left hemisphere's contribution, just to make clear that it works its necessary effects at an *intermediate* stage. Problems arise when this is treated as the *end* stage. In terms

of the metaphor of the Master and his emissary, the Master realises the need for an emissary to do certain work on his behalf (which he, the Master, must not involve himself with) and report back to him. That is why he appoints the emissary in the first place. The emissary, however, knowing less than the Master, thinks he knows everything and considers himself the real Master, thus failing to carry out his duty to report back. The right hemisphere's view is inclusive, 'both/and', synthetic, integrative; it realises the need for both. The left hemisphere's view is exclusive, 'either/or', analytic and fragmentary – but, crucially, *unaware of what it is missing*. It therefore thinks it can go it alone.

Sixth, a culture that exemplifies the qualities of the left hemisphere's world attracts to itself, in positions of influence and authority, those whose natural outlook is similar. People with certain autistic traits will be attracted to, and be deemed especially suitable for, employment in the areas of science, technology and administration which have, during the last hundred years, been immensely influential in shaping the world we live in, and are, if anything even more important today. Thus a culture which already has some prominent autistic characteristics attracts to positions of influence individuals who will help it ever further down the same path. This is not the only vicious circle involved. Increasing technologisation and bureaucratisation of life help to erode the more integrative modes of attention to people and things which might help us to resist the advances of technology and bureaucracy, so that in this way they aid their own replication. They make us more like themselves.

Finally, though the 'takes' of the two hemispheres are made to work together below the level of conscious awareness, they are not strictly compatible. This is most obvious when, as in our society, our thinking is no longer embodied in the practices, traditions and rituals of a community, but is developed in explicit, public, often political, debate, where much of its subtlety, and tolerance of necessary ambiguity, gets lost. Once dragged into the light of day and scrutinised, the hemisphere 'takes' are seen often to pull in opposite directions. The catch is that in such a society as ours any apparent inconsistency is treated as a sign of error or intellectual muddle. Ambiguity is no longer a strength, given that truth is known to be complicated and many-layered; it is a weakness, since truth is thought of as single and straightforward. It is therefore easier to accept the left hemisphere's point of view, which is easily articulated and unambiguous, and simply stands in contradiction to the right hemisphere's view, than to accept that of the right hemisphere, which is more multifaceted and harder to articulate, and is already inclusive of the apparently incompatible left hemisphere's point of view. This virtue makes it immediately vulnerable to the charge of inconsistency, and it is therefore dismissed.

\*

Since writing this book, I have begun to think more than ever about the

philosophical implications for how we see ourselves, the planet and our relation to it. In this I have been immensely helped by the reactions of readers and discussions with colleagues. It seems to me that we face very grave crises indeed, and that, if we are to survive, we need not just a few new measures, but a complete change of heart and mind. I know from the moving correspondence I receive that this book has helped individuals, far more than I could have hoped or expected, to change their outlook on the world and even to change their lives in important respects: to do better at work, to save their marriages, to re-evaluate their goals in life. That has been a revelation to me, since I did not foresee the potential for it to have the direct therapeutic effect it apparently has. Societal change, however, is another matter. It would be good to hope that in some way the thesis of this book could play a small part in such a shift, but no one solution can be found to what are agreed to be complex, perhaps intractable, problems.

However, in an era where truth seems to be up for grabs, the question of what we can rely on as true seems ever more pressing. In particular, I believe that reductionism has become a disease, a viewpoint lacking both intellectual sophistication and emotional depth, that is blighting our ability to understand what is happening and what we need to do about it. My current thoughts are directed towards illuminating what I see as a truer picture, a more helpful and, I believe, a more hopeful way of seeing our situation here on this planet, while we still have time.

This is the theme of my current thinking and writing. There are, it seems to me, four main pathways to the truth: science, reason, intuition and imagination. I also believe strongly that any world view that tries to get by without paying due respect to all four of these is bound to fail. Each on its own has its virtues and its vices, its gifts and its inherent dangers: only by respecting each and all together can we learn to act wisely. And each is a blend of elements contributed by either hemisphere.

However the same proviso applies in each case, namely that for each to be successful, what the left hemisphere can offer must be used in service of what the right hemisphere knows and sees, not the other way round. This is as important in the case of science as in that of imagination, in the case of reason as in that of intuition. The left hemisphere is a wonderful servant, but a very poor master.

We also need to be aware of the sheer extent to which the left hemisphere is, in the most down-to-earth, empirically verifiable way, less reliable than the right: in matters of attention, perception, judgment, emotional understanding, and indeed intelligence as it is conventionally understood. And that means that we should be appropriately sceptical of the left hemisphere's vision of a mechanistic world, an atomistic society, a world in which competition is more

important than collaboration; a world in which nature is a heap of resource there for our exploitation, in which only humans count, and yet humans are only machines – not even very good ones, at that; a world curiously stripped of depth, colour and value. This is not the intelligent, if hard-nosed, view that its espousers comfort themselves by making it out to be; just a sterile fantasy, the product of a lack of imagination, that makes it easier for us to manipulate what we no longer understand. But it is a fantasy that displaces and renders inaccessible the vibrant, living, profoundly creative, world that it was our fortune to inherit – until we squandered our inheritance.

Time is running out, and the way we think, which got us into this mess, will not be enough to get us out of it. Please read and I hope enjoy this book, and, if its message should speak to you, take it forward into the world. We need, I believe, to see the world with new eyes, for, as Henry Thoreau put it, ‘The question is not what you look at, but what you see.’<sup>8</sup>

---

<sup>8</sup> Thoreau HD, *Journal*, entry for 5 August 1851; in B Torrey (ed), *The Writings of Henry David Thoreau: Journal*, Houghton Mifflin, Boston & NY, 1906, vol 2, 373