

THE MATERIAL THEORY OF INDUCTION

by John D. Norton

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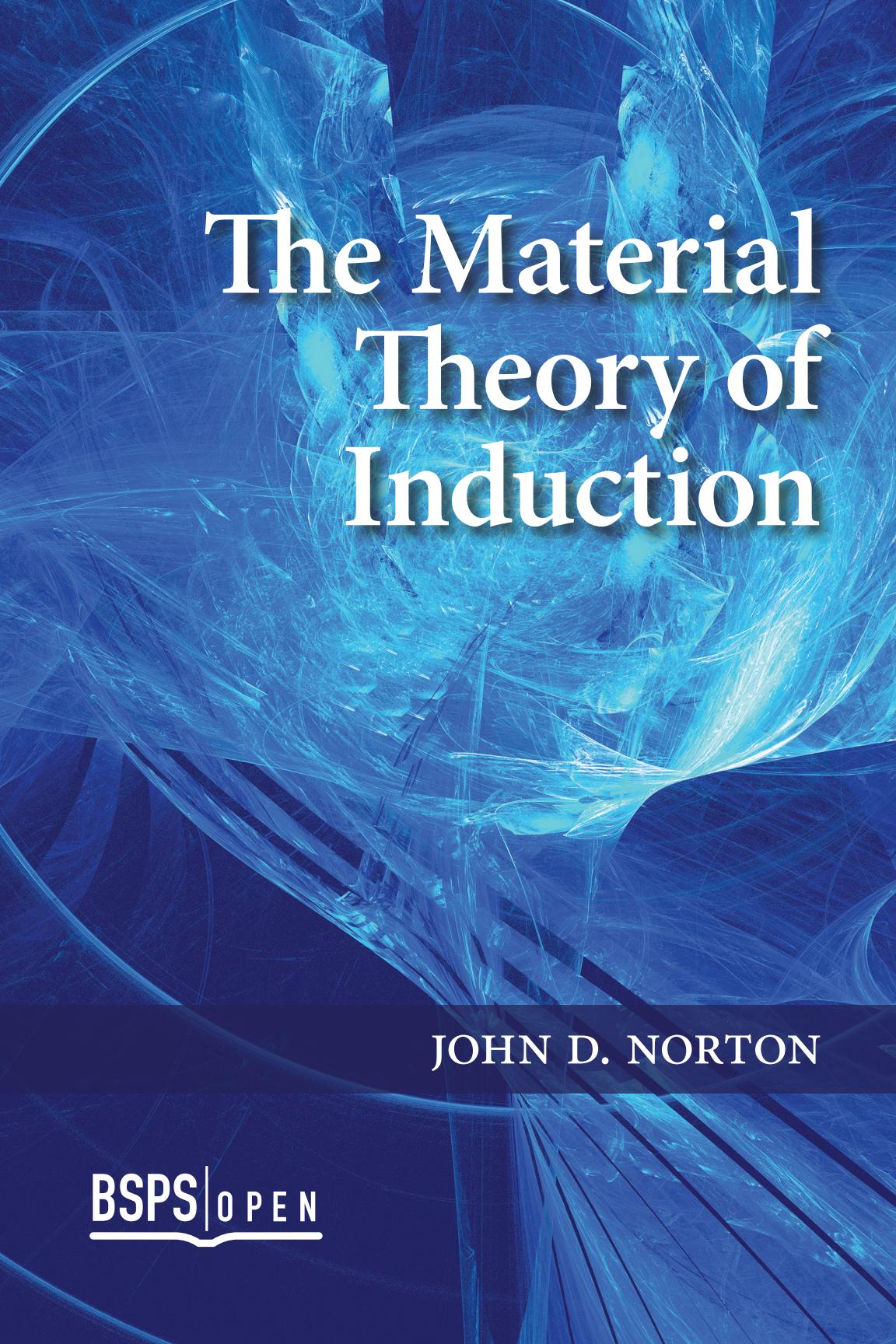
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JOHN D. NORTON

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Preface

The project for this volume started modestly. It was classified as the “little induction book” in my original notes. The plan was to write a short and easy introduction to the main ideas of the material theory of induction. As the writing proceeded, those modest ambitions were supplanted by increasingly ambitious ones until the project had ballooned into something enormous. There were three parts. The first dealt with qualitative notions of inductive inference and the second with quantitative notions. They correspond roughly to Chapters 1–9 and 10–16 of the present work. There was no space for the third part that dealt with the global structure of inductive support. It will be the subject of another volume. Readers anxious for a taste of its content should consult the Epilog here.

The principal idea of the material theory of induction is that background facts obtaining in some domain tell us which are the good and bad inductive inferences in that domain. This conception differs fundamentally from virtually all approaches to inductive inference in the present literature. There the good inductive inferences are distinguished from the bad by checking whether the inference has appropriate formal properties, such as fitting to an approved inferential template or preferred calculus. Because the divergence from the present literature occurs at such a fundamental level, my experience is that philosophers of science who work in inductive inference have trouble approaching the theory. The difficulty, I conjecture, is that we approach new ideas by trying to assimilate them into our existing conceptual system, which has in turn been shaped by our own research agendas. What are we to do when an idea arrives that does not neatly fit into any of our existing conceptual pigeonholes? Is this material theory just another variant of enumerative induction? Is it inference to the best explanation with some alternative notion of explanation? Is it the proposal of a non-probabilistic, mathematical calculus of inductive inference? Or is it another tiresome skeptical assault on inductive inference and the evidential grounding of science?

