

Conditionals: A Unifying Ranking- Theoretic Perspective

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1. Introduction¹

The topic of conditionals is an extremely important one. It lies at the bottom of so many philosophical issues (causation, dispositions, lawlikeness, etc.), and current theories of conditionals seem to fairly ground these issues. On the other hand, the topic has become ever messier. Philosophical opinions grossly diverge, not only about details, but also about such fundamental questions as to whether or not conditionals have truth-values. And the linguistic phenomenology is so rich, the interaction with tense, mood, negation, quantifiers, etc., so complicated, and the pragmatics so imperspicuous that plausible examples can be found for and against nearly every claim or account. The situation seems quite desperate.

One might say that the situation is inevitable; there is no reduction of complex reality to simple theories. However, I am convinced that the present confusion is also brought about by the fact that the discussions of the last 45 years have focused on suboptimal paradigms, propositional logic, probability theory, objective similarity spheres, or subjective entrenchment orderings: all of them are not optimally suited for laying foundations to any kind of conditionals.

This conviction grounds in my further conviction that the philosophical applications of conditional logic are better dealt with by ranking theory, as I have extensively displayed in Spohn (2012, ch. 12–15). If this should really be so, the deeper reason can only be that ranking theory is better suited for treating conditionals themselves. In this paper, I cannot give a full comparative argument, but my ambition is at least to display that ranking theory is well suited for a comprehensive and unified account of conditionals. The basic reason for being so suited can be summarized in one sentence: conditionals of all kinds express our conditional beliefs or something about them, and our conditional beliefs are most adequately represented by ranking theory. I have extensively argued for the second claim from Spohn (1983b) till Spohn (2012); I can't repeat this here and will restrict myself to

1. I am deeply indebted to several referees for many helpful comments of various kinds.

indicating the basic points. The main task of this paper will be to unfold the first claim.

We will see that the expression of conditional beliefs is not restricted to the Ramsey test. There are many more things about them that can be expressed as well. Indeed, the expressivistic strategy adopted here will extend to subjunctive and counterfactual conditionals. Moreover, we will see that this strategy is not committed to denying truth-values to conditionals; to some extent they can be recovered. Some such middle course seems exactly right; neither flatly denying truth-values nor sanguinely distributing truth-values for all (nested) conditionals will do.

I will proceed as follows: first, in section 2, I want to, unoriginally, suggest that our variegated conditional idiom basically serves to express our conditional beliefs. In section 3, I will suggest, and can do no more than suggest, that ranking theory is the best tool for analysis because it is the best account of conditional belief. This will be one principal shift proposed in this paper.

The next sections will carry out the other principal shift: when we ask how conditionals express conditional beliefs, we should not be overwhelmed by the excessively complex linguistic material with all its syntactic and pragmatic interactions. We should rather focus on what might be expressed. This study can be as clear, systematic, and possibly complete as the underlying account of conditional belief; it is this study that will be carried out here. The hope then is that, once we have a clear and systematic overview of the interpretative options, we can apply it to the linguistic material and have good guidelines for studying all those interactions. However, this paper will not redeem this hope in detail.

The interpretative or expressive options will be rich. Of course, the Ramsey test is the first thing that comes to mind; section 4 will be devoted to it. My crucial observation will be, though, that there are many more expressive options; the exclusive focus on the Ramsey test is fatal. Thus, in section 5, I will discuss relevance, which is basically a matter of conditional beliefs. Even more interesting is what I call the

“circumstances are such that” reading of conditionals, which will be introduced in section 6. This will lead us, in section 7, to an explication of the wide class of causal conditionals, *i. e.*, conditionals representing a causal relation within our expressivistic framework. This will conclude my transgression beyond the Ramsey test. Depending on the way we count, we will thus end up with more than twenty expressive options.

Section 8 will finally turn to the crucial issue whether and how my determinately expressivistic perspective can be reconciled with our deeply entrenched intuition that conditional discourse is about matters of fact, *i. e.*, truth-evaluable. Such reconciliation might seem impossible; but, in fact, we shall find that it goes quite far. Section 9 wraps up the paper by once more emphasizing the unifying perspective offered here.

In a way, this is chapter 18 of my book Spohn (2012) — or rather chapter 16 (so that the last two chapters would have to be deferred). Indeed, I had mentioned this as a painful desideratum. However, I had neither space, nor power, nor certitude enough to include the present topic there. Hence this paper will often refer to that book. Still, it should be self-contained.

2. Expressivism

In order to start from scratch, let me introduce the symbol \triangleright for the *schematic conditional*, *i. e.*, for any conjunction somehow representing a conditional relation; for indicative and subjunctive, past, present, and future, open, semi-factual, and counterfactual, backtracking and non-backtracking, material, strict, variably strict, and suppositional, epistemic and causal, inferential and content conditionals. These and even more qualifications can be found in the literature, which try to classify conditionals according to different criteria. The schematic conditional \triangleright is to even cover conjunctions like “even if,” “although,” or “because,” which also represent conditional relations. “ ψ even if φ ” roughly expresses that ψ is to be expected (even) *given* or *conditional on* φ . “ ψ although φ ” roughly expresses that ψ was not to be expected given φ . “ ψ because φ ” at least represents that ψ was bound to obtain

given φ . The list can easily be extended. Such conditional relations totally pervade ordinary language. Considering the schematic conditional is justified by my aim to explain a space of possibilities of what conditionals could mean and not to explain the specific meaning of any specific conditional. Therefore, I take a new symbol, which is — as far as I know — not yet put to specific use in the relevant literature.

We will thus be considering the sentence schema “ $\varphi \triangleright \psi$.” I will right away restrict our investigation to conditional assertions and will not look at other illocutionary roles that may be conditionalized as well; assertions are large enough a field. φ and ψ stand for unconditional or categorical sentences; I will explain why I do not consider nested conditionals. Moreover, I will not distinguish between sentences and utterances because this distinction will not become relevant in this paper. I will say that sentences *represent* propositions (= truth conditions), insofar as they do, and *express* mental states, in particular beliefs or any other features of epistemic states. Throughout the paper, the sentences φ and ψ are, respectively, taken to represent the propositions *A* and *B*. So, φ and ψ express the beliefs in *A* and in *B*. (This entails that I take belief to be a *propositional* attitude; I cannot burden the paper with issues of hyperintensionality.) Whether “ $\varphi \triangleright \psi$ ” also represents a proposition is an open issue which will be considered only in section 8. Before, I will only discuss what “ $\varphi \triangleright \psi$ ” might express.

So much for terminological preliminaries. What then could starting from scratch mean? For me, it means starting with semantics, with the meaning of conditionals. How are we to describe meanings? What is language good for? Primarily for expressing our mental states and attitudes. At least, our mental states and attitudes are the immediate causal predecessors of our speech; so, whatever else it signifies is mediated by them. Of course, the primary purpose need not be the most important or most interesting. (This emphasizes the speaker’s side while the hearer has the complementary task of understanding what is expressed.) Let me take this for granted here; this is not the place for foundational disputes about philosophy of language.

This idea should clearly favor expressivism, *i. e.*, the approach of doing semantics by describing the mental states expressed by linguistic means. Expressivism is indeed taken seriously, mainly as a metaethical position concerning the meaning of moral sentences, but also as a general semantic strategy (cf., *e. g.*, Gibbard [1990]). The label “expressivism” should not invoke too narrow associations. I do not pursue any specific expressivistic program such as Merin (2003) and Schroeder (2008). Also, when you search for assertibility or acceptability conditions instead of truth conditions, I already take you as engaging in the expressivistic business.

Even talk of truth conditions may be compatible with expressivism. At this point it is useful to note that we may speak of truth and truth conditions in an emphatic or shallow sense. When I referred above to truth conditions of conditionals, I intended the *emphatic* sense according to which a truth condition is an objective matter of fact not relative to subjects or perspectives. And, in this sense, it is at least problematic whether conditionals have truth conditions, just as it is at least problematic to assume moral facts. However, one may as well declare a conditional or, say, an evaluative assertion to be true not objectively, but only relative to the speaker’s beliefs or preferences. Let us call this a truth condition in the *shallow* sense. Then I find no relevant difference to expressivism. Assigning such a shallow truth condition to the assertion is the same — I take it — as saying that it expresses those beliefs or preferences or — more cautiously — something about those beliefs or preferences (a caution that will be appropriate throughout the paper). This equation may be too simple in the end (see Kölbel [2002] for more sophisticated views), but it will do for our purposes.

So, why not prefer expressivism? Why is truth-conditional semantics still the favored approach, even in philosophy? Certainly, the deepest and most difficult reason is marked by the so-called linguistic turn, the transition of 18th and 19th to 20th century philosophy, and its insight that mental states and their contents are identifiable only with reference to external states of affairs. Hence, it seems, we must first study what utterances mediately represent, namely

(emphatic) truth conditions, before we can know what they immediately express. Surely, Frege's so-called antipsychologism is the hallmark of that extremely healthy transition, whatever its present status (see, e.g., Burge [1979]).

Another point is that the states linguistically expressed are mainly propositional attitudes. Propositions are truth conditions and belief—the paradigmatic propositional attitude—is truth-evaluable. Here, truth may well be taken in the emphatic sense. Instead of taking φ to express the belief in A , we may therefore straightaway consider φ as representing A . Thus, truth-conditional semantics, even in the emphatic sense, may carry us most of the way, even if it does not literally apply to deontic language, etc., expressing other attitudes than belief. The same point is reflected in speech act theory that distinguishes illocutionary role and propositional content.

The basic reason for preferring truth-conditional semantics, often considered to be decisive even in philosophy, is that semantics must proceed compositionally and that we know how to state recursive semantic rules in terms of truth and reference (in possible worlds). However, the dialectic situation is not so clear. We may be content with using a shallow notion of truth for truth-conditional semantics. Then, as stated above, my notion of expressivism is broad enough to encompass this procedure. Or we may insist that truth-conditional semantics refers to emphatic truth. This may induce the challenge that expressivism should not be stated in terms of shallow truth conditions, but should provide a semantic recursion directly in terms of mental states expressed. This is how Kölbel (2002, ch. 4–5) distinguishes 'soft' (= shallow) truth from expressivism and how Schroeder (2008, sec. I.2) sets up the basic problem of expressivism; here, both intend a more ambitious notion of expressivism. Merin (1999, 2003, 2006) has made proposals how to meet those demands. I leave it open here whether or not ambitious expressivism can solve this problem.

At this point, we also slip into the notorious Frege-Geach problem of how to treat complex sentences parts of which are to be treated truth-conditionally and other parts in an expressivistic way. Shallow

truth conditions may be a way to avoid the problem. But if we insist on emphatic truth conditions, it is not clear whose problem this is. Usually, it is taken as a challenge to the expressivist. However, it may as well be seen as a problem for truth-conditional semantics to integrate sentences that have apparently no emphatic truth conditions.

I shall not attempt to resolve these intricate issues here. Also, I happily concede that truth-conditional semantics is fine, as far as it goes. My only point will be that, in an emphatic sense, it is not good enough for all mental states we might wish to express—not even in the derivative way just mentioned for propositional attitudes besides belief. I will implement an expressivistic strategy for dealing with the exceptions that are in the focus of this paper, and I will argue that this strategy is superior, however we solve the ensuing problems.

The exceptions first coming to mind are utterances like "ouch," which expresses pain and has no truth condition (only a sincerity condition; namely, actually being in pain). If this were the only kind of exception, one might as well neglect it. But it is not. I am very sure that conditional belief is a mental state that escapes the truth-conditional approach as well; conditional beliefs have *no* truth conditions! This is so important within our present context that it deserves a label: CB-*no*TC. (Here, truth conditions are again to be understood in the emphatic sense. This will be my default understanding in the rest of the paper unless I say otherwise.)

This claim is often taken to have been shown by Lewis (1976), called the 'bombshell' by Edgington (1995, p. 271), where the following is proved: assume that for all φ and ψ , " $\varphi \triangleright \psi$ " represents a proposition or truth condition the probability of which is identical with the conditional probability $P(B \mid A)$ (recall my convention about φ , ψ , A and B). Then P can only be a very trivial probability measure (in a specific sense). Bennett (2003, ch. 7) takes this to be one of several routes to NTV, the claim that indicative conditionals have no truth-value. However, the dialectic situation is not quite clear, as Bennett's chapter 7 thoroughly displays. Maybe there is not really a problem about truth conditions, but only one about embeddings of conditionals?

There is no point now in unfolding that dialectic situation. For the relevance of the debate concerning NTV for CB_{noTC} is not fully clear either; it very much depends on the relation between conditionals and conditional belief. The relevance would be immediate if conditionals were assumed to represent conditional propositions, and if conditional belief would then be equated with unconditional belief in such conditional propositions. The most pertinent impossibility result for this set-up is that of Gärdenfors (1986), which assumes this equation by strictly adhering to the Ramsey test. This result transfers the ‘bomb-shell’ to belief revision theory and shows that there is no proposition represented by “ $\varphi \triangleright \psi$,” which is accepted if and only if B is accepted after revision by A . However, this equation is doubtful; hence, difficulties with assigning truth conditions to conditionals do not automatically speak in favor of CB_{noTC} .

