Miguel Fonseca Martínez

Belief & Society





BELIEF & SOCIETY

Making Ranking Theory Useful for the Social World

By

MIGUEL FONSECA MARTÍNEZ



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All rights reserved. No part of this publication may be reproduces, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior permission of Universidad La Gran Colombia. To Martina, my precious pride and joy. A Anita por las letras y a Alcides por el mundo. Die Mythologie kann wieder in Fluß geraten, das Flußbett der Gedanken sich verschieben. Aber ich unterscheide zwischen der Bewegung des Wassers im Flußbett und der Verschiebung dieses; obwohl es eine scharfe Trennung der beiden nicht gibt.

> Ludwig Wittgenstein OC.97.

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Preface

"Depth and triviality are close neighbors in philosophy. Then, however, one might say that one kind of progress in philosophy just consists in the transformation of the profound into the trivial."

(Spohn, 2012, p. 555).

Epistemology is, at first glance, a specific field in the sciences. At the same time, epistemology is a general theory of what humans are *rationally* doing right or wrong in *all* sciences. In this sense, it is a field devoted to achieving knowledge following certain rational, justified principles and models. Thus, the critical question is: Why ought such principles and models be followed? And, given this, how do we establish better, clear, precise, and justified models of reasoning to tackle this normativity task and challenge?

The present book is thus devoted to answering such questions from social sciences. Thanks to this normative reflection, the main goal is to establish an ideal model—a methodological toolbox—for the internal or epistemic normativity of social sciences. Following the legacy of Wolfgang Spohn (2011), the book intends to study the epistemic normativity of social sciences as a central criterion of their identity and demarcation. The epistemic normativity that subjects follow to understand social phenomena is the core of this scientific knowledge and goes beyond the account of empirical methodologies that appeal to an external normativity that is not exclusively used to deal with objects and problems relative to social sciences.

Through an exhaustive analysis of Wolfgang Spohn's *Ranking Theory* (2012), this work defines the epistemic foundations of such internal normativity as the background to the ulterior construction

of a new ideal model and a toolbox of applications, given the internal or epistemic normativity here proposed, to the realm of social sciences. It is also a text devoted to methodological entailments given such a model. Thus, the book will show that this epistemological enterprise is indispensable to studying social practices from a scientific perspective.

Hence, the first step to complete these tasks is to specify how to work and achieve good, explicit, precise models and results. In this sense, the scope of formal epistemology gives us important developments and tools. This approach aims to solve all these problems using formal tools originating in sciences such as logic and mathematics. Therefore, formal epistemology has the same subject matter in brief, the theory of knowledge, and investigates such subject matter with formal devices. Formal epistemology helps us to set a firm ground and to build epistemological models to capture the rational structure of doxastic agent's epistemic states at a given time and the change of such epistemic states.

Given this state of affairs, belief is the core of epistemic states' normativity. The function of belief is to represent accurately and produce useful states of mind. However, the notion of belief becomes problematic because it is dispositional and uncertain; beliefs used to appear to the doxastic subjects in *degrees of belief*. The most crucial entailment of this conception of degrees of belief is that the problem of truth is equally different between ungraded and graded belief. Establishing degrees of certainty to solve all the above epistemological problems requires new formal tools to model and explain such important epistemological tasks.

The mainstream paradigm, in the realm of formal epistemology, regarding degrees of belief is the standard probability theory account. For the probabilistic reading, the issue does not have to do with the logical necessity of knowledge but the probability concept. A belief should be modeled not under the mechanics of the deduction but through a method that allows modeling when such a belief is more probable. One of the advantages of this approach is the possibility of quantitatively establishing the growth of or decrease in the plausibility of confirmation of a belief given particular evidence. The probabilistic approach allows measuring the models that are made on epistemological problems. In addition, the chance of talking of conditional probability constitutes a potential model for quantitatively addressing the problem of causality and inductive inference. One of the most used tools in epistemology from this approach is the so-called Bayesianism. Thus, standard probability theory cannot justify defeasible reasoning and its change over time. The update of information and learning or, alternatively, the specific dynamics and coherence of the change of degrees of belief, is possible thanks to Bavesian conditionalization, which gives rise to degrees of justification. Given a certain amount of background evidence, we can set different degrees of belief, which entails the degree of justification. In other words, the doxastic subject weighs the evidence according to specific update rules. Probability devices are helpful to measure and set how the degrees of belief behave in rational ways statically and dynamically. The goal is then to develop a rational mechanism of belief behavior.

Rationality is a solid degree to fix credence. However, probability standard theory is a continuum when you cannot *set* the notion of belief. Several tools of formal epistemology intend to solve particular problems of standard probability theory, such the dispositional essence of the notion of belief and the inner fixed character of belief states. Among the most notable variations of the theory of probability is the formal epistemology device called the *ranking theory* by Wolfgang Spohn (1988, 2012). This theory arises from probabilistic approaches but is strongly influenced by another formal model called the semantics of possible worlds, which is based on modal logic (Gamut, 2010).

Spohn's theory emerges as a response to the probabilistic mainstream of justifying degrees of belief and non-monotonic reasoning and, in addition, wants to solve another typical epistemological problem, the so-called inductive reasoning. Part of this kind of reasoning refers to the possibility of projecting observable patterns to several ulterior, unobservable instances. The fundamental problem is then the ground that justifies this type of reasoning. For Spohn, the issue has a common starting point: the clarification of the nature of the concept of belief, its statics, dynamics, and the possibility of establishing properties of knowledge through formal representations of belief (Huber, 2016a).

Regarding probability theory, which cannot accurately represent the notion of belief, ranking theory describes a static and dynamic theory of belief, with the advantage of defining and setting a symmetric definition of rational belief. It is also a theory of degrees of belief and explains the uncertain character of belief. Since degrees of belief are closely related to inductive inference and defeasible reasoning, it is also a theory of this particular realm.

Ranking functions are gradings of disbelief. Ranking functions represent that a belief is believed or taken to be true to some degree. On the other hand, it can mean that a particular belief is disbelieved or assumed to be false to some degree. The analysis of the conceptual components of knowledge begins with the study of belief and its foundations, which is the primary goal of Spohn's account. Ranking theory, or the so-called Wolfgang Spohn's *Laws of Belief,* is a theory on broad issues in epistemology and synthesis and a complete understanding of the theory of belief. The theory provides a normative approach to belief, belief change, belief revision and many possible applications to rationality, normativity, causation, and decision theory.

I examine Spohn's ranking theory deeply as the ground to achieve the goals of this work. I learned a lot about ranking theory and Spohn's philosophy thanks to close work and advice at Konstanz. Furthermore, I began investigating Spohn's work in 2008 after my first visit to the University of Konstanz. Through this journey, I adopted this theory as the most accurate tool to develop the riverbed, a strong theory on rationality, to draw a good means-end account for the social world. Likewise, thanks to ranking theory, I argue that a robust theory of rationality allows us to create epistemic models useful for social reality and, on the other hand, a methodology toolbox to understand and explain what our collective mind has created.

In this sense, the philosophical applications of ranking theory and how to make it useful for the account of an internal normativity of social sciences are perhaps the most salient entailment of the theory. Applications are, using an analogy, the creation of a *toolbox* for the specific objectives of this work. As a function of transmission of epistemic justification, the tool of reasons is the first and fundamental application. Reason is a *warrant* or epistemic justification between propositions. The second tool is the application of ranking theory to subjective normativity or *ceteris paribus laws*. Spohn's (2012) reading on ceteris paribus laws claims that this subjective normativity is the case when we can obtain normal conditions in a given ontological region. In other words, normal conditions are an epistemic issue related to the epistemic agent's beliefs and reasons given a particular background. Doxastic agents believe defeasible *a priori* specific hypothesis given necessary and sufficient reasons as a *ceteris paribus* law.

Finally, the account of causation and Spohn's proposal's origin, position, novelty, and fortune are remarkable. Causation theory and applications are the synthesis of the whole system of epistemic tools and, of course, the principal rich tool for the tasks of the dissertation.

This structure given by ranking theory allows us to set an epistemic normativity proposal driven by the formal rules of doxastic rationality. The laws of belief become the rock-bottom and structure of rationality. Spohn deals with two main topics regarding an accurate grounding for an epistemological normativity frame of our inference *switching yard: perception* and *a priori belief states*. Of course, the link and goal of these two aspects is achieving knowledge, that is to say, at least, true belief. Achieving true belief from a normativity perspective is then addressed to the conception of a justified belief. Hence, the first problem to deal with is the concept of *justification*; this task will reveal the origins of justified belief and the right path to a normative picture of knowledge.

Furthermore, the *a priori* structures of our cognitive system complete the epistemological normative frame. *A priori* structures are another type of epistemic justification and normativity that seems to be independent of experience. Spohn's *dynamic apriority* bets for a flexible conception of apriority that could match different doxastic states of the mind. Apriority is a dynamic notion related to our conceptual development and the structure of rationality itself. Truth-conduciveness of reasons is the key to achieving an apriority normativity, given a coherentist background on the notion of truth.

Given all this robust epistemological machinery of ranking theory, the text can finally give a novel account to make ranking a theory valuable for the social world. This development intends to throw light on certain foundational and methodological aspects of social sciences and would be helpful for philosophers and empirical social scientists. The idealized model of rationality developed by ranking theory is then applied to some critical aspects of the social world as a novel research and methodology *toolbox* for social sciences. This is the first approach of an extended research project; the proposal is then the *riverbed* for an ulterior research project of interdisciplinary applications to test the epistemic conditions model advanced in the present work.

Social entities and social action required normative epistemic conditions for the doxastic states of agents and social agents to set the ulterior doxastic states of other agents and groups of doxastic agents. The social world requires that a social agent and its members satisfy a given model of epistemic conditions to create social entities and perform collective action. Such normativity is thus an ideal or formal theory of the possibility of establishing criteria for interactive knowledge.

This theoretical model of epistemic conditions or normativity for interactive or collective knowledge allows us to turn the collective formation of entities on or off and prevent or suggest collective action. Collective knowledge requires evaluating our beliefs and reasoning as justified or unjustified, and in doing so, we are making normative judgments about them. As epistemology is a normative discipline, the relation between norms, rationality, and reasons is ineluctable.

Thus, there is a sort of twofold normative regulation. On the one hand, we have the relative regulation regarding a particular goal (instrumental) and, on the other hand, a regardless prescribing perspective of any goal. Therefore, the principles of logic, probability, and ranking theory are the most general norms for belief. No one can be said to believe without these norms. The task is to guide, regulate, and implement them as part of our epistemic practices. This argument results in the following definition: *Epistemic norms are necessary and sufficient conditions for an epistemic state if and only if warranted by a perceptual* or a priori *justified reason*. Ranking theory expresses these two general views on normativity and is the rationality model or riverbed used herein to attain the complex means-end and obtain knowledge in the social world.

The first step is to develop this novel epistemic normativity riverbed to show the link between ranking theory and the so-called building blocks of social reality. Then, we will see the many tools derived from ranking theory applied to the social world, including the dynamics of reasons and its entailments—the *ceteris paribus* account of social sciences—and a methodology model grounded in causality. Following this, we will examine the normative entailments to the internal normativity of social sciences. Lastly, we will argue for a further research horizon regarding the present proposal and Artificial Intelligence.

Therefore, the rhetoric of the present book is constructive; the reader has to hold their breath until the last chapter to reap the harvest. However, the harvest is just a starting point for further inquiry, as philosophy used to be a never-ending attempt to transform the profound into the trivial.

Finally, there are many people to thank. Foremost, I am deeply indebted to the Universidad La Gran Colombia for supporting this project through the Julio César García Research Fellowship. I would like to express my deepest appreciation to the Dean of the Education Sciences School, Universidad La Gran Colombia, Mrs. Mary Gaby Boshell, for her encouragement and help. I am also thankful to Wolfgang Spohn and Juan Carlos Moreno; their help and wisdom were invaluable. Thanks should also go to my head advisor, Martina Fonseca, for her advice and unwavering enthusiasm. Many thanks to my parents and family for their invaluable support, especially my dear, Andrea, Melquisedec and Magdaly and Marcela Fonseca for her corrections and company. Also, the help and encouragement of Olga and Manuel Vega were an oasis in the middle of a Roman summer. I would like to acknowledge my colleagues at the University of Konstanz: Jonas Linz, Guillaume Khayat, and Albert Dikovich. I learned much from our philosophical and historical discussions but, above all, from a shared *Lebenswelt*. I thank my colleagues in Bogotá for a shared journey in good company, especially Catalina

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Soli Deo gloria.

The Internal Normativity of Social Sciences

Introduction

The present chapter aims to establish an ideal model of internal or epistemic normativity for social sciences. Following the legacy of Wolfgang Spohn (2011), the text studies internal normativity, or epistemic normativity, as a central criterion of demarcation of social sciences. The internal normativity that subjects use to understand social phenomena is the core of this scientific knowledge and goes beyond the account of empirical methodologies that appeal to an external normativity that is not exclusively used to address objects and problems relative to social sciences. Through an exhaustive analysis of Wolfgang Spohn's *ranking theory* (2012), the work defines the epistemic foundations of such internal normativity as the background to the ulterior construction of a new ideal model and a toolbox of applications, given the internal or epistemic normativity proposed herein, to the realm of social sciences. Thus, this is an indispensable task in studying social practices from a scientific perspective.

The Demarcation of the Geistes Wissenschaften

One of the most important tasks of philosophy is to establish the limits and the authenticity of a scientific conception of the world. Philosophy aims to ground and problematize the methods from which science can obtain knowledge of the world. Hence, from the set of elements that constitute what we can call reality, that is, the collection of objects that sciences attend to, we can identify two perspectives that establish the demarcation criteria for the constitution and validation of scientific knowledge.

First, there are subject matters of *natural sciences*. Its distinctive features are described by the set of unique disciplines that have

physics as a reference and whose correlates are close to the objects. They do not require the intervention of any subject for their existence and are tied to the construct of empirical beliefs and objective measuring of evidence as Searle (1999) claims:

We can see the distinction between the distinctions clearly if we reflect on the fact that we can make epistemically subjective statements about entities that are ontologically objective, and similarly, we can make epistemically objective statements about entities that are ontologically subjective (...) Mountains and molecules, exist independently of our representations of them. However, when we begin to specify further features of the world, we discover that there is a distinction between those features that we might call intrinsic to nature and those features that exist relative to the intentionality of observers. (pp. 8-9)

Second, the so-called *social sciences* have as a correlate and subject matters the individual and collective products of the human mind (Spohn, 2011, p. 1).

Therefore, a task of the highest relevance for philosophy is establishing solid foundations to obtain genuine knowledge in social sciences. However, at first glance, we can think with authenticity about what kind of interest *society* can have in philosophy and not delegate that work of expertise to social scientists. It can be said that these blurred boundaries between the approaches of sociology and philosophy about the nature of society and its specific ways of obtaining knowledge are based on the *normative character* of the human activities that the latter discipline reveals (Miller, 2014). Such correspondence of human norms and behaviors, within the framework of a scientific and rational vision, is the starting point of this account of the philosophy of social sciences.

Such research was the case long before special or particular sciences existed. We can talk of the birth of this reflection in early modernity with the philosophy of Descartes (1641). The subject matter of physical sciences would be linked to *res extensa*, and paradigmatically, the so-called *res cogitans* would be related to the sciences of the mind or human sciences. Although the causal relationships between these two types of substances and the ontological and philosophical revision of the proposal turned it into an obsolete

reading, it nonetheless established an indelible hallmark on the development of Western philosophy and epistemology.

Even today, there is evidence of Cartesian dualism, mainly in the debate about consciousness. It is thought that explaining human sciences consists of dealing with the manifestations of consciousness. The knowledge of these phenomena is centered on the studies on consciousness that try to integrate it into the causal nexus of all nature or to understand the phenomena of consciousness as derivatives of biological processes (Spohn, 2011, p. 2).

In a second moment, after the emergence of particular sciences in the eighteenth and nineteenth centuries, methodological criteria of demarcation are suggested as a possible solution to the problem of the specificity of knowledge in social sciences. The emphasis of the investigation at the time is synthesized pertinently by the proposal of Windelband (1884).

For the classification of the disciplines directed to knowledge of reality, it is a present customary to distinguish between natural sciences (Naturwissenshaften) and humanities (Geisteswissenschaften): in this form, (...) So we may say that the empirical sciences seek in the knowledge of reality either the general in the form of the natural law or the particular in the historically determined form (Gestalt). The one comprises sciences of law, the other sciences of events; the former teaches what always is, the latter what once was. If one may resort to neologisms, it can be said that scientific thought is in the one case nomothetic, in the other idiographic. (pp. 11-13)

The founder of the school of Baden formulated the principle of methodological demarcation, differentiating between nomothetic and ideographic disciplines. According to this, physical sciences proceed nomothetically since they seek to subsume the phenomena for which they are responsible under general laws for a later explanation. On the other hand, human or ideographic sciences describe regularities in particular provinces and a generally unrepeatable reality.

The methodological demarcation criterion proposed was part of a debate that reached an critical moment in Dilthey's proposal (1883) for hermeneutics as a methodology of human sciences. The human sciences as they exist and as they are practiced according to the reason of things that were active in their history contain three classes of assertions: descriptive and historical statements (...) theoretical generalizations about practical contents (...) and evaluative judgements and practical rules. (p. 78)

Its fundamental idea is that human sciences should seek understanding through the hermeneutic method of interpretation to solve the epistemological problems that arise from the task of understanding. The center of hermeneutic understanding consists of a linguistic and historical understanding directly related to language as an essential feature of humankind and its products.

This methodological dualism suffered strong criticism in the twentieth century. Firstly, faced with the difference between nomothetic and ideographic, logical empiricism raised strong criticisms of this principle of demarcation. In this regard, Wolfgang Spohn (2011) says:

Single events are scrutinized everywhere, in astronomy and geology, etc., just as well as in historical or economic studies, and the attempt to generalize is undertaken everywhere; certainly, there are economic laws and perhaps even laws of history. One may suggest that the types of laws are different. (p. 2)

Regarding the differentiation that defines social sciences as hermeneutical sciences, we can affirm that this methodological principle of demarcation has been approached by perspectives such as the indetermination of Quine's (1960) translation:

Language is a social art. In acquiring it we have to depend entirely on intersubjectively available cues as to what to say and when. Hence there is no justification for collating linguistic meanings, unless in terms of men's disposition to respond overtly to socially observable stimulations. An effect of recognizing this limitation is that the enterprise of translation is found to be involved in a certain systematic indeterminacy. (p. viii)

On the other hand, another important account is the behavioral approach of Davidson's (1963) interpretation:

What is the reason between a reason and an action when the reason explains the action by giving the agent's reason for doing what he did? We may call such explanations rationalizations, and say that the reason rationalizes the action. Rationalization is a species of ordinary causal explanation. (p. 685)

Finally, the proposal of the pretended naturalization of semantics by Grice (1957) and his followers is another remarkable claim regarding hermeneutics approach. Grice (1975) asserts:

An utterer is held to intend to convey what is normally conveyed (or normally intended to be conveyed), and we required a good reason for accepting that a particular use diverges from the general use (p. 387)

All these premises lead to say that, overall, the hermeneutic philosophy has difficulties in its foundation because:

From an ordinary language point of view, opposing understanding to explanation is an unhappy move; since that opposition does not exist. In the relevant context, the two terms are often exchangeable. The sciences strive to understand nature just as human studies strive to understand men; cells are objects no less to be understood than texts. (Spohn, 2011, p. 3)

As the definitive response of the twentieth century to the Cartesian dualism and its legacy of a methodological division of natural and human sciences, the philosophy of consciousness has attempted to naturalize its study through methods of empirical explanation of the phenomena of the mind (Papineau, 2002). Not only has interpretation been naturalized, but also, in some methodological studies of natural sciences, understanding has been recognized as a normative criterion. Likewise, the mentioned naturalization program of semantics, thanks to psychology and behavioral studies, leads us to the debate on human action as a possible criterion of demarcation or methodological unification for science:

As a consequence, the issue was thrown back at the basic level where it belongs, i.e., to the question how to conceive of human action. There is no more basic level at which a principled difference between natural and human science could emerge; and reversely, if the difference cannot be perceived already there, the case is very likely to be hopeless. However, this is the level at which methodological dualist suffer their most dramatic defeat. (Spohn, 2011, p. 4) This debate arises regarding the antagonistic reading of human agency between *dispositionalists* and *causalists*. Ryle (1949) posits this opposition as fundamental for explaining human action. Hempel (1961) and Davidson (1963) reduce the dispositionalist explanation to specifically causal proposals. This, which is the principally accepted position (Schlosser, 2015), then seeks a methodological unification in virtue of the naturalization of philosophy:

The philosophy of action provides us with a standard conception and standard theory of action. The former construes action in terms of intentionality, the latter explains the intentionality of action in terms of causation by the agent's mental states and events. (p. 1)

In front of this ontological and methodological unification, a new path is proposed that does not follow the classic problems of the traditional methodological division we have described in general terms, nor to naturalization and methodological reductionism. This alternative is part of the current debate that seeks a dialogue between naturalism and normativity as criteria for a methodology of social sciences: "Paying due attention to the normative dimension of human societies is indispensable for an adequate account of us humans as social beings" (Risjord, 2016, p. 5). Risjord's proposal is then condensed in Spohn's (2011):

Single events are scrutinized everywhere, in astronomy and geology, etc., just as well as in historical or economic studies, and the attempt to generalize is undertaken everywhere; certainly, there are economic laws and perhaps even laws of history. One may suggest that the types of laws are different. (p. 2)

Spohn's Key Difference

Spohn's moderate vision is framed in the naturalization of normativity as a demarcating criterion of the methods of social sciences. After developing throughout his career an epistemological analysis under the so-called formal epistemology that results in the collection of his work called *Ranking Theory* (2012), Professor Spohn discusses the problem of the criteria of demarcation of science from the concept of normativity with an epistemological tone. The following is his proposal: There is a principled methodological difference between the natural and human sciences. The basic point is that human sciences are shot through with normative considerations in an irreducible way in which natural sciences are not. (Spohn, 2011, p. 4)

The concept that would allow a methodological element of demarcation is then the normative component that prevails in human sciences and that springs from an analysis of the rationality and agency of human beings:

Usually, the realm of normativity is decomposed into two parts, which are, of course, interrelated. One part relates to our actions: what should we do? The other part relates to our beliefs: what should we believe? Thus, the realm of the normative basically divides into theoretical and practical issues. (Spohn, 2011, p. 4)

Normative discourse expands as theoretical normativity to right or wrong inferences, relationships, and differences between determinism and probability. Equally, there would be normative principles of practical reason, such as the maximization of utility normativity, game theory, rational decision theory, etc., in addition to the criteria of ethical normativity:

More salient than all such norms of rationality are the more substantial ethical norms about how to lead a good and virtuous life and moral norms of justice, fairness and peaceful coexistence, norms that may enter legal codes or may be used as critical instances against positive law. (Spohn, 2011, p. 6)

Following Hart (1961), Spohn assumes that there would be *external* and *internal* perspectives on the subject, that is, two general forms that subsume both the theoretical and practical features of normativity:

Law nor any other formal social structure can be understood without an appreciation of certain crucial distinctions between two different kinds of statements, which I have called internal and external and which can both be made whenever social rules are observed. (p. v)

From the former, the rules that a subject adopts in a community are established. In this sense, a norm can be understood as a specific type of conventional regularity of behavior that supports model structures of exchanges of beliefs and desires in specific communities. Lewis claims: "Convention turns out to be a general sense of common interest, which sense all the members of the society express to one another, and which induces them to regulate their conduct by certain rules" (Lewis, 1969, p. 4).

Normativity and convention, with a Wittgensteinean tone, are either grounded in Bloor's (1997) theory:

There are two competing schools of thought about the nature of rule following. One is usually called individualism, the other collectivism. For the individualist, a rule in its simplest form is just a standing intention; for the collectivist, it is a shared convention or social institution (...) I shall defend a collectivist account. (p. ix)

The external perspective understands these norms as empirical facts related to empirical investigations that allow us to find the norms that regulate a community. The internal normativity is thus of another kind because:

The difference shows up already in the peculiar ambiguity in calling a norm valid, that it is to be accepted. The latter claim cannot be empirically confirmed or disconfirmed; it is subject to normative discourse where it may get approved or disapproved. (Spohn, 2011, p. 5)

In a general sense, the norms indicate what is right and wrong. The normative consideration of beliefs and actions is inherent to human beings; this refers to having an internal perspective on normativity. The point is that there is always something to explain when something is right or wrong. Moreover, the nature of this explanation consists of *being guided by reasons* that, while not always subsumed to logical necessity, are tied to plausible elements of validity. This does not prevent them from being, in the complete sense of the word, *reasons* that establish the criteria internally. Thus, internal normativity determines external normativity: "What is important is that normative discourse is not merely a matter of confessions, it is governed by (often defeasible) reasons, and it is fallible and open-ended" (Spohn, 2011, p. 6).