The material theory of induction is none of these. The slogans “All induction is local” and “No universal rules of induction” may appear

skeptical. They are not. They are an attempt to diagnose why inductive inference has, for thousands of years, been a locus of trouble for philosophers. The words “induction” and “problem” are nearest neighbors in any philosophical lexicon. This enduring, troublesome character derives, I believe, from a foundational mistake that was made at the outset. We tried and continue to try to understand inductive inference using the formal methods that have proven so fertile for deductive inference. While different formal approaches may work in different domains, a formal approach is the wrong one for understanding inductive inference overall. This approach is responsible for the enduring trouble. The material approach offers an alternative foundation for inductive inference that repairs the trouble.

A prominent corollary of the material approach is that probabilistic methods do not provide a universally applicable account of inductive inference. For those enamored by Bayesianism, it will be tempting to drop the material theory into the pigeonhole occupied by formal luddites whose opposition to all mathematical approaches is grounded in a visceral antipathy to them. I do not belong in that company, as Chapter 16 will make clear. My work elsewhere in history and philosophy of physics is very hospitable to mathematical methods, whose power continues to astonish me. I am especially impressed with the power of probabilistic methods in statistical physics. When they are applicable, they are wonders.

My advocacy and defense of probabilistic approaches extends to inductive inference, but only on a case-by-case basis. When probabilistic methods are warranted in some domain, they work and they work very well. Where Bayesians err is in their belief that probabilistic methods are a universal default that can be applied everywhere, automatically. Instead, my view is that probabilistic methods can be applied only in some domain when the background facts of that domain authorize it. We cannot just assume that they apply in some new domain. We have a positive obligation to show that they are warranted by background facts in each case.

A consequence is that I wilt every time I see yet another paper that promises a Bayesian analysis of such-and-such, especially when such-and-such is some aspect of inductive inference or evidential support. The pretense is that the Bayesian analysis will provide universal understanding. It cannot do this since Bayesian analysis cannot be applied everywhere.

Instead, we are given a few elementary results in the probability calculus. The terms of these formulae are then matched tendentiously with terms of art from such-and-such. The relabeled formulae are supposed to provide insight, but they only give us the illusion of understanding.

The style of analysis of this work falls within my conception of history and philosophy of science. It begins by taking the pertinent science seriously. This is especially important when it comes to inductive inference since the evidential successes of modern science are extraordinary. That we philosophers of science are struggling to vindicate these successes is more a commentary on our failures than any failure of the sciences. The chapters that follow are rich in examples from science. I lean towards grasping the science by exploring its history, for an emphasis on the history provides some protection from the inevitable, modern textbook simplifications of relations of inductive support. The presence of this history is not mere decoration; it is essential to understanding of the evidential relations in the science.

It is customary in a preface to acknowledge those who have been helpful in the book's project. This project has many distinct parts, commonly divided naturally by chapter. Rather than delivering here a long but opaque list of names, I have acknowledged in individual chapters those who have been especially helpful in those parts. Those acknowledgments fall short of naming all those who have provided support, encouragement, or helpful critical responses. To all those I have failed to name, I offer apologies and thanks.

On 27–28 October 2018, there was a conference on the material theory of induction at the Center for Philosophy of Science, University of Pittsburgh, called “Norton for Everyone: The Material Theory of Induction and Beyond.” It was beyond extraordinary and humbling for me to have the material theory of induction scrutinized by so many talented and accomplished philosophers of science. I would like to thank once again all those who participated. The conference organizers were John Earman, Bryan W. Roberts, and Elay Shech. Speakers and discussion leaders were Jonathan Bain, Nora Boyd, Jeremy Butterfield, Richard Dawid, Siska De Baerdemaeker, Balazs Gyenis, Eric Hatleback, Leah Henderson, Michel Janssen, Molly Kao, Jonathan Livengood, Wendy Parker, Dasha Pruss, Bryan W. Roberts, Elay Shech, and David Wallace. Many more

were present and contributed most valuably. With apologies to anyone I may have omitted, I would also like to thank Harvey Brown, Hasok Chang, Pat Corvini, Nick Huggett, Shahin Kaveh, Edouard Machery, John McCaskey, Tom Pashby, Willy Penn, Mike Tamir, Jennifer Whyte, and Jim Woodward.

After the conference, Elay Shech and Wendy Parker solicited contributions from the speakers and elsewhere for a special issue on the material theory of induction in *Studies in History and Philosophy of Science*. The now complete special issue includes an editors' introduction, fifteen papers and a response to each from me.¹ Once again, I thank the contributors for their interest and efforts. I reserve special thanks for Elay and Wendy for having undertaken the burden of organizing this special issue and shepherding its contributions through to completion.

When this manuscript was submitted to *BSPSOpen*, several anonymous reviewers for the press read the manuscript carefully and sympathetically. I thank them for their helpful remarks and corrections, which have been incorporated as best I can into the manuscript. I am also grateful to Michael Gollner for his thorough and sensitive copyediting of the manuscript.

Finally, I offer the most profound gratitude to my wife Eve, who has provided a happy home for my body and heart through the years of writing this work and many before it. Those who know the joy of true and enduring love will understand what that means. No combination of words can properly express it.

¹ The collection of papers can be accessed through the journal's website: <https://www.sciencedirect.com/journal/studies-in-history-and-philosophy-of-science-part-a/special-issue/10205S9XGWG>

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