Therefore, I prefer to omit the detour via conditionals and avoid the reliance on such an equation. I do not accept it, anyway, not because conditional belief would be so hard to grasp, but because conditionals are so varied and ambiguous. I also need not refer to embeddings of conditionals. Rather, the issue can be tackled directly, and is so in the proof in Spohn (2012, sec. 15.3) that conditional belief is not objectivizable, *i. e.*, cannot generally be assigned truth conditions. However, I am running ahead, since this proof presupposes the ranking-theoretic representation of conditional belief and the appertaining objectivization theory, which I cannot repeat here. Still, this is *my* decisive reason for CB_{noTC} .

Thus, conditional belief is not, and is not reducible to, a propositional attitude. It is rather a *bi-propositional attitude*, as it were. Each of the two propositions it relates, the condition and the conditionally believed, is a truth condition; their relation, however, cannot be grasped in truth-conditional (let alone truth-functional) terms. If so, an expressivistic semantics of conditionals cannot be reduced to truth-conditional semantics.

I have not yet discussed what conditional belief is at all; this is the topic of the next section. So far, it should only be clear that it is most

important for our cognitive life. It governs the dynamics of belief, or rather its rational dynamics. The basic rule is that conditional belief turns into unconditional belief upon learning that the condition obtains. In fact, this is too crude a rule of conditionalization; but all more sophisticated and more adequate rules for changing beliefs build on the notion of conditional belief (see Spohn [2012, sec. 5.4; ch. 9]). We might also say that all of our learning or inductive strategies, all of our non-deductive inferences depend on our conditional beliefs. One cannot overemphasize their importance for epistemology. The very same remarks would apply to conditional probabilities.

In any case, one must not assume the above equation: that conditional belief is unconditional belief in conditionals. This idea has generated considerable confusion and is, at best, a plausible hypothesis for some kind of conditionals. We should dispense with this idea. Rather, conditional belief—just like conditional probability—is a purely epistemological notion well characterized by its central role for the dynamics of belief, and as such independent of any semantic considerations concerning particular linguistic means. It does not derive from semantics, but can reversely ground expressivistic semantics.

Finally, it seems clear that, if our conditional idiom expresses anything, it expresses conditional belief or something about it; no other prominent attitude is in sight that could fill this expressive role. And reversely, if conditional belief is so fundamental for our cognitive life, as just claimed, then it cannot hide in the underground; it should find some linguistic expression. But which could that be, if not the conditional idiom? Again, one must not say that it is still unconditional belief that is expressed; namely, belief in a special kind of conditional propositions. This would presuppose what we are trying to analyze. And it would leave conditional belief itself without expression, which—as stated—is not to be equated with unconditional belief in conditionals.

We might eventually be able to return to the claim that conditionals express unconditional belief in conditionals, just as any assertion expresses the belief in the asserted. But if so, then only after carrying out the projection strategy with which Stalnaker (1984, ch. 6–8) has

paradigmatically struggled. In section 8, I shall indicate a clear and rigorous version of the projection strategy for introducing truth-evaluable conditional propositions.

The upshot is as follows: if *CBnoTC* is right and, if expressivism is therefore the semantic strategy to be employed, then any investigation of conditionals must start with studying conditional beliefs and the expressive relation between conditionals and conditional beliefs. This is what I shall do in the rest of the paper.

The upshot is not new, of course. It is embodied in the Ramsey test, which derives from Ramsey (1929, p. 142ff.) and directly takes conditionals to express conditional or suppositional beliefs. We will see that there are many more expressive options. Moreover, the Ramsey test is rather only a guiding idea that has found various explications in the literature. So, disagreement starts when we get to the details.

3. Conditional Belief

How should we account for conditional belief? Let's at least introduce symbols: $Bel(A)$ represents unconditional belief in A , and $Bel(B \mid A)$ represents conditional belief in B given or conditional on A . The subject and the time of belief may be left implicit; all my terms for epistemic states refer to the present attitudes of the speaker. Again, A and B stand for propositions. A proposition is a set of possibilities and thus a truth condition of a sentence, *i. e.*, the set of possibilities in which the sentence is true.

To be more explicit, let W be the set of all possibilities in a given case (you may, but need not think of possibilities as full possible worlds; they may be small worlds, centered worlds, or any other mutually incompatible and jointly exhaustive items); and let \mathcal{A} be a Boolean algebra of subsets of W , which is closed under negation, conjunction, and disjunction. I shall not assume any other closure properties. \mathcal{A} is the set of propositions at hand, and A and B are taken from \mathcal{A} . \bar{A} is the negation of A , $A \cap B$ the conjunction of A and B , $A \cup B$ their disjunction, and $A \rightarrow B = \bar{A} \cup B$ the material implication (in set-theoretical

instead of sentential terms). As mentioned, I shall consider propositions as objects of belief and ignore problems of hyperintensionality.

So, how should we account for conditional belief? In the literature, this question is distractingly intertwined with the issue of accounting for conditionals. A small minority (*e. g.*, Lewis [1976], Jackson [1987]) defends the view that an indicative conditional " $\varphi \triangleright \psi$ " may basically be interpreted as the material implication " $\varphi \rightarrow \psi$," thus expressing $Bel(A \rightarrow B)$ — the belief in the material implication. For the half-truth of this view, see below. Therefore, one might be tempted to identify the conditional belief $Bel(B \mid A)$ with the unconditional belief $Bel(A \rightarrow B)$. However, nobody has proposed anything like this; it would be crazy. For, if we take A to be false, we take $A \rightarrow B$ as well as $A \rightarrow \bar{B}$ to be true, and then, according to this proposal, we would believe B as well as \bar{B} conditional on A . However, even conditional belief is rationally bound to be consistent (at least under all conditions not considered to be impossible). Hence, this proposal would be inadequate.

Perhaps the most popular view today is that treating conditionality in epistemic terms means treating it by conditional (subjective) probabilities (see, *e. g.*, Adams [1965, 1975], Edgington [1995, 2003, 2008]); this is part of the success story of Bayesianism in contemporary formal epistemology. I am very sympathetic to this approach; but I am not fully satisfied. Conditional probabilities indeed provide the best of the received models of epistemic conditionality. The problem, however, is that belief is not probability, and conditional belief is not conditional probability.

The most plausible connection between belief and degrees of belief is that belief is sufficient degree of belief, which is called the Lockean thesis (by Foley [1992]). The literature always interprets it in terms of probabilities. However, thus interpreted, the Lockean thesis is not tenable. The basic point is this: it is a fundamental law of rational belief that, if you believe A and believe B , or — what's the same — if you take A and B to be true, then you also take $A \cap B$ to be true, or believe it. (Well, one may contest this law, but, without it, hardly any theory of rational belief is left. We must start somewhere.)

However, if your probability of A is high (above the relevant threshold) and that of B is also high, that of $A \cap B$ need not be. Thus, this fundamental law of rational belief refutes the probabilistic Lockean thesis. This point is highlighted by the well-known lottery paradox (cf. Kyburg [1961, p. 197]).

The issue has provoked a vigorous discussion with quite a few epicycles. For perhaps the most advanced probabilistic account of the Lockean thesis, see Leitgeb (2014); but even this has its hitches, for instance, by making belief ascriptions in my view excessively context- or partition-sensitive (he discusses this objection on p. 152–159). So, without engaging into detailed discussion, my conclusion is as follows: there is no good way to save the probabilistic Lockean thesis. Belief and probability are incongruent phenomena. And I am convinced that dispensing with belief and turning to Jeffrey's (1992) radical probabilism is no solution either. (For all this see my extensive discussion in Spohn [2012, sect. 3.3, and ch. 10].)

The point extends to conditional belief and probability. Everyone accepts the following logical law for indicative (and subjunctive) conditionals: if $\varphi \triangleright \psi$ and $\varphi \triangleright \chi$, then $\varphi \triangleright \psi \ \& \ \chi$. This well fits to the generally accepted law of rational conditional belief saying: if $Bel(B \mid A)$ and $Bel(C \mid A)$, then $Bel(B \cap C \mid A)$. However, we get none of this if we identify conditional belief with high conditional probability. Hence, it seems inadequate to treat conditionals and conditional belief in probabilistic terms.

This seems to contradict Adams (1965, 1975) who has developed the standard logic of conditionals in probabilistic terms in a most attractive way, including the above law about conjunction. (I take this standard logic to be the basic system **V** of Lewis [1973, p. 132] for un-nested conditionals, possibly with additional axioms.) But there is no contradiction. Adams starts with what is now called *Adams' thesis*: that “the probability of an indicative conditional of the form ‘if A is the case, then B is’ is a conditional probability” (Adams [1975, p. 2]), *i. e.*, $P(A \triangleright B) = P(B \mid A)$, provided A and B do not contain a conditional in turn (*i. e.*, belong to factual language, as Adams says). One may well call

this a probabilistic version of Ramsey's test. In itself, it does not yet provide a semantics for $A \triangleright B$; it only says how credible or acceptable a conditional is, whatever it means. However, Adams ingeniously turns this into a criterion of validity of logical inferences with conditionals: “if an inference is truth-conditionally sound then the uncertainty of its conclusion cannot exceed the sum of the uncertainties of its premises” (Adams [1975, p. 3]). The formal version is this: an inference is sound iff for each $\varepsilon > 0$ there is a $\delta > 0$ such that, for all probability measures, the conclusion has probability $\geq 1 - \varepsilon$, if all of the premises have probability $\geq 1 - \delta$ (cf. Adams [1975, p. 57]). Thereby, Adams is able to account for the logical behavior of indicative conditionals in the standard form.

All this is very nice, and in a way I have no quarrel with it. Adams' approach has been deeply and extensively developed; see, *e. g.*, Bamber (2000) for a meticulous investigation, which adds to Adams' above probabilistic definition of ‘entailment with surety’ a rich account of ‘entailment with near surety.’ Adams and Bamber approach (conditional) belief by approaching (conditional) probability 1. They do not equate the two, because they move within standard probability theory wherein which probabilities conditional on something having probability 0 are undefined and, hence, beliefs conditional on something disbelieved could not be explained on the basis of such an equation. One might, however, fully endorse this equation if one resorts to Popper measures instead of standard probabilities. This idea has been executed, *e. g.*, by Hawthorne (1996). Again, one ends up with the standard logic, which includes rational monotony.

My main reservation about all this is the following: my proposal below will capture conditional belief directly and in much simpler a way. There is no need at all for these probabilistic detours and surrogates, no need for Popper measures or those quite involved ε, δ -Limit constructions. We need not maintain the false and superfluous pretense that we could capture belief in probabilistic terms or approach belief by approaching probability 1. In particular, we should not equate belief with probability 1 via Popper measures. This is not

only phenomenologically, but also theoretically inadequate. As Hawthorne (1996) shows, Gärdenfors' (1979, 1981) belief revision theoretic account of conditionals gets thereby probabilistically reproduced, since the 0–1-structure of Popper measures is equivalent to epistemic entrenchment orderings (as already proved in Spohn [1986]). In turn, this entails that my reservations below concerning belief revision theory extend to the use of Popper measures in the present context. Finally, since subjective probabilities can't be true or false (in the emphatic sense), Adams' approach cannot point a way for conditionals to be true or false. Intuitively, however, at least some conditionals can be true or false. Hence, the probabilist must either reject this intuition or go for heterogeneous accounts of conditionals. However, if we approach conditionals in terms of belief instead of probability, this awkward alternative will not arise (see sections 6–8 below).

So, let us not reject the probabilistic approach, but let us put it to one side in order to make room for other considerations. How else could we grasp conditional belief? Curiously, belief revision theory originates directly from the Ramsey test. Gärdenfors (1979, 1981) was motivated by this test to directly inquire into the rational behavior of belief revision, of what to believe after supposing or accepting a possibly belief-contravening proposition. This has developed into so-called AGM belief revision theory (according to Alchourrón et al. [1985]). It is canonized in Gärdenfors (1988); it has, however, found many hotly debated variants (cf., e.g., Rott [2001]).

The importance of this field cannot be overemphasized; it was about the first genuine philosophical emancipation of formal epistemology from the probabilistic paradigm. However, in Spohn (1983b, sec. 5.2; 1988, sec. 3), I raised the problem of iterated belief change: belief revision theory is unable to provide a complete dynamics of belief; it can account only for the first, but not for further changes. This also entails that it does not provide an adequate notion of conditional belief. The problem has been thoroughly attended; see, e.g., Rott (2009). Let me just say, again without engaging into detailed argument, that all proposals within the confines of belief revision theory have remained

unconvincing in my view (but see my extensive discussions in Spohn [2012, sec. 5.6; ch. 8]).