Normativity is an element found in all scientific disciplines. Still, in the case of human sciences, this demarcation criterion is constituted by the nature of the internal normativity required for it. Let us quote the argument of Spohn's reading about the meaning of normativity as a principle of demarcation:

Indeed, all disciplines are infected by so much normativity. The point is that only the human sciences are entangled with normativity in a special and much more far-reaching way, namely simple because only the human sciences deal with objects, namely us humans, that have an internal normative perspective (...). The crucial question now is: Can the human sciences do so by restricting themselves to the external perspective, from which normative phenomena and may be studied accordingly? The crucial answer is: No, they cannot. Merely in order to do their empirical work properly they have to actively engage into normative theorizing from the internal perspective (or listen to those thus actively engaged). That is, they have to do something no natural science has to do; they have to leave their empirical home and enter foreign terrain, i.e., normative discourse, in order to properly cultivate their home domain. (Spohn 2011, p. 7)

All this is because there is a strong asymmetry when we pursue to achieve an account of human activities. Humans are susceptible to normative considerations that guide our actions; hence the need to theorize normatively:

The idealized theory applied and amended in empirical research should not merely collect what the community presently thinks is right; it should state what is right, something that can be inquired only from within the internal perspective, even though only the limit of normative inquiry is definitive. (Spohn, 2011, p. 9)

The reflection on internal normativity is thus directed to an ideal theory that constitutes the external norms' criteria and mode of implementation. This idealization is empirically and progressively adapted by correcting the general theory of an internal normativity model with additional theories that adapt it to *imperfect* beings like humans. Professor Spohn (2011) clarifies this particular:

Ideally, we would implement the norms, though actually we are imperfect. And as with any idealized theory, we need additional error theories correcting the idealized theory and making it empirically more adequate, thus explaining also deviations from the ideal. This is why we have the asymmetric explanation situation. (p. 8) The ideal theory of internal normativity is not only responsible for affirming through data collection what a community believes is right or good; an internal theory of normativity *must say what it is to be correct*, something that could only be investigated, as they say, from an internal perspective relative to the human being and its structure of rationality. Thus, the changes and structure of society and any other product of the human mind could be grasped more easily if one realizes right or wrong concerning the conception of fundamental concepts that guide a horizon to collective action. Therefore, *the difference between natural and social sciences comes from the need to theorize normativity from an internal perspective*. Professor Spohn (2011) remarks on this conclusion:

We have the normative perspective and have to respect it as an empirical ideal in doing empirical human studies. Hence, even from the empirical third person perspective one is committed to the normative first person perspective. One cannot do well in the former without engaging in the latter; you cannot complete empirical psychology and thus the other human sciences without engaging in normative considerations –something not required in the natural sciences. So, ontological unity in terms of suitable supervenience relations does not prevent there to be a principled methodological difference. (p. 12)

But why should we appeal to this idealized theory to conduct empirical research? Spohn's answer is divided into two dimensions. First, he affirms that the norms adopted by a community are a matter of fashion; the possibility of establishing declarative norms tied to ideologies, power structures, etc., makes them contingent in a strong sense (Spohn, 2011, p. 9). Second, they constitute historical explanations, for example: "They [norms] are only historic explanations why some countries drive on the right and not on the left or have a proportional instead of a majority voting system" (Spohn, 2011, p. 9).

Since these forms of external normativity are contingent, the dynamics of our internal normativity can be understood as *the set of efforts to find guidelines on what should be correct by appealing to rationality as a source of high standards*. An ideal theory would allow an *ideal* to which the normative dynamics can be approached thanks to an empirical correction that shows errors and corrections.

The Legacy and the Agenda

The ideal theory of internal normativity is then a proposal that assumes the need to be filled with content. Professor Spohn's proposal then suggests an epistemological principle of demarcation without mentioning any particular internal ideal theory that accounts for the criteria that support such normativity for social sciences. The legacy of Spohn is *the possibility of establishing an ideal theory, or model, of internal normativity*.

This theory can be expressed in another way as a model of epistemic normativity that establishes the criteria of what is correct or incorrect regarding an empirical investigation of the products of the human mind. From the first person's perspective, normativity is related to how the subject and their mental products are understood. Therefore, a theory of internal normativity is a normative epistemological theory.

Since epistemology deals mainly with knowledge problems, the first step in constructing an ideal theory of human sciences' internal normativity is establishing epistemic normativity. For this, and following the legacy of Professor Spohn, this work will explore the ranking theory (Spohn, 2012). This account aims to establish the laws of justified, rational belief as the fundamental input to establish a foundation, a rock-bottom, for the internal normativity of social sciences and, thus, for constructing an ideal model that substantiates the methodology of social and human sciences.

Therefore, the question that follows is: Why choose Spohn's theory? First, Spohn's theory is a proposal that attempts to summarize in a single work most of the epistemological problems of contemporary philosophy in a synoptic way. Spohn's work traces a theory of belief, establishes the laws that shape its statics and dynamics, and proposes a theory of rationality, inference, and its relations with the problem of induction and causality (Huber, 2012). Based on it, Spohn set the laws of rationality and built a theory of perception, justification, and apriority normativity relevant to the present tasks. Spohn's theory is pertinent, novel, and eager to prove:

Ranking theory has been developed into a comprehensive, formal epistemology in over 600 pages, which can provide a normative account of the dynamics of beliefs and non-monotonic reasoning. Its originator claims that the study of ranking functions is the study of beliefs, which ranking theory delivers the dynamic laws of beliefs, and that it is the legitimate sister of probability theory. (Skov-gaard-Olsen, 2014, p. 70)

Secondly, Spohn's legacy consists of a continuum between the formulation of his ranking theory and the possibility of constructing an ideal theory about the internal normativity projected as a novelty within the framework of the philosophy of social sciences, allowing us to open a new theoretical field of applications of epistemological concepts to the construction of social reality (Zahle, 2016).

Beyond this, Spohn's theory is a pivot susceptible to criticisms and complements that can result in the first steps for formulating an ideal theory of internal normativity for social sciences, which is what this research intends.

Thus, the problem of the present work is presented synoptically: How the epistemic foundations, condensed in Wolfgang Spohn's ranking theory, allow for the formulation of an internal theory of normativity that delimits methodologically the production of knowledge of social sciences?

The first step to achieve this goal is to set the ground for the research, that is, to analyze and introduce the origins and fundamentals of ranking theory.

The Origins of Ranking Theory

Ranking theory results from more than thirty years of philosophical work that became a reality in Spohn's publication of *Ordinal Conditional Functions*. *A Dynamic Theory of Epistemic States* (1988). The frame of this development is the so-called Formal Epistemology, an alternative epistemology approach of which Spohn is the founder and protagonist. Given this, it is necessary to describe this novel research field first.

Formal Epistemology

Epistemology is the philosophical discipline responsible for studying knowledge and justified belief; epistemology problematizes and searches for the foundations of knowledge, its structure, and limits. Its main problems are related to the possibility of establishing necessary and sufficient conditions for knowledge, the sources of knowledge, how we understand the justification concept, and what makes these criteria justify our beliefs by converting them into knowledge (Steup, 2014). The ranking theory is framed in the so-called formal epistemology within the different epistemological accounts and proposals. This approach wants to solve all these problems using formal tools originating in sciences such as logic and mathematics (Hendricks & Pritchard, 2006).

Therefore, formal epistemology has the same subject matter, that is to say, briefly, the theory of knowledge, and investigates it with formal devices. The first device or tool used is the type of logic of Frege and Russell (Douven & Schupbach, 2017, p. 1). Thus, its starting point can be placed in the use of first-order logic as a resource to explain, construct, and defend philosophical theories about the nature of knowledge at the beginning of analytic philosophy:

A satisfactory definition of scientific law, a satisfactory theory of confirmation or of disposition terms (and this includes not only predicates ending in "ible" and "able" but almost every objective predicate, such as "is red"), would solve a large part of the problem of counterfactuals. Conversely, a solution to the problem of counterfactuals would give us the answer to critical questions about law, confirmation, and the meaning of potentiality. (Goodman, 1954, p. 3)

A typical example is Nicod's (1930) criterion for testing scientific hypotheses:

Nicod's Criterion: a universal generalization is confirmed by its positive instances (as long as no counter-instances are discovered) $\forall x (Fx \supset Gx)$ is confirmed by $Fa \land Ga$, $Fa \land Ga$, by $Fb \land G$, etc. (Weisberg, 2016)

One can think, following this criterion, that the rational proof of a scientific hypothesis is simply the reverse of a deduction, as follows:

 $\forall x (Ex \supset Nx)$ Ea Therefore: Na So, the reverse model is:

Ea Na Therefore: $\forall x (Ex \supset Nx)$

In this sense, by finding an object x, the hypothesis implies the prediction Nx. In generalizing the proposal, the central issue is that the hypothesis is confirmed when the predictions are corroborated. We then model the prediction through the logical implication as a formal tool. This deductivist approach has suffered strong criticism because it does not allow models related to knowledge, hypotheses, and theories regarding relative degrees of truth satisfaction. From this arises the necessity to appeal to a probabilistic approach (Weisberg, 2016). The genealogy of probability is sketched precisely by Douven and Schupbach (2017) in the following quote:

Probability theory dates back further, with Christian Huygens and the Port Royal logicians (in collaboration with Blaise Pascal) laying the groundwork in the mid-seventeenth century. Jacob Bernoulli, Thomas Bayes, and Pierre-Simon Laplace made important contributions in the eighteenth century, and with Bruno de Finetti (1937/1964) and Andrey Kolmogorov (1950), probability theory received its contemporary form. (p. 2)

For the probabilistic reading, the issue does not have to do with the logical necessity of knowledge but the concept of probability. In the previous case, for example, a hypothesis should be modeled not under the inversion of the deduction but through a method that allows modeling when such a hypothesis is more probable. The formal tool required then is a standard theory of probability, which starts from a function: P(A) = x. Its constituent axioms are the following: **1.** For any proposition A, $0 \le P$ (A) ≤ 1 .

2. For any tautology A, P(A) = 1.

3. For any logically incompatible propositions A and B, P $(A \lor B) = P (A) + P (B)$ " (Weisberg, 2016).

The second required element is a conditioned probability that goes a little beyond the absolute probability described:

Definition: The conditional probability of *B* given *A* is written P(B|A) and is defined: $P(B|A) = P(B \land A) / P(A)$ (Weisberg, 2016).

For our example, it can be said that one of the advantages of this approach is the possibility of quantitatively establishing the growth of or decrease in the plausibility of the confirmation of a hypothesis given particular evidence. The probabilistic approach allows measuring the models made on epistemological problems. In addition, the chance of talking of conditional probability constitutes a possible model for quantitatively treating the problem of causality and inductive inference. One of the most used tools in epistemology that is borne from this approach is the so-called Bayes theorem:

Bayes Theorem: $P(H|E) = P(H) \times P(E|H) / P(E)$ (Weisberg, 2016).

Its philosophical importance comes from the strength it has to symbolize and model different problems and epistemological criteria, among them the possibility of theoretical adjustment, the novelty of prediction, and the priority of calculated plausibility (Weisberg, 2016). The Bayes theorem is a potent tool for the quantitative confirmation of epistemological problems since it allows modeling the causality and the induction through a specific form of abduction, that is, by the possibility of evaluating the causes by the effects, as is patent in the formula.

In very synoptical terms, these devices have been used since the beginning, with the goal of every analytical approach to clarify the arguments. However, the final shape of this young approach is modeled thanks to the modal logic developments of Kripke: But it was only after a proper semantics had been developed for modal logic (mainly in the work of Saul Kripke) that they started using logic to analyze epistemological concepts. Following Jaako Hintikka's pioneering work in "Knowledge and Belief" (1962) came the rise of modal epistemology, which seeks to analyze knowledge, justification, and related notions in terms of what goes on, not just in the actual world, but also in various nonactual worlds, in some, sense, close to the actual one. (Douven & Schupbach, 2017, p. 2)

These are nowadays perhaps the most extended and proper accounts to model knowledge. Nevertheless, probability theory is more flexible to the fit between its structure and the fact that human reasoning is related to uncertainty. Probability theory allows us to deal with *degrees of belief*. That insight was apparent in certain studies in the 1980s:

The insight that a full understanding of human thinking and rationality requires taken seriously a graded notion of belief received much of its impetus from work in psychology starting in the 1980s. Until then, it had been the received view among psychologists that a good reasoning is a matter of obeying the laws of logic. Psychologists have noticed that much of our non-mathematical reasoning can be good, despite being uncertain and defeasible. Accordingly, they claim that the standards of rationality for such reasoning are not provided by a monotonic logic but must be sought elsewhere. (Douven & Schupbach, 2017, p. 3)

In that sense, standard probability theory cannot justify defeasible reasoning and its change over time. The update of information and learning, or, in other words, particular dynamics, and coherence of the change of degrees of belief, is possible thanks to the Bayesian conditionalization rule:

For Bayesians, probabilities are inherently subjective at least in the sense that they are interpreted as a particular epistemic subject's degrees of (rational) belief. Bayesians require that an agent's degrees of belief be statically and dynamically coherent. The epistemic agent has a stock of background knowledge, and that agent's degrees of belief to be (statically and dynamically) coherent, must be fixed by these known propositions in such a way that they satisfy the axioms of probability. (Douven & Schupbach, 2017, p. 6)

This derives from degrees of justification. Given a certain amount of background evidence, we can fix different degrees of belief, which entails the degree of justification. In other words, the doxastic subject weights the evidence according to specific update rules. Probability devices are helpful to measure and set how the degrees of belief behave in rational ways statically and dynamically. The goal is then to set a rational mechanism of belief behavior. We can define the criterion of this agenda thanks to the classical Lockean Thesis:

Lockean Thesis (LT): It is rational to believe x (categorically) if and only if it is rational to believe x to a degree above a certain threshold value y, where y is then typically assumed to be close, but unequal to 1. (Douven & Schupbach, 2017, p. 19)

Rationality is a solid degree to fix credence. However, probability standard theory is a continuum when you cannot *fix* the notion of belief. Several tools of formal epistemology want to solve particular problems of standard probability theory, such as the big problem of the dispositional essence of the notion of belief and the inner fixed character of belief states. Among the most notable variations of the theory of probability is the formal epistemology device called the *ranking theory* of Wolfgang Spohn (1988, 2012). This theory arises from the probabilistic approaches but is strongly influence by another formal model called the semantics of possible worlds, which is based on the modal logic (Gamut, 2010).

Spohn's theory emerges as a response to the probabilistic mainstream regarding justifying degrees of belief and non-monotonic reasoning and, in addition, wants to solve another typical epistemological problem, the so-called inductive reasoning. Part of this kind of reasoning refers to the possibility of projecting observable patterns to several ulterior, unobservable levels. The fundamental problem is then the ground that justifies this type of reasoning. The problem has, for Spohn, a common starting point: the clarification of the nature of the concept of belief, its statics, dynamics, and the possibility of establishing properties of knowledge through formal representations of belief (Huber, 2016a).

Spohn (1988) begins his proposal, called initially *ordinal conditional functions,* from the explanatory problems of the Bayesian model on the nature of belief and theories about the changes of belief, mainly Alchourron et al. (1985). Thus, the way to obtain a good notion of belief and its changes is to represent the doxastic states of an agent through a ranking function (Huber, 2012, p. 584).

Introducing Ranking Theory

In formal epistemology, ranking theory is a theory of belief revision. The purpose of the theory is related to the mechanism that allows an ideal doxastic subject to organize and hierarchically classify the degrees of belief in time and revise such beliefs given new information or evidence. The theory is devoted to *ideal doxastic agents* because of certain important warrants. First, the theory does not want to deal with the computational or physical limitations of doxastic agents such as people or computers. Second, given its normative and counterfactual nature, the theory has a broad ontological scope of application. Hence, ranking theory is an *ideal model* of a theory of belief.

The first difference from standard approaches is its qualitative character:

Belief revision theory models belief as a qualitative attitude towards sentences or propositions: the ideal doxastic agent believes a proposition, or she disbelieves the proposition by believing its negation, or she suspends judgment with respect to the proposition and its negation. This is different from the theory of subjective probabilities, also known as Bayesianism, where belief is modeled as a quantitative attitude towards a proposition: the ideal doxastic agent believes a proposition to a specific degree, her degree of belief or credence, for the proposition. (Huber, 2016a, p. 3)

Nevertheless, the ranking theory appeals to numbers to adequately model the agent's belief states regarding the several revisions of such states. In that sense, ranking theory advances the AGM theory of belief revision. AGM theory represents the old beliefs of a particular doxastic subject at a given moment, thanks to a belief set of formal language sentences, and models the change with an entrenchment ordering of these sentences. The goal of AGM is to set how firmly *x* holds the beliefs in its belief set.

The entrenchment ordering is twofold. First, there is the case of *expansion*. The new evidence does not contradict the old sentence belief set and adds new information. The second case is *revision*. Here, the evidence shall contradict the old belief set. Huber (2016a) explains AGM belief revision as follows:

The entrenchment ordering does most of the work in a revision of the agent's beliefs. Suppose the agent receives new information that contradicts her belief set. Since the new belief set that results from the revision has to be consistent, some of the old beliefs have to go. The entrenchment ordering determines which beliefs have to go first: the least entrenched beliefs are the beliefs that have to go first. If giving up those is not enough to restore consistency, the beliefs that are next in the entrenchment ordering have to go next. And so on. (p. 5)

AGM theory has significant properties such as maximality, minimality, dominance, conjuctivity, and transitiveness. According to the first, tautological sentences are always believed, and we never give them up because of consistency. Minimality expresses that there are sentences that the doxastic subject does not believe and does not belong to the set at the beginning of the whole process. The rest of the properties can be modeled as follows:

For all sentences A, B and C from L:

- 1. if $A \le B$ and $B \le C$, then $A \le C$ Transitivity
- 2 if A B, then $A \le B$ Dominance
- 3. $A \le A \land B$ or $B \le A \land B$ Conjunctivity.
- (Huber, 2016a, p. 5)

Given this background, Spohn (1988) proposes a qualitative conditional belief theory that assigns numbers to the different propositions of ranking functions. Furthermore, here is the first advantage of ranking theory over AGM theory. Ranking functions deal with propositions:

Instead of taking the objects of belief to be sentences of a formal language it in both more general and more convenient to take them to be propositions of some field or algebra over a set of possible worlds
W. Here it is the relevant definition. A set of subsets of W, $A\subseteq A\left(W\right)$ is an algebra over W if and only if

i) The empty or contradictory set \emptyset is a proposition in A.

ii) If A is a proposition in A, $W/A = \neg A$, is also a proposition in A, and

iii) If both A and B are propositions in A, then the union or disjunction of A and B is also a proposition in A. (Huber, 2016a, p. 21)

In non-formal language, the axioms make clear that in ranking theory, the doxastic subject should believe the tautology evident in proposition W. Secondly, the doxastic subject should disbelieve the empty proposition, that is to say, the contradictory proposition with maximal strength. Finally, she should disbelieve $A \cup B$ if and only if the doxastic subject disbelieves both A and B disjunctors.

Given these axioms, ranks are degrees of disbelief. Here it is the mechanism or functions as presented by Huber (2016):

A proposition *A* is disbelieved just in case *A* is assigned a positive rank k(A)>0. A proposition that is not disbelieved is assigned rank o, but this does not mean that it is believed. Instead, belief in a proposition is characterized as disbelief in its negation: a proposition *A* is believed just in case the negation of *A*, $\neg A$, is disbelieved, $k(\neg A)>$ 0. An agent suspends judgment with respect to a proposition (and its negation) if and only if, both the proposition and its negation are assigned rank 0. (p. 22)

Moreover, it is the same regarding a conditional rank k(A|B) > 0. As this explanation shows, ranks are numerical, but the difference with probabilities is the measuring scale. Probabilities are measured on an absolute scale and cannot fix the degree of credence. Ranking functions are the norms of how a subject should organize beliefs and conditional ones at a given time and how they re-organize or revise that set of propositions given new information or evidence. Such a normativity theory is consistently committed and wants to achieve and hold beliefs.

Therefore, this normative theory's agenda and goal is the horizon of truth and knowledge. In the following chapters, we will see how Spohn constructs this functional theory and presents the challenge of using it to find the laws of belief.

The Laws of Belief

Introduction

One of the fundamental problems of epistemology is determining the nature of the foundational concepts of our doxastic attitudes. The analysis of the conceptual components of knowledge then begins with studying the belief and its foundations. *Ranking Theory*. or Wolfgang Spohn's (2012) Laws of Belief, is a theory on broad issues in epistemology and synthesis and a complete account of the theory of belief. The theory provides a normative approach to belief, belief change, and belief revision and numerous possible applications to issues related to rationality, normativity, causation, and decision theory. Wolfgang Spohn's theory and work have received outstanding honors, including the Lakatos Award in Philosophy of Science (2012) by The London School of Economics and Political Science and the Freqe Prize (2015) by the German Gesellschaft für Analytische Philosophie. Ranking Theory is already applied to specific fields such as AI (Goldszmidt & Pearl, 1996), Psychology of Reasoning (Skovgaard-Olsen, 2014), Semantics (Benekewitz, 2016; Haas, 2016), Pragmatics (Huber, 2016b), Logic (Kupffen, 2016; Müller, 2016), and Rational Cooperation and Theory of Choice (Nida-Rümelin, 2016), among others. All these facts lead us to understand ranking theory as a milestone in contemporary analytic philosophy; this seminal work still has countless applications to other branches of philosophy. The present work intends to use ranking theory as an epistemic foundation for analyzing the internal normativity inherent to social sciences. This chapter introduces the Ranking Theory or the Laws of Belief. This general presentation will serve as a robust foundation and tool for the ulterior development of an account of the internal normativity of social sciences.

Traditional Approaches to Belief

The first traditional definition of belief is that to believe *is to take it to be the case*, that is, *regard it as true*. This definition originates in the pioneer epistemological reflection of Plato in the *Theaetetus:* "Knowledge is true judgement with an account" (Plato, 2014 pp. T1. 201d-210a). When we talk about *taking it*, we think about the ability *to represent* a doxastic state of mind. The belief is then related to its objects, as it traces a link between which it is believed and a proposition. It can be said that a doxastic subject S has a propositional attitude A, which in this case is to believe in a statement expressed by a proposition P that draws a particular state of affairs (Schwitzgebel, 2011, pp. 14-24).

Definition 2.1: SA (believes) P.

From this structure emerges a philosophical position called representationalism, which includes belief in the mental representation of a proposition. Our mind stores the content of a specific proposition and, accepting it as true, constitutes what we call belief:

We claim that the mayor distinction is that, while both connectionist and classical architectures postulate representational mental states, the latter but not the former are committed to a symbol-level of representation, or to a language of thought. (Fodor, 1988, p. 3)

Beliefs are like the language of thought, the representations that allow us a particular relationship with and behavior toward the world. To have beliefs is thus to construct an integrated collection or associative system of representations of propositions that allow one to situate epistemically in a certain way and to have patterns of behavior in the world:

A natural system of representation is not only one in which the elements (like the elements of certain systems), have a power to indicate that is independent of the interest, purposes, and capacities of any other system, but also one in which, the functions determining what these signs represent are also independent of such extrinsic factors. (Dretske, 1988, p. 62) The propositional attitude, that is, to believe, is correct if and only if P is true.

Definition 2.2: SA (believes) P if and only if P is true.

While representationalism asserts that the belief system is the language of thought, such a belief system becomes patent mainly in natural language. From this, it follows that its interpretation is situated in the correspondence between the belief system and a linguistic and semantic system (Blumson, 2012).

On the other hand, the *dispositional and interpretational* approaches understand belief as sets of patterns of observable behavior, that is, susceptible to interpretation by an external agent. "The system has the particular belief that P if its behavior conforms to a pattern that may be effectively captured by taking the intentional stance and attributing the belief that P" (Schwitzgebel, 2015, p. 1.1).

Definition 2.3: S A (believes) P if and only if S has a specific behavior disposition D connected to P.

This vision, coined mainly by Dennett (1978, 1987, 1991), shows us that to believe in something is to conform to specific patterns that overflow physical forms of prediction of the behavior of the subject to whom beliefs are attributed (Dennett, 1991). In the same vein, Davidson (1984) characterizes the attribution of beliefs to a practice. From the postulates of the indeterminacy of the translation of Quine (1960), Davidson thinks that to attribute beliefs to a subject would consist of reconstructing or instead interpreting the set of statements that a doxastic subject utters, and showing why these make sense under a set of observable patterns of behavior in a given environment:

I follow Quine in supposing that even if we narrow attention to verbal behavior that reveals when, and under what conditions, a speaker gives credence to a sentence, there is no direct way of sorting out the roles of belief and meaning in explaining that credence. Eliciting separate accounts of belief and meaning requires a theory that can bring to bear on the interpretation of each sentence and its accompanying attitudes the contribution of further data. Only by studying the pattern of assents to sentences can we decide what is meant and what believed. (Davidson, 1984, p. xvii)

Another reading, which in some authors overlaps with the previous ones, is functionalism about mental states and beliefs. Functionalism conceives beliefs as a mental state that is formed in a particular manner due to its causal relationship with sense data, the behavior itself, and other types of mental states, including other beliefs:

The most important classes of things with which we have direct acquaintance are our own sensations, which we may be said to understand, and facts or characteristics or relations of sense data or meanings, which we may be said to perceive. The objects of knowledge and belief I shall term propositions. (Putnam, 1975, p. 49)

In this respect, Schwitzgebel refers: "As Milkan, Papieneau and others have suggested, it seems that one to say is to be in a state that fills a particular causal role, and it seems quite another to say that beliefs are states that represent how things stand in the world" (2015, p. 2.1). Such a view opposes the understanding of belief as a mere internal structure of the mind or brain. The theses of this perspective can be defined as follows:

Definition 2.4: S A (believes) P if and only if P is directly caused by a perceptual stimulus E (under normal conditions).

Definition 2.5: S A (believes) P if and only if S believes that Q (causes) P.

Different perspectives deny the substantial existence of the concept of belief. *Eliminativism* affirms that the only value that belief can have is to understand it as a wrong thesis of the history and development of the philosophy of mind and neuroscience, in the way of certain theses of Ptolemy and Newton in the field of physics. The concept of belief is a way of saying of folk psychology that would be

appeased when a strong scientific thought expresses the true consistency of mental processes (Churchland, 1981). Instrumentalism also denies a strong existence of the concept of belief but gives it a particular form of conditioned subsistence. This view states that thinking about belief attribution is simply a practical and helpful matter for specific purposes. It is thought that beliefs are part of unnecessary ontological inflation; in this interpretation, they are creations of our imagination or fictions. Dennett configures an instrumentalism that allows a particular form of subsistence to the beliefs, denominating them useful fictions (Dennett, 1991, p. 29). He affirms in this sense: "Centers of gravity are real because they are (somehow) good abstract objects. They deserve to be taken seriously, learned about, used (...) I have claimed that beliefs are best considered to be abstract objects rather like centers of gravity" (Dennett, 1991, p. 29). Beliefs are tools built to capture the structures and nature of ontologically more robust phenomena. Regarding this issue and its relationship with previous perspectives, Dennett (1991) clarifies:

Fodor's industrial-strength Realism takes beliefs to be things in the head—just like cells and blood vessels and viruses. Davidson and I both like Churchland's alternative idea of propositional attitude statements as indirect "measurements" of a reality diffused in the behavioral dispositions of the brain and body. (p. 245)

In the conference entitled *"What is present to the mind?"* Davidson (1989) defines this vision as strongly linked to the dispositionalist and interpretationalist theses.

