
Preface

What is the physical basis of mind? How does the brain work? How are the commands of our will transmitted to the body's muscles? How do we become aware of our surroundings? These are questions that have puzzled thinkers from the earliest times. For at least two millennia the answers to these questions made use of the concept of "animal spirit"; only in the past 200 hundred years have the answers been formulated in terms of electricity.

This book follows this millennial history from earliest times. It shows how the idea of an intrinsic "animal spirit" emerged in classical antiquity and was refined in late classical and medieval times, only to encounter observations in the Renaissance and experiments in the Early Modern period showing that some of the fundamental assumptions of this earlier way of thinking could not be verified. It was during the second half of the 1700s that what would become known as a "paradigm shift" began to occur. The concept of animal spirit was replaced, not all at once, but ultimately completely, by the experimentally validated theory of animal electricity, which has grown into the neurophysiology we have today.

The story is a fascinating one. It traces the history and foundations of our present-day understanding of the nervous system. Yet it has seldom, if ever, been told from start to finish, and for this reason is little understood or rarely taught, even by historians of the life sciences.¹ Indeed, most histories of the discipline we would now define as neurophysiology are restricted to the modern era and devote just a few paragraphs, if any, to the great narrative of what went before.

We hope that our book will help to rectify this historical omission and some of the distortions spawned by the absence of a good source on this subject matter. Nevertheless, a disclaimer is in order right from the outset. The idea that anyone or even a team of historians could write a complete history of the doctrine of animal spirit has to be dispelled. The primary literature is simply too vast, since at its root this concept permeates so many different fields, of which we could mention philosophy, physiology, medicine, and theology, to name just four. Moreover, each of these fields is itself vast, each has many representatives saying the same or slightly different things, and each can be approached in more than one way. As a result, choices have to be made and the end product must, of necessity, be a construction based on subjective decisions.

Our book is no exception. Our focus is not on every facet of the animal spirit doctrine, but on how it formed the basis of early neurophysiologies, allowing philosophers and physicians to "understand" how, for example, we might perceive a visual image, flex a muscle, or perhaps even recall a memory. In addition, knowing it would be futile to try to cover the views of hundreds of early thinkers, we restricted our account to those individuals whose works and names are generally better known, for the most part people regarded as leading figures in the history of philosophy, and then in medicine, and more specifically physiology. Such an approach has made our subject matter more manageable, and it allows us to tell this story in a book of reasonable size. It also leaves the door open for deeper scholarly studies on various facets of what we are covering, as well as for alternative approaches to our subject matter, which we certainly hope this initial but modest attempt at a synopsis will stimulate.

This book, a long time in coming, integrates the work of four authors from three countries on two continents. It would not have been possible without modern electronic means of communication. Our email inboxes have been filled week after week with questions and comments, drafts and revisions. It is, therefore, useful to say a few words about how we came together to research and write on this topic.

The idea originally came from Will Clower, who was particularly interested in 17th- and 18th-century neuromuscular physiology, and what led to the paradigm shift whereby the older animal spirit doctrine was replaced by electrical ideas. Several years after Will had produced a preliminary draft, and now being engaged in a non-academic career, he met with Stan Finger and asked him whether it might be possible to make what he had started into a publishable book. Stan agreed but immediately recognized the need to greatly expand Will's coverage. He wanted to include a number of chapters on the origin of the concept of animal spirit in the ancient world, its role during medieval times, and much more information on how electricity emerged as a potent force in physiological thought. With these thoughts in mind, he persuaded Chris Smith and Eugenio Frixione, who had different areas of historical expertise, to join in the enterprise and help produce a more encompassing history that would have even broader appeal. We thank Will for his generosity in allowing us to take what he had written and then to modify, expand, and frame it in broader contextual ways.

A greatly expanded outline followed, and it was decided that each of the authors would write and take final responsibility for different chapters, which would then be circulated for comments and approval. The work was accordingly

¹ See Rothschild, 1958, and Glynn, 1999, for two rare monographs in compact form.

divided as follows: Chris Smith was the lead author on the Prologue and on Chapters 2, 4, 6, 7, 8, and 9 as well as on the introductions to Sections 3 and 4 and the chronologies; Eugenio Frixione took charge of Chapters 1, 3, 10, 11, and 12, plus the introductions to Sections 1 and 2; Stan Finger was responsible for Chapters 13, 14, and 15 and the introduction to Section 5, while also assuming the invaluable role of general critic and copy-editor; and Will Clower took on the initial drafts of the epilogue. Chapter 5 was a particular instance that involved close cooperation of Chris, Eugenio, and Stan. But as it turned out, all chapters and the prologue and epilogue involved considerable cross-fertilization, with different authors contributing different perspectives, interests, and expertise. Hence, as we worked through the book, the chapters came increasingly to reflect the combined thoughts and expertise of the group as a whole.

Looking back, we feel that the strategy we adopted in bringing the book to fruition was advantageous. The different approaches, perspectives, and questions of the four authors combined to illuminate different aspects of a complex topic, and allowed us to present a better understanding

of the individuals who played key roles in our history and of the changing times in which they found themselves.

We hope this book will appeal to both general readers and neuroscientists interested in the history of their subject. To this end, we have attempted to keep the style accessible to all, while providing many quotations (or translations of such) from original or early sources. Further, we have provided bibliographies and in some instances reasonably detailed references, so that historians will be able to find the sources and some of the vast scholarly literature that followed these seminal writings.

Finally, a preface provides an opportunity to acknowledge the many people—fellow workers, teachers, colleagues, librarians, editors, friends, and, far from least, family—who have helped with advice, knowledge, and patience as our book has taken shape. Without them this work could not have been completed, and we thank them all.

With all of this in mind, we hope that this book will be read by all who wish to follow the intriguing story of how, over the millennia, we have come to understand the workings of that most important of our possessions, our nervous system.