I have proposed a solution that fully solves the problem of iterated belief change in Spohn (1983b, sec. 5.3; 1988, sec. 4) by what is now called ranking theory; the theory is fully developed and defended in Spohn (2012) and partially in many earlier papers. This rich theorizing is my ultimate justification for maintaining that ranking theory provides the most adequate account of conditional belief. I admit that I hardly argued here for this claim; I have only indicated some central problems with some of the main alternatives. However, I should not further expand the comparative business; it must suffice here that this claim has at least some initial plausibility.

Let me introduce the basic concepts for they are crucial for the rest of the paper:

Definition: κ is a *negative ranking function* for \mathcal{A} , the Boolean algebra of propositions over W , iff κ is a function from \mathcal{A} into $N \cup \{\infty\}$, the set of natural numbers plus infinity, such that for all $A, B, \in \mathcal{A}$:

- (1) $\kappa(W) = 0$ and $\kappa(\emptyset) = \infty$,
- (2) $\kappa(A \cup B) = \min \{\kappa(A), \kappa(B)\}$.

$\kappa(A)$ is called the (*negative*) *rank* of A . If $\kappa(A) < \infty$, then the *conditional rank* of B given A is defined as

- (3) $\kappa(B \mid A) = \kappa(A \cap B) - \kappa(A)$.

Negative ranks represent degrees of *disbelief* (this is why I call them negative). That is, $\kappa(A) = 0$ says that A is not disbelieved, and $\kappa(A) = n > 0$ says that A is disbelieved (to degree n). According to (1) and (2) we have $\min \{\kappa(A), \kappa(\bar{A})\} = \kappa(W) = 0$; that is, at least one of $\kappa(A)$ and $\kappa(\bar{A})$ must be 0. This means that you cannot take both $\neg A$ and \bar{A} — to be false; this is a basic consistency requirement. But we may have $\kappa(A) = \kappa(\bar{A}) = 0$, in which case κ has no opinion about A . *Belief* in A , $Bel(A)$, is the same as disbelief in \bar{A} and thus represented by $\kappa(\bar{A}) > 0$.

Similarly for conditional ranks; they represent *conditional degrees of disbelief*. Definition (3) is intuitively plausible: it says that you arrive at your degree of disbelief in $A \cap B$, when you add your degree of disbelief in A and your degree of disbelief in B , given that A should be true. Conditional ranks also represent conditional belief: $\kappa(B \mid A) = 0$ says that B is not disbelieved given A ; $\kappa(B \mid A) > 0$ represents disbelief in B given A ; and $\kappa(\bar{B} \mid A)$ represents *belief in B given A* , *i. e.*, $Bel(B \mid A)$. Again we have:

$$(4) \text{ either } \kappa(B \mid A) = 0 \text{ or } \kappa(\bar{B} \mid A) = 0 \text{ or both.}$$

That is, you cannot have contradictory beliefs under any condition A which you do not take to be impossible, *i. e.*, for which $\kappa(A) < \infty$. Given definition (3), (4) is indeed equivalent with (2). This means that ranking theory essentially assumes nothing but conditional consistency — and thus has extremely strong normative foundations.

The crucial point is that beliefs may be weaker or firmer and they are still beliefs. This is our everyday notion, and it is respected by ranking theory; ranks are intended to measure those degrees of beliefs. However, initially it was unclear how they do so; ranks may have appeared to be arbitrary. This has certainly hampered the acceptance of ranking theory. The situation has changed, though, with Hild and Spohn (2008), where a rigorous measurement theory for ranks is offered in terms of iterated contractions. It corresponds to the measurement of probabilities, the difference being that ranks are measured on a ratio scale and probabilities on an absolute scale — cf. also Spohn (2012, ch. 8). Hence, we are dealing with two different kinds of degrees of belief, ranks and probabilities, and only one of them also represents belief.

In fact, there is no need to say that belief in A — $Bel(A)$ — is represented by $\kappa(\bar{A}) > 0$; we might as well represent it by $\kappa(\bar{A}) > z$, for some fixed threshold $z > 0$. The laws of belief come out the very same; it's only that belief is vague and can be taken more or less strictly, depending on the threshold z . Thus, the Lockean thesis is absolutely correct, if the degrees of belief it refers to are taken to be ranks and not

probabilities. In what follows, I shall keep things simple and stick to the first interpretation of $Bel(A)$ as $\kappa(\bar{A}) > 0$.

Despite the sharp interpretational contrast, there is also a striking similarity between the ranking axioms (1)–(3) and the axioms of probability including the definition of conditional probability; by taking the logarithm of probabilities relative to a small (or infinitesimal) base the latter roughly (or almost exactly) translate into the former. This generates a lot of similarities of a mathematical nature. (For a rigorous translation see Spohn [2012, sec. 10.2].)

One might think that Adams attempts to probabilistically approximate the behavior of conditional ranks with his ϵ, δ -limit constructions. However, as indicated above, he rather approximates the 0–1-structure of Popper measures or epistemic entrenchment orderings. In any case, we should not try to approach ranks in probabilistic terms; it is so much more straightforward to simply replace probabilities by ranks. This is, in a nutshell, what I shall propose.

It may seem awkward to work with negative ranks representing disbelief, because of the double negations involved (this was another point hampering the reception of ranking theory). However, it is no problem to directly represent belief. If κ is a negative ranking function for \mathcal{A} , we may define the *positive ranking function* β for \mathcal{A} by:

$$(5) \beta(A) = \kappa(\bar{A}).$$

β thus represents degrees of *belief*; $\beta(A) > 0$ says that A is believed (after we have put the threshold z to one side) and $\beta(A) = 0$ says that A is not believed. We may also directly axiomatize positive functions by translating (1) and (2) by means of (5). Thus:

$$(6) \beta(W) = \infty \text{ and } \beta(\emptyset) = 0,$$

$$(7) \beta(A \cap B) = \min \{ \beta(A), \beta(B) \}.$$

(7) says that your degree of belief in a conjunction equals your weakest degree of belief in the conjuncts — and thus entails the fundamental

law that you believe a conjunction iff you believe both conjuncts. The definition (3) of conditional negative ranks translates into:

$$(8) \quad \beta(B \mid A) = \beta(A \rightarrow B) - \beta(\bar{A}).$$

At first an unlikely translation, but its content is highly intuitive, saying that your degree of belief in a material implication is your corresponding conditional degree of belief plus your degree of belief in the vacuous truth of the implication, *i. e.*, in the falsity of its antecedent. I will unfold the importance of (8) below. However, with (8), it is particularly clear that positive ranks have no formal analogy with probabilities. This explains my determinate preference for negative ranks.

We may even integrate positive and negative ranks into one notion, which I call a *two-sided ranking function* τ defined by:

$$(9) \quad \tau(A) = \beta(A) - \kappa(A) = \kappa(\bar{A}) - \kappa(A).$$

Conditional two-sided ranks are defined analogously:

$$(10) \quad \tau(B \mid A) = \beta(B \mid A) - \kappa(B \mid A) = \kappa(\bar{B} \mid A) - \kappa(B \mid A).$$

Two sided-ranks are intuitively most intelligible, because they represent belief and disbelief at once: A is believed or disbelieved or neither iff, respectively, $\tau(A) > 0$, < 0 , or $= 0$ —similarly for conditional two-sided ranks. This is why I shall often refer to two-sided ranks below. However the formal behavior of two-sided ranks is clumsy; it is best accessible via definition (9) and the behavior of the component concepts.

The long and the short of all this: if we want to theoretically capture (rational) conditional belief, we best do it by (3) and (8). Positive and negative conditional ranks are, respectively, conditional degrees of belief and disbelief; and if these degrees are non-zero, they represent conditional belief and disbelief. We should proceed with our expressivistic exploration of conditionals in terms of this representation.

4. The Ramsey Test

The expressivistic view of our topic was introduced by Ramsey (1929); thus the *Ramsey test* is the natural starting point of our investigation. In

our specific framework, the test tells that the schematic conditional “ $\varphi \triangleright \psi$ ” expresses the following:

$$(I.1) \quad \tau(B \mid A) > 0,$$

i. e., $Bel(B \mid A)$, the conditional belief in B given A or under the supposition of A (as before, φ represents A and ψ represents B). We might also say that (I.1) provides assertibility conditions for “ $\varphi \triangleright \psi$,” in the sense that “ $\varphi \triangleright \psi$ ” is assertible only for someone whose doxastic state satisfies (I.1). Or we might say that (I.1) provides acceptability conditions for “ $\varphi \triangleright \psi$,” in the sense that “ $\varphi \triangleright \psi$ ” is acceptable only for someone satisfying (I.1); putting it this way, however, tends to refer to the hearer’s and not to the speaker’s side. (There may be subtle differences between assertibility and acceptability; see Douven and Verbrugge [2010].) I prefer to continue speaking of what we might express instead of assertibility or acceptability conditions.

There is no need here to rehearse the tremendous plausibility of the thesis that indicative conditionals are often characterized by the Ramsey test, *i. e.*, express (I.1).

Interlude 1: The Logic of the Ramsey Test According to (I.1)

Let me display the ensuing logic: ranking functions entail a semantics for a non-iterated fragment L_1 of conditional logic implementing the Ramsey test. The syntax is simple: let L_0 be the language of propositional logic, and let \triangleright stand for the conditional. Then, if φ and ψ are sentences of L_0 , $\varphi \triangleright \psi$ is a sentence of L_1 , and if φ and ψ are sentences of L_0 or L_1 , propositional combinations of φ and ψ are sentences of L_1 , too. Thus, no nestings of \triangleright can occur in L_1 .

The semantics runs thus: let V be the set of valuations (of the sentence letters) of L_0 . For $\varphi \in L_0$ and $v \in V$ $v \models_0 \varphi$ says that φ is true in v . Define $V(\varphi) = \{v \mid v \models_0 \varphi\}$ to be the set of valuations in which φ is true. Moreover, for any ranking function κ for V , let $\mathcal{B}(\kappa) = \{\varphi \mid \tau(V(\varphi)) > 0\}$ be the set of sentences expressing beliefs held in κ (or the associated two-sided ranking function τ), and let $C\mathcal{B}(\kappa) = \{\varphi \triangleright \psi \mid \tau(V(\psi) \mid V(\varphi)) >$

0} be the set of conditional sentences corresponding to the conditional beliefs in κ .

Now we may recursively define truth for all sentences in L_1 relative to a valuation $v \in V$ and a ranking function κ for V by specifying the following recursive base: $\langle v, \kappa \rangle \models p$ iff $v \models_0 p$ for any sentence letter p of L_0 , and $\langle v, \kappa \rangle \models \varphi \triangleright \psi$ iff $\varphi \triangleright \psi \in CB(\kappa)$. Note that we thereby provide what I above called shallow truth conditions for the sentences in L_1 .

Then we have a choice: we may call $\chi \in L_1$ *semi-epistemically logically true*, $\models^{se} \chi$, iff $\langle v, \kappa \rangle \models \chi$ for all valuations $v \in V$ and all ranking functions κ for V . Or we may epistemically restrict that notion by requiring that all (unconditional) beliefs in κ must be true in the valuation v . That is, we may define a sentence χ of L_1 to be *epistemically logically true*, $\models^e \chi$, iff $\langle v, \kappa \rangle \models \chi$ for all ranking functions κ for V and all valuations $v \in V$ such that $v \models_0 \varphi$ for all $\varphi \in \mathcal{B}(\kappa)$.

It is easily checked, then, that the restriction of Lewis' logic \mathbf{V} (cf. Lewis [1973a, p.132]) to the fragment L_1 is correct and complete with respect to \models^{se} . In particular, neither Centering nor Weak Centering hold with respect to \models^{se} simply because there is no relation between the facts according to v and the conditional beliefs according to a ranking function κ for V . By contrast, it is Lewis' logic \mathbf{VC} , restricted to the fragment L_1 (which also results from Adams' probabilistic semantics), that is correct and complete with respect to \models^e , since \models^e specifies such a relation. In particular, Weak Centering holds since $\tau(B \mid A) > 0$ entails $\tau(A \rightarrow B) > 0$ (see also (11) below) and Centering holds since $\tau(A \cap B) > 0$ entails $\tau(B \mid A) > 0$. However, according to \models^e these axioms only indicate a relation between conditional and unconditional beliefs. This agrees with how Gärdenfors (1988, p. 148ff.) sets up things; he also accepts these axioms.

This interlude showed that the ranking-theoretic route leads to generally accepted logics, as it should be. In principle, the logic for the other expressive options to be discussed below could be worked out in the same way, since the behavior of ranking functions is well known,

though not completely in every relevant aspect; the business might become tricky. However, this business is not my interest here.