We know there is no contradiction between the temperature of the air being 32 ° Fahrenheit and o ° Celsius; there is nothing in the relativism to show that the properties being measured are not real. Curiously, though, this conclusion has been repeatedly drawn (...) Yet in the light of the considerations put forward here, this comes to no more than the recognition that more than one set of one person's utterances might be equally successful in capturing the contents of someone else's thoughts or speech. Just as numbers can capture all the significant features of another person's thoughts and speech in different ways. This fact does not challenge the reality of the attitudes or meanings thus reported. (p. 10)

The previous collection of definitions, drawn from the current debate on the subject and its main points of view, leads us to a diverse, conflicting, and unfinished view of the nature of rational belief and its objects. This configures the need to establish *an alternative* for the nature of the belief and its objects to fulfill the purpose of this work, that is, a neutral route to represent what a doxastic attitude is and the objects to which it is related, without requiring the vast task to synthesize, reconcile, take firm commitments, or say the last word on the matter. This neutral route becomes a provisional instrument that would later present us with the possibility of locating the proposal presented here in the geography of the debate and, perhaps, pointing out the epistemological and ontological commitments that can be derived. The alternative that will be used as a tool is Wolfgang Spohn's conventional theory about belief and its objects.

Belief and Its Objects: The Neutral Account of Wolfgang Spohn

One of the main objectives of Spohn's Ranking Theory is to establish a general theory of belief, a theory of the degrees of belief or certainty, for a later bet on the nature of knowledge (Spohn, 2012, p. 2). Spohn's proposal arises from an important distinction regarding the formation of beliefs and their nature. This refers to the differences and relationships between inferential and non-inferential beliefs. In other words, this is the problem of induction and the problem of the foundations of belief. A general theory of belief would then be composed of these two dimensions or epistemological components.

First, the dimension that refers to base or non-inferential beliefs has two classical traditions that establish the source of belief in *a priori principles* and *empirical principles*. The first tradition is related to the possibility of having *a priori* beliefs as epistemic foundations, and the second tradition considers perception a foundation of belief, thus speaking of observational beliefs as an epistemic foundation. The epistemological problem about this dimension thus consists in establishing the norms or criteria that allow defining the *statics of belief*. The second dimension is related to the typical philosophical problem inherited from Hume's (1748) thought, namely, the nature of induction as a form of reasoning. Spohn (2012) states the problem of induction as follows:

This is the problem about which expectations about the future on the basis of our beliefs about the past, which general beliefs to entertain on the basis of our singular observations, which beliefs about the non-observed to infer from our beliefs about the observed—i.e., general, which beliefs to infer from our basic, non-inferential beliefs. (p. 3)

According to Spohn, the inductive reasoning scheme would be a specific function that projects from a first doxastic state to a new possible doxastic state. Spohn's reading raises the problem of induction as "(...) the search for reasonable strategies of changing or revising one's beliefs in the light of new evidence" (2012, p. 4). The epistemological problem about this dimension is establishing the norms or criteria that allow us to define the *dynamics of belief*.

In this sense, a general theory of belief could account for these two dimensions if two fundamental questions can be answered: "Which laws or rules hold for the dynamics of doxastic states, and how are the initial doxastic states from which the dynamics start to be characterized?" (Spohn, 2012, p. 6).

A theory about belief should motivate the philosopher to establish what normative criteria work for a dynamic and a static account of belief. This would be the first step to talk about a normative perspective of rationality later. Therefore, an analysis of the dynamics and statics of belief would provide a state of the objects over which it is believed, that is, the entities over which doxastic attitudes are adopted.

Spohn's proposal affirms a neutral strategy, at least initially, to perform this task. Strong ontological commitments on the nature of belief will be derived from a formal and, therefore, conventional analysis of such dimensions. The initiative is thus to construct the formal building to analyze the belief in its dynamics and statics, that is, a theory of formal representation of beliefs (Huber, 2016a). Spohn (2012) then begins his standard definition of belief as follows: Our representation of the objects of belief is entirely standard. They are propositions, and propositions are represented as sets of possibilities from a given space of possibilities. Basically, the neutrality is achieved by being totally silent on the issue of what a possibility is. The underlying space of possibilities is primitive and always denoted by W. Propositions, then are subsets of W and denoted by A, B, C, D, and E, with or without subscripts. Hence, propositions are what the probability theorist calls events, a usage that I avoid here since it is colloquially and philosophically inappropriate. (p. 17)

Spohn (2012) illustrates the formal apparatus with the following example:

Let W be the set of all possible global weather courses in 2009, i.e., continuous sequences of global weather states from the beginning to the end of the year 2009. Formally, this is just some very rich set. Now, meteorologists are not interested in each and every detail of these weather courses. Suppose rather they have established a fine grid of weather stations over the earth and are only interested in the values measured at this station every hour. So for each station and every hour in 2009 they consider the possible temperature at s and t (...) Now all these variables should indeed be variables in the formal sense, for instance, the proposition that the temperature in Konstanz at 12 pm on 1 August 2009 is 32° C should be a proposition over W. (p. 19)

The set W represents all the possibilities of belief, focused on a given doxastic subject at a particular time, on a certain date, in the manner of the meteorological station of Konstanz. When the subject believes that the proposition according to which 32 °C is true, at a particular time, this possibility is updated as a subset of W, excluding the possibilities of its complement, that is, the other possibilities of W.

Definition 2.6: A is believed (B) by subject s and at time t, Bst (A), if and only if all possibilities in $\neg A$ are excluded (by subject s and at time t) (Spohn, 2012, p. 21).

This account's conventional and neutral character is to understand beliefs as propositions and sets of possibilities. Given the above, the conventional formal apparatus includes a vital component of modal logic and the semantics of possible worlds. When Spohn talks about sets of maximized opportunities and possible worlds centered on subjects at a specific time and space, he is necessarily appealing to this formal tool. Spohn tentatively uses the concept of a *possible world* as a formal representation and does not take part in the debates on the ontological commitments of the semantics of possible worlds (Lewis, 1986. Spohn interprets the possible worlds as centered doxastic possibilities, as shown in 2.6. He states: "Rather we need centered worlds as doxastic possibilities. Here a possible world may be understood as a triple <w, s, t> consisting of a possible world w, a subject s, and a time t, both existing in w" (Spohn, 2012, p. 22).

The function described above thus fulfills the objective of relating a doxastic subject with a proposition at a particular time. We can then think of believing as the exclusion of possibilities, as the ability to judge through language, to assent to a particular truth function (Carnap, 1942). Spohn (2012) comments on this topic: "Certainly the most natural answer is that believing one out of a set of possibilities to obtain just means assenting to a given description of this set of possibilities; speech is the foremost manifestation of belief" (p. 23). The conditions of possibility of this manifestation in the language are related to normative criteria that warrant inferential and perceptual relations. In addition, as the way to make the belief patent is a linguistic issue, the normativity extends to a minimum of communicative principles and commitments:

For a proposition to be true is for it to be assertible, where this means not capable of being asserted but correctly assertible; assertible, that is, in accordance with the relevant semantical rules, and on the basis of such additional, though unspecified, information as these rules may require (...) True, then means semantically assertible and the varieties of truth correspond to the relevant varieties of semantical rule. (Sellars, 1963, p. 101)

This normative pragmatics account is very close to Spohn's theory. Robert Brandom's (1994) "Make it explicit" is indeed a remarkable foundation of Spohn's proposal:

This is an investigation into the nature of language: of the social practices that distinguish us as rational, indeed logical, concept mongering creatures-knowers and agents (...) The result is a new kind of conceptual role semantics. It is at once firmly rooted in actual practices of producing and consuming speech acts, and sufficiently finely articulated to make clear how these practices are capable of conferring the rich variety of kinds of content that philosophers of language have revealed and revealed in. The natural world does not come with commitments and entitlements in it; they are products of human activity. In particular, they are creatures of the attitudes of taking, treating, or responding to someone in practice as committed or entitled. Mastering this sort of norm-instituting social practice is a kind of practical know-how, a matter of keeping deontic score by keeping track of one's own and others' commitments and entitlements to those commitments, and altering that score in systematic ways based on the performances each practitioner produces. The norms that govern the use of linguistic expressions are implicit in these deontic scorekeeping practices. (pp. xii-xiv)

The disposition to judge, as an exclusion of possibilities, is an exercise of counterfactual reasoning sinces it is related, as it was said, to the semantics of possible worlds as sets of possibilities. The propositions that patent the belief do not necessarily have as a correlate a concrete world of facts that are the case, in the manner of the *Tractatus* (Wittgenstein, 1922), but to various possible worlds with *intentional* or epistemic referents. Spohn states in this sense: "If we conceive of objects of belief as sets of possibilities, then we really conceive of them as pure contents. A pure content is nothing but a truth condition; a set of possibilities is true if and only if the one and only current possibility is a member of it" (2012, p. 25).

These sets of possibilities are unsaturated functions using Fregean terminology: "We thus see how closely that which is called a concept in logic is connected with what we call a function. Indeed we may say at once: a concept is a function whose value is always a truth value" (Frege, 1892, p. 183).

Spohn, following Frege, thinks that it is not necessary to establish particularly the references or objects of a function to understand the *sense* of it (Fonseca, 2009). Given this, we can define the objects of belief as sets of possibilities, as follows: Definition 2.7: The set Ω of possibilities is true if and only if the current possibility is $A \subseteq \Omega$.

However, regarding this definition, a problem arises since updating an epistemic possibility requires a mental representation tied to the possibility of assent. From this, it follows that there may be various representations linked to the same proposition; that is to say:

Having a belief is somehow having a mental representation in the belief mode (and not, say, in the mode of a desire or a supposition), which will usually be a conceptual representation, if that is too unclear, a linguistic representation; this is finally, something remove determine. The belief is then endowed with content only because of this representation is somehow related to the content or because of the sentence representing the belief has a truth condition. (Spohn, 2012, p. 25)

Spohn solves the problem by reaffirming that a belief is not a matter inherent to the representational content but a normative disposition that becomes a counterfactual exercise of assent to a truth function. It is only linked contingently with linguistic and behavioral provisions. Spohn's conventional proposal thus suggests a *general form* of belief.

To sum up, Spohn's conventional reading (neutral) understands the belief as follows:

i. Beliefs are epistemic possibilities, and epistemic possibilities are possible worlds like Lewis's possible worlds:

They are Kantian noumenal worlds, though not unknowable or even inconceivable, but simply initially unknown and unconceived. Such a Lewisian possible world, and only such a world, presents a complete manifold of experience to us; such a world contains everything that can be experienced (...) Our current field of experience is the current universe of course. However, for all we know, that universe might be different from what it actually is; very different totalities of experience might confront us. Therefore, we have to envisage other totalities as well. So, as I say, doxastic possibilities are Lewisian possible worlds. (Spohn, 2012, p. 27) ii. The belief as the exclusion of possibilities is a counterfactual test: "Now what does it mean to believe a proposition construed in terms of such possibilities? That is, what does it mean to exclude such a possibility? It means undergoing a vastly counterfactual test" (Spohn, 2012, p. 28). After setting a possible world centered on a doxastic subject and observing it in an idealized way, the experiment is carried out to consider epistemic alternatives that allow to fix exclusion, that is, belief rationally. Spohn (2012) explains it in the following way:

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Explanation 2.8: A doxastic possibility (s, t) is a doxastic alternative of s^{*} at t^{*} iff the maximally experienced and considered judgment about (w, s, t) is compatible with the doxastic state of s^{*} at t^{*}, i.e., iff that judgment is only an expansion, but not a revision of this doxastic state. The possibility is excluded by s^{*} at t^{*} iff it is not a doxastic alternative of s^{*} at t^{*}. And the proposition A is believed by s^{*} at t^{*}, i.e., iff all possibilities in – A are excluded. (p. 29)

If all the counterfactual revisions of such a possible epistemic world led to expanding a belief and thus giving it more strength, the matter does not constitute a problem. However, a review of w constitutes the beginning of the exclusion process.

iii. To believe, given a counterfactual test, is to take it to be true:

There is another answer: A belief is true if it survives the further experience and belief formation (in the world we are living in). All (or most) of our beliefs are somehow premature or risky or fallible. We claim them to be true; this is what it means to have them. And that claim consisted in the expectation that we ultimately do not receive any reasons to withdraw that belief. (Spohn, 2012, p. 29)

iv. To be true refers to two notions of truth: "There are two notions of truth, the correspondence notion and its family and the one implicit in (2.6) that is often called the pragmatic notion of truth or described as ideal ascertainability or ideal justifiability" (Spohn, 2012, p. 29). Spohn defends the account, according to which the notion of truth as correspondence is adequate to speak of possible worlds in the style of Wittgenstein, that is, worlds where facts correspond to propositions about the real world. However, for possible Lewisian worlds, where one does not have as a correlate sets of objects of facticity, a pragmatic notion of truth is more appropriate, given the dynamics inherent to those objects of belief (Fonseca, 2012; Spohn, 2008) . This will, therefore, allow us to speak of degrees of certainty based on measures of the plausibility of the doxastic states.

v. Therefore, the propositions are the objects of the belief, as unsaturated truth-bearers.

In this way, already setting a conventional and neutral definition of the belief and its objects, which is related to the formal instruments pointed out and limited, Spohn begins the task previously proposed to build a theory about belief in two axes or fundamental perspectives, namely, its *statics* and its *dynamics*. Thus, Spohn started his work by constructing a theory related to the dynamics of belief.

Dynamics of Belief: The Problem of Induction

The first idea that should be addressed when discussing the dynamics of belief is the possibility of change in the doxastic states. Such changes result mainly from an inherent characteristic: Finding a maximized certainty regarding an object of belief is usually challenging. The counterfactual test enunciated above is an exercise that the doxastic subjects practise frequently due to the difficulty of establishing certainty in many subjects. Spohn says:

First, there was always the idea that belief inevitably comes in degrees of certainty, and that the ideal of maximal certainty, if it exists, is rarely achieved. It was unclear, though, just how to measure uncertainty. (Spohn, 2012, p. 32)

Hence, the difficulty of measuring the exclusion of possibilities described in the previous section is because the belief is presented in degrees of certainty. The challenge arises in establishing methods of measuring degrees of certainty to exclude possibilities that ulteriorly fix a belief. The fundamental notion in this sense is the notion of probability. It appears in the argument because the measure would consist of modeling plausible degrees of certainty. Therefore, the theory of probability has become the formal, pioneer, and founding mechanism to talk about measuring degrees of certainty for doxastic states. Spohn then begins his argument for a theory about degrees of certainty, following the paradigm of probability theory. He asserts:

(...) probability theory contains the most sophisticated ideas concerning the dynamics of doxastic state (...) As I have emphasized, this is my paradigm theory, and even though I will present ranking theory as a genuine and fruitful alternative, I will develop it in a close parallel to this paradigm. (Spohn, 2012, p. 33)

The formal tool required as a guide for Spohn's theory is a standard theory of probability, which starts from the following definition:

Definition 2.9: A function: P(A) = x is a measure of probability if and only if it is composed of the following axioms, namely:

1. For any proposition A, $0 \le p(A) \le 1$.

2. For any tautology A, p(A) = 1.

3. For any set of logically incompatible propositions A and B, p $(A \cup B) = p (A) + p (B)^1$

The idea, then, is to treat the degrees of certainty the same way as relative frequencies. In addition, to correctly model the changes in beliefs, one can resort to another tool proper to the theory of probability, that is, conditional probability. In our case, it can be said that one of the advantages of this approach is the possibility of quanti-

P(W) = 1 (normedness)

If $A \cap B = \emptyset$, then $P(A \cup B) = P(A) + P(B)$ (additivity)" (Spohn, 2012, p. 33).

¹ "Definition 3.1: Let A be an algebra over W. Then P is a probability measure on A iff P is a non negative, normalized, and (finitely) additive function from A into the set of reals, i.e., iff for all A, $B \in A$:

 $^{0 \}le P(A) \le 1$ (non-negativity)

tatively establishing the growth of or decrease in the plausibility of confirmation of a hypothesis given certain evidence. The definition of conditioned probability is:

Definition 2.10: The conditional probability of B given A is P (B|A) and is defined as:

 $P(B|A) = p(B \cap A) / p(A)^2$

One of the most used tools in epistemology is the so-called *Bayes Theorem*. Its philosophical importance comes from the strength it has to symbolize and model different problems and epistemological criteria, among them the possibility of theoretical adjustment, the novelty of prediction, and the priority of calculated plausibility (Weisberg, 2016). The Bayes Theorem is a robust tool for the quantitative confirmation of epistemological problems since it allows the modeling of causality and induction, as evident in the definition:

Definition 2.11: The Bayes Theorem is defined as: $P(A|B) = [P(A) \times P(B|A)] / P(B)^3$

In a specific sense, Spohn describes the importance of Bayes' Theorem for his purpose as follows:

The importance of this theorem lies in the fact that since its discovery it received a dynamic interpretation and thus served as the first dominant model of belief change. The dynamic interpretation is this: The posterior probability P ($A_{\kappa}|B$), as it was called, of some hypothesis A_{κ} given some evidence B is proportional to its prior probability P(A_{κ}) and to the likelihood P ($B|A_{\kappa}$) of the evidence B under

 $P(B|A) = P(A \cap B) / P(A).$

if P(A) = 0, P(B|A) is undefined" (Spohn, 2012, p. 34).

 3 "Theorem 3.5: (Bayes Theorem) Let $A_1,...,A_n \in A$ partition W, let $B \in A,$ P(Ai) > 0 (I = 1,...,n), and P(B) > 0. Then for each k in (1,...n),

 $P(A_{K}|B) = P(B|A_{K}) \cdot P(A_{K}) / P(B)"(Spohn, 2012, p. 36).$

 $^{^2}$ "Definition 3.2: Let P be a probability measure on A, let A, B \subseteq A and P(A) > 0. Then the conditional probability of B given or conditional on A as

the hypothesis AK. The proportionality factor is given by the prior probability P(B) of the evidence (...) This interpretation is not fully dynamical, since there is only one probability measure mentioned in the theorem and no points of time. (Spohn, 2012, p. 36)

What can be said then about the dynamics of belief in probabilistic terms is made explicit in Bayes' theorem, namely, that the dynamics of belief can be understood in conditionalization. For our case, we can define the conditionalization from Bayes like this:

Definition 2.12: The probability P of a first state of belief (A) conditions the subsequent probability P' of the state of belief (provided evidence with (P(E)> 0), if and only if P'(A) = P(A|E).

From the formal apparatus that is put into play, Spohn gives us the first law on the dynamics of belief that, according to his words, states:

Then the dynamic law of simple conditionalization states: (3.8) If P characterizes the doxastic state of some subject s at time t and E is the total evidence or information s receives between t and t', then the doxastic state P'of s at t' is the conditionalization of P w.r.t. E (2012, p. 37).

The information contained in E reduces the space of possibilities of W, that is, the maximized set of possibilities of belief towards E. The counterfactual test required in the previous section is demonstrated through this procedure of conditionalization, where we can exclude the possibilities outside E to fix our states of belief with greater plausibility or certainty. We should ask ourselves: Why not be happy just with probabilistic epistemology? Spohn answers:

Let me try to pinpoint the source of trouble. It is, I believe, that Bayesianism does not have the notion of belief, B, by merely has the notion of degrees of belief. However, only beliefs are doxastic attitudes capable of being true, and we are used to speaking of the justification of beliefs rather than of the justification of subjective probabilities. Hence, if Bayesianism misses beliefs, it misses all the things related to belief and, worst of all, knowledge. Small wonder that the traditional epistemologists find Bayesianism useless (2012, p. 44) The epistemology based on a probabilistic perspective is therefore insufficient, although we can say that it is fundamental. The problems faced by the probability theory mainly refer to the paradoxes it suffers. The most famous is the lottery paradox. If one has evidence (sufficient) to bet that one lottery ticket is a loser, the evidence justifies the conclusion about each other ticket or almost all tickets. Therefore, one concludes that no ticket will win. However, everybody knows there is always a winner in a fair lottery. Theories of degrees of belief could avoid these difficulties. Kvanvig (2010) remarks:

The fundamental reality according to probabilists, is degree of belief, and if a cognizer in the lottery situation assigns a subjective winning probability of 1/n to each ticket in a n-ticket fair lottery, those probabilities are consistent. (p. 29)

Spohn (2012) believes that his theory can fill these gaps and provide a better approach to the dynamics of beliefs:

What is my conclusion, then? We do want an account of belief B, of acceptance, of taking a proposition to be true, or whatever may express the same notion, which applies not only to tautologies and other maximal certainties, but also to contingent propositions. Probabilistic epistemology is unable to provide such an account, as the lottery paradox forces us to recognize. Hence, the only choice left is to develop such an account independent of probability theory. (p. 46)

The ranking theory can be understood then as an extension of the Bayesian epistemology that aims to overcome the problems explained. Next, we will synthetically present Spohn's ranking theory, his attempt to overcome these obstacles, and the way he traces, from its formalization, the laws of the dynamics of belief.

Ranking Theory

Ranking theory then seeks a way of measuring beliefs that overcomes the typical problems of a probability theory. Spohn formulates a theory that shows degrees of belief beyond the concepts of plausibility and probability that seem more like a continuum where there are no steps to rest. Our degrees of belief are supported, although on scales, by a firm floor, in one way or another. It raises the problem at the core of the proposal: The essential point here is that, on the one hand, there is a deeply rooted tendency to project belief onto some scale of (un) certainty that is naturally interpreted in terms of probabilities. On the other hand, the scale does not really fit; belief is clearly not maximal certainty, but also not any probabilistic degree below the maximum (...) We start out with belief being a yes-or-not affair, and indeed must do so, though we will be led again to degrees of belief, albeit not probabilistic ones. (Spohn, 2012, p. 47)

Hence, he begins his theory with a proposal about the conditions for revising a state of belief. This comes from the fact that we always have something as believed, which can be revised later. This first static state of belief has conditions from which a further revision can be given. According to the formal tools at hand, we can define a static state of belief as follows:

Definition 2.13: A static state of belief is a doxastic state of a subject s at time t under its belief set, that is, $Bst = (A \subseteq A \mid Bst)$.

According to tradition, there would exist two fundamental laws that rule a static state of belief. These are the *logical consistency* of belief sets and the need for *deductive closure* of such sets (Hintikka, 1962).

Definition 2.14: A static state of belief is a doxastic state of a subject s at time t under its belief set, that is, $Bst = (A \subseteq A \mid Bst)$ if and only if Bst is consistent and has deductive closure.

There are criticisms due to the typical philosophical problem of logical omniscience and the nature of consistency and logical consequence. Spohn (2012) states the following regarding these problems and the approach of his theory:

Still, logical consequence is undecidable (in the technical sense). Hence (4.2) assumes a belief set to be objectively and a fortiriori, subjectively undecidable. What should it mean then that a belief such an undecidable set? This is the real problem behind (4.2), and it concerns (4.1) as well, since logical consistency is also undecidable. How, then, can it be required of rational persons? Was Frege irrational because he firmly believed in an inconsistent axiomatization of set theory? Clearly not. He would only have been irrational if he had stuck to the axiomatization after Russell's discovery of the inconsistency. But of course he immediately saw the impact of Russell's antinomy. For this reason one might want to conclude that (4.1-4.2) should be weakened to:

(4.3) Belief sets are believed to be consistent.

(4.4) Belief sets are closed under believed logical consequence. (p. 48)

However, remembering that Spohn considers the objects of belief as propositions and therefore abandons any particular mental and linguistic representation by its mere instrumental and tangent character, the laws of consistency and deductive closure are some of the fundamental bases of his theory. For this, he affirms the need for a doxastic subject to observe these two laws for their formation of sets of beliefs.

Consistency requires the subject to recognize that the actual possibility can never be in the contradictory, empty proposition. And deductive closure requires the subject to recognize that (i) if the actual possibility is in each of two propositions, then it is so also in their intersection, and (ii) if the actual possibility is contained in some proposition, then it is also in any superset. Or referring once more to representations of truth conditions, we might say that consistency requires the subject to know that sentences of the form $p \land \neg p$ cannot be true, and deductive closure requires the subject to know that p 1,...,pn are true if and only iff $p1, \land ... \land$, pn is true. (Spohn, 2012, p. 50)

Thus, these two primitive laws make it possible to establish what Spohn calls the *core* of a set of beliefs: the intersection that makes both consistency and deductive closure patent. To achieve this, he defines the core of a belief set as follows:

Definition 4.5: Let A be an algebra of propositions. $B\subseteq$ A is a belief set iff for all A, $B\in$ A:

 $\emptyset \notin B$ If A, B \in B then A \cap B \in B If A \in B and A \subseteq B, then B \in B If A is a complete algebra, the B is a complete belief set iff moreover For any $B' \subseteq B, \cap B' \in B$

For a complete belief set B, \cap B is called its core. (Spohn, 2012, p. 50)

The doxastic states of an ideal subject can be represented by a complete set of beliefs or, by their core, that is to say, the intersection of all the propositions believed, given that set of beliefs. The core demonstrates the consistency and deductive closure of the state. However, why would we have these conditions as foundations of the static belief state of a subject? Such conditions, and in this sense all the other normative aspects that will be studied, work, following the interpretation of Huber (2016b) as "hypothetical imperatives that are justified by being shown to be the means to attaining the cognitive ends they are conditional upon" (p. 180). The justification of these normative principles depends on the purposes of the cognitive agencies to be resolved and seeks to objectify the conditions that should be reached for such cognitive agencies. The normative conditions of consistency and deductive closure do not seek cognitive agency other than maintaining actual sets of beliefs. Getting to the truth and avoiding error is vital to several epistemic agencies. It is worth saying that the importance of this epistemic agency is relevant, above all, as a foundation for obtaining knowledge, and therefore, it becomes Spohn's initiative. You can leave this brief note on the meaning of the regulations, which will be elaborated carefully later, and return to the explanation. The normativity of the principles about the statics of a doxastic state allows the development of a theory about the changes or dynamics of the doxastic states from the concept of conditioned belief, the center of Spohn's (2012) theory.

