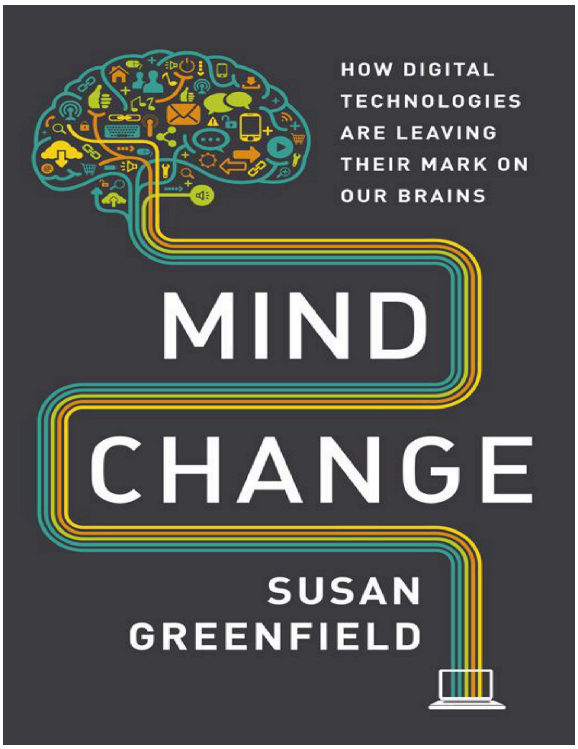


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PREFACE

The events leading up to the writing of *Mind Change* have been unfolding for the past five years, and arguably for much longer than that—perhaps unknowingly ever since I started neuroscience research and began to realize the power and vulnerability of the human brain. True, my main focus over several decades has been trying to uncover the basic neuronal mechanisms accountable for dementia, literally a loss of the mind. But even before I ever put on a white coat, it was the still broader and more general question of what might be the physical basis for the mind itself that held an utter fascination for me. Having made the rather unconventional journey to brain research from classics via philosophy, I was always interested in the big questions of whether we truly have free will, how the physical brain might generate the subjective experience of consciousness, and what makes every human being so unique.

Once I was in the lab, some aspects of these tantalizing issues could be translated into specific questions that might be tested experimentally. Accordingly, over the years, we've researched the impact of a stimulating, interactive "enriched" environment on brain processes, as well as the release and action of the versatile and hardworking chemical messenger dopamine, in turn linked to the subjective experiences of reward, pleasure, and addiction. At a more applied level, we've investigated how the drug Ritalin, used to treat attention deficit hyperactivity disorder (ADHD), might work, and how insights from neuroscience can contribute to improved performance in the classroom. Yet there has always been an underlying theme common to all these diverse areas of inquiry, including our research on neurodegenerative disorders: novel brain mechanisms, how they might be inappropriately activated in disease, and, more generally, how these as yet underappreciated neuronal processes enable each of us to adapt to our own individual environment—to become individuals.

This wonderful *plasticity* of the human brain served as a natural segue into thinking about the future and how upcoming generations might adapt to the very different, highly technological landscape of the decades to come. Accordingly, in 2003 I wrote *Tomorrow's People,* exploring the possible new kinds of environment and lifestyle that information technology, biotechnology, and nanotechnology in combination would deliver. In turn, this very different potential world led me to reflect more on the implications for identity. In 2007, these ideas were set out in *ID: The Quest for Meaning in the 21st Century,* which subsequently was to inspire a novel of a dystopian future *(2121)*. In *ID,* I had suggested that three broad options had historically presented themselves for self-expression. The *somebody* scenario of defining oneself via consumerism offered an individual identity without true fulfillment, while the *anyone* alternative of a collective identity resulted in the opposite, fulfillment that was subsumed into a wider impersonal narrative. Finally, there was the *nobody* possibility traditionally achieved with wine, women, and song, where the sense of self is abnegated in favor of being a passive recipient of the incoming senses. When you have a "sensational" time, I argued, you were no longer "self"-conscious.

