THE PRINCIPLE OF THE COMMON CAUSE

The Common Cause Principle says that every correlation is either due to a direct causal effect linking the correlated entities, or is brought about by a third factor, a so-called common cause. The principle is of central importance in the philosophy of science, especially in causal explanation, causal modeling, and in the foundations of quantum physics.

Written for philosophers of science, physicists and statisticians, this book contributes to the debate over the validity of the Common Cause Principle, by proving results that bring to the surface the nature of explanation by common causes. It provides a technical and mathematically rigorous examination of the notion of common cause, providing an analysis not only in terms of classical probability measure spaces, which is typical in the available literature, but also in quantum probability theory. The authors provide numerous open problems to further the debate and encourage future research in this field.

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This book summarizes and develops further in some respects the results of research the authors have undertaken in the past several years on the problem of explaining probabilistic correlations in terms of (Reichenbachian) Common Causes. The results have been published by the authors of this book in a number of papers, partly in collaborations with each other and with other colleagues; these papers form the basis of the present book. We wish to thank especially Balázs Gyenis, Zalán Gyenis, Inaki San Pedro, Stephen J. Summers, and Péter Vecsernyés for the cooperation on the topic of the book and in particular for allowing us to use material in joint publications.

In our work we also have benefited greatly from collaborations and informal discussions with a number of other colleagues. These include Nuel Belnap, Arthur Fine, Jeremy Butterfield, Rob Clifton, Gerd Grasshoff, David Malament, Tomasz Placek, Samuel Portman, Elliott Sober, Leszek Wronski, and Adrien Wüthrich – we thank them all for their interest in our work and for their readiness to share with us their insights and views.

The research that the book is based on was partially supported by several small grants from the Hungarian National Science Found (OTKA). The final writing was facilitated by the OTKA grant with contract number K100715.

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