The restriction to the fragment L_1 is important. The Ramsey test (I.1) cannot make immediate sense of nestings of conditionals. The same holds in probabilistic terms. We have Adams' thesis, which obeys this restriction to L_1 (or 'factual language') and is just a probabilistic version of the Ramsey test (whence it is doubtful whether $P(\varphi \triangleright \psi)$ can be understood as a probability). And there is *Stalnaker's thesis* (cf. Stalnaker [1970, sec. 3]), which extends Adams' thesis to nested conditionals, and thus treats " $\varphi \triangleright \psi$ " as representing a proposition and attempts to assign to it a proper unconditional probability. Alas, it founders at Lewis' trivialization theorem. So, we better stick to the restriction.

Interlude 2: The Equivalence Thesis

With the help of (I.1), we can clarify the status of the so-called equivalence thesis, which attracted a lot of interest. It says that at least the indicative conditional \triangleright is simply the truth-functional material implication \rightarrow , perhaps amended by some suitable pragmatic background. For nested conditionals, it is known to lead to nonsensical results. (See the proof of God's existence in Edgington (1995, p. 281), with truth-functional "if": "If God does not exist, then it's not the case that if I pray my prayers will be answered. I do not pray. Therefore God exists."). However, restricted to the fragment L_1 , it has a lot of plausibility (whence its prominent defenders such as Grice [1975], Lewis [1976, p. 305ff.], and Jackson [1987, ch. 1–2]). The half-truth of this position is well explained by the Ramsey test. With the definitions (9) and (10), (8) immediately entails:

$$(11) \text{ if } \tau(A) \geq 0, \text{ then } \tau(B \mid A) > 0 \text{ if and only if } \tau(A \rightarrow B) > 0.$$

(Because of (9) and (10), (11) is equivalent to: if $\kappa(A) = 0$, then $\kappa(\bar{B} \mid A) > 0$ iff $\kappa(A \cap \bar{B}) > 0$. Because of (8), this is equivalent to: if $\kappa(A) = 0$, then $\kappa(A \cap \bar{B}) - \kappa(A) > 0$ iff $\kappa(A \cap \bar{B}) > 0$. And this is obviously true.)

That is, if A is not taken to be false, B is believed conditional on A if and only if the material implication $A \rightarrow B$ is believed. In still other

terms, if not $Bel(\bar{A})$, “ $\varphi \triangleright \psi$ ” may be taken to express either belief, since they amount to the same thing.

Thus, (11) refutes the full equivalence thesis that equates the indicative conditional \triangleright and the truth-functional material implication \rightarrow without any restriction. However, one might say that it is true under the assumption that the antecedent is not taken to be false. This assumption is thus an adequate epistemic characterization of the pragmatic background required by the equivalence thesis. Or one might say that the equivalence thesis holds for so-called open conditionals (see (II) below), which are indicative conditionals additionally characterized by the speaker being indeterminate about the antecedent (*i.e.*, $\tau(A) = 0$). According to (11), being open in this sense is not required; $\tau(A) \geq 0$ is enough of an assumption. But note that open conditionals are thereby only epistemically and not in any way linguistically defined.

The equivalence thesis derives its plausibility from the innocent principle often called the direct argument: “ φ or ψ ” entails “if not φ , then ψ .” This appears most convincing, and indeed has many correct instances. Jackson (1987, sec. 1.1) proves the equivalence thesis with the direct argument (and two further, still more innocent principles). However, (11) explains what is wrong with the direct argument; the entailment holds only if the disjunctive premise “ φ or ψ ” is open as well in the sense that “ φ or ψ ” is not assumed because φ itself is already taken to be true. That is, the direct argument itself holds only conditionally, and no unconditional equivalence thesis may be derived from it. This agrees with Stalnaker’s (1975, sec. IV) account of the direct argument. And Evans and Over (2004, p. 114) point to the same fact, when they say that it makes a difference whether one has a constructive or a non-constructive justification for the disjunctive belief “ φ or ψ .” If having a non-constructive justification for “ φ or ψ ” only means believing the disjunction without believing any of the disjuncts, then their explanation comes to the same.

Gillies (2004) makes an alternative attempt to capture similarities as well as differences of open or epistemic conditionals and material

implications within the setting of dynamic or update semantics. However, I sense a certain confusion of perspectives in his attempt. Update semantics describes how the common ground of interlocutors changes in response to certain utterances. Thus, leaving subtleties aside, it basically describes how the beliefs of a hearer change through utterances. However, Gillies (2004, sec. 4) describes the update potential of an open conditional in an auto-epistemic way, according to which the open conditional makes a claim about what is already in the common ground. Either, the conditional agrees with what is already contained in the common ground (or acceptance base) and then confirms it without changing it, or it does not agree and thus makes the common ground collapse. This does not seem to be an adequate description of what goes on on the hearer’s side. And the speaker’s side is more directly described by (I.1) and (11) without engaging into dynamic semantics.

Before proceeding to the next major topic, let me mention various other expressive options that go without saying, but should be explicitly listed here. First, if we can express conditional belief according to (I.1), we can also express other conditional epistemic attitudes; that is, we may use “ $\varphi \triangleright \psi$ ” also for expressing

$$(I.2) \tau(B | A) = 0, \text{ or}$$

$$(I.3) \tau(B | A) < 0,$$

or combinations thereof. For instance, indicative might-conditionals usually express (I.1 or 2), *i.e.*, $\tau(B | A) \geq 0$; “if it rains, he may come late” expresses that I do not believe him to be in time given that it rains.

And let us not forget that in uttering “ $\varphi \triangleright \psi$ ” we might also express our attitudes towards A by itself and towards B by itself, *i.e.*, whether

$$(II.1) \tau(A) > 0, \quad (II.2) \tau(A) = 0, \text{ or} \quad (II.3) \tau(A) < 0,$$

and whether

$$(III.1) \tau(B) > 0, \quad (III.2) \tau(B) = 0, \text{ or} \quad (III.3) \tau(B) < 0,$$

i. e., whether we take the antecedent and the consequent of the conditional to be true or to be false. Of course, we can express (II) and (III) also by unconditional sentences, simply by asserting φ or ψ , etc., and we usually do. However, using the conditional idiom is almost always accompanied by expressing some version of (II) and (III).

This claim becomes intelligible when we note that the expressivistic approach is so far neutral as to how (conditional) beliefs are expressed, *i. e.*, whether they are expressed as an assertion, a presupposition, or an implicature of the utterance. From a linguistic point of view these are, of course, important semantic and pragmatic distinctions. From an expressivistic point of view, however, these distinctions come later and may be initially neglected, as I will do here. Therefore, it is correct to say that conditionals might be used for expressing (II) and (III), even if only as a presupposition or implicature.

Here are some examples: I already mentioned open conditionals that by definition express (II.2) (and usually express (III.2) as well). If counterfactuals deserve their name, we thereby express, by presupposition or implicature (or even presuppositional implicature, as suggested by Leahy [2011]), that we take their antecedent and their consequent to be false, *i. e.*, as counterfactual. However, no rule without exception. By saying “if he had taken arsenic, he would have shown exactly those symptoms which he does in fact show” (Anderson 1951), I make an inference to a possible explanation, *i. e.* from the belief in the consequent (III.1) at least to the possibility of the antecedent, thus expressing (II.1 or 2). (See the discussion of option (IV.1) below for the potential correctness of such an inference.) So, I will continue speaking of conditionals *usually* expressing this and that. It is extremely difficult for linguists to state stricter rules, and I will not engage in their business, though I hope to facilitate it by extending the expressive options.

Other examples for (II) and (III) are “even if” and “because,” which I have also subsumed under the schematic conditional \triangleright . “ ψ because φ ” is factive and thus expresses, among other things, (II.1) and (III.1), *i. e.*, belief in A and in B while “ ψ would have been the case, even if φ

had been the case” usually expresses, among other things, (II.3) and (III.1) and is thus also called a semi-factual. With a little ingenuity one can presumably find instantiations for all nine combinations of (II.1–3) and (III.1–3).

I should finally add that we cannot only express belief in A , etc., but also strength of belief in A . There are many modifiers in natural language indicating strength of belief, at least roughly and vaguely. (Introspection does not reveal precise degrees of belief, so that no more precision can be expected from the expressive means.) Because these modifiers are so widespread, it may seem that expressivism must take a probabilistic route, at least as far as assertive speech is concerned. However, it can seem so only as long as probabilities are the only model of degrees of belief. Therefore, I insist that these degrees can also be interpreted as ranks. And I insist that sensitivity to degrees of belief must not blind us for the fact that the basic phenomenon to be expressed is belief itself. Be this as it may, I shall not ponder about the expression of strength of belief, because it is not specific to the conditional idiom; those modifiers are equally common in unconditional assertive speech.

5. Relevance

In the rest of the paper I want to explore how we can go beyond the Ramsey test. There is much more to the epistemic relation between the propositions represented by the antecedent and the consequent of the schematic conditional “ $\varphi \triangleright \psi$ ”; it’s not just the conditional belief. Another relation — a most important one indeed — is *epistemic relevance*. Five decades ago or so, relevance was a residue left to the pragmatic wastebasket, but only because there was no way to capture relevance with the means of extensional logic. A nice example for this inability is found in Frege’s claim that “but” has the same sense as “and,” *i. e.*, is truth-functionally equivalent to it, and differs only in tone. However, it seems plainly wrong to relegate epistemic relevance to matters of tone. (For a monograph on how to do better, see Merin [1996].) A more serious example is the celebrated Hempel-Oppenheim theory of

deductive-nomological explanation, which essentially foundered at its inability to incorporate relevance considerations. (This story is nicely told in Salmon [1989], particularly in ch. 3.)

Rott (1986) notices the significance of relevance to conditional logic, and Merin (2007) elaborates on it. Philosophers tried various ideas to understand relevance (one idea being relevance logic; cf. Anderson and Belnap [1975]). Sperber and Wilson (1986) is very well received in linguistic pragmatics and psychology. However, as illuminating as their observations on the role of relevance in human communication are, their general characterization is empty of what relevance basically is: “An assumption is relevant if and only if it has some contextual effect in that context” (p. 122). There is no point here in trying to survey the many attempts at capturing relevance. In my view, the epistemically basic sense of relevance is explicated in (subjective) probability theory by its notion of (in-)dependence: A is relevant to B iff B probabilistically depends on A , *i. e.*, iff $P(B | A) \neq P(B | \bar{A})$, *i. e.*, iff A makes a difference to the epistemic assessment of B . Clearly, we can also distinguish positive and negative relevance. This is indeed the basic notion of inductive logic and confirmation theory (cf., *e. g.*, Carnap 1971). And it is clearly the dominant paradigm for accounting for relevance.

This probabilistic notion is fine, and if we were concerned only with relevance, we might perhaps return to the probabilistic paradigm (although the distinctions (IV.1a–d) introduced below are important and useful, they cannot be duplicated in probabilistic terms). However, we have changed the paradigm for good reasons, and, therefore, it is noteworthy that epistemic relevance is captured in ranking theory at least as well. A is *positively relevant*, *irrelevant*, or *negatively relevant* to B , if, respectively, A raises, does not change, or lowers the degree of belief, *i. e.*, the two-sided rank of B , *i. e.*, iff respectively:

$$(IV.1) \quad \tau(B | A) > \tau(B | \bar{A}),$$

$$(IV.2) \quad \tau(B | A) = \tau(B | \bar{A}),$$

$$(IV.3) \quad \tau(B | A) < \tau(B | \bar{A}).$$

(For my reasons for stating, *e. g.*, (IV.1), as above and not as $\tau(B | A) > \tau(B)$, see Spohn [2012, p. 106f].)

Note that explicating relevance as raising or lowering degree of belief — as is done in (IV) — requires the full resources of ranking theory. They were not yet required for the Ramsey test (I). That is, for this explication of relevance, one needs cardinal conditional degrees of belief as ranking-theoretically defined in (3) and (8) (or as offered by conditional probabilities). Only thereby one is able to compare degrees of belief under varying conditions, as is required by (IV). By contrast, purely ordinal conceptions such as the entrenchment orderings of belief revision theory (cf. Gärdenfors 1988, ch. 4), though sufficiently powerful for dealing with the Ramsey test (I), is unable to deliver such comparisons in an adequate way. This remark also applies to the similarity spheres of Lewis (1973a), which are only ordered without quantitative distances. Thus, adequately representing relevance is a crucial point in my view where ranking theory is superior to those alternative theories (as I have pointed out already in Spohn [1983a, note 18]).

So, my suggestion is that the schematic conditional “ $\varphi \triangleright \psi$ ” may be used to express some kind of relevance (IV.1–3) — and indeed is mostly so used. Admittedly, this is commonly done by way of implicature. However, I said already that the expressivist can, at least initially, proceed without distinguishing assertion, presupposition, and implicature. So, the indicative conditional “if” usually expresses positive relevance. When I say “if it rains, he will come late,” I thereby express that I do not believe him to be late, if it does not rain. This effect is usually explained in terms of Gricean conversational maxims, but note that those maxims themselves ground in the notion of relevance. “If Oswald did not shoot Kennedy, someone else did” clearly expresses positive relevance: given that Oswald did shoot Kennedy, I do not believe — or believe less firmly — that someone else did as well. (More on this famous example below.) “Because” also expresses positive relevance; it differs from “if” only with respect to (II) and (III). “He came late, because it rained” does express the same conditional relation as

before. (More on “because” below.) There are many more ways to express positive relevance (IV.1).