But might the supra-sensational digital technologies of the twenty-first century be shifting the balance away from an occasional and contrived situation (drinking, fast-paced sports, dancing) in favor of the "mind-blowing" scenario becoming more the default cognitive mode? These thoughts were in the background of my mind when, in February 2009, I had the chance to articulate them more clearly.

There was a debate in the United Kingdom's House of Lords on the regulation of websites, particularly with regard to children's well-being and safety. If you sign up to speak at such an event, the convention is that you present an argument based on your own specific area of expertise. Since I knew nothing whatsoever about legislation and regulatory practice, I decided to offer a perspective through the prism of neuroscience. The syllogism I used was quite straightforward and not particularly original. Any neuroscientist might well have said the same thing: the human brain adapts to the environment and the environment is changing in an unprecedented way, so the brain may also be changing in an unprecedented way.

The reaction by the international print and broadcast media to this seemingly bland and logical argument was out of all proportion to its

content. Needless to say, I had to endure the inevitable press misrepresentation resulting from a priority of selling copy over the actual truth: “Baroness Says Computers Rot the Brain” was just one of the more lurid headlines. Meanwhile, I was also told by journalists interviewing me, with the glee that people have for imparting bad news, how reviled I was in some quarters of the blogosphere, and then asked how I felt about it.

My reaction was, and has been, that I’m happy to discuss the science prompting my ideas and that I will wave the white flag if trumped by hard facts. That is what scientists do: it’s how we publish our peer-reviewed papers and it’s how we develop theories. Most of us take professional criticism as the warp and weft of the research process. However, what was really interesting here was the apparent ferocity of the personalized animosity in some cases. Had I said the earth was flat, I doubt if anyone would have cared. Clearly I was touching a very raw nerve that made some people feel threatened or in some way undermined. Until then, I hadn’t realized just how important an issue this was for our society. I therefore continued to read more, to think, and to speak in a wide range of forums about the brain of the future—indeed, the future of the brain.

Then, on December 5, 2011, the House of Lords presented a further opportunity for more formal open discussion. I had the chance to introduce a debate to “ask Her Majesty’s Government what assessment they have made of the impact of digital technologies on the mind.” As you can imagine, securing parliamentary time in the historic red and gold chamber is not easy, and I felt very fortunate even to have been given the brief slot that is known as a “Question for Short Debate.” Present at this debate were a range of representatives from diverse sectors, ranging from business to education to medicine.

Interestingly enough, most of the noble lords seemed keen to emphasize the benefits of technology, and the general tone from the majority of those speaking gave the impression that there was no need for immediate concern. In his summing up, the then British parliamentary undersecretary of state for schools, Lord Hill of Oareford, concluded that he was “not aware of an extensive evidence base on negative impact from the sensible and proportionate use of technology,” although, “just as any technological revolution can lead to great progress, so it always also leads to unexpected problems, to which we must indeed always be alert.”

One of the drawbacks of the format of Questions for Short Debate is that, as the name suggests, time is short and, unlike with lengthier slots of different types, the peer who has instigated the particular topic, as I had done on this occasion, is unable to reply to the ideas that have been aired. Needless to say, if I had had the chance, I would have questioned the minister on four basic points.

First, very little is currently being done by the U.K. government to promote research into the effects of screen culture on the young mind, or indeed the mind at any age. If such an initiative was undertaken, it would be vital to know what kind of research was being done, in what kind of areas, how much funding was being provided, and over what period of time they were anticipating conducting these studies.

My second point would have been that if technology is indeed being used "sensibly" (in itself a subjective judgment), then by definition such "sensible" practices could not have a significantly negative impact. The whole point I had been trying to make was that technology is not necessarily being used in moderation; some surveys have suggested that it is used up to eleven hours a day. Would this really qualify as "proportionate"?

My third point would have been that when we look at the various aspects of cyberculture, there is indeed reason for concern. Yet this ministerial speech serves as a good example of a strategy popular not just with politicians and civil servants but also with anyone wanting a quiet life: prevarication until more evidence comes in, without any indication of just how much and what type of evidence would be convincing enough to launch a wide discussion involving policy makers, parents, teachers, and taxpayers more generally. So my fourth and final point would have been that the unspecified "problems" mentioned by the minister will be "unexpected" only if we neither anticipate nor discuss them.