We have now come to the key question of this book. What can we say about the dynamics of doxastic states represented as (complete) belief sets or their cores? Let us make the question precise: Suppose that s' state at t is characterized by the prior core C and that s changes to the posterior core C' at t. What drives the change? This may have any causes: forgetfulness and recollections, thoughtlessness, drugs, wishful thinking, exhaustion, etc. However, it was clear all along that we do not want to examine these kinds of changes, but only changes that are clearly rationally accessible. This is why we are always considering evidence driving doxastic change. Let us start with the simple assumption that evidence comes in propositional form. (p. 51)

As we saw in (2.12), the evidence motivates the possibility of simple conditionalization. The evidence motivates the dynamics of the doxastic states. Thus, following the principle of simple conditionalization in (2.12), the fundamental question arises: Let E be all the evidence of the doxastic subject s between t and t'. How is the new core *C*' rationally subsumed at time t'? Spohn (2012) responds in the following way:

Consider the consistent case first. It is governed by two highly plausible conditions. The first one is:

(4.7) If $C \cap E \neq \emptyset$, then $C' \subseteq C \cap E$.

This says that the posterior state preserves all of the prior beliefs, accepts the evidence as well, and draws all the logical conclusions from combining evidence and prior beliefs. (4.7) thus sets a minimum for the posterior belief set and still allows it to be exceeded. (p. 52)

Everything then depends on the acceptance of evidence *E*. The new core of the state of belief is a subsumption of the state of prior belief conditioning, new evidence *E*, we could say prosaically. No matter what type of core may be subsequently, this should be consistent.

Many proposals affirm that the change of beliefs can be different. For example, following Quine (1951), one can connotatively speak of central and peripheral beliefs:

For vividness I have been speaking in terms of varying distances from a sensory periphery. Let me try to clarify this notion without metaphor. Certain statements, though about physical objects and not sense experience, seem peculiarly germane to sense experience and in a selective way: some statements to some experiences, others to others such statements, especially germane to particular experiences, I picture as new the periphery. But in this relation of germaneness I envisage nothing more than a loose association reflecting the relative likelihood, in practice, of our choosing one statement rather than another for revision in the event of recalcitrant experience. (p. vi)

It is believed that the revision of the latter is much more likely than the revision of the former. For example, it would be easier to believe in a priori beliefs and simple laws and hypotheses rather than beliefs that refer to accidental facts or complex hypotheses. However, how can we measure such centrality? According to Spohn, more than 4.10 as a criterion for the revision of beliefs is not required, this is: "(4.10) If $C \cap E \neq \emptyset$, then $\emptyset \neq C \subseteq E$ " (2012, p. 52).

The point is that regardless of the transmission of belief from the first state to the second, the disposition of this transition is contained in the previous state. Based again on the example of Quine, we can say that what comprises the centrality or peripheral character of particular beliefs is the result of the review, i.e., the result of the counterfactual test stated above. Thus, the ranking theory could measure the degree of centrality of a set of beliefs. The mechanism through which this measurement is initiated is a selection function that allows defining the transition from a core C to C'.

Definition 4.11: Let A be an algebra over W. Then g is a selection function for A iff g is a function from A- $\{\emptyset\}$ into A such that for all A, B \in A - $\{\emptyset\}$:

(a)→Ø ≠ g (A)
$$\subseteq$$
 A,

(b)→If g (A) \cap B ≠ Ø, then g (A \cap B) = g (A) \cap B. (Spohn, 2012, p. 54)

After accepting specific evidence, the function g (A) is configured as the core of further belief. Thus, we can return to 2.12 and understand g (A) as a belief revision scheme that stands out from the traditional probability theory by formulating the so-called simple conditionalization law:

(4.12) If the selection function g characterizes the doxastic state of the subject s at time t \rightarrow and if E is the total evidence s receives and accepts between t and t', then g (E) is the core at t,' so \rightarrow that, s believes A at t' *iff* g (E) \subseteq A. (Spohn, 2012, p. 55)

This model of belief revision as a sort of counterfactual test allows us to see the structure of how a doxastic subject *chooses* their preferred beliefs given a set of beliefs and this model of plausibility. This leads to a meaningful, valuable account of social sciences, as we will see later, mainly economics and psychology. Spohn (2012) suggests:

Why were economists so excited about this formal result? Because it showed how to make preferences behaviorally accessible. Preferences were clearly a basic notion of all microeconomic theory, but at the same time a hypothetical construct, a latent variable, as psychologists said, or a theoretical notion, as philosophers said which is not directly observable. (p. 57)

However, this counterfactual test cannot eliminate certain beliefs for convenience. If you want rational dynamics of belief ruled by consistency and deductive closure, you must leave certain other beliefs. If evidence forces the change of a specific doxastic state, we must arrive at another belief set with consistency and deductive closure. Spohn's proposal leads to an ordered set of possibilities as the foundations of this dynamics of belief. Nevertheless, how this ordered set is established? Through the concept of *ranking functions* (Spohn, 1988, 2012):

Definition 5.5: Let A be a complete algebra over W. Then k is an A measurable completely minitive natural negative ranking function iff k is a function from W into $N^+ = N \cup \{\infty\}$ such that $k^{-1}(0) = \emptyset$ and k-1 (n) ¹ A for each $n \in N^+$. k is extended to propositions by defining k (\emptyset) = ∞ and k (A) = min { k (w) | w \in A} for each non empty A \in A; K(A) is called the negative Rank of A. (Spohn, 2012, p. 70).

Ranking theory measures degrees of disbelief of an agent through negative ranking function *k*. Spohn explains the formal structure as follows:

Thus, k (A) = 0 means that A is not disbelieved al all, k (A) = 1 means that A is disbelieved to the last degree, k (A) = 2 means that A is disbelieved to the second least degree; and so on. Hence, A is believed iff - A to some positive degree, i.e.: (5.6) B (A) iff k (-A) > 0. (Spohn, 2012, p. 71)⁴

^{4&}quot;Example 5.7, Tweety: A quick example might be helpful here. Look at Tweety, an entity which has acquired some fame in the non monotonic reasoning literature. Tweety has, or fails to have, each of the three properties: being a bird (B), being a penguin (P), and being able to fly (F). This makes for eight possibilities. Suppose you have no idea who or what Tweety is (for all you know, it might even be a car). Then your negative ranking function might be the following one (I am choosing the ranks in an arbitrary, though intuitively plausible way, just as I would have to arbitrarily choose plausible subjective probabilities if the example were a probabilistic one):

K	$B \cap \neg P$	B∩P	$\neg B \cap \neg P$	$\neg B \cap P$
F	0	4	0	11
¬F	2	1	0	8

In this case, the strongest proposition you believe is that Tweety either not a penguin and not a bird $\neg B \cap \neg P$ or a flying bird and not a penguin $(F \cap B \cap \neg P)$ all other possibilities are disbelieved" (Spohn, 2012, p.71).

Spohn's theory is aimed at degrees of disbelief. However, it is possible to translate it into positive ranking functions β for a more intuitive interpretation.

(5.11) If k is a negative ranking function for A and if β (A) = k(¬A) for each A \in A, then β is a positive ranking function for A and vice versa. (Spohn, 2012, p. 75)

In this sense, there may also be an equivalence that refers to both a positive and a negative ranking of the two-sided function τ .

Definition 5.12: Let A be an algebra of propositions. Then τ is a two sided ranking function for A there is a negative ranking function k for A such that τ (A)= k(¬A) – k(A), or a positive ranking function β for A such that τ (A)= β (A) - β (¬A), for all A \in . τ (A) is called the two sided Rank of A. (...) A two sided ranking function thus takes positive as well as negative values. The intended interpretation is, of course, that a proposition A is believed if τ (A)=0, disbelieved if τ (A)<0, and neutral or undecided if τ (A)=0. Indeed, for any A \in A we have: (5.13) τ (¬A)= ¬ τ (¬A). (Spohn, 2012, p. 75)

Thus, for an appropriate design of a model of the dynamics of belief, we need to apply the concept of simple conditionalization to our ranking functions. These are the conditional ranks and the equivalences between functions following the interpretation of Skovgaard-Olsen (2014, p. 72):

i. Negative Conditional Rank of B given A: k (B | A) = k (A \cap B) - k(A)

ii. Negative Equivalence with Positive Ranking Function: β (A) = k (¬A).

iii. Positive Conditional Rank of B given A: β (B | A) = β (¬A \cup B) - β (¬A)

iv. Two-sided Equivalence with negative and positive Ranking Functions: τ (A)= β (A) - K(A) = $k(\neg$ A) - k(A)

v. Two-sided Conditional Rank of B given A: τ (B | A) = β (B | A) - k (B | A) = k (\neg B | A) - k (B | A)

The ranking is thus fixed as a function of ordinal numbers in the following way (Goldszmidt & Pearl, 1996):

- i. A and $\neg A$ are believable (suspension of judgment) = k(A) = 0
- ii. $\neg A$ is believable = k(A) = 1
- iii. $\neg A$ is strongly believable= k(A) = 2
- iv. $\neg A$ is very strongly believable = k(A) = 3
- v. ...

You also have not just degrees or rankings for disbelief but, as we saw, degrees of belief and combined grading of disbelief and belief. Rankings allow us to place (organize) an ideal doxastic agent's beliefs on a podium at a given moment using a metaphor. We cannot use this metaphor with probabilistic accounts. Similarly, we have degrees of conditional disbelief (belief or both) with rules to update it for a complete account of the dynamics of belief.

Obeying the rules of the theory, this ideal doxastic agent can thus maintain consistent and deductively closed beliefs, even diachronically, as the grounds of other epistemic goals such as good reasons, scientific knowledge, etc. Huber (2016b) clarifies this topic as follows:

To the extent that the ideal doxastic agent has this goal, she should obey the norms of ranking theory. It is not that we are telling her what and how to believe. She is the one who is assumed to have this goal. We merely point out the (objectively) obtaining means-end relationships. Of course, if the ideal doxastic agent does not aim at always holding beliefs that are jointly consistent and deductively closed, our response will cut no ice. But, as already mentioned before that is beside the point: it is mistaking a hypothetical imperative for a categorical one. (p. 186)

Now, we are in *the garden of forking paths* (Borges, 2018). In this *means-end* approach, the best choice for our goal is to obey ranking theory imperatives. Therefore, the next step is to study the various applications of ranking theory.

Philosophical Applications of Ranking Theory



Introduction

In the second step, the guidance question is: *How to make this theory useful for our purposes?* This chapter is then devoted to the philosophical applications of *ranking theory* and how to make it worthwhile for the account of an internal normativity of social sciences. This chapter's totality is spent searching for relevant philosophical applications of ranking theory to achieve the ulterior goal of a general account of the internal normativity of social sciences. This chapter is, using an analogy, the creation of a *toolbox* for the specific objectives of this work.

Firstly, this chapter will deal with the tool called *reasons*. This is the first application to deal with. Reasons can be understood as functions of transmission of epistemic justification. Given the concept of relevance regarding ranking functions and conditional ranks, the concept of reason is a sort of *warrant* or epistemic justification between propositions. The chapter will explain the construction and meaning of this application.

Second, it will deal with applying ranking theory to subjective normativity or *ceteris paribus laws*. Spohn's (2012) reading on ceteris paribus laws claims that this subjective normativity is the case when we can obtain normal conditions in a given ontological region. In other words, normal conditions are an epistemic issue related to the epistemic agent's beliefs and reasons given a specific background. Doxastic agents believe a particular hypothesis defeasible a priori given necessary and sufficient reasons as a ceteris paribus law.

Finally, the chapter provides an account of the state of the art on causation and the origin, position, novelty, and fortune of Spohn's proposal on the matter, thanks to the development of ranking theory. In Spohn's words, ranking theory was created as a foundation for a theory of causality.

Reasons

The first crucial philosophical application of the ranking theory's theoretical account is clarifying the concept of *reason*. This topic is related to the problem of confirming a hypothesis given specific evidence and, thus, to the concept of *relevance*. There are two paradigmatic notions of confirmation following *Carnap* (1962):

According to the first, a hypothesis is confirmed by the evidence if the (subjective or logical) probability of the hypothesis given the evidence is high, where the vague "high" at least means "greater than .5", but usually something stronger. According to the second, a hypothesis is confirmed by the evidence if the evidence is positively relevant to, or raises the probability of, the hypothesis. (Spohn, 2012, p. 104)

The evidential support of hypotheses can *change* the credibility of such hypotheses. Thus, it is necessary to design models of non-deductive reasoning, like Spohn's theory, to confirm hypotheses given the concept of relevance. Crupi (2016) asserts:

The point of relevance confirmation is that the credibility of a hypothesis can be changed in either a positive confirmation in a strict sense or negative way (disconfirmation) by the evidence concerned. Confirmation thus reflects an increase from initial to final probability, whereas disconfirmation reflects a decrease. (p. 3.3)

Spohn claims that translating high probability criterion into ranking theory terms is inadequate for his theory. To say that *A* confirms *B* if *B* is believed, given, for instance, β (B/A) > 0, is not a positive rank notion of *confirmation by firmness* but just a conditional belief, as we studied previously. Spohn chooses the alternative notion of *relevance* as more adequate to his theory. His account of the dynamics of belief is then a good model of confirmation by relevance.

To grasp the concept, it is better to start talking of relevance in terms of ordinary language statements like A confirms B, A supports B, and finally, *A is a reason for B*. Spohn (2012) thus defines relevance from these intuitive notions, as follows: Definition 6.1: Let κ be a negative and τ the corresponding two-sided ranking function for A, and A, B \subseteq A. Then A is a reason for B or positively relevant to B w.r.t. κ *iff* τ (B|A) > τ (B|¬A), i.e., iff κ (¬B|A) > κ (¬B|¬A) or κ (B|A) < κ (B|¬A). A is a reason against B or negatively relevant to B w.r.t. κ iff τ (B|A) < τ (B|¬A). Finally, A is relevant to B or dependent on B w.r.t. κ iff A is a reason for or against B w.r.t. κ . (p. 105).

Skovgaard-Olsen's (2014, p. 76) interpretation leads to the following chart:

- i. A is positively relevant to C iff $\tau(C/A) > \tau(C/\neg A)$
- ii. A is irrelevant to C iff τ (C/A) = τ (C/ \neg A)
- iii. A is negatively relevant to C iff τ (C/A) < τ (C/ \neg A)

The previous model then becomes a non-monotonic reasoning model for confirming scientific and non-scientific hypotheses. The multiple applications go from argumentation theory to legal issues to scientific methodology. These matters will be dealt with later in this work. This model of relevance therefore results in the concept of *reason*.

Reason can be understood as a function of transmission of epistemic justification; this is to say, the transmission of justification from a belief *A to B*. Moretti and Piazza (2013) claim that:

Transmission of justification across inference is a valuable und indeed ubiquitous epistemic phenomenon in everyday life and science. It is thanks to the phenomenon of epistemic transmission that inferential reasoning is a means for substantiating predictions of future events and, more generally, for expanding the sphere of our justified beliefs or reinforcing the justification of beliefs that we already entertain. (p. i)

Therefore, we can understand the concept of reason as a specific *warrant* or epistemic justification between propositions. To be a reason is to be a particular warrant, support, or ground between propositions. Spohn claims that: "In German the point is even a bit clearer. Here 'reason' disambiguates into 'Grund' and 'Vernunft';

and it is just the notion of a 'Grund' or 'Begründung' that is explicated in Def (6.1)" (2012, p.105). It is clear that Spohn does not use the concept, for instance, in the sense of Kant's reason (1787, A835-B863, p. 863)

Ranking theory is then a mechanism to measure each warrant's strength, that is, its relevance, and thus find reasons.

Now, it is necessary to specify more deeply what *being a reason* is. First, *being a reason* is a relationship between propositions (Spohn, 2012, p. 105). This comes from the whole structure revealed in the ranking theory and the conventional account of belief previously exposed. Second, this relationship between propositions is *relative* to a doxastic subject, i.e., possible worlds centered as subjects at a specific time and space. Therefore, *the different doxastic subjects do not need to always agree on their reasons*. Third, a clear difference exists between *being a reason* and *having a reason*. Spohn (2012) explains this with an example:

Sadadam's alleged mobile underground laboratories are reason to believe that he is (on the verge of) possessing weapons of mass destruction. Everyone agreed on this. But only George W Bush and some other statesmen had a reason to believe in the laboratories and hence in the weapons. Moreover, we should distinguish a factive and non-factive sense of having a reason. In the factive sense, the reason must obtain or be true; in the non-factive sense the reason need only be believed. (p. 106)

Finally, due to the roles of ranks, we can distinguish different kinds of reasons:

Definition 6.2. Let k	x, t, A, and B as in 6.1. '	Then A is a
Supererogatory		τ (B A) > τ (B \neg A)> 0
Sufficient	Reason for B w.r.t. к iff	$\tau (\mathbf{B} \mathbf{A}) > 0 \geq \tau (\mathbf{B} \neg \mathbf{A})$
Necessary		τ (B A) \ge 0 > τ (B \neg A)
Insufficient		$0 > \tau (B A) > \tau (B \neg A)$

(Spohn, 2012, p. 107)

These four types of reason relations are grounded in the notion of relevance and the inner nature of ranks. Spohn (2012) explains his novel typology as follows:

The hopefully suggestive qualifications "supererogatory" and "insufficient" are novel: a supererogatory reason strengthens the belief in something already believed, whereas an insufficient reason weakens, but does not eliminate the disbelief in something still disbelieved. A reason that is not sufficient might still be necessary; "insufficient" is a stronger opposite to "sufficient" than "not sufficient". The qualification "sufficient" and "necessary" are familiar and fitting. A sufficient reason for B suffices to believe B, whereas a necessary reason for B is necessary to give up disbelief in B. Clearly there is only one way to belong to two kinds of reasons, namely by being a necessary and sufficient reason. Otherwise, the categories are disjoint. (p. 108)

At this point, we can bring back the notion of conditional rank and talk about conditional reasons and the dynamics of reasons. Spohn (2012) defines the dynamics of reasons as follows:

Definition 6.3: Let κ be a negative ranking function for A, and A, B, C \subseteq A. Then A is a (supererogatory, sufficient, necessary, or insufficient) reason for or against B conditional on or given C w.r.t. κ iff, respectively, A is a (supererogatory, sufficient, necessary, or insufficient) for or against B w.r.t. Kc. (p. 109).

Moreover, *Tweety* strikes back: Given that *T* is a bird, this proposition is a *reason* to believe *T* can fly. However, given new evidence that *T* lives in the Antarctic, the first proposition became a *reason against* T's ability to fly.

Reasons can also be classified by their *behavior*. Spohn calls it their formal structure. Firstly, reasons behave *like deductive reasons:* "Definition 6.4: $A \subseteq A$ is a deductive reason for $B \subseteq A$ *iff* $A \subseteq B$ " (Spohn, 2012, p. 110).

So, a deductive reason must be a *sufficient* or *supererogatory* reason given the novel typology of Spohn's theory. Deductive reasons are not relative to doxastic states, hence their monotonicity. The other kind of behavior is being an *inductive reason*. Inductive reasons must be understood as complementing the set of deductive

reasons. Inductive reasons are portrayed by ranking theory and the dynamics of belief account. However, this behavior is not necessarily related to an asymmetric classic inference. This is a critical remark on this topic:

The basic point is that deductive reasons are our prevalent conception of reasons and deductive reasons have a direction; antisymmetric is the only way to revert them. The point can also be expressed more neutrally. Reasons are closely related with (deductive or inductive) inference, and inference appears to be asymmetric. We infer the general from the singular, the future from the past, the unobserved from the observed, we confirm the hypothesis by the evidence. Listing these alleged asymmetries makes clear, though, that they do not hold. Inferences run in any direction; we infer the singular prediction from the general hypothesis, etc. The asymmetry is not in what reasons are, but rather in the reasons we have or get. (Spohn, 2012, p. 112)

Another feature of reasons is that we can *weigh reasons*. We are always wondering whether we should believe certain propositions or not. The kind of inferences we use is how we can weigh reasons. Moreover, the typology of reasons allows us to weigh reasons following our purposes. However, only deductive reasons cannot be weighed at all because its inner behavior makes it clear. That is why perhaps we can leave this dominant reasoning model for several epistemic purposes.

Deductive validity is not the only criterion to say that reasoning is logically well established. This problem arises when the consequence relation is not only, and necessarily, the logical entailment. When the premises are only supported by likelihood, and other things being equal, the acceptance of the claim relies in offer good reasons for its acceptance. This is evident, for instance, in everyday reasoning and practical reasoning. Reasoning is in a significant dynamic and non-monotonic or defeasible dimension, as Spohn claims in this ranking theory application.

Finally, an essential feature of reasons is that belief change is caused by reasons. Of course, we have other causes of belief change, such as limited memory, illness, and many other disturbing factors. However, one normativity conclusion from Spohn's account is that *we cannot change beliefs without the force of reasons*.

Ceteris Paribus Laws

Laws of nature are considered necessary, universal, and truth assertions supporting causation, explanation, and relations of phenomena or counterfactual states of affairs. This paradigm, linked to physics, draws the standard meaning of *law* in science. However, several generalizations or models differ from this definition in other fields or special sciences. Some examples are the following:

- 1. Law of Demand
- 2. Mendel's laws

From these classic examples, we can infer that these generalizations are not necessary, universal, and truth-supporting claims but are valid laws, for instance, in economics and biology sciences. This kind of generalization needs a ceteris paribus clause, which means "other things being equal." Thus, ceteris paribus laws are universal statements with certain exceptions. John Stuart Mill (1843) used this concept correctly in his account of disturbing economic factors:

Political economy considers mankind as solely occupied in acquiring and consuming wealth(...) not that any political economist was ever so absurd as to suppose that mankind is really thus constituted (...) when a concurrence of causes produces an effect, theses causes have to be studied one at a time, and their laws separately investigated (...) since the law of the effect is compounded of the laws of all causes which determine it. (p. vi-9.3)

Mill's account asserts that there are exceptions or disturbing factors in theories, which often override laws' meaning because laws do not fit with phenomena.

Another definition that brings light to the meaning of the ceteris paribus clause is Cairnes's (1888) description of political economy. He says on political economy theories that, "The doctrines of political economy are to be understood as asserting, not that will take place, but what or what tends to take place, in this sense only they are true." He also claims," Ceteris paribus is what would or what tends to take place if normal conditions are obtained." (Cairnes, 1888, p. 103). Ceteris paribus clauses, in Cairnes's view, are *tendencies* of what probably takes place.

In the contemporary philosophy of science, since logical positivism until today, definitions of this issue are related, excluding disturbing factors in theories and scientific procedures. Through this exclusion, the ceteris paribus clause, sciences could assert phenomena' necessity and sufficient relation (Hempel, 1965; Nagel, 1961). This argument is problematic when applied to social sciences and other specific scientific disciplines. Certain neighbor phenomena in some theories and models of such disciplines are not irrelevant or fixed. Therefore, ceteris paribus laws require a solid analytical approach to define their nature and function.

First, following Schurtz et al.'s (2015) approach, we can differentiate *comparative* and *exclusive* ceteris paribus laws. Comparative *ceteris paribus laws* show that if the value of a variable increases, then another variable increases in direct and equal proportion. For instance, an increase in gas temperature leads to an increase in volume. On the other hand, *exclusive ceteris paribus laws* not only need the value of variables to stay fixed but also require excluding disturbing factors.

Comparative should be *restrictive* when instantiated to a specific class of circumstances or *unrestricted* when asserts a probabilistic cause for all circumstances:

I suggest distinguishing between two conceptions of cp-law: comparative versus exclusive. Comparative cp-laws require that factors not mentioned in the antecedent or the consequent law remain unchanged. In contrast, exclusive cp-laws assert the connection between antecedent and consequent only under the condition that certain factors are excluded. (Schurtz et al., 2015, p. 3.1)

Similarly, we can distinguish *definite* and *indefinite* exclusive *ceteris paribus laws*. *Definite* specifies the disturbing factors excluded from the law. Indefinite consists of a "universal second order condition, which excludes all kinds of disturbing factors to the law, whatever they are" (Schurtz et al., 2015, p. 3.1)
The problem with exclusive ceteris paribus laws may fall into trivialization because it is so difficult to account for all the excluded factors. In the semantic conception, the key to resolving the exclusive perspective problems is to add the missing conditions to the laws (Fodor, 1991). This leads to the following schema of a plausible solution:

A factor C is a completer relative to a realizer R of A and a consequent predicate B iff:

- 1. R and C are strictly sufficient for B.
- 2. R on its own is not strictly sufficient for B.
- 3. C on its own is not strictly sufficient for B. (Fodor, 1991, p. 23)

Also, to resolve the problem of multiple mental states, he adds that:

Cp (A then B) is true iff either (1) for every realizer R of A there is a completer C such that A and C then B or (2) if there is no such a completer for realization R1 of A there must be many other laws in the network for A for which R1 has completers (Fodor, 1991, p. 27).

Another perspective to solve the problem is called epistemic. Completion is explanatory and only required *post-factual*. This proposal answers the question: Why the law was not instantiated? It is necessary to bring evidence for the existence of the disturbing factor (Pietroski & Rey, 1995). This is the schema for the thesis:

Cp (A then B) is non-vacuously true iff:

1. A and B are otherwise nomological.

2. For all x if Ax then (either Bx or there exists an independently confirmable factor that explains why -Bx).

3. Cp (A then B) explains at least something as assumed in 2. (Pietroski & Rey, 1995, p. 92)

An alternative theory to solve the problem is called *normality theory*. For this case of normality theories, Spohn's (2012) account of ceteris paribus laws is very relevant and plausible. In this particular theory, we can say that ceteris paribus clause means "other things being normal":

My goal will rather be to explain how the notion of a ceteris paribus condition flows directly from the logic of non-probabilistic defeasible reasoning as explicated by ranking theory. If defeasible reasoning really is the basis of the phenomenon, it is no wonder that it is ubiquitous in the sciences, including physics. (Spohn, 2012, p. 305)

Ceteris paribus laws are the case when we can obtain normal conditions in our ontological region, i.e., conditions are highly probable in such ontological region. Another way to think about it is by using highly probable conditions in a particular possible world.