“He will come late whether or not it rains” expresses irrelevance (IV.2). And negative relevance (IV.3) may have even more expressive means than positive relevance. “Despite” basically indicates negative relevance and so does “but.” It is generally deviant to say “*Fa*, but *Fb*,” for instance: “Ann sings, but Bob sings” (whereas “*Fa* and *Fb*,” or “Ann sings and Bob sings” is perfectly okay). An interesting explanation lies in Carnap’s principle of positive instantial relevance (cf. Carnap [1971, sec. 13]), which says that, in the absence of further background information, one instance of a feature is positively and not negatively relevant for next encountering a further instance of that feature. (For this observation, see Merin [1996, 1999].) “He came late, although it rained” expresses that, given it rained, it came as a surprise that he came late; apparently, one would rather have expected him to come late without rain. From the expressivistic point of view, relevance is a central episodic aspect to be expressed and not merely some pragmatic add-on.

Whether conversational relevance as generally required by Grice’s maxims of conversation can be fully captured with the above notion of relevance is a different question that need not concern us here. But it might be worth trying. For instance, in so-called biscuit conditionals (“there are biscuits on the sideboard if you want some”), the irrelevance of the antecedent for the consequent is salient, but not claimed, *e.g.*, by a “whether or not” construction. Still, the conversational relevance of such a conditional can be well explained in the present terms (namely by the positive relevance of the antecedent as well as the consequent of the example for the goal of eating something — see Merin [2007] for details).

Note that the expressive options (II), (III), and (IV) are logically independent; unconditional degrees of belief in *A* and *B* are compatible with any direction of relevance between *A* and *B*. It would be interesting to develop the logic of positive relevance conditionals, *i.e.*, of conditionals expressing (IV.1). Let me only remark that the behavior of positive relevance is not straightforward nor completely known,

although Spohn (2012, theorem 6.7) covers a lot of ground. (The same holds, by the way, for probabilistic positive relevance.)

I might point out, though, that ranking theoretic positive relevance is *symmetric*: if *A* is positively relevant to *B*, *B* is positively relevant to *A*. And it holds for the negations as well; that is, if *A* is positively relevant to *B*, \bar{A} is positively relevant to \bar{B} . The same applies to negative relevance. It is well known that the very same claims hold for probabilistic relevance or dependence. There is a deeply entrenched tendency not only to correctly apply *modus ponens* and *modus tollens*, but also to commit the alleged fallacies of affirming the consequent (from “if φ , then ψ ” and ψ infer φ) and denying the antecedent (from “if φ , then ψ ” and non- φ infer non- ψ). Apparently, there is a tendency to read “if” as “iff” (indeed, there is no phonetic difference). If “if” expresses positive relevance (IV.1), this tendency may be explained by the facts just observed. The probabilistic version of this explanation seems presently to be favored by psychologists (cf. Oaksford and Chater [2007, p. 118ff.]); but it may as well be given in ranking-theoretic terms (see Olsen [2014, ch. III–IV]). One might think that the general validity of the symmetry of positive relevance goes too far; many conditionals do not display this symmetry. However, this need not mean that they do not express positive relevance at all. It may also mean that they express a specific kind of positive relevance.

Indeed, an important observation is that the ranking-theoretic option (IV.1) may be further differentiated. For a long time, I felt justified in calling *A* a *reason for B*, if *A* speaks for *B*, if *A* supports or confirms *B*, if *A* strengthens the belief in *B* — that is, if *A* is positively relevant for *B*, if (IV.1) obtains. (For further justification, see Spohn [2012, ch. 6].) Also, I chose this label in order to indicate the large philosophical resonance space of the notion of positive relevance. The point now is that there are various kinds of reasons or positive relevance. If *A* is a reason for *B*, it raises the degree of belief in *B*. But from where to where? In probabilistic terms, no specific raisings stand out. However, in ranking-theoretic terms we can distinguish four cases (with self-explaining

labels), and we might have an interest in expressing any of them by using a conditional “ $\varphi \triangleright \psi$ ”:

(IV.1a) $\tau(B \mid A) > \tau(B \mid \bar{A}) > 0$, *i. e.*, A is a *supererogatory reason* for B .

(IV.1b) $\tau(B \mid A) > 0 \geq \tau(B \mid \bar{A})$, *i. e.*, A is a *sufficient reason* for B .

(IV.1c) $\tau(B \mid A) \geq 0 > \tau(B \mid \bar{A})$, *i. e.*, A is a *necessary reason* for B .

(IV.1d) $0 > \tau(B \mid A) > \tau(B \mid \bar{A})$, *i. e.*, A is an *insufficient reason* for B .

Thus, *e. g.*, A is a sufficient reason for B , if B is believed given A , but not given \bar{A} . Only kinds (b) and (c) are not disjoint; A may be a necessary *and* sufficient reason for B . The same distinctions may be made for negative relevance. In this way, the expressive options for “ $\varphi \triangleright \psi$ ” differentiate further. It is certainly a point in favor of ranking theory that it is able to represent these distinctions and definitely a point counting against probability theory that it cannot capture such a familiar notion as that of a sufficient reason, which must not be shortened to the notion of a logically sufficient reason.

Again, the properties of these kinds of reason are not straightforward and not completely known. Some expectations (trained or distorted by deductive logic) may be disappointed, *e. g.*, the relation of being a sufficient reason is *not* transitive. And if A and A' are sufficient reasons for B , $A \cap A'$ need not be! Moreover, in order to continue on the above remark, the four kinds of reasons are not symmetric by themselves; only their disjunction (IV.1) is. (For more on that behavior, see Spohn [2012, sec. 6.2].)

Finally, the logical independence of (IV) from (II) and (III) no longer holds for the subtypes (a)–(d). There are many interesting interactions of (II) and (III) with these subtypes. For instance, if A is a supererogatory reason for B , B must also be believed unconditionally. And if “ $\varphi \triangleright \psi$ ” is a counterfactual “if φ had obtained, ψ would have obtained” and thus expresses, via presupposition or implicature, the belief in the falsity of A and B , (II.3) and (III.3), and if it moreover expresses the

Ramsey test (I.1), then it entails positive relevance (IV.1); indeed, A must then be a necessary and sufficient reason for B , *i. e.*, (IV.1b+c) apply. By contrast, if “ $\varphi \triangleright \psi$ ” stands for “ ψ because φ ” expressing belief in A and B , (II.1), and (III.1), and positive relevance (IV.1), then A must be a sufficient or supererogatory reason for B , and so forth. There is no place here to study all these interactions.

6. Circumstances

It might appear that (I)–(IV) exhaust our expressive options for the schematic conditional “ $\varphi \triangleright \psi$.” We can express our attitudes towards A and B by themselves and how we epistemically relate A and B . And since we have refrained from attending to specific degrees of belief, nothing seems left out. Nothing? No, there is at least one further most important class of beliefs that we might express with conditionals. The idea is indicated at many places in the literature; it is perhaps obvious. However, as my remarks at the end of this section will show, I cannot find that the idea has found a clear description, let alone a proper theoretical treatment. Let me explain what I have in mind:

We might start with the infamous sample pair of Quine (1960, p. 222) concerning the Korean war:

(12) If Caesar were in command, he would use the atomic bomb.

(13) If Caesar were in command, he would use catapults.

The pair was designed to demonstrate the hopeless context-dependence and indeterminacy of counterfactual discourse. I find the case not so hopeless, though. (12) directs our attention to a certain issue or question under discussion: what kind of political leader was Caesar? Violent, audacious, prudent, compromising, etc.? (13) raises a different question: what kind of warfare technology was available at Caesar’s times? (See Roberts [1996] for a general account of the pragmatic role of the ‘question under discussion.’)

Formally, a question is represented by a partition of the possibility space W ; for instance, a psychological partition each cell of which

represents a complete possible psychological condition of Caesar, or a technological partition, etc. The question then is: which cell of the partition is the true one? There must be exactly one that is true. But an informative answer need not identify the true cell; it need only say that the true cell lies in some subset of the partition – for instance, in one of the many “compromising” cells of the very fine-grained psychological partition.

What do (12) and (13) assert? Clearly, they give an answer to their respective question. (12) says: Caesar is a kind of person such that he would use the atomic bomb, if in command. And (13) says: the kind of technology available to Caesar was such that he would use catapults, if in command. And by uttering (12) and (13), I express the corresponding beliefs.

A bit more formally: let φ = “Caesar is in command” representing the proposition A and ψ = “Caesar uses the atomic bomb” representing the proposition B ; so, (12) is abbreviated as “ $\varphi \triangleright \psi$.” With (12), I claim that Caesar is of a certain psychological characteristic C^* . So, I believe C^* , *i. e.*, $\tau(C^*) > 0$. Somehow, C^* is determined with the help of “ $\varphi \triangleright \psi$ ”. But how? We just said that C^* is the characteristic such that given it and Caesar’s being in command, he would use the atomic bomb, *i. e.*, such that $\tau(B \mid A \cap C^*) > 0$. Is C^* thereby uniquely determined? No. We have to be a bit more careful. What I really express is my belief that Caesar belongs to one of those cells C of the psychological partition for which I believe B given $A \cap C$. That is, I believe in the disjunction C^* of those cells C for which $\tau(B \mid A \cap C) > 0$. And this disjunction is indeed unique.

We could go through the same exercise with (13) and the appertaining technological partition. This amounts to a clear description of the relevant context-dependence of (12) and (13): the context created by the utterances themselves in these cases consists in a certain issue or partition, and within that context it is determinate what the conditional assertion claims or expresses.

The abstract representation of the situation is this: let \mathcal{P} be a partition of W , *i. e.*, a set of mutually disjoint and jointly exhaustive

conditions or propositions. Then we may use the conditional “ $\varphi \triangleright \psi$ ” for expressing the belief that one of all those conditions in \mathcal{P} obtains given which we believe B conditional on A – formally:

$$(V.1) \tau(C^*) > 0, \text{ i. e. } Bel(C^*), \text{ where } C^* = \bigcup \{C \in \mathcal{P} \mid \tau(B \mid A \cap C) > 0\}.$$

I will call (V.1) the “*circumstances are such that*” reading of conditionals, because it expresses the belief that circumstances C are such that the conditional belief in B given A can be maintained.

What is the relation between (I.1) and (V.1)? Not trivial, but quite close. This is why one may get easily confused about what precisely is expressed. First, we might wonder whether B is believed given A and C^* , if B is believed given A and C for each cell $C \subseteq C^*$ of the partition \mathcal{P} . The answer is yes:

$$(14) \text{ For } C^* \text{ as defined in (V.1) we have } \tau(B \mid A \cap C^*) > 0.$$

(This is theorem 14.14 of Spohn 2012.) Intuitively, (14) says that what is conditionally believed given each disjunct $C \subseteq C^*$ is so, too, given their disjunction C^* . Then it is also unconditionally believed, one might think, when that condition C^* is itself believed, as stated in (V.1). This, however, would be a fallacy; this further conclusion holds only under certain assumptions:

$$(15) \text{ For } C^* \text{ as defined in (V.1), if } \tau(B \mid A \cap C^*) > 0, \text{ then } \tau(B \mid A) > 0 \text{ iff } \tau(C^* \mid A) > 0. \text{ Moreover, } \tau(C^* \mid A) > 0 \text{ is entailed by } \tau(C^*) > 0 \text{ and } \tau(A) \geq 0. \text{ Hence, } \tau(A) \geq 0 \text{ is sufficient, and } \tau(C^* \mid A) > 0 \text{ is necessary and sufficient, for inferring (I.1) from (V.1).}$$

(This is part of theorem 14.81 of Spohn 2012.) So, perhaps, the Ramsey test (I.1) does not fully capture, but is only entailed by what is expressed; this is so, if it is (V.1) that is expressed. Of course, the alternative additional premises, $\tau(A) \geq 0$ or $\tau(C^* \mid A) > 0$, may or may not be

plausibly satisfied in a given case. (For an example of their violation, see the end of section 7.)