And just at that very moment, with the uncanny coincidences that can sometimes occur in life, I was approached by Random House to write this book. *Mind Change* could therefore be viewed in one sense as an answer to the minister, but its main purpose is to meet the needs of a society that should be squaring up to make some decisions. In order to do so, we must have a balanced and comprehensive overview of the scientific research. While such an overview can never be exhaustive, it should cover the most significant findings—and that is what you will find in this book. It's worth

noting, however, that one deliberate omission is the field of Internet pornography, where the controversy and debate are obviously not so much about whether it is “good” or “bad,” or about how it impacts on types of thinking, but more about legislation and regulation, which are outside the scope of the journey here.

The main goal of *Mind Change* is to explore the different ways in which digital technologies could be affecting not just thinking patterns and other cognitive skills but also lifestyle, culture, and personal aspirations. Accordingly, in addition to coverage of the peer-reviewed scientific literature, you’ll find discussion of the various goods and services that could be revealing a new type of mindset, as well as commentaries and reports in the popular press that act as a mirror to the society in which we live.

Discovering and collating such a wide range of diverse types of material would be—indeed, *is*—extremely daunting. However, once again fate took a hand, and at a beach party in Melbourne in December 2012, I was fortunate enough to meet Olivia Metcalf. Olivia had just finished a PhD at the Australian National University in Canberra, studying videogames, and was unsure of the path she wished to take. Amazingly, she was available and willing to help ensure that the manuscript, then in first draft, encompassed the wide range of research into digital technologies. Over the subsequent year, Olivia’s contribution has been invaluable. Her scrutiny and critique of the work have truly raised the game of what *Mind Change* can offer: an in-depth perspective on a highly complex and fast-moving field.

Some thirty-five years ago, while I was working in Paris, a colleague showed me the front page of a newspaper featuring a heavily bearded man in a sweater of dubious taste. “He’s from the green movement,” he sneered, laughing at the individual as a weird eccentric. The idea of a “green” movement certainly seemed strange to me, as did the phrase “climate change.” Now this concept significantly impinges on much of public policy and influences individual lifestyle. *Mind Change* is so called because I suggest that there are similar parallels with climate change, albeit lagging behind by several decades: both are global, controversial, unprecedented, and multifaceted. While the challenges of climate change require exercises in damage limitation, *Mind Change* could open up the most exciting possibilities for twenty-first-century society to realize the full potential of each human mind as never before, if only we can discuss and plan what

kind of world we want to live in or, more specifically, what kind of people we actually want to be.



MIND CHANGE

A GLOBAL PHENOMENON

Let's enter a world unimaginable even a few decades ago, one like no other in human history. It's a two-dimensional world of only sight and sound, offering instant information, connected identity, and the opportunity for here-and-now experiences so vivid and mesmerizing that they can outcompete the dreary reality around us. It's a world teeming with so many facts and opinions that there will never be enough time to evaluate and understand even the smallest fraction of them. For an increasing number of its inhabitants, this virtual world can seem more immediate and significant than the smelly, tasty, touchy 3-D counterpart: it's a place of nagging anxiety or triumphant exhilaration as you are swept along in a social networking swirl of collective consciousness. It's a parallel world where you can be on the move in the real world, yet always hooked into an alternative time and place. The subsequent transformation of how we might all be living very soon is a vitally important issue, perhaps even *the* most important issue of our time.[1] Why? Because it may be that a daily existence revolving around smartphone, iPad, laptop, and Xbox is radically changing not just our everyday lifestyles but also our identities and even our inner thoughts in unprecedented ways.[2] As a neuroscientist, I'm fascinated by the potential effects of a screen-oriented daily existence on how we think and what we feel, and I want to explore how that exquisitely adaptable organ, the brain, may now be reacting to this novel environment, recently dubbed the "digital wildfire."[3]