I had emphasized that normality is an indexical or egocentric notion that refers to what is normal to us in our environment. Detached from such a context, normality is not meaningful. Thus detached, we could only say that everything in our environment is extremely exceptional, since the earth is such an extraordinary place in our universe. (Spohn, 2012, p. 335)

Thus, in Spohn's reading, standard conditions are an epistemic issue because an epistemic agent believes something about the normality of conditions. The epistemic dimension is linked with the ontological dimension as long as a doxastic agent might believe in certain *a priori* defeasible relations of phenomena, given a specific fixed background.

What I am suggesting, then, is that we give the talk of normal conditions an epistemic reading: normal conditions are the conditions expected or at least not ruled out. This contrast with the trivial reading according to which the ceteris paribus conditions with regard to a given law or hypothesis H are defined as those conditions under which H is true. It contrasts with the existential reading according to which ceteris paribus is just an existential quantifier over conditions possibly of a suitable kind (...) It also contrasts with the eliminativistic reading, as one might call it, according to which normal conditions are to be replaced by an explicit list of specific conditions under which H holds. (Spohn, 2012, p. 313)

The definition of such an a priori defeasible condition is the following: "The belief in the reduction sentence H = S if (D iff R) is defeasible a priori, or, equivalently, it is defeasible a priori that given S, D is a necessary and sufficient reason for R" (Spohn, 2012, p. 323). Therefore, normal conditions are epistemic conditions resulting from a fixed background. Spohn's (2012) remarks:

First, suppose we get more information about the background conditions. We expect to learn that the background is normal, and our experience might confirm this. It might also disappoint this expectation [...] However, what cannot change through this learning process is the conditional belief in the reduction sentence given normal conditions; this relation remains fixed through-out all information about the background. (p. 323)

We cannot clear up all the conditions as the applications required to certify its satisfaction from a wide ontological and metaphysical point of view, as exclusive ceteris paribus theories want to achieve. That is impossible, and that is why we need to explain this through defeasible reasoning. Epistemologically, ceteris paribus laws, as a hypothesis or a priori defeasible clauses of reasoning, are powerful tools for human knowledge that fix laws through the belief in certain *a priori* defeasible normativity of the knowledge of phenomena.

As we have seen, ceteris paribus laws are normative defeasible reasoning beliefs. Hence, they are non-monotonic due to new information, which should affect its validity. The ceteris paribus laws used to be formulated with a non-strict conditional or default non-monotonic modus ponens. Following Schurtz et al. (2015), we can find two semantic criteria for non-monotonic laws:

1. High probability semantics: An inference of a conclusion conditional from a set of premise conditionals is regarded as valid in this semantics iff the uncertainty of the conclusion conditional is not greater than the sum of the uncertainties of the premises.

2. Normality semantics: A conditional is considered as true in a ranked-world model lowest-rank A-worlds are B-worlds. An inference is considered as valid in this semantics iff all ranked-worlds-models, which verify all premise conditionals verify the conclusion conditional. (p. 3.2)

The Spohn's account is addressed to the normality semantics. The general schema of Spohn's normative structures is most apparent with the following explanation: We believe defeasible a priori the hypothesis or ceteris paribus law, as we believe that: given variable S, then D is a necessary and sufficient reason for R and vice versa, or, for instance, we believe Ceteris Paribus that, if x is put into water, then x is soluble if and only if x dissolves.

Necessary and sufficient reasons are ranked world models with specific properties, as established in the philosophical application of ranking theory to the concept of *reason*:

A is a:

Supererogatory	Reason for B iff	t (belief in) (B/A) >t(B/-A)>o
Sufficient	Reason for B iff	t(B/A)>o≥T(B/-A)
Necessary	Reason for B iff	t(B/A)≥0>t(B/-A)
Insufficient	Reason for B iff	o>t(B/A)>t(B/-A)

As we have seen, sufficient and necessary are non-monotonic or deductive reasons. Therefore, sufficient and necessary are not fixed notions. All are relative to specific calculus in a given possible world.

The sufficient and necessary conditions fixed the background, linking the probability to the first ranking o. That is why we can still talk of laws, and that is why we are talking of defeasible laws.

Moreover, as Schurtz et al. show, we can fix the formulation of a law with a default modus ponens, the ceteris paribus clause, and the other aspects of semantics. Consequently, Spohn's proposal of a general form of normality ceteris paribus laws can be used as an a priori model for every defeasible reasoning normativity.

Causation

Philosophy has been concerned with this topic since the beginning of the discipline itself. However, there are certain milestones in the development of the problem. The Early Greek philosophy, Aristotle, and the Middle Ages philosophers claim an objective reality of causation connected with substance and occasionalism (Aristotle, 2016, I, 3, 983 a, 26 a, II, 2 and VII, 8, 1033 b). The second milestone is Hume's causal skepticism. Hume (1748) starts a criticism of the necessity of causation, claiming:

When we look about us towards external objects, and consider the operation of causes, we are never able, in a single instance, to discover any power or necessary connection; any quality, which binds the effect to the cause, and renders the one an infallible consequence of the other. We only find, that that the one does actually, in fact, follow the other. (p. VII.63).

Hume argues that concepts are just copies of our experiences. Hence, the point, following Hume, is that we cannot have an experience or direct impression of causation; events seem *conjoined* but not *connected*. Cartwright (2014) argues on Hume's account:

Human beings, he believed, are deeply prone to forming habits. So, having observed a regular association between two kinds of events, we come to expect the second when we see the first. Looking inwards at ourselves, we notice this feeling of expectation; we get an impression of it. Our concept of causation, Hume claimed, is a copy of that impression of expectation. All that is happening in the external world that contributes to our coming to have this concept is a regular association of events. The concept itself derives from an impression of our internal state. (p. 309)

Regarding causation, the necessary connection is perceived not between events but between the subject's ideas (Beebee, 2006, p. 85). Hume's definition of causation is twofold:

We may define a cause to be an object followed by another, and where all the objects, similar to the first, are followed by objects similar to the second. Or, in other words, where, if the first object had not been, the second never had existed. (Hume, 1748, VII)

The first definition leads to the view of causation as regularity, and the second is the alternative of probabilistic and counterfactual accounts of causality.

The regularity view of causation is, following Psillos (2009), the opposite of a classic thesis of *productive* relation linked with causality. To this account, *c* causes *e* if and only if:

- i. C is spatio-temporally contiguous to e.
- ii. E succeeds in time.

iii. All events of type C are regularly followed by (conjoined) events of type E.

This regularity view of causation is thus a set of "(...) patterns among events even if there were no minds around (...) one might think of regularity as the mereological sum of its instances" (Psillos, 2009, p. 133). This perspective is based either on specific criticism of Hume's skepticism or asserts that causality is a mind-independent feature of reality. The supposed existence of regularity in nature supports this account.

Since the laws of nature are, in a certain sense, different from regularities, this account suffers several problems. For instance, the controversy over the example of the succession of day and night sustained by Reid (1788) and *Brown* (1822) makes the problem explicit. Given the regularity's account premises, is the day a cause of the night? These counterexamples led to the account of *conditions* and *structures* related to causal relations. Mill's reading defines causes not only as regularities but as regularities *under certain conditions:* "The cause then, philosophically speaking, is the sum total of the conditions positive and negative taken together" (Mill, 1911, p. 217). Sufficient and necessary conditions show how the regularities that constitute laws of nature are parts of a structure:

Even if we know everything, we should still want to systematize our knowledge as a deductive system, and the general axioms in that system would be the fundamental laws of nature. The choice of axioms is bound to some extent to be arbitrary, but what is less likely to be arbitrary if any simplicity is to be preserved is a body of fundamental generalizations, some to be taken as axioms and others deduced. (Ramsey, 1928, p. 12)

Therefore, it is possible to add to a standard definition of regularity theories of causation that: "c causes e if and only if c belongs to a minimal set of conditions that are sufficient for e given certain laws" (Menzies, 2017, p. 1.1).

Several problems remain since the Reid and Brown controversy and the improvements in the theory (Mackie, 1974). The first is imperfect regularities. The classic example is that smoking is a cause of lung cancer: even some smokers do not develop it. The second is the irrelevance of certain regularities. This is a non-causa pro-causa fallacy for coincidence; to curse someone each time he smokes it is not the actual cause of his lung cancer. Another regularity problem is asymmetry or a kind of non causa pro causa fallacy of reverse causation; lung cancer is not a cause to smoke. Finally, there are spurious regularities. Jeffrey's (1965) example is apparent: the decline in barometric pressure and the drop in a column of mercury is a spurious regularity regarding the effect of the storm. Hitchcock (2018) revisits the example of lung cancer to introduce the notion of probability in causation as a way to fix all these problems: "Thus, smoking is a cause of lung cancer, not because all smokers develop lung cancer, but because smokers are more likely to develop cancer than non-smokers" (p. 2.3).

This general motivation of *likelihood* is collected by proposals named probabilistic theories. Probabilistic theories of causation are based on one *root idea*, as Cartwright (2014) claims:

When a cause is present there should be more of the effect than if it were absent. That is the root idea of the probabilistic theory of causation. If C –type events occurring at some arbitrary time t cause E—type of events at a time t' later, then we should expect: P (Et/Ct) > P(Et"/¬Ct). (p. 313)

The *relata* of probabilistic causation theories regarding actual causation are often called *events*. General causal relata are often called *factors*. Events are random variables in a probability space. Hence, causation is related to raising the probability of an event *e* given an event *c*. This is the *root idea* common to several approaches to probabilistic causation, such as Reichenbach (1925), Suppes (1970), and Cartwright (1979).

Reichenbach (1925) introduced several important notions to this reading. Foremost there is the notion of *screen off*: If $P(E|A \cap C)$ = P(E|C), then C is said to screen A off from E. Therefore, A and E are independent. Hitchcock clarifies the matter as follows:

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Reichenbach recognized that there were two kinds of causal structure in which C will typically screen A off from E. The first occurs when A causes C, which in turn causes E, and there is no other route or process by which A affects E (...) We might say that C is an intermediate cause between A and E. (...) The second type is a common cause of A and E. (Hitchcock, 2018, p. 2.3)

The second type of screen off is represented by the barometer example. A decline in pressure causes the drop of mercury and the storm, but air pressure *screens off* the measure because this does not affect the occurrence of the storm. In this sense, Reichenbach developed the notion of the *common cause principle*⁵. Ultimately, these not actual causal relations of two separate events are determined by a common causal probabilistic relationship. Nevertheless, this notion is problematic regarding the *root idea* of probabilistic accounts. First, in some cases, *c* and *e* can have a common cause; therefore, the root idea is necessary but insufficient to explain causation. Second, these common causes can give rise tp relations called *reverse inequalities* given specific contexts that make our *root idea* unnecessary. This is cleared in the so-called Simpson's (1951) paradox.⁶

Cartwright (1979) wanted to solve these problems through background contexts. The core idea is that *C* causes *E* iff $P(E/C \cap B) > P(E/\neg C \cap B)$ for every background context *B*. Hence, background context is a sum of variables that, in the frame of our *root idea*, as patent in the previous formula, become fixed as a kind of constant. Given *B*, a cause *C* must raise the probability of *E* in every back-

i. 0 < P(C) < 1

ii. $P(A\&B|C) = P(A|C) \times P(B|C)$

iii. $P(A\&B|\sim C) = P(A|\sim C) \times P(B|\sim C)$

iv. $P(A|C) > P(A|\sim C)$

v. $P(B|C) > P(B|\sim C)$.

 6 This is an example from Malinas and Bigelow (2016) on Simpson's paradox: a/b < A/B, c/d < C/D, (a + c)/(b + d) > (A + C)/(B + D) or 1/5 < 2/8, 6/8 < 4/5, 7/13 > 6/13.

⁵ Following the explanation of CCP by Hitchcock (2018): Given $P(A\&B) > P(A) \times P(B)$ and neither *A* nor *B* is a cause of the other, there will be a common cause, *C*, of *A* and *B*, satisfying the following conditions:

ground context. This position leads to a debate on the scope of the background context and the beginning of certain causal modeling and interventionist approaches.

Another branch derived from Hume's twofold definition and probabilistic root idea is the approach named the *counterfactual theories* of causation. These are based on the semantics of counterfactuals made explicit by Stalnaker (1999) and Lewis (1973). We can define it generally, following Paul's reading:

That is C causes E because the counterfactual If not C, then not E is true. To the extent that this is successful, we have a counterfactual analysis of causation (...) Counterfactuals are subjunctive conditionals of the form, if it were the case that A, then it would be the case that B. (Paul 2009, p. 158)

Lewis's theory is based on certain asymmetry or over-determination of facts regarding a counterfactual *a priori* conceptual analysis (Menzies, 2017). From this point of view, causes are something that makes a difference. Counterfactual dependence between two distinct possible events leads to a causal dependence of two distinct actual events. Hence, events behave with transitivity; this is to say, causal dependence is successful if it belongs to a particular causal chain of actual events (Lewis, 1973, p. 563). In that sense, there is a temporal asymmetry of causal dependence; the present counterfactually depends on the past. (Lewis, 1973, p. 567) Finally, Lewis's lecture argues that there is no space for *backtracking counterfactuals* or specific preempted potential causes because the premises of transitivity and actual causal chains make clear that potential causes are related to the counterfactual concept of dependence but not to actual causes. That is why: "Causal dependence is sufficient for causation but not necessary: it is possible to have causation without causal dependence" (Menzies, 2017, p. 1.2). Lewis' actual causation is then based on the transitivity closure of counterfactual dependencies. The problem with this chain of events is that the effects do not always depend counterfactually on their causes, not even directly. Given this, counterfactual accounts suffer from problems like preemption, redundancy, backtracking counterfactuals, simultaneity, and trumping. However, the counterfactual approach has particular virtues that later theories

of causation have exploited. Paul claims on these virtues: "A general theoretical motivation for a reductive analysis of causation is that such an analysis would be deeply related to many other central philosophical topics, and would serve as a tool for philosophers, scientists, and others to use" (Paul, 2009, p. 166)

Halpern and Pearl (2005), in continuity with the probabilistic and counterfactual approaches, formulate a definition of causality in the language of *structural equations*. This causal modeling approach sets new methods to grasp causal relationships and new answers to its inner problems.

Here we give a definition of actual causality cast in the language of structural equations. The basic idea is to extend the notion of counterfactual dependency to allow contingent dependency. In other words, while effects may not always counterfactually depend on their causes in the actual situation, they do depend on them under certain contingencies. (Halpern & Pearl, 2005, p. 844)

This definition allows for solving, for instance, problems such as preemption and redundancy. The truth of the causal claims is relative to a specific model, and the model is relative to a particular context or background. They claim that in that sense:

It is possible to construct two closely related structural models such that C causes E in one and C does not cause E in the other. Among other things; the modeler must decide which variables (events) to reason about and which to leave in the background [...] models of the world is a better representation of those aspects of the world that one wishes to capture and reason about. (Halpern & Pearl, 2005, p. 845)

A set of random variables and functions build an equation representing several mechanisms that model how the variables influence or cause others. Variables behave in this way:

In practice, it seems useful to split the random variables into two sets, the exogenous variables, whose values are determined by factors outside the model, and the endogenous variables, whose values are ultimately determined by the exogenous variables. It is these endogenous variables whose values are described by the structural equations. (Halpern & Pearl, 2005, p. 847) The system of equations requires random variables that support the direct and deterministic relationships of the model to shore up the adequacy of the variables influencing the model. This makes it possible to avoid problems of preemption, simultaneity, and redundancy. However, the proposal suffers from certain weaknesses.

It may seem strange that we are trying to understand causality using causal models, which clearly already encode causal relationships. Our aim is not to reduce causation to non-causal concepts but to interpret questions about causes of specific events in fully specified scenarios in terms of generic causal knowledge such as what we obtain from the equations of physics. The causal models encode background knowledge about the tendency of certain event types to cause other event types. (Halpern & Pearl, 2005, p. 849)

Beyond the authors' warning, the proposal falls into a certain circularity, as Cartwright (1979) declares, because the variables they set as background are not understood as causes themselves; in the end, exogenous variables seem to determine the whole mechanism of causality. Halpern and Pearl's theory seems to be an interventionist account of causality and, in a certain sense, a *means-end* reading of causation. Exogenous variables are fixed as the obtaining circumstances of the *particular* causal process modeled.

Spohn's (2006) *workable* alternative, our main task, seeks to solve all these problems thanks to the benefits of *ranking theory* and its account of induction and dynamics of belief. In the same path of counterfactual, probability, and causal modeling proposals, Spohn starts his theory perhaps at the beginning of the problem, that is to say, Hume's definition: "The paper builds on the basically Humean idea that A is a cause of B iff A and B both occur, A precedes B, and A raises the metaphysical or epistemic status of B given the obtaining circumstances" (Spohn, 2006, p. 93).

The improvement of this basic idea, which Spohn makes clear in 2012 is due to the relationship established between inductive inference and causal inference, to which the second chapter of this work was devoted. The first step to establish this relationship is fixing the conceptual framework of his theory of causation. Firstly, Spohn's framework deals with particular causation. General causal processes are a later business to deal with. As we saw in § 2.3, Spohn's account uses the language of *variables*, not *events*. Variables are specific objects at a particular time and with certain properties. To be the case for these properties of the variable is the *realization* of such variable. Hence, all these small worlds in § 2.3 are in one-dimensional ontological states of affairs and other- dimension epistemic propositions (Spohn, 2006, p. 96). Notably, this set of variables is finite. Besides this, Spohn assumes determinate temporal relations regarding causal processes:

For instance, a specific game of chess certainly is a causal process, and the natural variables to consider are all the possible moves of the game. The exact points of time at which the move occurs may be taken to be irrelevant; what matters is only the temporal order of the moves. (Spohn, 2012, p. 342)

Therefore, Spohn represents temporal relations as follows: "I will usually write X<Y and X≤Y in order to express that X precedes or is realized before (or at the same time as) Y" (2012, p. 341). It entails a discrete temporal order for this model of causation. *X-propositions* or atomic propositions represent the variables and are the *relata* of causal relations. Causal relations *are* relations between atomic facts. Regarding temporal relations, *A* can be a cause of *B* only if *A* is not later than *B*. Spohn's proposal is thus grounded in the asymmetry of temporal precedence: "General relativity theory has inspired fantasies about backwards causation, and so do certain obscure quantum effects. All this is far beyond my ken. Let me simply state that none of the subsequent theorizing would work without this assumption" (Spohn, 2012, p. 351).

At this point, he returns to his earlier definition in 2006; given this framework and the advances of ranking theory, he defines causation as: "A is a cause of B iff A and B obtain, A precedes B, and A is a reason for B given the obtaining circumstances" (Spohn, 2012, p. 354).

This is an epistemic reading based on the conception of reasons as the relation between ranking functions. Spohn claims then: "Thus like Hume, I take causation to be an idea of reflection; I am bound to claim that causation is in the eye of the beholder" (Spohn, 2012, p. 340). Causality is a sort of epistemic relation. It is based *not on physical probabilities or mechanisms but on the doxastic agent's reasons. Therefore,* causes are conditional reasons (see: § 3.2). In that sense, as ranking theory distinguishes kinds of reasons, we obtain kinds of causes: "Therefore, we will be able to equally naturally distinguish supererogatory, sufficient, necessary, and insufficient causes. Necessary and sufficient causes are the focus of the traditional accounts" (Spohn, 2012, p. 354).

Obtaining circumstances following Spohn are defined as all the other causes of *B* that are not caused by *A*. This definition falls, apparently, into the circularity objection of Cartwright (1979). Spohn (2006) answers with this proposal:

However, the circularity dissolves, if only A's being a direct cause of B is considered. In this case there are no intermediate causes, i.e. no causes of B caused by A; the relevant circumstances may hence include all other causes of B (p. 104)

For instance, a *causal chain* $A \rightarrow B \rightarrow C$ given the negative ranking $k(A) = k(\neg A) = 0$ shows that *A* screens off *B* from *C*.

K(. A)	С	¬ C
В	0	1
¬ B	2	1

	k(. ¬A)	С	$\neg C$
	В	1	2
	¬В	1	0

Moreover, something similar happens regarding a conjunctive fork $A \rightarrow B$ and $A \rightarrow C$.

K(. A)	С	¬ C
В	0	1
$\neg B$	1	2

k(. ¬A)	С	$\neg C$
В	2	1
$\neg B$	1	0

All this is because the ranks count the violations of causal relations; therefore, more violations lead to more disbelief (Spohn, 2006, p. 106). Hence, the epistemic direct causation account seems to solve circularity problems. In this sense, Spohn's (2012) improvement gave us a powerful tool to clarify and interpret causation regarding ranking functions: The following paradigmatic ranking tables in terms of two sided ranking function τ derived from the basic negative ranking function ξ are instructive:

τ (C .)	В	$\neg B$
А	1	-1
$\neg A$	-1	-1

(a) joint necessary and sufficient causes

τ (C .)	В	$\neg B$
А	1	0
$\neg A$	0	-1

b) joint sufficient, but not necessary causes

τ (C .)	В	$\neg B$
А	1	1
$\neg A$	1	-1

c) redundant causes. (Spohn, 2012, p. 364)

Tables a) and b) are, in a certain sense, common in theories of causation, but table c) is a novelty to solve several inherited problems of the predecessor theories. The first one is *overdetermina-tion*. In this case, two or more independent causal processes produce the effect.

τ (C .)	В	¬ B
А	2	1
$\neg A$	1	-1

"Overdetermining causes" (Spohn, 2012, p. 366).

This kind of cause is related to the notion of supererogatory reasons. "For instance, to avoid the notorious cruel firing squad, the prince sings a love song (A) and accompanies it by playing the mandolin (B) in order to wake up the beloved princes (C)" (Spohn, 2012, p. 365). The ranking theory explains it better than fine-graining events, structural contingencies, and regularity proposals.

The second case is the classic problem since Lewis (1973) of preemption by cutting. Table (c) represents better

The classic example introduced by Hart (Honoré, 1959, p. 219) is the story of the desert traveler, which starts with the first assassin pouring poison into the traveler's water keg, continues with the second assassin drilling a hole in the keg, and sadly ends with the traveler's death in the desert. (Spohn, 2012, p. 365)

Counterfactual approaches are concerned with potential preemption and backward causation. However, the ranking theory approach deals with these problems easily. In this sense, preemption by trumping is represented in this table:

τ (A .)	S ₁	$\neg S_1$
M1	2	2
$\neg M_1$	1	-1

"Trumping, binary case" (Spohn, 2012, p. 368). [CITA]

The classic example of this causal problem is the following, as described by Lewis (2000):

The Sergeant and the Major are shouting orders at the soldiers. The soldiers know that in the case of conflict, they must obey the superior officer. But as it happens, there is no conflict. Sergeant and Mayor simultaneously shout Advance! The soldiers hear them both; the soldiers advance. Their advancing is redundantly caused: If the Sergeant hat shouted Advance! And the Mayor had been silent, or if the Mayor had shouted Advance! And the Sergeant had been silent; the soldiers would still have advanced. But the redundancy is asymmetrical: Since the soldiers obey the superior officer, they advance because the Mayor orders them to, not because the Sergeant does. The Mayor preempts the Sergeant in causing them to advance. The Mayor trumps the Sergeant. (p. 81) According to the table representation, we do not need to appeal to fine-graining causal chains or specified models for each asymmetrical case but to appeal to reasons. The Sergeant's shout is a necessary and sufficient cause, and the Mayor's shouting is a supererogatory cause. Spohn's causation theory is thus a good modeling tool for several theoretical and practical purposes. In this sense, he claims that:

These examples aptly show how, already in the case of direct causation, the ranking-theoretic account provides us with greater expressive means than all rivals. These means allow us to take our intuitions at face value without further ado. Of course, the modeling of examples is hardly ever unique; as Halpern, Pearl (2005a) emphasize again and again, there often are several plausible alternatives, and several manners of causal talk are thus representable. Still, I submit that ranking theory enriches our modeling options in plausible and unprecedented ways. (Spohn, 2012, p. 369)

Given all this, how can this local direct causation model be extended to a general causation account?

I do not speak about repetitions, generalizations, or causal laws, though I do suggest that this is a simple step, once we have successfully dealt with the single case. Or to be explicit: If ξ describes the causal relations in the given single case, then the law λ_{ξ} is the causal law that generalizes to all like cases. Of course, causal laws may only be ceteris paribus laws. We may embed all of our considerations about the single case into a background of normal conditions. The corresponding generalization will then produce only a ceteris paribus causal law. (Spohn, 2012, p. 357)

The law $\lambda\xi$ is then, as explained in the previous section, a *ceteris paribus law*. Spohn (2006, p. 115) claims that λ is the conjunction of all causal conditionals regarding ξ . This leads to a normal condition proposition or ceteris paribus clause with respect to a specific frame or causal-like set. A causal law is a subjective law, a mind-relative notion of causation.

The last problem that Spohn's causation theory faces is relative to the costs of a subjective or epistemic perspective of causation. This is the problem of objectification. Spohn (2012) claims that we can choose one of three paths. The first is to ignore the issue and use the tools of the theory from a *means—end* perspective. From a second perspective, one may be *ecumenical* and say that the theory can have several interpretations. Finally, the last way is to get involved in the problem of a mind-independent notion of causation, principally regarding the ontological commitments of the natural sciences. Spohn follows the last path and starts a *projectivistic projectivity* approach.

To be explicit, an objective (possible) law is a true or false generalization backed up by an objectifiable persistent ranking function, and an objective causal pattern (or law, if generalized) is a true or false pattern of succession backed up by a ranking function that is objectifiable w.r.t. its (subjective) causal relations. Or as I titled my (1993a): causal laws are objectifications of inductive schemes. (Spohn, 2012, p. 469)

At this point, it is crucial to claim that for this work, perhaps we do not have specific costs to pay. This is because the ontological commitments to social reality as we set in § I.2 are purely mind-relative. Social reality is a product of—at least at this moment—human minds and, therefore, is epistemic and mind-relative. This causation model is workable for our purposes, and, just for the moment, to take the first or the second path is quite enough.