The foregoing discussion was guided by the Ramsey test; that is, it focused on the additional conditions C under which the conditional belief in B given A is maintained. However, the discussion of (12) and (13) might have been even more plausible in terms of positive relevance. The conditional “ $\varphi \triangleright \psi$ ” might as well be used for expressing the belief that one of all those cells in \mathcal{P} obtains given which A is taken to be positively relevant to B – formally:

$$(VI.1) \quad \tau(C^*) > 0, \text{ i. e., } Bel(C^*), \text{ where } C^* = \bigcup \{C \in \mathcal{P} \mid \tau(B \mid A \cap C) > \tau(B \mid \bar{A} \cap C)\}.$$

Now, expressive options proliferate. Just as (V.1) builds on the Ramsey test (I.1), one might introduce options (V.2) and (V.3) building on (I.2) and (I.3). Similarly, one might define options (VI.2) and (VI.3), paralleling (IV.2) and (IV.3). And it would certainly be worthwhile to differentiate (VI.1) in the same way as we differentiated (IV.1), according to the various kinds of reason or positive relevance. Let me pick out just one instance:

$$(VI.1b) \quad \tau(C^*) > 0, \text{ where } C^* = \bigcup \{C \in \mathcal{P} \mid \tau(B \mid A \cap C) > 0 \geq \tau(B \mid \bar{A} \cap C)\}.$$

According to (VI.1b), “ $\varphi \triangleright \psi$ ” expresses the belief that some circumstances obtain under which A is a sufficient reason for B .

Is (VI.1) related to (IV.1) in the same way as (V.1) to (I.1)? No, assertions parallel to (14) and (15) do not obtain. The reason is that the positive relevance of A for B given various C according to (VI.1) may be any of the kinds (a)–(d), and then it is unpredictable how these relevancies mix. (In a probabilistic setting this is called Simpson’s paradox.)

However, if we focus on a specific kind of positive relevance, as we do in (VI.1b), the picture changes. Then we have in analogy to (14):

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$$(16) \quad \text{For } C^* \text{ as defined in (VI.1b) we have } \tau(B \mid A \cap C^*) > 0 \geq \tau(B \mid \bar{A} \cap C^*), \text{ i. e., that } A \text{ is a sufficient reason for } B \text{ given } C^*.$$

And the assumption of (VI.1b) that C^* itself is believed once more helps us to further conclusions, in analogy to (15):

$$(17) \quad \text{For } C^* \text{ as defined in (VI.1b), given } \tau(C^* \mid \bar{A}) \geq 0 \text{ and given either } \tau(A) \geq 0 \text{ or } \tau(C^* \mid A) > 0, \text{ (VI.1b) entails (IV.1b), i. e., that } A \text{ is (unconditionally) a sufficient reason for } B.$$

(For proofs, see theorems 14.14 and 14.81 in Spohn [2012].) Again, one must be clear about what the additional premises mean. But let us no longer dwell on technicalities. For the moral should be obvious by now: by all means, we must closely observe the many formal relations between the various expressive options as determined by ranking theory; without being clear about these relations we never gain clarity about the various conditionals and their relations.

You may have already noticed the most interesting feature of (V.1) and (VI.1); namely, that, according to them, conditionals express an *unconditional* belief $\tau(C^*) > 0$, which is truth-evaluable and hence either true or false. This well conforms to our intuition. Look at (12) and (13) again. We may well have a dispute about them, and we all think that this is a factual dispute. What kind of character or political leader was Caesar? Was he really so reckless and aggressive as (12) claims? Which evidence do we find in his biography and his writings for or against (12)? And so forth.

This observation is most important. In section 2, I strongly emphasized CBnoTC, the claim that conditional belief has no truth conditions, and thereby motivated the expressivistic approach. Even if the arguments were good, they appeared counter-intuitive. Now we have a partial explanation for this intuition. Maintaining CBnoTC does not entail that conditionals do not have truth conditions at all; they fail to have them only insofar as they express only conditional belief or relevance, as they do according to (I) and (IV). However, they may also express more complex features definable in terms of conditional belief,

something that is indeed truth-evaluable, and (V) and (VI) show how they might do so. I shall deepen this observation in section 8.

Interlude 3: Sly Pete

Let me exemplify (V) and (VI) with another much discussed example, the Sly Pete story of Gibbard (1981, p. 231). It is about a poker game. Zack saw the hand of Pete's opponent and signalled it to Pete. Jack need not know this, but he saw both hands and thus that Pete's was the losing one. Jack and Zack have to leave the room and can only speculate about the outcome. So, Zack believes and sincerely asserts "if Pete called, he won," whereas Jack believes and sincerely asserts "if Pete called, he lost."

Gibbard argues that both are right in their ways and that nothing breaks the symmetry between them. Hence, he concludes that the two conditionals cannot be assigned truth values and only be interpreted in an epistemically relativized way, as explained by the Ramsey test. Many have accepted this argument, as far as indicative conditionals are concerned. It is also grist for my mill.

However, it is not clear that indicative conditionals must be interpreted according to the Ramsey test (I.1), (neglecting relevance considerations). The "circumstances are such that" reading (V.1) might be equally or more appropriate. We may well suppose that Jack and Zack have no deep inductive disagreement and will agree once they share their information. According to what Lycan (2001, p. 168) calls the Hard Line (which is commonly accepted according to his polls), they will then agree that Jack is right because he has the overriding information. However, even this is not so clear. Another circumstance might be that Sly Pete is a deft or even perfect cheat; he will succeed if he calls and decides to cheat. In that case, Zack would be right.

The point is this: once we engage in this kind of discussion, we apply to those indicative conditionals the "circumstances are such that" reading (V.1), according to which it is a factual question over who is right (unless there is an inductive disagreement which persists even after all facts are commonly known – more on this below). This point

holds, I think, also *vis à vis* the variants which Edgington (1995, p. 293ff.) and Bennett (2003, p. 85ff.) bring up in order to perfect the symmetry between the two contradictory opinions. Either there is some hidden fact of the matter that breaks the symmetry – and then one of the two opposing indicative conditionals is correct – or there is no such fact of the matter (of what will happen, *e.g.*, in Bennett's example, when all three gates are open); and then none of the two opposing indicative conditionals is correct under reading (V.1).

Let me point to some precedents of (V) and (VI) in the literature. First, I am struck by the similarity of (V.1) to the formula (8) of Adams (1975, p. 131), which is supposed to treat counterfactuals within his probabilistic framework and which has been further developed by Skyrms (1981); (V.1) indeed looks just like a ranking-theoretic translation of that formula. I am not aware that Adams' two factor model, as he calls it, has made a deep impression on the ongoing discussion perhaps because he himself was not so confident of it calling it *ad hoc* on p. 132. A further point may have been that that formula delivers only a dubious expected assertibility value for counterfactuals and not a probability, as Adams himself notes on p. 132 and as Skyrms (1981) makes more explicit. Whatever the reasons for this neglect, they do not apply to (V.1), which was introduced here definitely not in an *ad hoc* way and clearly specifies the beliefs expressed and not some expected assertibility value – the theoretical use of which is very obscure. This is a further point in favor of the ranking-theoretic versus the probabilistic point of view.

The other precedent I have in mind is that it has become quite customary to speak of the basis of a conditional (*cf.*, *e.g.*, Edgington [1995, p. 283]), which is supposed to consist in the facts that make the conditional true or assertible. Speaking of the categorical base of a disposition may bear not only a terminological resemblance. When Bennett (2003, ch. 22) gives a central role to the evidence or explanatory bases of conditionals, he has again something similar in mind. These usages of "base" will fit still better to the special case of causal conditionals

discussed in the next section. Finally, when Lewis says that counterfactuals, and thus the similarity ordering on which they ground, supervene on the character of actual world (cf. Lewis [1986, p. 22]), he refers to such a basis on a grander scale in a more metaphysical mood and much more debatable way.

However, at the three places cited, this basis remains rather dim and without further theoretical treatment; I am not aware that it has been elaborated elsewhere. (V)–(VI) offer subjective counterparts of that basis, namely the (context- or partition-relative) proposition C^* of (V) and (VI). This proposition may well be called the basis on which the relevant conditional belief is held, and its explication opens the way to a rigorous and detailed study of the basis of conditionals so understood.

7. Causal Conditionals

(V) and (VI) are important general schemes, referring to a somehow contextually given partition \mathcal{P} . Still more important is a special case. The next big claim I want to defend in this paper is that all *causal conditionals* instantiate scheme (VI) in a specific context-independent way.

Causal conditionals are those conditionals which are interpreted as somehow representing causal relations. However, this way of talking may presuppose that causal relations are something that obtains objectively. Within our expressivistic approach, we better say that causal conditionals are those expressing causal beliefs, *i.e.*, beliefs about causal relations. Causal conditionals are strongly correlated with the subjunctive mood and the counterfactual phrasing (although these correlations are never completely reliable). Indeed, the most prominent theory of deterministic causation is the counterfactual one, which started out by defining causal relations in terms of counterfactuals (cf. Lewis [1973b]). Matters have become more and more complicated, due to numerous causal puzzles like overdetermination and various kinds of preemption (cf. Collins et al. [2004]). The nowadays even more fashionable interventionist account of causation (cf. Pearl

[2000], Woodward [2003]) also claims to be a variant or specification of the counterfactual approach.

Causal conditionals are very common, and most counterfactuals are to be interpreted in a causal way. The Ramsey test is considered to be inadequate for them, since it establishes only an epistemic and not a causal relation. Therefore, the opinion prevails that they constitute a different type of conditionals that requires a different account, say, in terms of the Stalnaker/Lewis semantics or in terms of structural models or equations. Contrary to this opinion, I claim that there is no need to change the framework. Causal conditionals indeed do not follow the Ramsey test (I.1), but they do follow the “circumstances are such that” reading (VI.1). Let me explain.

First, we may assume that the Boolean algebra \mathcal{A} over the set W of possibilities is generated by a set \mathcal{A}^* of *simple propositions*, *i.e.*, each proposition in \mathcal{A} is a possibly very complex Boolean combination of propositions in \mathcal{A}^* . And we may further assume that each of the simple propositions in \mathcal{A}^* refers to a fixed temporal location. “It’s freezing in Konstanz on March 19, 2014,” “I do not sleep well on March 20, 2014,” “my flight starts at 6 am, March 21, 2014”: each of these represents a simple proposition referring to a (possibly coarse-grained) specific time. Complex propositions by contrast need not have a determinate temporal location.

We may imagine then that the possibilities in W , as far as they can be characterized by \mathcal{A}^* , are maximal consistent conjunctions of simple propositions in \mathcal{A} or their negations; each possibility is an entire possible history of the form “first A'_1 and then A'_2 and then $A'_3 \dots$ ”, where each A'_i is a simple proposition or its negation. Those histories need not be complete histories in any absolute sense; they would be so only if the possibilities in W were full Lewisian, or rather Wittgensteinian, possible worlds. Hence, the histories in W are more or less fine-grained depending on the richness of \mathcal{A}^* . These informal descriptions are good enough for our present purposes. Of course, a formal treatment would have to be fully explicit about these algebraic

matters, and then issues of granularity would loom large (cf. Spohn [2012, sec 14.9]).

Next, we may observe that the antecedent and the consequent of a conditional often refer to simple propositions. The general reason may be logical simplicity, but in the case of causal conditionals the reason is that antecedent and consequent refer to singular cause and effect, which have to have a fixed temporal location. So, a causal conditional has the form “ $\varphi \triangleright \psi$,” where φ now represents A_t referring to t , and ψ represents $B_{t'}$ referring to t' ; for instance, if I had dropped the glass (right now), it would have broken (a second later). We may assume that t' is later than t and neglect here philosophical problems about whether a cause might be simultaneous with or even later than its effect.

Now, what does it mean that A_t is a cause of $B_{t'}$? There is not the slightest hope of adequately dealing here with this issue. (See Spohn [2012, ch. 14] for a comprehensive exposition and defense of my view.) Let me only briefly sketch the answer I endorse for more than 30 years: A_t is a *cause* of $B_{t'}$, if A_t is positively relevant to $B_{t'}$, in some sense, or if A_t makes a contribution to $B_{t'}$; that is, if within the given course of events or on the basis of the actual history H A_t was somehow required to bring about $B_{t'}$. Thus, A_t is a *cause* of $B_{t'}$, if given the actual history H A_t is positively relevant to $B_{t'}$, *i. e.*, if $\tau(B_{t'} | A_t \cap H) > \tau(B_{t'} | \bar{A}_t \cap H)$.

Thus, very roughly, causes are reasons given the actual history. The topic “reasons and causes” is an important one in epistemology, and for many centuries it has produced profound confusions under varying labels. When I am short-circuiting this issue here, this may be taken as illuminating or as continuing confusion. In any case, my short-circuit has good precedent. To begin with, conditioning on the history H has been first explicitly proposed by Good (1961–3) within statistical attempts at causation, and it is widely accepted, *e. g.*, in econometrics (see Granger 1969). The idea is also present in the counterfactual approach. In a way, the crucial issue about counterfactuals is what is cotenable — to be kept fixed — with the counterfactual assumption. And then it is always said that, when the counterfactual is a causal one, it

must be understood in a non-backtracking way — that is, as not affecting the past, as leaving the past unchanged and thus as letting the actual history be fixed and given. The very same point is emphasized in the interventionist approach: the idea of an intervention is precisely to keep history fixed and miraculously, as it were, to wiggle only with the cause. So, conditioning on the history is a very common idea.