Two Lectures on Epistemic Normativity



Introduction

This chapter is devoted to the epistemic normativity entailments of ranking theory. In Spohn's account, epistemic normativity is structured by the formal rules of doxastic rationality. In this sense, the laws of belief become the rock-bottom and structure of rationality. The role of inferences, as outlined in the previous sections, is not the whole story:

Our scheme of inferences is not merely a big switching yard in which we can move to and fro and up and down. Somehow, our inferences must start somewhere in order to arrive somewhere; somehow we form unconditional beliefs in the end; having only conditional beliefs would be useless. (Spohn, 2012, p. 472)

Therefore, Spohn addresses two main topics regarding a well-accurate grounding for an epistemological normativity frame four our inference *switching yard: perception* and *a priori belief states*. Of course, the link and goal related to these two aspects is achieving knowledge, that is to say, at least, true belief. In that sense, achieving true belief in a normativity perspective is then addressed to the conception of a justified belief. Hence, the first problem to deal with is the concept of *justification*; this task will reveal the origins of justified belief and the right path to a normative picture of knowledge.

On the other hand, the a priori structures of our cognitive system complete the epistemological normative frame. A priori structures are another type of epistemic justification and normativity that seems to be independent of experience. Spohn's *dynamic apriority* backs a flexible conception of apriority that could match different doxastic states of the mind. A priority is a dynamic notion related to our conceptual development and the structure of rationality itself. Truth-conduciveness of reasons is the key to achieving apriority normativity, given a coherentist background of the notion of truth.

Justification and Perception

The traditional starting point to study justification is the *Agrippan trilemma* (Klein, 1981). The initiator of the trilemma is the necessity to provide reasons or warrants for belief. A belief is justified if it has reasons supporting it. The problem arises because those grounds need to be justified, or if not, they cannot confer justification. Given this, here there are the horns of the trilemma down the spotlight of ranking theory:

Having to give reasons for the reasons already specified we are caught in an infinite regress that we can never exhaust and that never produces any grounds for us to eventually stand on. Can it be escaped? Yes, we might try the second horn and stop the regress at some basic grounds that, exceptionally, are not in need of justification. Some disrespectfully call this dogmatism. The more familiar and positive label is foundationalism. In any case, the task is then to more specifically characterize those alleged basic grounds and to clear up the mystery of how they can be exempt from justificatory demands. If one despairs of resolving this mystery, one might finally reach for the third horn and accept that in the process of specifying reasons one must sometimes (always?) return to reasons already adduced at some earlier stage. This might be denounced as a justificatory circularity, or one, can acknowledge it as the basic logic of coherentism. (Spohn, 2012, pp. 474-475)

Hence, given the trilemma hypothesis, Spohn starts to think about the nature of justification through the proposal of ranking theory and the mechanism of relations of reasons. He places his proposal within the main conceptions on the possible relation of reasons, as follows. The first conception is the *positive relevance conception*. Spohn endorses this perspective in his work, as § 3.2 shows. The second is the *deductive (demonstrative) conception*. The entailment of reasons is the mechanism of this dominant conception. The deductive approach is a good tool for strong reasons; however, it is insufficient to explain non-monotonic reasons, as presented above in § 3.2. The third conception may be called *computa*- *tional.* Reasons are reasons with respect to a particular set of inference rules. The most important thing to this conception is to state the rules that govern inferences. This perspective is not just related to deductive models; several non-monotonic computational models of inference exist. Finally, it is the *causal* conception of reasons. A belief is a reason for another if it is a cause. The big problem with this last conception is that belief is *dispositional*, and, in that sense, it is hard to say that one belief *causes* another. First, we have to deal with normative aspects and then try to grasp the relation of causality and these doxastic states.

As expected, Spohn chose the first one as the more convenient and the core of his proposal. The task of achieving good reasons requires criteria to satisfy standards of rationality, and in his view, the positive relevance conception of ranking theory is a good place to find it out. Ranking theory can help us move from the concept of being a reason to the concept of being justified. Let us see how the mechanism works. As we saw in § 2.5, ranking theory laws assign degrees of (dis)belief to a particular set of propositions given the degrees of (dis)belief of another set of propositions. This leads to the coherence between degrees and then to justification. Spohn says: "Justification explained: Degrees of justification or justifiedness are degrees of (justified, rational) belief and hence positive ranks" (Spohn, 2012, p. 481). This is the first step, that is, to say what we mean with justification. The second step is to find out what makes beliefs justified and whether internal or external this justification is the case.

According to a mainstream called *evidentialism*, what justifies belief is evidence. If you possess evidence to believe *A*, then you are justified to believe *A*. "In this view, evidence consists of perceptual, introspective, memorial, and intuitional experiences, and to possess evidence is to have an experience of that kind" (Steup, 2018, p. 2.2). That kind of experience represents *A* as a true belief. However, *reliabilists* claim that this is not enough. Indeed, the evidence is important, but experiences are justified if and only if they result from a reliable cognitive process of perception, memory, among others.

The other dimension of the justification is related to the context of justification or the *internal* vs. *external* debate. Firstly, we have to deal with the *internalism* account. In the internalism approach, the justification factors are mental states accessible through reflection. On the other hand, *externalism* claims that something external to the mind, certain external conditions, turns belief into knowledge and justifies belief. Spohn (2012) moderately argues about this debate:

So, my overall impression is that the confusing manifold of positions in the theory of knowledge essentially results from partial (attempted) externalizations and objectifications of the various aspects of the internalistic picture that I have out lined and that I take to be basic. (p. 486)

Spohn claims that the debate is a misunderstanding of the consistency and behavior of the sources of knowledge justification. Hence, the problem now goes to the first justification source: perception. Spohn (2012) explains his argument as follows:

The answer appears obvious: somehow, it comes from perception. All mental activity depends on perceptions; without perceptions we could not acquire any concepts whatsoever; perceptions are the elixir of our minds. This is not quite the right sort of dependence, though. Sure, we could not even acquire a priori beliefs without perceptions, since even a priori beliefs presuppose concepts, and concept acquisition rests on perception; however, the justification of a priori beliefs, if there is any, does not depend on perceptions or perceptual evidence. Still, all our a posteriori beliefs are justificatory dependent in this way, and we need to more specifically describe this dependence. So our task, finally, is to understand the role of perception in belief formation. (pp. 486-487)

For justified beliefs that lead to knowledge, we need sources with a reasonable degree of reliability. Perhaps emotions or biased prejudices are not the best candidates. However, perception qualifies very well. Besides this, perception is an excellent pivot to evidentialism and reliabilist accounts and to the externalism and internalism debate. In this sense, Spohn chooses perception as the starting point to set a reading on how the dynamics of belief are driven. Fact perception is the idiom relevant to us; if I perceive that A, it is analytically implied that A is actually the case that I believe that A. Indeed, fact perception is the paradigm insofar knowledge is at least justified true belief, that A is the case and I justifiably believe that A. This is what everybody using our terms must say. (Spohn, 2012, p. 487)

The structure of perception is traditionally defined as the *causal theory of perception*. We can define it in this way:

If a perceives that A, then the fact A is a cause of a believing A.

This results in the thesis that perception entails true belief. The causal theory of perception is thus essentially a robust paradigm of valuable knowledge for Spohn's agenda. However, as we saw in § 3.4, direct causation is frame relative. Perception is relative to the conceptual frame imputed to the doxastic subject, and the causal relations, as we saw in § 3.4, are essentially relative to the doxastic possibilities of the specific doxastic subject. For instance, an object is red if and only if it looks red to those who look at it. This leads to the sum of reliable conditions such as bright daylight, normal observers, and so on. So, we can say that an object is red if and only if it looks red *under normal conditions*. Thus, Spohn arrives at the *Schein-Sein principle*:

Given that an object is looked at, the proposition that it looks red is a defeasible a priori reason for the proposition that it is red and vice versa (...) however, we need to be more explicit about the subjects and the times involved and thus we arrive at what I call The Schein-Sein Principle (defeasible version): Given that the person a attends at t to some external situation, $\Phi_{a,t}$ (A) is, for the person b, a defeasible a priori reason for A, and vice versa. The Schein-Sein Principle (unrevisable version): Given that a attends at t to some external situation under normal conditions, $\Phi_{a,t}$ (A) is, for b, an unrevisably a priori reason for A, and vice versa. (Spohn, 2012, p. 495)

The principle says that we initially trust in the perceptions of others. *Ceteris paribus*, my doxastic conditions are not different from the situation of others and then the resemblance is evident. Even counterfactually, things are supposed to appear (and be to me and the others in the same way given this normative structure. Spohn claims that my beliefs about this kind of causal perception experiences, or ΦI , now (A), are then first-order beliefs. A posteriori are the grounds of the initial doxastic states in each dynamics of belief. Acquiring such belief is thus at that initial doxastic state that is maximally certain. This argument leads directly to the *Schein-Sein-Belief Principle*:

The Schein-Sein-Belief Principle: Let $B_{a,t}(A)$ be the proposition that a believes at t that A, and let A be a proposition such that $\Phi_{a,t}(A)$ is well-defined. Moreover, assume the non-reflexive case in which either $b \neq a$ or the reason relations are considered at a time $t' \neq t$. Then, given that a attends at t to some external situation, each of the four propositions A, $\Phi_{a,t}(A)$, $B_{a,t}(\Phi_{a,t}(A))$, and $B_{a,t}(A)$ is a defeasible a priori reason for b for each other of the four propositions. (Spohn, 2012, p. 506)

This principle presupposed that normal conditions are identical for different doxastic subjects, *a* and *b*. In that sense, normal conditions entail rationality, and each doxastic subject masters the concepts that set the propositions appropriately. Of course, this is just a defeasible a priori principle; however, reaching ulterior firm rock-bottom is beneficial.

A critical dimension of this principle is the possibility of establishing a solid relationship between consciousness and knowledge. The *Schein-Sein-Belief Principle*, as we said upon, sets the initial doxastic state as maximally certain. *If* Φa , *t* (*A*) is well-defined and given to me, then I have it, or *Ba*, *t* (*A*). Therefore, I *know* I have it; if it is not given to me, *I know* I do not. Spohn explains it with an excellent example:

The usual paradigm is pain: if I am in pain, I feel-that is, I am aware of my pain; if I feel no pain, I have no pain, however painful my bodily condition may be. Conversely, if I feel pain, I have pain, however phantom-like or inexplicable it maybe. This relation is so close that it seems odd (or even ungrammatical, as Wittgenstein (1953, § 246) suggested) to say: "I know I am in pain." (Spohn, 2012, p. 509)

This ungrammatical *hinge* is the starting point of a solid epistemic normativity. Spohn develops it thanks to the *Conscious Essence Principle:* "C is a (possible) content of consciousness of subject a at time t if and only if, necessarily, C iff $B_{a,t}$ (C) (that is, a believes C at t)" (Spohn, 2012, p. 509). Belief *is*, in this case, knowledge. However, the contents of consciousness are relative to subjects and times. That is why this hinge is defeasible a priori and frame relative. One necessary entailment of this argument is the possibility of extending the *Conscious Essence Principle* to the sets of broader doxastic subjects; perhaps this is the core of this work, as we will see in the ulterior chapter. Spohn claims this is an introductory hypothesis:

I will speak only of contents of consciousness of persons like us. An interesting side issue is whether the subject a may be a group or some other social entity. Colloquially, we speak of something like collective consciousness. Often this may mean no more than common knowledge. Perhaps, though the Conscious Essence Principle fits even then. (Spohn, 2012, p. 509)

Let us keep it in mind and follow in elaborating on our normativity grounds.

Therefore, following the previous argument, *hinge* contents of consciousness are ineffable at a phenomenal level. Nevertheless, the contents of consciousness, as hinges, appear to me as sets of possibilities even if I cannot understand them as a part of a grammar or a specific language. In the proposition that something appears to me as A, the appearances depend on concepts assessed through a linguistic community or grammar. In that sense, intentional consciousness is not just sensations and feelings. Some mental activities are not *felt* in a certain way; for example, the task to finish the present work. I am not always aware or thinking about (almost) finishing it. However, that is a continuous concern and a doxastic task. Now, Spohn thinks that we can establish the difference between phenomenal and intentional consciousness thanks to the Conscious Essence Principle: "If A is an actual content of consciousness for me, I believe A, and I also believe that I believe A, etc. Thus, intentional consciousness agrees with what has been called "higher-order through consciousness." (Spohn, 2012, p. 515)"

As we saw in § 2.3, doxastically, A belief is a centered possible world that conforms to all a subject's beliefs. Therefore, I believe that A and the content of "I believe that I believe that A" are different manifestations of the same proposition. At this point, Spohn explains the resemblance of his theory to the tradition of Kant's thought: I cannot forbear the remark that this principle closely resembles the original synthetic unity of pure apperception that Kant (1781/87, B 136) declares to be the supreme principle of understanding. It says that the "I think" must be able to accompany all my representations, intuitions as well as judgments. Intuitions are part of phenomenal consciousness; judgments are part of intentional consciousness. (Spohn, 2012, p. 515)

The *Conscious Essence Principle* claims that the essence of the contents of consciousness is that they are *ipso facto* believed and, in that way, *ipso facto* known. It entails that beliefs in the contents of consciousness are true and then perfectly warranted or justified. Contents of consciousness are reliable guarantees of justified beliefs. That identity leads to understanding it as knowledge. In this sense, we can measure those propositions with ranking theory as follows: "If τ_{at} is the two-sided ranking function of a at t then for any possible content C of consciousness of a at t τ_{at} (C) = $\pm\infty$ " (Spohn, 2012, p. 517).

Hence, the rank is maximal and can be understood as a hinge or rock-bottom of our epistemic normativity. This results in the following argument on justified belief and the nature of warrants. Why I believe A is a request for reasons or warrants for A. However, I cannot give reasons for believing A, as the previous argument claims. Thus:

I certainly can do so regarding the beliefs of others, or regarding my own past beliefs, and I can reason about my likely future beliefs. My own present beliefs, however, are a peculiar blind spot for my in this respect. (Spohn, 2012, p. 518)

This blind spot is the same regarding possible actions. Reasoning on possible actions or evaluating them does not need an explanatory epistemic attitude. This is the *fuse* of the freedom of the will. Then, we can affirm that there is an ineffable basis for our belief formation, and that is why the contents of consciousness at the level of phenomena are related ontologically to the external world and link with the realm of my beliefs. However, on the other hand, Φa , t(A)is related to specific frames. It is different when the proposition is addressed to the phenomenological *now*, or to the *past* or to the future. Φa , past (A) is an object of reasoning and, of course, it starts the dynamics of belief pictured in the previous chapters.

This is the normative proposal on the cognitive system's first kind of inputs, that is, perception-founded inputs. This account combines several elements of foundationalism, coherentism, internalism, and externalism in a very interesting, novel and idiosyncratic way. So, in the next section, we will explore the normativity of the second kind of input or the problem of apriority.

A Priori Structures

The last reading is about another kind of input to our cognitive system. This section will deal with the a priori structures of our cognitive system. A priori structures are another type of epistemic justification and normativity that seems to be independent of experience. Traditionally, they rest on certain propositions that obey the principle, but their form and innate cognition faculties determine their propositional content. For instance, Kant's pioneer famous definition claims that: "(a priori knowledge) is knowledge that is absolutely independent of all experience" (Kant, 1787, B2-3). Contingent facts or objects do not determine the content of this kind of knowledge source. A judgment is a priori if and only if it is necessarily true (Kant, 1787, B3-4). In Kant's account, a priori is thus linked with conceptions such as *contingency* is *always* a modality related to facts and necessity is equivalent to universality (Hanna, 2017, 2.2.1).

Kant founded the distinction between analytic and synthetic judgments and the relation with apriority. *Analyticity* is truth under conceptual or linguistic meaning sources, and *syntheticity* is truth given empirical sources. The former is then necessary judgments, and the latter is contingent. As we will see later, these are the two primary sources of apriority, and the first is perhaps the most explored. In that sense, analyticity and apriority are sometimes commensurable for certain philosophical accounts (Hanna, 2017, 2.2.1).

This classic reading founded in Kant's approach gives rise to conceptions such as innate ideas, idealism, and several approaches

claiming that empirical evidence can *never* override this knowledge. Similarly, Putnam (1983) claims that a priori knowledge is not defeasible; in his view, we have certain rational propositions grounded a priori that we believe, and there are rational propositions that *must* be justified a priori.

In the foregoing, I use the idea of an absolutely "unrevisable" truth as an idealization. Of course, I agree with Quine that this is an unattainable "limit." Any statement can be "revised." But what is often overlooked, although Quine stress it again and again, is that the revisability of the laws of Euclid's geometry, or the laws of classical logic, does not make them more "empirical" statements. (Putnam, 1983, p. 496)

A priori is thus not defeasible at all. Necessary truths are just analytical propositions. The breaking point is that certain necessary truths can be justified as knowledge through empirical sources. This is evident, for instance, in the arguments of Stegmuller (1965) and Kripke (1972):

Of course, it is only a contingent truth (not true in every other possible world) that the star seen over there in the evening is the star seen over there in the morning, because there are possible worlds in which Phosphorus was not visible in the morning. But what contingent truth shouldn't be identified with the statement that Hesperus is Phosphorus. It could only be so identified if you thought that it was a necessary truth that Hesperus is visible over there in the evening or that Phosphorus is visible over there in the morning. But neither of those are necessary truths even if that's the way we pick out the planet. These are the contingent marks by which we identify a certain planet and give it a name. (p. 274)

Following Kripke, there are several *contingent truths* justified a priori, such as the proposition "the standard meter stick in Paris is a meter long." These tautological contingent propositions are a solid challenge to the classical approach.

Nevertheless, the great challenge is the possibility that some evidence can override several a priori propositions, first a priori justified, such a the a priori justified belief of Kant himself that geometry is a priori based (Kant, 1787). Several counterexamples can illustrate that a priori justification cannot be independent of experience (Russell, 2017, §.2). For instance, propositions such as "All dolphins are mammals" and "All penguins are birds" are analytical and a priori. However, we achieve this knowledge given a certain relevant set of experiences (*in time*) and then seem defeasible in a certain sense. Evidence, driving epistemic change, and conceptual achievement are substantial challenges to the traditional account.

On this wise, there is a debate about a firm conception of a priori justification and a defeasible version of the a priori justification. The key to solving this debate perhaps lies in what Russell (2017, §.4) sharply points out: "A more plausible requirement is that a priori knowledge and justification be independent of all experience beyond what is needed to grasp the relevant concepts involved in the relevant proposition." To be a priori justified is to be justified *by enabling* experiences.

Spohn's position in this debate is founded in ranking theory and tries to establish a novelty epistemic normativity solution on a priori justification. Spohn's reading is twofold; there is unrevisable and defeasible apriority. Here is the definition given:

A doxastic state is unrevisably a priori iff all possible rational doxastic states have it, and defeasible a priori iff all possible initial doxastic states have it; derivatively, then, these two notions could be carried over to propositions (or judgments or sentences). (Spohn, 2012, p. 522)

We can call this approach *dynamic apriority*. Spohn bets for a flexible conception of apriority that could match with different doxastic states of the mind. Apriority is a dynamic notion related to our conceptual development. The task given such a definition is to establish how these doxastic states or beliefs are structured conceptually in a certain way. The example of the bachelor explains it perspicuously:

It seems obvious that, typically, belief contents are conceptually structured in some way. That all bachelors are unmarried should turn out to be unrevisably a priori, indeed analytic, but it cannot be believed by someone who has not acquired the concept of bachelor and does not know what a bachelor is. This, it seems, refutes our original explication: that all bachelors are unmarried is not believed in all possible doxastic states; at best it is believed in all possible doxastic states mastering the concept of a bachelor. What can and cannot be believed in a given doxastic state is relative to the conceptual means acquired by or in this state. (Spohn, 2012, p. 523)

An unrevisably a priori state, as the bachelor one, requires having beliefs involving the concept "bachelor" if and only if the doxastic subject masters this concept. As in the previous section, this kind of normativity is frame relative. Just in that sense, the proposition is unrevisably a priori. Only the concept acquired *ceteris paribus* allows us to establish the unrevisable a priori feature. This is a good explanation of this topic:

We may indeed say that Euclidean geometry was unrevisable *a priori* in the sense explained here, as long as this geometry was the only conceptualization of space at our disposal. Kant was right; no experience whatsoever could disprove Euclidean geometry. This changed with the extended conceptual means provided by the invention of non-Euclidean geometries; only then could we even begin to ask whether experience conforms to this or that geometry. In this way, even the unrevisable *a priori* may be subject to change. (Spohn, 2012, p. 526)

On the other hand, and following the frame relative normativity proposal, a doxastic state is defeasible a priori just if and only if: "Each possible initial doxastic state capable of having this feature has it- where a doxastic state is initial with respect to this capacity iff the state has (acquired) the capacity, but not further exercised or applied it" (Spohn, 2012, p. 524). In other words, noticing not normal conditions leads to a defeasible state of the priority given to the first doxastic state. As presented in the previous section, *ceteris paribus*, my doxastic conditions are not different from the situation of others. The Schein-Sein Principle claims that my initial beliefs or Φ I, now (A) are then first-order beliefs. So, they are the grounds of the initial doxastic states in each dynamics of belief and, therefore, maximally certain. As we say, normal conditions entail rationality, and that each doxastic subject masters the concepts that set the propositions appropriately. This is the sense of defeasible apriority because learning and dynamics of belief can change this first hinge, as we saw in § 2.5.

At this time, the distinctions on a solid or defeasible apriority are relative to just one source of the apriority: *the conceptual apriority relation*. As the classical traditions present, several forms of the relation between concepts and the apriority structure exist. The first form is analytic truths or a priori necessary truths. Second, there are a priori contingent truths, such as the meter stick in Paris or Sir Edmund Hillary on the Everest for the first time ("the first to climb Mt. Everest climbed Mt. Everest"). Spohn asserts that there is another kind of defeasible relation between the concepts and the a priori. There are defeasible a priori propositions given conceptual grounds. This is explicit in *ostensively learned concepts* as "dog" and "witch." "There are dogs" is defeasible a priori because it is true, but it may change to be false. In the case of the "witch" concept, it is easier to grasp the difference. Spohn (2012) exemplifies it as follows:

Take e.g., the ostensively learned term "witch." Of course, one can ostensively acquire that term only by also coming to believe that there are witches. Later on one learns that witches are essentially possessed by the devil, and since there is no devil, as we know today, there cannot be witches. (p. 526)

These ostensively learned concepts need a more vivid development, perhaps in other work, given our present goals, because these analytic propositions are almost the first source of conceptual acquisition (Watkins, 1957).

Consequently, these are the conceptual origins of the a priori. However, Spohn claims another origin of the a priori structures. Following Kant (1787) and his synthetic principles a priori project, Spohn wants to construct another source of the a priori outside the conceptual relation. Kant's project was difficult to achieve because of several unintelligible features and ontological commitments (Stegmuller, 1965). The reaction of logical empiricists made the business clear (Carnap, 1934); there are just empirical and conventional truths. For Carnap (1942), analyticity is relative to grammar and languages (p. 247). Hence, we cannot think of the first source, conceptual relation. Therefore, synthetic a priori is almost senseless. Quine (1951) criticizes the notion of analyticity because of the inner circularity of the definition and the lack of empirical criteria. His new perspective

about an epistemology without the notion of analyticity is still, in a certain sense, to be fulfilled (Creath, 2017, § 4.3).

This account was dominant until Kripke's reflections. Following Kripke, there is a gap between metaphysical and epistemological modalities, as we saw (Kripke, 1972). Apriority and necessity then are driven by different kinds of modalities. Therefore, is relative to different models of modality. Nevertheless, for Spohn (2012), Kripke's claims are still in the field of conceptual a priori relation:

As I just tried to indicate Kripke's apriority still was of an exclusively conceptual origin, whereas Kant's notorious necessary conditions of the possibility of experience intended to more generally refer to the constitution of our mind, our intuition and our understanding, and not merely to what comes along with the concepts we happen to acquire. (p. 527)

So, to keep going, Spohn traces a path analogous to Kant's. Like Kant, Spohn focuses the inquiry on the doxastic subject. The logic-syntactic structure of a judgment expressed by a proposition is not enough. Given a specific epistemic frame, the doxastic subject projects themselves cognitively into the world. Hanna expresses it precisely when he refers to Kant's judgment theory:

The judger cognitively orients herself in the world by projecting the object under specific points of view (Gesichpunkte) or modes of presentation that would also be typically cognitively associated with the constituent concepts of the judgment by any other rational human animal in that context. (Hanna, 2017, 1.3)

The new path to find another source of apriority is then *rationality itself*. Firstly, as Kant did, Spohn claims that "all principles of theoretical rationality are unrevisably *a priori*" (Spohn, 2012, p. 527). For instance, consistency and deductive closure are unrevisable *a priori* notions. For example, all the fundamental axioms of probability are then part of the form of our thought. However, *where* are the axioms and boundaries of our thought? Like Frege (1984, pp. 289-311), Spohn answers that this is *a logical inquiry* guided and aimed by the word *true*. Therefore, the idiosyncratical way to do this special task is to "discern the laws of truth" (Frege, 1984, p. 259). The first step to achieve that goal, the normativity of certain unrevisable *a priori* axioms, is looking at the connections between reasons and truth from Spohn's perspective.

The first dimension to set that relation is the first person's perspective. The first guarantee of truth is our fundamental beliefs. Contents of consciousness are the kind of guarantee for truth and reason relations:

From the first- person perspective the answer seems obvious: Reasons induce belief; and to believe something is to believe it to be true – so much is tautological. Therefore, reasons bring me closer to the truth; this is what I have to think and say (...). Apparently, the force of the question only appears in the third-person perspective. You, or God, or the scientist, may respond to me: "Sure, this is what you have to say; you always believe that you believe the truth. However, we would like to question whether this is really so, whether, and to what extent, your impressive rational powers dispose you to dispose you to find out about the actual truth." (Spohn, 2012, p. 537)

The guarantee of the first-person perspective is given by identity because the actual contents of consciousness are identical regarding their beliefs. Our fundamental beliefs are thus justified a priori. However, as Spohn quoted, we are forced to walk into the second dimension or, in other words, into the third-person perspective. The point is that in this perspective, *I cannot* make a solid commitment to normativity because *normativity is, in fact, an internal discourse*. To ask an external source of normativity about epistemic issues is a sort of senseless heteronomy. Neither God nor scientists or teachers can answer this question. The first-person perspective is the frame of normativity. Spohn (2012) asserts:

However, the first-person perspective is not my private one, it is that humanity, not only of actual humanity, but the entirety of potential participants in normative discourse. And that entirety cannot ask someone on the outside. Surely, we can try to figure out in that discourse what the external scientist, or God, would say. However, this would just be another move within the internal normative discourse. (p. 538)

Therefore, we must set a truth notion that fits this internal normativity discourse. As we saw in § 4.2, Wittgensteinian correspondence truth theories are related to the third-person perspective; this approach is related to a cognitive relation with the external world. So, this approach is not enough for our purposes. Nevertheless, Spohn's (2008) account of the two-dimensional truth is perfect for this task. We can appeal to a coherent and pragmatic sense of truth to justify our epistemological mechanism.

Coherence theories state that the truth of a proposition is the coherence of such proposition regarding an explicitly given set of propositions (Young, 2018, § 1). In both cases, truth-bearers and truthmakers are propositions. The set given is then a power set of the possible propositions believed or taken to be true. In the case of Spohn's account, we can talk of so-called *beliefs in use* because beliefs are dispositions that fall in a vast counterfactual exercise of exclusion of possible worlds, as we studied in § 2.3. This *superset* then is just a structure or general unsaturated truth possibilities. Philosophers like Putnam (1983) claim that this superset is the limit of inquiry or the set of beliefs of an omniscient being. However, that is not a real problem for Spohn's belief theory.

Ranking theory is, in this sense, a coherent theory of truth. Ranking theory shows that a system of beliefs is coherent with respect to a centered doxastic subject. Of course, the inductive normativity explicit in the dynamics of belief, reasons, and causality is the epistemic justification of truth conduciveness. Ranking theory axioms construct this kind of a priori unrevisable structure of reasons. Truth-conduciveness of reasons is then the key to setting an appropriate truth notion. I think I receive direct beliefs, and thus, I have to believe it. To have them is to take it to be true. However, they might turn out to be false; to be absolute truth, they must resist further learning stages. Truth is thus a dynamic achievement. For each truth, there is a truth reason. The *laws of belief* the set of ranking theory axioms, give rise to the internal task to achieve the system's truth and coherence. Spohn (2012) synthesizes this: "The slogan "truth must be believable" suggests, rather that the totality of true reasons in favor of some true atomic proposition A outweighs the totality of true reasons against A. Otherwise, one could not ultimately believe A" (p. 546).

Moreover, here emerges the correspondence theory of truth in its bidimensional account. As we saw in the previous section, percep-

tion guarantees the justification of external input and, in that sense, the starter of this dynamic task of finding the coherence of truth reasons and the stability of our belief system. Empirical propositions must be learnable and powerfully drive the change of our degrees of belief and indicate the right way to find truth.

Therefore, this internal account of truth conduciveness is based on an ideal theory of rationality that is unrevisable a priori, which is truth in every possible doxastic state. As we said previously, this internal deliberation, from the first-person perspective, is a deliberation not inner to only one subject but to the entire epistemic first-person community. In normal conditions, truth is detectable given truth reasons and then believable.

Ranking theory can then set a collective structure of rationality and ground or a rock-bottom to a possible collective consciousness.



Making Ranking Theory Useful for the Social World
Introduction

The philosophy of social sciences is responsible for dealing with the traditional problems of philosophy and its link with the empirical study of human society. In general, the nature of social sciences is conceived as follows:

Social science will be understood broadly as including all systematic empirical research into the activities of human beings, with a special interest in those things we do together, as part of larger social groups. It explicitly includes methods like interviews and participant observation. And unless otherwise specified "theory" is not restricted to talking about causes and laws. Theory includes all the ways that social scientists formulate and express their results. (Risjord, 2014, p. 6)

The general problems of philosophy that engage with such investigations of collective human action can be divided into matters relating to the theory of value, including ethics and aesthetics, epistemology, and metaphysics. The philosophy of social sciences fits and is relevant in all these philosophical subfields. Therefore, this discipline's distinctive or essential feature is determined by its tasks in relation to such diverse philosophical realms.

The realm of epistemology deals with collective human action and establishing the possibility of sharing and building the same epistemic goals, norms, and methods. Mainstream epistemology traditionally searches for knowledge and its nature in the isolated individual. However, it is important to remark on the difference of *knowledge* in the background of social interaction and shared epistemic goals. From this, we can talk of a new branch in the philosophical study of social sciences called *social epistemology*. Douven and Schupbach (2017) explain the difference as follows:

In groundbreaking work, Goldman (1999) showed that an exclusive focus on the isolated epistemic agent was deeply mistaken. There are important aspects of our epistemic lives that can only be understood by considering our interactions with fellow epistemic agents and by studying whole collectives of agents pursuing truth in a concerted effort. (p. 16)

The central point is that what we believe or know is, in a vast sense, derived from our interaction with others. We can ascribe belief or knowledge to different social groups. Thus, the critical debate is how we can develop or construct epistemic group attitudes as a sort of aggregation derived from individual epistemic attitudes (Douven & Schupbach, 2017, p. 17). From this analysis, we can set property methods and protocols to achieve social sciences epistemic goals.

The proposal is then, as preluded in previous chapters, to set a formal epistemological account or ideal model of the epistemic normativity that grounds the possibility of epistemic group attitudes such as beliefs, knowledge, and rationality and, in the same way, methods for the scientific study of such collective epistemic attitudes. We can frame these claims in the recent and pioneer subfield of *formal social epistemology* and a novel theory in this promising realm: the ranking theory approach as a tool to face these social epistemology challenges.

The final chapter is thus devoted to developing a novel account to achieve the goal of making ranking theory useful for the social world. This development intends to illuminate certain foundational and methodological aspects of social sciences and would be helpful to philosophers and empirical social scientists. The idealized model of rationality developed by ranking theory is then applied to some critical aspects of the social world as a novel research and methodology *toolbox* for social sciences. This is the first approach of an extended research project; the present chapter is then the *riverbed* for an ulterior research project of interdisciplinary applications to test the epistemic conditions model explicated here.

Social entities and social action require normative epistemic conditions for the doxastic states of agents and social agents to set the ulterior doxastic states of other agents and groups of doxastic agents (Chant & Ernst, 2008, p. 549). The social world requires that a social agent and its members satisfy a given model of epistemic conditions to create social entities and perform collective action. Social epistemic challenges of the form: "I believe that you believe" (Tuomela, 2002, p. 28) require high-order beliefs as necessary conditions for this task. Such normativity is thus an ideal or formal theory of the possibility of establishing criteria for interactive knowledge in the sense of the pioneering work of Goldman (1999). Truth and information seeking is then essentially social:

People have interest, both intrinsic and extrinsic in acquiring knowledge (true belief) and avoiding error. It therefore makes sense to have a discipline that evaluates intellectual practices by their causal contributions to knowledge or error. This is how I conceive of epistemology: as a discipline that evaluates practices along truth linked dimensions. Social epistemology evaluates specifically social practices along these dimensions. (Goldman, 1999, p. 69)

This theoretical model of epistemic conditions or normativity for interactive or collective knowledge allows us to turn the collective formation of entities on or off and prevent or suggest collective action. Collective knowledge requires evaluating our beliefs and reasoning as justified or unjustified, and in doing so, we are making normative judgments about them. As epistemology is a normative discipline, the relation between norms, rationality, and reasons is ineluctable.

The notion of norm is commonly associated with the notion of rationality, both because norms concern what one ideally ought to do or think, and because rationality seems to be normative in the sense that it prescribes a certain kind of conduct. (Engel, 2011, p. 47)

Thus, there is a sort of twofold normative regulation. On the one hand, we have the relative regulation with respect to a certain goal (instrumental) and, on the other hand, a prescribing perspective regardless of any goal. Engel (2011) argues in this sense that "One can understand these (epistemic norms) as general requirements of rationality following from the very nature of belief and of the mental" (p. 49). Therefore, the principles of logic, probability, and ranking theory are the most general norms for belief. No one can be said to believe without these norms. The task is to guide, regulate, and implement them as part of our epistemic practices. This argument drives to the following definition:

Definition 5.1: Epistemic norms are necessary and sufficient conditions with respect to an epistemic state if and only if warranted by a perceptual or a priori justified reason.

Ranking theory expresses these two general views on normativity and is the rationality model or riverbed used here to achieve the complex means-end to obtain knowledge in the social world.

The first step is to develop this novel epistemic normativity riverbed to show the link between ranking theory and the so-called building blocks of social reality. In the second section, we shall see the many tools derived from ranking theory applied to the social world. First, the tool of the dynamice of reasons and its entailments is the ceteris paribus account of social sciences and a methodology model grounded in causality. Then, we shall see the normative entailments to the internal normativity of social sciences and the paradigm of the internal deliberation for social sciences. Finally, we will argue for a further research horizon regarding the present proposal and Artificial Intelligence.

The Building Blocks

The foundational *building blocks* of social reality are propositions. The present approach is similar to John Searle's pioneer account of *The Construction of Social Reality* (1999) and Spohn's reading of society in 2011. In this sense, social facts depend on the human mind and are a human creation. Searle's (1999) pioneer account affirms:

How can there be an objective world of money, property, marriage, governments, elections, football games, cocktail parties and law courts in a world that consists entirely of physical particles in fields of force, and in which some of these particles are organized into system that are conscious biological beast, such as ourselves? (pp. xi-xii) This *invisible ontology* requires special kinds of entities. Such entities are thus mind-dependent but, at the same time, need to be objective. Only this *objective* character guarantees the possibility of establishing knowledge and science in this ontological realm. Therefore, social facts must be *independent of particular states of mind* in the sense of particular representations. In this way, candidates to fulfill this ontological commitment are propositions. Social facts are then social propositions.

Given the ranking theoretical approach, propositions are sets of possibilities in a given space of possibilities. The following definition makes clear the force of this assertion.

Definition 5.2: A is a social proposition iff S is the power set of social possibilities and propositions (A, B, ...) are subsets of S.

Social propositions are then counterfactuals; such propositions are believed if, firstly, in a sort of epistemic move, we exclude the complement of the set of a given proposition as taken such complement as not believed. That is to say:

Definition 5.3: A is a social proposition believed by a subject s at a specific time t, Bst (A) iff the subject s excludes all possibilities in $\neg A$ at a specific time t.

A social proposition is a centered possible world or counterfactual standard represented as SP = Bst(A).

Social propositions are thus an exercise of counterfactual reasoning; i.e., the previously described epistemic move. The objects of social belief are not necessarily a concrete world of facts but rather a set of intensional counterfactual referents.

Social propositions (SP) are epistemic dispositions, and their content is beliefs. Then, they became social knowledge only if:

Definition 5.4: SP (Bst (A)) is social knowledge iff SP (Bst (A)) is true.

Therefore, social propositions are the counterfactual exercise to assent to a truth function. Of note is that dispositions, social beliefs, and propositions are epistemic states, not necessarily taken as true beliefs. A centered doxastic subject at a particular time could have false beliefs and reasoning. The social world is then an epistemic dimension, a set of epistemic possibilities or noumenal worlds that can represent a complete manifold of experience, even far away from our actual world. Social reality or social world is not a necessary world; it always could be different.

The epistemic task of belief in social propositions requires a counterfactual test or epistemic reasoning process of exclusion of possibilities. Therefore, it is an inference process guided by certain epistemic normativity. To believe a social proposition is to be led by a means-end intention of taking such propositions as truth. However, taking it to be truth is related to a coherentist sense of the word truth. Coherence theories affirm that the truth is the coherence of a proposition regarding a given and specific set of propositions.

Nevertheless, the pursuit of truth is not easy. Subjects practice very often the counterfactual test of beliefs. It is hard to establish certainty on many subjects because *the big sets of social beliefs come in degrees of certainty*. To avoid this difficulty, ranking theory provides a formal mechanism to measure degrees of certainty in social sciences propositions. The mechanism of measuring is twofold. There are two kinds of social propositions and two kinds of social beliefs inferential normativity. First, we have static a priori beliefs and, then, inferential or dynamic beliefs supported by perception and evidence. Following the standards of probability theory, ranking theory dynamics of belief can be understood in terms of conditionalization.

Definition 5.5: The probability P(A) is a condition to the subsequent probability P'(A), given certain evidence E and P(E)>0, iff P'(A) = P(A/E).

This substantial idea, borrowed from Bayes's theorem, leads to the ranking theory idea of the simple conditionalization law. The evidence reduces the space of possibilities of the power set S for our business. The counterfactual test required is fulfilled thanks to this epistemic normative device or epistemic mechanism.

However, the probabilistic perspective is, in a certain sense, insufficient, as pointed out in § 1.4. Ranking theory is a solid tool to measure degrees of belief and the dynamics of social beliefs and propositions, as evident in the following definition:

Definition 5.6: SP ((Bst (A)) is a social static belief iff SP ((Bst (A)) is consistent and has deductive closure.

Propositions of social belief sets are believed to be consistent and closed under logical consequence mechanisms. These first ground belief laws make a solid commitment to truth and scientific knowledge possible. Maintaining true sets of beliefs is an important epistemic agenda, led by the commitment to getting to the truth and avoiding an error.

Given these fundamental first-order laws of belief, we can start the task of measuring degrees of belief. The first case of normativity, given such important laws, is belief conditionalization. Any dynamics of belief ruled by consistency and deductive closure leads us to a ranking function. Ranking functions measure the reliability or degree of a specific social proposition. Given this formal mechanism, we can measure and test the strength of the social building blocks of social reality, as we shall see in the next section.

If an agent wants to achieve the goals of getting to the truth and avoiding error regarding social propositions, they should obey the ranking theory norms as an epistemic reasoning model. That does not mean obeying implies telling what content they must believe. These norms establish objective criteria to obtain this means-end agenda, that is, social scientific knowledge.

As explained in the second and third chapters of the book, ranking theory measures mechanisms and laws of belief account entail a set of epistemic conditions and normativity evident in the employment of different philosophical applications. For our task, these building blocks can be set as a methodology toolbox for social sciences and the achievement of social knowledge. In the next section, we shall explore specific models of applications as a methodology epistemic criterion for the social world.

A Methodology Toolbox

Reasons and society

Ranking theory applications could behave as a methodology toolbox for social sciences. On the ground that social propositions are the building blocks of social reality, such blocks require a reasonable epistemic justification as warrants of the whole structure. A justified building block is what ranking theory calls a reason; the social world is built thanks to *reasons*.

A reason is a mechanism of confirmation of a hypothesis given certain evidence. The confirmation of a given hypothesis is connected with the concept of epistemic relevance, as remarked in § 3.2. The support of evidence drives the change in the degree of firmness or credibility of a specific social proposition; that is what relevance indeed means.

Ordinary language statements like "A confirms B, A supports B, and A is a reason for B" portray the relevance concept. Ranking theory formal definitions allow setting a model of reasons such as:

- i. A is positively relevant to *C* iff τ (*C*/*A*) > τ (*C*/ \neg *A*)
- ii. A is irrelevant to C iff τ (C/A) = τ (C/ \neg A)
- iii. A is negatively relevant to C iff τ (C/A) < τ (C/ ¬A)

(Skovgaard-Olsen, 2014, p. 76).

This model of relevance is a non-monotonic model of reasoning, a model of transmission of epistemic justification. The unique value of this model is evident in everyday life events of the social world. Epistemic transmission of justification and inferential reasoning are vital tools for modeling the prediction of events, grounding and reinforcing already justified beliefs, or revising and changing others. Ranking theory is a *means* to measure the force and strength of such reasons or justified beliefs in social sciences.

A critical feature of reasons already explained in § 3.2. is that reasons are relative to doxastic subjects, and, again, it should be highlighted that different doxastic subjects do not need to always agree on their reasons. Here arises an important claim of the proposal: in the social world, doxastic subjects are not just individuals but *collective doxastic subjects*.

This novel notion needs to be more detailed, settled, and explained. The key question is: *How to expand this individual epistemic notion to a group of epistemic subjects?* In this sense, how do we share reasons? Moreover, how are we expected to infer and transfer justification as social epistemic agents? The following definitions formally clarify this thought issue.

Definition 5.7: A is a collective doxastic reason iff such a reason is the arithmetic mean or average of the two-sided valued ranking functions measures of belief firmness and relevance of each member of the collectivity, formally:

Given {*τ*1, *τ*2, ... *τn*}

 $\mu(A) = \frac{1}{n} \sum_{i=1}^{n} \tau i = \tau_{1+\tau_{2}+\dots+\tau_{n}}$

The result is then a Supererogatory, Sufficient, Necessary, or Insufficient reason regarding such warrant or social proposition.

Definition 5.7 engenders the notion of the *social epistemic agent*. A social epistemic agent is an intensional concept defined as the result of the previous equation at a particular time. The social beliefs resulting from this process constitute a social epistemic agent as the set of collective doxastic reasons for a group of individuals at a certain time.

In this sense, we can establish the dynamics of belief in the same way as individuals and expand the mechanism to collective doxastic reasons and social epistemic agents in a given time. Doxastic collective reasons are the social propositions we are trying to achieve. Language is the representation but just a contingent feature that makes patent the assent to a given social proposition due to the epistemic normativity of ranking theory. This model is thus fruitful if and only if each subject *obeys* such an epistemic normativity model.

Given this model and the ranking theory normativity, the dynamics of social beliefs or the weight of reasons for social epistemic agents are driven by evidence-guided conditional inference. The vast and extended recognition of evidence produces a revision or change of social beliefs.

Here, it is a paradigmatic example. The failure of Ptolemy's geocentric model of the universe, based on Aristotle's requirements for the uniform circular motion of celestial bodies, led Copernicus (1992) to a heliocentric model. The model has a direct relationship between the planets' distance and the orbits' size as the principal warrant. This is the theory starter of an extensive social process, the scientific revolution (Rabin, 2015). The Copernicus hypothesis starts the counterfactual test and the measuring and reliability of several social beliefs, beginning with individuals and certain influencer persons such as Luter, Tycho Brahe, and Clement VII. Here starts the revision process of beliefs with evidence; this is a progressive path. The new evidence compiled, for instance, by Brahe, Kepler, and Cassini, drives a change in certain fundamental social beliefs regarding the so-called weltanschauung of a given social set in time. This process is asymmetrical, and that is why plenty of communities, at the same time, still firmly believed in the Ptolemy model as a strong hinge. Evidence drives the change, but it differs from the belief change of isolated and social individuals. Moreover, the belief change is different given the scale of members of a determinate community.

The model of Definition 5.7 expresses the whole thing. Epistemic changes of belief in a social background are asymmetrical with respect to individuals. A necessary entailment of this claim is that the epistemic dynamics regarding social groups is slower than the dynamics applied to individuals. In this sense, they are slower in direct relationships regarding the number of members of the social groups. Nevertheless, the force and commitment are more potent as a social belief in larger groups than in small ones. Social epistemic agents such as democracies, assemblies, families, tribes, and so on can have individual subjects with good epistemic normativity skills who obey evidence but do not champion their claims because of the consequences of Definition 5.7 regarding a specific social proposition. This happens because beliefs are dispositions. Provided certain normativity, just the pretension to get into the truth and avoid error guarantees social epistemic agents in the pursuit of knowledge. We cannot change the sets of beliefs in the social world and thus, the social world itself, without this dynamics of reasons. However, as we shall see later, freedom is a sort of epistemic fuse for individuals with respect to the realm of the *individual itself and social groups*. *Individuals do not need to engage consistently in social behavior and, of course, in social epistemic states*.

Normal conditions in social sciences

Given ranking theory normativity, ceteris paribus clauses or normal conditions clauses is a central topic for social sciences' methodology. This model of defeasible reasoning leads to an important application. Ceteris paribus laws are the case under normal conditions in a certain ontological realm. We obtain high probable conditions in a specific counterfactual or possible world.

Spohn's ceteris paribus account is a normal conditions interpretation in a ranking theoretic epistemic approach, as explained in § 3.3. At this point, it is good to return to this issue to fulfill our purpose. We can define *normal* as the not unexpected. Ceteris paribus laws aim to establish criteria to make claims that can be true or false, confirmed or disconfirmed. All this arises because scientists and philosophers of science have several difficulties in achieving certainty about such claims. Ceteris paribus clauses are then a sort of ideal epistemic condition.

Hooke's law, for instance, allows us to know about good manufactured springs. Ceteris paribus means in this case not being exposed to extreme forces, temperature, or other *exceptional* conditions (Spohn, 2014, p. 386). Interpretations of ideal conditions of the speed of light lacking resistance are a valuable model; nevertheless, they always introduce further problems in the commitment to the truth or confirmation of such hypotheses. The question is then: How to ground truth conditions? How to set an appropriate epistemic space of conditions? Spohn claims that ceteris paribus laws are epistemic normativity criteria or default rules beyond the problem of truth conditions (Spohn, 2014, p. 391). Spohn (2014) upholds: "First, within the epistemic interpretation, the meaning of an utterance is not a truth condition, but the mental state expressed by that utterance" (p. 392).

Epistemic states express beliefs and sets of beliefs. Moreover, an epistemic account is not related to truth conditions but to belief expectations. Belief formation is a task related to the belief of our possible beliefs, that is, our conditions to make inductive reasoning. Therefore, the ranking theory approach to ceteris paribus laws is grounded in the mechanism of conditional belief, the relevance approach of reasons as explored in § 3.3.

As agents and scientists we continuously have beliefs, expectations, conjectures and we do so unconditionally as well as conditionally, and we may or may not believe or expect the conditions to obtain in turn. (Spohn, 2014, p. 393)

Accordingly, the expectations account as a root of normal conditions clauses needs a belief theory and an inductive logic model. Ranking theory fulfills these requirements, as hitherto argued.

Initial rank τ can be interpreted as an initial belief credit, or in ranking theory code, a defeasible a priori hypothesis, on conceptual grounds, and given the mastering of such concepts. This initial rank allows learning with inductive logic, starting from the dynamics of such initial credit.

The dynamics of belief is here changed to a learning process from this initial credit. Thus, how do we learn from the initial rank τ credit? The laconic answer is "Conditionalizing on the data observed" (Spohn, 2014, p. 402). Applying ranking conditionalization, we can figure out the behavior of our expectations.

The means-end is to maintain a reliable hypothesis with as few violations of expectations as possible. Thus, normality is meaningful in a particular environment or background. For the social world, normal conditions are epistemic conditions in the following sense: a social epistemic agent's belief in certain *a priori* defeasible relations of phenomena given a specific fixed background or a power set of social propositions.

Ceteris paribus clauses are necessary and sufficient reasons that work as reasoning conditions or hypothesis conditions to reasoning. We believe defeasible a priori the hypothesis or ceteris paribus law if we believe that:

Definition 5.8: $H = S \rightarrow (D \leftrightarrow R)$ is defeasible a priori given S, and D is a necessary and sufficient reason for R.

For instance, ceteris paribus clause of demand: The scarcer the supply, the highest the prices, formally: *CP if x is* $y \rightarrow x$. Supply curves relate price and quantity under the assumption that the other factors do not change. The expectation is that the relevant economic factors do not change, except the product's price. The ceteris paribus law of demand does not hold if the expectations are not met.

Several factors can affect the clause regarding the production of products. For instance, in a factory of cars, the increase in steel prices could affect the curve of production and thus the price of each car. The factory will obtain fewer profits, so it will not manufacture the same quantity of cars. Among other exceptional conditions, we can posit natural or weather conditions, specific unexpected policies, and the rush of certain technology advancements. All these disturbing factors set and start the revision of beliefs and the dynamics of inductive reasoning.

Ceteris paribus laws are, therefore, the defeasible or a default clause obtained *after* such a revision process. Therefore, given ranking theory normativity, they can be modeled with the model of relevance and the dynamics of reasons as argued in the previous section. A linear process of relevance revision can obtain the normal conditions clause a in specific fixed background (Spohn, 2014). At the same time, this is one of the basic ideas of the causal account regarding social sciences that we shall see in the next section. Therefore, recalling the theory introduced in § 3.3, the final power tool of ranking theory in social sciences is the model of causation.

Causation in social sciences

The intuitive core idea of causation is the association between different kinds of events and the expectation of one following another. The tendency to form such a habit is inherent to the dynamics of human beliefs. The ranking theory approach to causation is guided by the probability of an event given another. In the same way, this is the core idea for a proposal of a causation account as the ground of specific methodologies applied to social sciences.

This starting point for ranking theory is well explained by Cartwright (1979), as explained in 3.4, and we can reformulate it to our present task as follows:

Definition 5.8: Given two social propositions C and E, C causes E iff $P(E/C \cap B) > P(E/\neg C \cap B)$ for every background context B.

Such a core idea is strongly related to the hypothesis of counterfactuals as the rock-bottom of social propositions. Counterfactuals are subjunctive conditionals of the form "if it were the case that A, then B would be the case." In short, something relevant drives an important difference (Halpern & Pearl, 2005, p. 845). Causation in this perspective is relative to models, which are relative to certain backgrounds; the modeler decides the set-up of variables as the better representation of those aspects of the social world that one wishes to reason about.

The practical ranking theory advantage, as an evolution of this counterfactual account of causation (Spohn, 2006, 2012), is the following basic idea:

Definition 5.9: Given two social propositions, A and B, A is a cause of B iff A and B both occur, A precedes B, and A raises the epistemic status of B given the obtaining circumstances.

From a strict ranking theory perspective, we obtain the following:

Definition 5.10: Given two social propositions, A and B, A is a cause of B iff A and B obtain, A precedes B, and A is a reason for B given the obtaining circumstances.

Obtaining circumstances are the set of complements or other causes of B that are not A. This is the counterfactual test before being presented in § 2.2. In this sense, it is possible to say not given the obtaining causes but *ceteris paribus*.

The ranking theory approach to reasons applied to causation claims causation is thus in the eye of the beholder; causation is based on epistemic reflection. Causes are conditional reasons in a defeasible reasoning model.