What is unusual about my short-circuit is its appeal to the epistemological notion of a (conditional) reason, thus turning causation into something relative to our epistemic state. However, even this move has good precedent. It’s Hume’s move, and it has been one of the most bewildering moves in the entire history of philosophy. On the other hand, I cannot find that it has been convincingly refuted; it remains a thorn in the flesh of philosophy. My reason for following Hume is simple and powerful: namely, that all objectivist conceptions of causation have been unable to come up with an adequate notion of positive relevance. All in all, all those causal puzzles (overdetermination, preemption by trumping, etc.) can be best solved with the epistemic notion of positive relevance (see in Spohn [2012, ch. 14]). A supplementary reason is that the epistemic relativization of causation can be undone to a large extent; we need not forswear our objectivistic intuitions (see section 8 below).

We should not further digress into the philosophy of causation; let me return to my explanation of causal conditionals. So far, I said that A_t is a cause of $B_{t'}$ iff, given the actual history H , A_t is positively relevant to $B_{t'}$ (according to the epistemic state κ or τ). But we have to be a bit more precise. What is the actual history H ? As I have argued several times (cf. Spohn [2012, sec. 14.4]), we should focus on A_t being a *direct* cause of $B_{t'}$ and then take the entire history up to the effect at t' except the cause at t as the relevant history H . Moreover, we should not merely refer to the actual history; we should make explicit that there are many possible histories and that each possibility or world has its own history (up to t') and its own causal relations. So, let $H_{w,t'}^t$ denote the history or the course of events in the possibility w up to time t' with the exception of t . Of course, how rich $H_{w,t'}^t$ is depends on the richness

of the set \mathcal{A}^* of simple propositions originally assumed. So, my final explication for the present purposes is this:

(18) A_t is a *direct cause* of $B_{t'}$ in the possible world w (relative to the ranking function τ) iff A_t is positively relevant to $B_{t'}$ given $H_{w,t'}^t$, i. e., iff $\tau(B_{t'} \mid A_t \cap H_{w,t'}^t) > \tau(B_{t'} \mid \bar{A}_t \cap H_{w,t'}^t)$.

Extending this to an account of indirect causation is a most delicate issue (cf. Spohn [2012, sec. 14.11–13]), which need not concern us here.

Now, at long last, we are prepared to address causal conditionals. When I utter the counterfactual “if φ had not been the case, ψ would not have been the case,” with φ and ψ as above and intending a causal interpretation, I express my belief that A_t is a (direct) cause of $B_{t'}$. How might this belief be understood in view of (18)? Well, it’s the belief that the world or history is such that A_t is a (direct) cause of $B_{t'}$; it’s the belief in the truth condition of “ A_t is a (direct) cause $B_{t'}$,” in the set of worlds w in which the definiendum or definiens of (18) is satisfied.

Take an example: “If it had not rained, he would not have come late.” As a causal conditional this says the same as: “He came late, because it rained.” There are plenty of possible histories in which this is not true, plenty of other possible causes that could have delayed him without the rain playing any role. In asserting one of the two sentences, I express my belief that none of these alternative histories obtains.

Now, we can finally see how causal conditionals fall under the schemes (V) and (VI). Each schematic conditional of the form “ $\varphi \triangleright \psi$,” again with φ and ψ as above, can be understood without any contextual clues as referring to the set or partition $\mathcal{H}_{t'}^t$ of possible histories $H_{w,t'}^t$ up to t' with the exception of t ; the question under discussion is – so to speak – how was history? And then we can take the conditional “ $\varphi \triangleright \psi$ ” as expressing (V.1) or (VI.1) referring to that specific partition, e. g.:

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(VII.1) $\tau(H^*) > 0$, where $H^* = \{w \in W \mid \tau(B_{t'} \mid A_t \cap H_{w,t'}^t) > 0\}$,
or

(VIII.1) $\tau(H^*) > 0$, where $H^* = \{w \in W \mid \tau(B_{t'} \mid A_t \cap H_{w,t'}^t) > \tau(B_{t'} \mid \bar{A}_t \cap H_{w,t'}^t)\}$.

Let me call (VII) and (VIII) the “*history is such that*” reading of conditionals. It is clear that (VII) and (VIII) ramify in the same way (V) and (VI). It is also clear that my explanations concerning causal conditionals are captured by (VIII.1) that focuses on conditional positive relevance; its ramifications would include conditionals expressing sufficient and/or necessary causation. Perhaps, though, we do not want to include this and only express the belief that history is such that $B_{t'}$ *must* obtain given A_t ; and then option (VII.1) is pertinent. Finally, it is clear that, if the conditional “ $\varphi \triangleright \psi$,” is to express (VIII.1), then it is to be read as “ ψ , because φ .” We may also take (VIII.1) as expressing a conditional of the form “non- $\varphi \triangleright$ non- ψ ”; then, indeed, it is the counterfactual “if φ had not been the case, ψ would not have been the case.”

This concludes my list of expressive options for conditionals. It goes far beyond the Ramsey test and, as my many examples have displayed, most of those options are required for accounting for the rich linguistic phenomena.

Interlude 4: The Oswald/Kennedy Case

Let me demonstrate the power of my approach with the famous pair introduced by Adams (1970):

(19) If Oswald didn’t kill Kennedy, someone else did.

(20) If Oswald hadn’t killed Kennedy, no one else would have
(and Kennedy would have been alive, for a while at least).

Let $O =$ “Oswald killed Kennedy” and $S =$ “someone else killed Kennedy.” For the sake of simplicity, let O and S stand both for the sentences and the propositions represented by them. Then (19) may be abbreviated as $\bar{O} \triangleright_1 \bar{S}$ and (20) as $\bar{O} \triangleright_2 \bar{S}$. The thrust of the pair is obvious

and powerful: both (19) and (20) are true, or at least clearly acceptable. Hence, \triangleright_1 and \triangleright_2 must be two different kinds of conditionals. Since then, it seemed that theories of conditionals have to bifurcate with regard to what is usually classified as indicative and subjunctive conditionals — a most dramatic effect of the pair (19) and (20).

Stalnaker (1975) tried to preserve unity by proposing that (19) and (20) involve a context shift so that \triangleright_1 and \triangleright_2 are to be interpreted in two different contexts. (20) can be uttered only in a context where O is assumed to be true, whereas (19) makes sense only in a context where O is treated as open. And then Stalnaker goes on to explain how each conditional may be acceptable in its own context. However, I do not find the claim about (19) convincing. It's perfectly acceptable to say: "I do believe that Oswald killed Kennedy; we all do. But if it wasn't him, someone else must have killed Kennedy." I don't see here a context shift initiated by "but." Why should one assume here a pretense of being open towards the antecedent, if that openness has been explicitly denied? Indicative conditionals do not seem to be bound to be open conditionals. (This point is shared by Woods [1997, p. 54].)

Here is a perfectly straightforward account of this example within my framework, which neither involves context shift nor different theories of conditionals, but only one ranking function and two expressive options. First, it is clear that we believe O and reject S . Hence, our two-sided ranking function τ is such that:

$$(21) \tau(O) > 0 \text{ and } \tau(\bar{S}) > 0.$$

Let's keep things simple and disregard relevance considerations. Then (19), or \triangleright_1 , is most plausibly interpreted according to the Ramsey test (I.1) and thus expresses:

$$(22) \tau(S \mid \bar{O}) > 0.$$

It does not merely express, though, a belief in the material implication $\bar{O} \rightarrow S$. This is so because the antecedent is believed to be false according to (21), and hence the condition for the equivalence in (11) is not satisfied.

My further suggestion was that counterfactuals are interpreted according to scheme (VII.1) (again neglecting relevance considerations). If we apply this to (20), or \triangleright_2 , (20) says that history (= H^*) is such that, if \bar{O} and H^* , then \bar{S} . So, H^* agrees with the Warren report confirming that Oswald was a single assassin, and \bar{H}^* would be a disjunction of alternative histories with other or multiple assassins including, *e.g.*, a conspiracy. Thus, (20) expresses:

$$(23) \tau(H^*) > 0 \text{ and } \tau(\bar{S} \mid \bar{O} \cap H^*) > 0.$$

All these conditional and unconditional beliefs (21)–(23) perfectly go together in one consistent doxastic state — in fact ours — and thus are well expressed in one and the same context by (19) and (20). For instance, the negative ranking function might be this:

κ	$O \cap S$	$O \cap \bar{S}$	$\bar{O} \cap S$	$\bar{O} \cap \bar{S}$
H^*	2	0	6	4
\bar{H}^*	1	2	3	4

Since the middle left upper box contains the only 0, κ believes O , \bar{S} , and H^* ; this accounts for (21) and one half of (23). Moreover, we have $\kappa(\bar{O}) = \min \{6, 4, 3, 4\} = 3$, $\kappa(\bar{O} \cap \bar{S}) = 4$, and thus $\kappa(\bar{S} \mid \bar{O}) = 1$; *i.e.*, S is believed given \bar{O} , as required by (22). Finally, the two upper right boxes say that $\kappa(S \mid \bar{O} \cap H^*) = 6 - 4 = 2$; *i.e.*, S is disbelieved, and \bar{S} believed, under this condition, as y the other half of (23) requires.

Isn't there a mistake? According to (15), (23) seems to entail $\tau(\bar{S} \mid \bar{O}) > 0$ and thus to contradict (22). However, none of the alternative additional premises in (15) needed for this inference holds. $\tau(\bar{O}) \geq 0$ would do as additional premise, but it is denied by (21); we do believe that Oswald killed Kennedy. $\tau(H^* \mid \bar{O}) > 0$ would do as well. However, the above figures entail that $\kappa(H^* \mid \bar{O}) = \kappa(\bar{O} \cap H^*) - \kappa(\bar{O}) = 4 - 3 = 1$. Given that Oswald did not kill Kennedy, we do not stick to our historical belief H^* ; history must have been different then in one of the ways

contained in $\overline{H^*}$, because we rather stick to the belief that Kennedy was indeed killed.

8. Truth

Let us finally turn to the truth-evaluability of conditionals in the emphatic sense. This issue has caused the deepest divide. There are strong intuitions and good arguments on either side. In section 6, when introducing the “circumstances are such that” readings (V) and (VI), I indicated that this reading has the potential of bridging the deep divide. So, how is this reconciliation supposed to go?

The background of my reconciliation is that ranking theory comes along with a rigorous and sophisticated objectivization theory. The core idea of this theory is to study the extent to which aspects or features of ranking functions uniquely correspond to truth conditions or propositions (I will give examples of what is meant by this) and may thus be called true or false (in the emphatic sense). This is precisely what is required here. I argued that conditionals may express (I)–(VIII), which are features of our ranking functions. (It is a feature of a ranking function to satisfy (I.1), (I.2), etc.) If those features were to uniquely correspond to propositions, the corresponding conditionals would do as well and would thus be truth-evaluable.

One important point is that objectivization is not an all-or-nothing affair, but has a surprisingly differentiated answer, which extends to truth conditions of conditionals in the same differentiated way. This seems precisely what we want. Another point is that this objectivization theory becomes quite involved. Here I can only mention the basic results we need; for all details I have to refer to Spohn (2012, ch. 15).

A first positive, though trivial result is this: the feature of a negative ranking function that consists in having certain (dis)beliefs is objectivizable: beliefs uniquely correspond to propositions believed; propositions are (objectively) true or false, and so are beliefs. To that extent, a ranking function can be called true or false as well. However, having beliefs is simply a matter of negative rank o or $\neq o$, and so this feature

vastly underdetermines the entire inductive or dynamic behavior built into a ranking function.

By contrast, the fact that a proposition receives a specific positive or negative two-sided rank is not objectivizable in the required sense. Of course, it may be an objective fact about the doxastic state of a given subject at a given time; but nothing corresponds to that fact in reality. The proposition may be true or false insofar as its positive or negative rank may be correct. However, the numerical value of the rank represents the strength of (dis)belief and cannot be called true or false as such. (As is well known, this observation equally applies to subjective probabilities.)

Our interest focuses on conditional belief. Indeed, *CBnoTC*, the thesis that conditional belief has no truth conditions, was central to this paper. In section 2, I have referred to the trivialization theorems of Lewis (1976) and Gärdenfors (1986) for *prima facie* justification (though, as mentioned, the dialectic situation is tricky). And I have indicated there that the thesis is confirmed by this objectivization theory. Conditional belief turns out to be objectivizable only to a very limited extent, *i.e.*, only for ranking functions with a devastatingly poor and unacceptable inductive behavior. As to the relation of being a sufficient reason, matters are even worse; if there are more than two possibilities in the possibility space, it is not objectivizable with respect to any ranking function not strictly identical to o (cf. Spohn [2012, theorem 15.5]). This negative result extends, of course, to positive relevance or being a reason in general.