Causation remains at the heart of social sciences, as the *LSE Motto* affirms: *Rerum cognoscere causas*. The more profound sense of this lemma is that knowing the causes of things allows us to describe and understand the world, construct a better social world, and change our living conditions, given our inductive inferences or possible world predictions. As Nancy Cartwright (2014) claims, social studies need to study causal relations for two critical reasons: "Social science studies causal relations at two levels. The first is the singular: what are the causes and effects of specific single events? The second is the general: what kinds of features are generally connected as cause and effect?" (p. 310)

These levels of causation, as epistemic normativity, have the advantage of fitting perfectly with the standard statistical methods used by social science to test relations of phenomena. All these observational studies or social experiments, which take data from populations in their natural environment, can be interpreted clearly through the normative epistemic account of causation; for instance, the randomized controlled trials (RTC) evident in the following definition.

Definition 5.11: Let KI be, where all causes of Et take N as some fixed value:

 $Ct \rightarrow Et \text{ in } Ki \leftrightarrow P(E_t / Ct + Ki) > P(E_t / \neg Ct + Ki)$

Treatment groups with C_t and $\neg C_t$, for instance, in placebo trials are certain kinds of RTC. The typical problems of balance of K, such as problems with the balance of populations, should be best solved with this causation approach, given the benefits of ranking theory.

Another advantage is the possibility to model and manipulate phenomena with specific models of causation, as Cartwright (2014) shows: "The manipulation view of causation revolves around the idea that causes give us effective strategies for producing effects we want or preventing those we do not; by manipulating the cause we can manipulate the effect in a predictable way" (p. 316).

The basic idea is that an intervention is a manipulation done in the right way to make the causal relation, or lack thereof, apparent (Cartwright, 2014, p. 316). For instance, inflation, when it occurs naturally, can, in the short run, reduce unemployment. The formal structure of manipulation is thus the following: "The basic idea is that, supposing C_t and E_t are regularly associated in S, then C_t causes E_t in S just in case the association between C_t and E_t is invariant under interventions in C_t " (Cartwright, 2014, p. 320).

This is related to the previous ceteris paribus account. Causal claims in social sciences are meaningful to give a ceteris paribus laws clause related to a given causation model. The advantages of the ranking theory account of causation are helpful for the social world because of the complexity of experimentation in social sciences. The task is then running this causation model in specific problems of the social world.

However, there is a strong aversion to the use of causal modeling in the practice of social sciences, as Kinkaid (2009) makes clear:

Widely used causal modelling techniques in the social sciences arguably make implicit assumptions about the nature of social causation that fit poorly with some or much social science research. (p. 727) The aversion argument can be normalized as follows:

Aversion argument:

1. Social entities are constructed aggregates.

2. No constructed aggregate can be a real cause.

3. Thus, social entities cannot stand in causal relations.

(Heldstrom & Swedberg, 1998, p. 11)

Aggregates can be causes because, as hitherto argued, *social facts supervene on individual facts*. Social causes are epistemic states and become *real* by the disposition to believe in social propositions. Kinkaid (2009) has a very similar approach to this affair:

When a particular corporation acts in a market, it has a causal influence. The influence of that specific entity is realized by the actions of the individuals composing it just as the influence of the baseball on the breaking window is realized by the sum of particles composing it. (p. 731)

Given the ranking theory approach, social propositions can be interpreted as causes. However, this is a horizon to achieve; gaining knowledge in social sciences is challenging, and causation models can have an important use and perhaps more fertile than in natural sciences. The conclusion is then starting to test these models in everyday social scientific practice.

An Epistemic Normativity Frame for Social Sciences

The inductive path

Ranking theory sets certain important normativity entailments. Formal rules are evident in the argumentation of the laws of belief, and the toolbox of applications constitutes a riverbed for rationality. Consequently, such normativity entailments are helpful for social sciences' internal normativity, as explained in § 1.3. The switching yard of rationality ruled by ranking theory models a twofold picture of knowledge justification: perception or inductive path and the apriority model. This section will start with the normativity entailments of perception and induction.

As we saw in § 3.4, the positive relevance conception endorses the ranking theory account of a coherent logic of justification of knowledge and, in the same way, social knowledge. Being a reason entails the possibility of being justified. Degrees of justification are directly related to positive ranks or degrees of belief with a ranking theory tone.

The root of this coherentist account of justification is perception. If doxastic subject a perceives A at time t, then fact A is the cause of a's believe in the proposition A'. All this rests on the *Schein-Sein Principle*, as introduced in § 4.2, formally: Φa , t (A).

This means that we initially trust in our senses and the sensations and assertions of others. Thus, *ceteris paribus*, my doxastic conditions are not different from others, and the reliability in my perceptions, beliefs, and assertions concerning others are high and optimal. Even counterfactual things are supposed to appear and be identical to me and the others, considering this normative modeled structure.

Definition 5.12: A is a first-order belief given that Φa , t (A) iff ΦI , NOW (A) and, ceteris paribus, if ΦI , NOW (A) then ΦAll other doxastic subjects, NOW (A) as a first-order belief.

Different doxastic subjects, *ceteris paribus*, master the same belief and, in that sense, the same first-order beliefs. This entails the epistemic foundation of shared beliefs in social groups.

Simultaneously, these first-order beliefs are related to the capacity of each doxastic subject to master and form concepts and linguistic or language basic notions as terms and propositions. Language as a social phenomenon is grounded in this essential normativity claim. This shows the shared formation of concepts of groups given a specific shared background. Here, it is important to remark on the relation between consciousness and knowledge regarding social groups. *Schein-Sein-Sein Principle* leads to the notion of *self-consciousness*:

Definition 5.13: Subject I is self-conscious iff, if ΦI , NOW (A), then BI now (A). Therefore, I know I have A as true belief or KI now (A).

For example, let us see this Wittgensteinean classic topic. If I am in pain, I feel it. So, I believe it, and therefore, I know A. If I do not feel pain, I do not have it, and I know I do not. Borrowing Wittgenstein's (1951) words, this structure is an ungrammatical *hinge* of knowledge (§ 575).

BI now (A) is immediately a truth and justified content of consciousness. Nevertheless, each hinge is in a certain sense different because of time and conceptual frame of subject and subjects. Then, conscious hinges are defeasible a priori propositions born in perception.

On the other hand, this frame relative hinge can be shared as propositional content thanks to language. We can share the propositional content and thus master concepts like pain for our example. Here, the subject becomes a social agent, and we can discuss *collective consciousness*. This kind of common knowledge goes beyond the first-order beliefs, but *ceteris paribus*, a set of doxastic subjects called social agents or social entities, can know such hinges, e.g., pain, given such defeasible a priori structures. Formally:

Definition 5.14: If A is an actual content of consciousness of the form Φ I, NOW(A), then BI now (B (A)) and KI now (A), then, ceteris paribus, another subject O believes that A, and therefore, Φ o, NOW(A) then Bo now (B (A)) and Ko now (A).

Contents of consciousness are *ipso facto* believed and known, and thus *ipso facto* believed by other subjects with the same background, linguistic competencies, and mastering the same concepts; all these conditions constitute the normal conditions clause.

In this sense, collective consciousness is derived from representations of particular perceptions of subjects and is a high-order form of thought—collective consciousness supervene upon particular epistemic states.

Given a ranking theory measuring system, the content of consciousness can be modeled and measured as τ_{at} (C) = $\pm \infty$. That is to say, such content of consciousness is a maximal measure and rock-bottom of certainty under this model of epistemic normativity. A request for justification or a request for warrants or reasons for C are thus senseless; my present beliefs are an epistemic blind spot for myself. The entailment of our hypothesis is that the collective contents of consciousness are blind spots for a first-person point of view. Another entailment is that this blind spot applies to possible actions or counterfactuals.

This big problem of the model is countered with two fuses. The first one is *free will*. The second is the learning or override process of evidence based on first-order beliefs, considering the defeasible a priori character of first-order beliefs. Many times, counterintuitive experiences are more profound forms of perception. For example, as we saw, it seemed intuitive to think of a time when the earth was flat, a proposition that fits our model with maximum certainty for a first-order belief. However, the dynamics of belief of the ranking theory can be overriden given new evidence; for instance, more profound forms of perception are built thanks to new scaffold technologies and systems of metrization that allow us to grasp numerous phenomena out of our range of standard perception.

The apriority path

Another helpful topic is the so-called normative a priori account from a ranking theory standpoint. The first helpful notion for the social world is the argument of the contingent truth. A famous example is the proposition, "The standard meter stick in Paris is a meter long." Tautological contingent propositions are an epistemic hinge, and in this sense, kinds of contents of consciousness, that is, knowledge a priori. These concepts are relevant for the social world as the essence of the imposition of functions on intensional entities. Assignments of social functions depend mainly on tautological contingent propositions believed maximally but defeasible a priori. For example, x stands for y model of social propositions, and the case of money and other social functions. In the end, these are the constitutive rules of the structure of the social world.

Following the apriority path, a priori knowledge can be justified by enabling experiences. However, the ranking theory accounts for apriority, a dynamic notion related to our *conceptual development*. For instance, "All bachelors are unmarried" is unrevisable a priori and analytic if and only if the doxastic subject acquired and mastered the bachelor concept. Euclidean geometry is another remarkable example; it is a priori and analytic. However, Euclidean geometry *changed* epistemically with the conceptual means of the invention of non-Euclidean geometries in the nineteenth century (Lobachevski, 1837).

These remarks and examples make patent the form and structure of unrevisable a priori propositions and are helpful for the following ranking theory commitment introduced in §4: *All principles of theoretical rationality are unrevisable a priori*. Doxastic subjects project themselves cognitively into the world, giving a specific theoretical a priori normativity frame.

Coherence theories affirm that the truth is the coherence of a proposition with respect to a given and specific set of propositions. This entails the necessity of the truth conduciveness of reasons; *truth consists of resisting further stages of learning and belief revision*.

The laws of belief, the set of ranking theory axioms, and its entailments result in the internal or epistemic task of achieving the truth and coherence of such a set of propositions. This task's ideal or means-end intention is that the truth must be believable. Such a process or task is a sort of internal deliberation, a continuous process of reflection and learning, and, in this case, an entire epistemic first-person community of reflection.

Collective consciousness depends on the continuous doxastic state of reflection; internal normativity ruled by epistemology models such as the ranking theory account is a necessary task for a set of good epistemic community deliberation.

Internal normative deliberation

Internal deliberation is a strong entailment of the ranking theory normativity account. Spohn's method of normative deliberation is a unique methodology tool to study norms from a diachronic perspective, appealing to the use of participant observation to study norms. Spohn distinguishes two perspectives on normativity, as we argue in § 4.

On the one hand, it is possible to consider from a third-person external perspective. Thus, approached, norms are the object of empirical investigation. On the other hand, norms may be viewed from a first-person internal perspective. Here, the norms are evaluated by asking whether they should be adopted and to answer this, question it is necessary to engage in normative deliberation. (Zahle, 2016, p. 90)

The main argument is that social scientists have an external normative perspective and an internal one. This perspective arises when they consider the norms and normativity within the social groups and the change of such normativity over time. Zahle (2016) clarifies Spohn's claim as follows:

Spohn's argument may be reconstructed as follows. When considering norms in a diachronic perspective, their development may sometimes be explained as due to changes in fashion or as a result of historical contingencies. In addition, the changes in norms overtime sometimes have to be seen as a result of individuals aiming to find out and do what is right. In the latter case, an idealized theory must be adopted to the effect that, as a result of their efforts, individuals get closer and closer to a certain ideal situation in which they have found out and are doing what is right. (p. 90)

Spohn clarifies that the ideal is not reachable; it is a normative fiction. However, social science requires engaging their inquiry with the formulation of ideal theories on normativity. In the present model, the first step is to formulate an ideal theory on rationality and knowledge of the social world, with the ulterior goal of formulating it regarding the manifestation of language and actions. The procedure is then described perspicuously by Zahle (2016):

In order to specify the ideal, the social scientist must engage in normative deliberation (...) When the social scientist has collected data about the past norms within a community, she may sometimes come to realize that the employment of an idealized theory is called for: she must represent the norms as changing, overtime, in the direction of an ideal state in which the right norms are implemented. In order to posit the right norms, the social scientist has to make use of the distinct method of normative deliberation. (p. 91)

As hitherto argued, deliberation is, therefore, epistemically related to the internal justification of our beliefs. Each doxastic subject *must* deliberate on the dynamics of beliefs given a particular normative model, in this case, the ranking theory approach. Inductively, social agents have the same duty; social agents *must* justify their own shared beliefs. Moreover, this justification is necessary even given the possibility of suspending judgment and the free will fuse. The freedom of the subject is an internal deliberation weight of reasons process.

Thus, internal deliberation is the epistemic weight of reasons and the ranking of the acceptable or achievable reasons for an individual doxastic agent or a social one. It is important to remark on the similarities of the present proposal with the last claims on the theory of democracy. Tom Christiano (2018) describes the central normative notions of democracy as follows:

The basic principle seems to be the reasonableness according to which reasonable persons will only offer principles for the regulation of their society that other reasonable persons can reasonably accept. The notion of the reasonable is meant to be fairly weak on this account. One can reasonably reject a doctrine to the extent that it is incompatible with one's own doctrine as long as one's doctrine does not imply imposition on others and it is a doctrine that has survived sustained critical reflection. (§2.2.2)

Nevertheless, we can say that this interpretation, driven by the internal deliberation on the norms of rationality and reasonableness regarding society, is an instrumentalist account and is devoted or committed with a unanimous and complete consensus. Self-governing and internal deliberation are related; free will is then, again, the *fuse* of this epistemic account. In *Christiano's* (2018) words:

The idea is that the right of self-government gives one right, within limits, to do wrong. Just as an individual has a right to make some

bad decisions for himself or herself, so a group of individuals have a right to make bad or unjust decisions for themselves regarding those activities they share. (§2.2.1)

While decision-making and action are not our present business, internal deliberation and epistemic normativity are a sort of condition of the possibility of doing so. In the same spirit as Habermas's proposal (1984), if the social world wants to achieve the goal of a theory of society and a scientific approach to the social world, it is necessary to establish a model or theory of rationality, and in that sense such tasks involve normative content. Habermas (1984) claims regarding such social theory:

If we assume that the human species maintains itself through the socially coordinated activities of its members and that this coordination is established through communication—and in certain spheres of life through communication aimed at reaching agreement—then the reproduction of the species also requires satisfying the conditions of a rationality inherent in communicative action. (p. 397)

Here arises another horizon to the application of the toolbox here presented. Given that arguments are the manifestation of rational behavior in the sense of the reconstruction of propositions, reasons, and pragmatic commitments, the present account is equally relevant to a ground-specific theory of argumentation in the same mood of a defeasible account of arguments by authors such as Blair (2012), Walton et al. (2008), and van Eemeren and Grootendorst (1992), among others. This is a further challenge of great importance, but let me discuss a research challenge that can subsume the others.

Further Applications: Social Artificial Intelligence

Artificial Intelligence (AI) can be defined synoptically as "the field devoted to building artificial animals (or at least artificial creatures that—in suitable contexts—appear to be animals) and for many, artificial persons (or at least artificial creatures that—in suitable contexts—appear to be persons)" (Bringsjord & Sundar, 2018, §1). This mainstream definition started with the pioneering work of Alan Turing (1950), *Can a Machine Think?*, and his challenge of the

so-called Turing test (TT). Some scholars place the first milestone in Descartes's (1641) test for AI (p. 116) and others in the famous 1956 Dorthmouth conference (Bringsjord & Sundar, 2018, §2).

However, despite several divergent opinions, the TT is perhaps this field's best criterion and research horizon (Oppy & Dowe, 2019, \S 1). TT consists of a counterfactual, where a human being and a computer are isolated and separated, and both are requested by a judge with several questions. Given the strength of the answers, the judge sets a 50/50 possibility criterion of indiscernibility to declare which is a human or a machine. If the judge reaches this 50/50 standard, the TT is passed. AI is, for this mainstream, the dream to pass TT. The last boundary is the possibility of answering arbitrary and random questions, as IBM Watson's jeopardy machine starts to do (Levesque, 2013).

The core of TT is linguistic indistinguishability, but as we shall see, the present proposal wants to go beyond this classic milestone. The following account, on a sort of weak artificial intelligence, wants to set the modeling of doxastic attitudes and doxastic reasoning as the core of the field. This account aims to achieve a constructive definition guided by formal tools from philosophy such as first-order logic, intentional logic, probability approaches, and, as a novelty, a ranking theory approach.

In this account, AI is strongly related to reasoning and inference. From a constructive point of view, it is not just a question of a human-based development but an ideal rationality model; it is not just about thinking like humans. In a novel sense, the goal is to think rationally and then act rationally. By the way, this is not an imitation of human epistemic capacities. Conversely, it is an idiosyncratic form of proper rationality of these kinds of agents. Therefore, the goal is to model intelligent agents who think and act according to specific models of reasoning. In this account, intelligence and optimal rationality are symmetrical. An intelligent agent is thus guided by rationally normative reasoning models that lead to a possible machine-learning process. Here appears the challenge of modeling deep belief network learning and inference.

Ranking theory and the present account of a toolbox of models for social agents can result in thinking about AI social agents from

a formal but not monotonic or logicist approach. The first step is to model social rationality or epistemic conditions and, thus, start to model social action for AI agents.

This account is near the multi-agent system AI proposal (Ferber, 1999). AI's main conditions are related in this reading to a constructive vision of AI. The conditions are the partial possibility of perceiving the environment and communicating and achieving goals in a background of multiagent relations between all the entities capable of fulfilling such conditions and performing actions collectively. Multiagent systems want to achieve accurate problem-solving skills, multiagent simulations for social science, the construction of synthetic worlds, and collective robots.

The horizon is to set epistemic conditions for artificial social agents and model actionable social knowledge.

Conclusion Against the social juggernaut



This sort of philosophical postscript is devoted to a metaphorical figure, the juggernaut. This destructive and unstoppable chariot procession in honor of one of the names of Krishna, *Jagannatha*, *the world lord*, and its overwhelming sacrifice entailments is an excellent image to my concluding claims.

The out-of-control behavior of society and the assumption that we ought to be blind devotion and a merciless sacrifice to it is one of the essential premises of the metaphor. Society is not, nowadays, a means-end structure of normativity and institutional guidance to fruitful collective action and decision-making, but a colossal machinery of collective blind co-working being crushing destructive. Improving individuals and collectives is not an explicit goal of current mainstream models of society.

Society behaves more like an overflowing river of decadent institutions and innocuous symbols. Moreover, perhaps the objective would not be to face it but to channel the river from the inside, modeling the riverbed and making the bitter water docile.

The Wittgensteinean simile of the riverbed has been, therefore, the guiding concept of the intentions of the present dissertation. Furthermore, the countless nights of meditation in front of the Rhine River writing the text's chapters gives this literary device a necessary family air to the profound meaning of the work. The key to finding *Das Rheingold* is thus grounded in the deep epistemic normativity of our rationality.

The central point is that what we believe or know is, in a vast sense, derivate from our interaction with others, and thus, we can ascribe belief or knowledge to different social groups. Thus, the critical debate is developing or constructing epistemic group attitudes. As shown in the previous sections, we can set property methods and protocols from this analysis to achieve social sciences epistemic goals.

This novel account has shown the relevance of ranking theory as a helpful theory of rationality and clarifies how it can be applied to the social world. The dissertation then highlights certain foundational and methodology aspects of social sciences and their importance to philosophers and empirical social scientists. The idealized model of rationality developed by ranking theory is then applied to some critical aspects of the social world as a *toolbox* for social sciences. The models and the methodological toolbox are a normative hypothetical imperative, a means-end theory to apply formal philosophy, specifically, formal epistemic machinery to the social scientific realm.

As the last chapter discuses, this is an extended research project; the present work is the riverbed for an ulterior research project of interdisciplinary applications to test the epistemic conditions model developed here. This theoretical model of epistemic conditions or normativity for the interactive or collective knowledge allows us to turn the collective formation of entities on or off and prevent or suggest collective action.

All this is possible, given a particular social ontology patent in the last chapter. Social facts are grounded in human minds and perhaps other epistemic doxastic subjects. This *invisible ontology* requires a special kind of entity. Such entities are thus mind-dependent but, at the same time, need to be *objective*. Only this objective character guarantees the possibility of establishing knowledge and science in this ontological realm. Therefore, social facts have to be independent of particular states of mind in the sense of particular representations. In this way, candidates to fulfill this ontological commitment are propositions. Social facts are then social propositions. Social propositions are certain kinds of counterfactual reasoning; they are epistemic dispositions, and their contents are beliefs. Social propositions are knowledge if such counterfactual assents to a truth function. Maintaining authentic sets of beliefs is an essential epistemic agenda, led by the commitment to getting to the truth and avoiding an error. However, this particular truth function reveals that the reliability of social propositions is, most of the time, graded.

Ranking functions measure a specific social proposition's reliability or degree of belief. We can measure and test the strength of social building blocks of social reality given this formal mechanism on the ground that social propositions are the building blocks of social reality. Such blocks require a reasonable epistemic justification as warrants of the whole structure. A justified building block is what ranking theory calls a reason; the social world is built thanks to *reasons*.

A critical feature of reasons is that reasons are relative to doxastic subjects, and, again, it should be highlighted that different doxastic subjects do not always need to agree on their reasons. Here arises an essential claim of the proposal: In the social world, doxastic subjects are not just individuals but *collective doxastic subjects*.

The main achievement of dissertation *A* is a collective doxastic reason iff such a reason is the arithmetic mean or average of the two-sided valued ranking function measures of belief firmness and relevance of each member of a collective, formally:

Given { $\tau_1, \tau_2, \dots, \tau_n$ } $\mu(A) = \frac{1}{n} \sum_{i=1}^{n} \tau_i = \frac{\tau_i + \tau_2 + \dots + \tau_n}{n}$

The result is then a Supererogatory, Sufficient, Necessary, or Insufficient reason concerning such warrant or social proposition.

A social epistemic agent is an intensional concept defined as the result of the previous equation at a particular time. The social beliefs resulting from this process constitute a social epistemic agent as the set of collective doxastic reasons for a group of individuals at a particular time.

Given this model and the ranking theory normativity, the dynamics of social beliefs or the weight of reasons for social epistemic agents are driven by evidence-guided conditional inference. The vast and extended recognition of evidence leads to a revision or change of social beliefs.

A necessary entailment of this claim is that epistemic dynamics regarding social groups are slower than those applied to individuals. In this sense, they are slower in direct relationship with the number of members of social groups. Nevertheless, the force and commitment are more potent as a social belief in larger groups than in small ones.

We cannot change the sets of beliefs in the social world, and in that sense, the social world itself, without this dynamics of reasons. However, freedom is a sort of epistemic fuse for individuals regarding the realm of individuals themselves and social groups. *Individuals do not need to engage consistently in social behavior and, of course, in social epistemic states.*

For the social world, standard conditions are epistemic conditions in the following sense: a social epistemic agent's belief in certain *a priori* defeasible relations of phenomena given a specific fixed background or a power set of social propositions. Ceteris paribus clauses are necessary and sufficient reasons that work as reasoning conditions or hypothesis conditions to reasoning.

Causation, therefore, remains at the heart of social sciences. Causes of things allow us to describe and understand the world, construct a better social world, and change our life conditions, considering our inductive inferences or possible world predictions.

Given the ranking theory approach, social propositions can be interpreted as causes. However, this is a horizon to achieve; gaining knowledge in social sciences is challenging, and causation models can have an important use and perhaps more fertile than in natural sciences. The conclusion is then to test these models in everyday social scientific practice.

Thus, collective consciousness is derived from representations of particular perceptions of subjects and, is a high-order form of thought—collective consciousness supervenes upon particular epistemic states. Given a ranking theory measuring system, the content of consciousness can be modeled and measured as τ at (C) = $\pm \infty$. That is to say, such content of consciousness is a maximal measure and rock-bottom of certainty given this model of epistemic normativity. A request for justification or a request for warrants or reasons for C are thus senseless; my present beliefs are an epistemic blind spot for myself. The entailment of our hypothesis is that the collective contents of consciousness are blind spots for a first-person point of view. Another entailment is that this blind spot applies to possible actions or counterfactuals.

Collective consciousness depends on the continuous doxastic state of reflection; internal normativity ruled by epistemology models as ranking theory account is a necessary task for a set of good epistemic community deliberation. Internal deliberation is a strong entailment of the ranking theory normativity account. Spohn's method of normative deliberation is a unique methodology tool to study norms from a diachronic perspective, appealing to the use of participant observation to study norms. In the present model, the first step is to formulate an ideal theory on rationality and knowledge of the social world, with the ulterior goal of formulating it regarding the manifestation of language and actions.

Finally, as a new research horizon, ranking theory and the present account of a toolbox of models for social agents can lead to thinking about AI social agents in a formal but not monotonic or logicist approach. The first step is to model social rationality or epistemic conditions and, thus, start to model social action for AI agents. This account is near the multi-agent system AI proposal (Ferber, 1999). AI's main conditions are related in this reading to a constructive vision of AI. The conditions are the partial possibility of perceiving the environment and communicating and achieving goals in a background of multiagent relations between all the entities capable of fulfilling such conditions and performing actions collectively. Multiagent systems intend to achieve accurate problem-solving skills, multiagent simulations for social science, the construction of synthetic worlds, and collective robots. The challenge is setting epistemic conditions for artificial social agents and modeling actionable social knowledge.

Regarding the literary language, the present work can be understood as an airbag against the social juggernaut. It suggests a new way of methodological research in social sciences and a new way to understand the deep ontology of society and human relations. Nevertheless, it is, in spirit, an elucidating work. Perhaps, it prevents us from understanding the right time to not suffer company at all.

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Belief & Society: Making Ranking Theory Useful for the Social World has been laid out with Minion Variable Concept - Georgia typography. It was printed on Earth Pact®, in Ediciones Carrera 7a. Belief & Society: Making Ranking Theory Useful for the Social World is a critical and constructive inquiry on Wolfgang Spohn's Ranking theory and its philosophical applications in social epistemology.

Miguel Fonseca introduces a new way of methodological research in social sciences and a new way to understand the deep ontology of society and human relations. This novel account shows the relevance of ranking theory as a helpful theory of rationality, and it clarifies how it can be applied to the social world. Therefore, the book highlights certain foundational and methodological aspects of social sciences and their importance.