These observations already clear up our issue for the expressive options (I)–(IV). Insofar as the schematic conditional “ $\varphi \triangleright \psi$ ” expresses (dis)belief in the propositions represented by the antecedent φ and the consequent ψ according to (II) and (III), this belief is objectivizable and the conditional true or false. This is not very interesting, of course; we would rather speak of whether or not the presuppositions or implicatures of the conditional are satisfied. (But I had made clear that we need not distinguish between assertion, presuppositions and implicatures as long as only the expression of epistemic states is at issue.)

By contrast, insofar as the conditional “ $\varphi \triangleright \psi$ ” is understood according to the Ramsey test (I) and simply expresses conditional belief, it can generally not be called true or false. *A fortiori*, this assertion extends to the case where the conditional “ $\varphi \triangleright \psi$ ” is used to express any kind of relevance assessment according to (IV).

However, this is not to say that the case is entirely lost. The basic thesis here is that we use the conditional to express *something about* our conditionals beliefs, and this may still be objectivizable, even if conditional belief by itself is not. This is indeed the case for the options (V)–(VIII), and indeed to a larger extent than immediately meets the eye.

Let us first look at the general cases (V) and (VI). According to them, the conditional “ $\varphi \triangleright \psi$ ” simply expresses a belief, a belief about the circumstances under which the conditional belief in *B* given *A* can be maintained. This belief can be true or false, and so the conditional can be as well. This explains why we can have factual disputes about conditionals thus understood; they are disputes about those circumstances, as displayed in the various examples above.

However, the objectivity of those conditionals is partial and not straightforward. It first presupposes agreement about which issue or partition \mathcal{P} is the contextually given focus of argument. If this is unclear, it is unclear which belief is expressed according to (V) or (VI). More importantly, even if the partition is clear, the belief expressed according to (V) or (VI) secondly depends on one’s ranking function, more specifically, on particular conditional beliefs or relevance assessments contained in it, which are, as I noted above, not generally objectivizable. Those conditional beliefs are indirectly expressed as well. To this extent, conditionals interpreted according to (V) or (VI) are not objectivizable.

This fact is also reflected in our disputes. We may think that we have a factual dispute and then discover we are talking at cross-purposes because we judge the conditional at hand relative to diverging conditional beliefs. That divergence is much harder to discuss and may not be objectively decidable. Therefore, the truth-evaluability of

conditionals is a peculiarly mixed affair according to (V) and (VI). This peculiarity does not seem to have received proper recognition in the literature on conditionals.

The problem can only be avoided when we presuppose a fixed ranking function, or at least fixed conditional beliefs, on which conditional assertions are based. Relative to them, conditionals are truth-evaluable; and if we have those conditional beliefs in common, dispute about conditionals is purely factual dispute. However, no general statement is possible about the extent to which this commonality can be presupposed.

This treatment resembles the notion of objective probability put forward by Jeffrey (1965, sec. 12.7). He says that objective probability is just subjective probability conditional on the true cell of a relevant partition. This is still a mixture of objectivity and subjectivity, as Jeffrey was well aware. However, insofar as conditional subjective probabilities agree, disputes about objective probabilities are disputes about the true cell of the relevant partition—just as in the case of (V) and (VI).

The truth issue gets still more involved and interesting when we look at the special interpretations (VII) and (VIII). However, I should first address a concern about my account of the truth-evaluability of (V) and (VI), which will apply to (VII) and (VIII) as well. The concern is this:

When I said that under options (V) and (VI) a conditional expresses my belief that “circumstances are such that ...,” this may have appeared acceptable. However, now I say that this is the truth condition of a conditional under (V) and (VI). And this may sound odd; that circumstances are right does not seem to be the *content* of the conditional, or what the conditional *asserts*. In other words, when we argue about a conditional and its circumstances in the way indicated, we seem to *exchange reasons for taking the conditional to be true* and not to make claims about what the conditional asserts. Is there a subtle confusion?

I don’t think so. First, note that there is a subjective correlate to this talk of reasons for a conditional. We might extend our notion of a reason in section 5 and say that *C* is a reason for the *conditional* belief in *B* given *A*

(relative to a ranking function τ) iff $\tau(B \mid A \cap C) > \tau(B \mid A \cap \bar{C})$. Thereby, we can represent what I so far described as a dispute about the truth of a conditional under option (V.1) as an exchange of reasons for the relevant conditional belief. However, this is just a redescription of the same matter.

Still, are the true reasons part of what the conditional asserts? We can put things either way. Let us still refer to option (V.1), and still assume that φ and ψ , respectively, represent propositions A and B . Then we might say that the conditional " $\varphi \triangleright \psi$ " is true in world w relative to the partition \mathcal{P} and with respect to the ranking function τ iff we have $\tau(B \mid A \cap C) > 0$ for the unique cell $C \in \mathcal{P}$ for which $w \in C$, i. e., which is true in w . So much is clear. Note that truth of " $\varphi \triangleright \psi$ " is thus triply relative, to w , \mathcal{P} , and τ . This is a way of assigning truth in the shallow sense referred to in section 2, which I take to be well compatible with the expressivistic strategy adopted here. However, what should we say now is the truth condition of " $\varphi \triangleright \psi$ "? There are four options:

First, we might say, as I did so far, that the truth condition of " $\varphi \triangleright \psi$ " is the set of all worlds w in which " $\varphi \triangleright \psi$ " is true, keeping τ fixed (and neglecting the relativity to \mathcal{P}). Still keeping τ fixed, we might secondly say that the truth condition of " $\varphi \triangleright \psi$ " varies with the world w and simply consists in the cell C of \mathcal{P} that is true in w , provided " $\varphi \triangleright \psi$ " is at all true in w . We might thirdly include τ in the truth condition of " $\varphi \triangleright \psi$ ", which then consists of all pairs $\langle w, \tau \rangle$ in which " $\varphi \triangleright \psi$ " is true. Or we might, fourthly, combine the second and the third possibility.

Either way is fine. According to the first way, the truth condition of a conditional is indeed that the circumstances are right; this is how I have described them above. According to the second way, the factual truth condition may change (because it depends on the true cell C) and the conditional belief is what is kept constant across the changing truth conditions. According to the third way, the truth condition is not merely factual and includes the appropriate conditional beliefs, on which the factual part of the truth condition depends. And the fourth way combines the two dependencies.

Thus, according to the latter three ways, the truth condition of " $\varphi \triangleright \psi$ " is not simply a fixed proposition, as in the first way. Rather, the conditional " $\varphi \triangleright \psi$ " asserts that the world is such, and the epistemic state should be such, that *the conditional belief in B given A can be maintained in that world*. According to these ways, then, the beliefs expressed by the conditional " $\varphi \triangleright \psi$ " under option (V.1) might be more appropriately conceived as reasons for the conditional, i. e., for maintaining the relevant conditional belief, or as the base of a conditional in the sense of Edgington (1995, p. 283) and Bennett (2003, ch. 22).

However, I cannot see any substantial difference between those alternatives; they are just variations of the initial, triply relative definition of the truth of a conditional. The important point is what is objective and what is subjective in those shallow truth conditions. The factual world w is objective, and the ranking function τ (and the partition \mathcal{P}) is subjective. And this holds for all four representations of truth conditions. In any case, one must not assume that the world w somehow determines the ranking function τ appropriate to it or even the true ranking function (as Lewis [1986, p. 22] does with respect to the similarity spheres, when he claims them to supervene on the character of the actual world). This idea is so far without any foundation.

It will receive partial foundation, though, when we finally look at the special interpretations (VII) and (VIII) of the temporally loaded conditional " $\varphi \triangleright \psi$," where φ represents A_t and ψ represents $B_{t'}$. The above observations about the general cases (V) and (VI) apply to these special cases as well. However, the situation improves further. One point is that the uncertain reference to the contextually given partition \mathcal{P} in the general case is replaced by a textually given partition $\mathcal{H}_t^{t'}$ of histories in the special case.

The more important point concerns the special form of the conditional beliefs or conditional ranks referred to in (VII) and (VIII). Their condition consists in a full possible history up to t' including A_t or \bar{A}_t ; and the proposition $B_{t'}$, conditionally ranked is about t' . So, we may call them *past-to-present* conditional beliefs or ranks (with a variable

present t'). Various points are remarkable about those past-to-present conditional beliefs:

First, we might say that they embody our inductive strategy, what to expect next if history had been such and such. Slightly more explicitly, define the *inductive strategy as from t^** (relative to a given ranking function) as the set of all past-to-present conditional ranks for all $t' \geq t^*$. This inductive strategy does not represent the actual predictions, which suffer, of course, from incomplete knowledge of history up to t^* ; and our actual predictions may well diverge because our historic beliefs diverge. Still, together with such historic beliefs, or rather a doxastic state or a ranking function concerning history, the inductive strategy determines the actual predictions or expectations. More precisely, the *historic part* of a ranking function about the history up to t^* and the inductive strategy as from t^* together determine the full ranking function concerning past, present, and future. (This is a direct consequence of an iterated application of (3), just as the probabilistic counterpart would result from the generalized multiplication theorem.)

Moreover, the past-to-present conditional ranks have a peculiar stability. That is, no information about the history up to t^* can change anything about the inductive strategy as from t^* . So, these two parts play two very different epistemological roles. We learn about history all the time; all our experiences are about history. By contrast, our inductive strategies for the future are, in a way, experientially stable. This is not to say that we cannot change our inductive strategies at all; one should think that our inductive strategies are able to change or learn as well. However, how to account for this ability is a difficult issue not to be addressed here; in my view, this ability can be accounted for only in an indirect way as a second-order affair (in Spohn [2012, sec. 12.5], when addressing the ranking-theoretic confirmation and disconfirmation of laws, I say more about this issue).

Thus, the point of this decomposition is that we may agree or disagree about either part, and that these disagreements are of an entirely different nature. If we disagree in our historic parts, this may be called

a broadly factual disagreement (though the beliefs about the past also involve lots of inductive inferences). If, on the other hand, we disagree in our inductive strategies, this cannot be a factual disagreement since, as stated, no argument about the historic part can change anything about our inductive strategies. A dispute about the latter must be settled in a different way, and it may not be resolvable at all, as in our discussions with those guys stubbornly maintaining Goodman's odd grue-hypothesis concerning a future emerald. Reversely, this may raise the hope that we agree in our more stable inductive strategies, confining divergence to our historic parts, where it is quite common.

If this is so, schemes (VII) and (VIII) make a lot of intersubjective sense. According to the "history is such that" reading the conditional beliefs indirectly expressed are part of the inductive strategy embodied in a ranking function. We may then reasonably hope to share our inductive strategies, even if we do not share (conditional) beliefs in general. If so, conditionals falling under (VII) and (VIII) may be understood as referring to a fixed common inductive strategy, relative to which they are fully truth-evaluable. Hence, what may be a dubitable presupposition in the general case is perhaps a plausible assumption in this special case.

The final crucial step is that the negative results concerning the objectivizability of conditional beliefs in general do not carry over to the special conditional beliefs contained in an inductive strategy. The issue is complex, but the net result is that under certain conditions — in Spohn (2012, sec. 15.4–5), I describe two different sets of such conditions — inductive strategies are objectivizable, *i. e.*, do have objective, emphatic truth-values after all.

Let me describe this point in slightly different terms. In the previous section, I have explained on the basis of my explication (18) of direct causation how scheme (VIII.1) is appropriate for causal conditionals. This approach, however, seemed to be stuck with an epistemically relativized notion of causation, something intuition revolts against. Therefore, I was keen on obtaining positive objectivization results concerning direct causation (or what comes to the same, concerning

inductive strategies in the specific sense defined above), and to the extent I have succeeded I can speak of causation as an objective relation even within my epistemic approach. This is my attempt of constructively carrying out the projection strategy which Stalnaker (1984, ch. 7) had argued to be required and had attempted to explicate. (In fact, I take all of this to be essentially an explication of Hume's ideas on causation in present-day terms.)

What does all of this mean for a causal conditional " $\varphi \triangleright \psi$," interpreted according to (VII) and (VIII)? It cannot only be true or false in its factual claims; what the factual claim is can also be based on an objectively true or false inductive strategy. History might actually be such that the glass would have broken if dropped. So, "if I had dropped the glass, it would have broken" might make a true claim. And it does so not just on the basis of my subjective inductive strategy; whether it is based on a correct strategy, is itself truth-evaluable.

I should emphasize, though, that the details of the objectivization theory need to be studied. The description I have given is as fair as it can be on the informal level; but it is no substitute for the precise theory. Also, I should point to Huber (2014), who presents an alternative and quite different projection or objectivization strategy for ranking functions and for conditionals explained in ranking terms. This strategy proceeds by translating David Lewis' Principal Principle into ranking theory. However, this is not the place for comparison.

9. Conclusion

We have gone a long way — and it was still much too short. I have left open very many details, and too often I have referred to Spohn (2012) for further explanation. Comparative discussions with the vast relevant literature could and should have been much more extensive and systematic. Given the topic, this is unavoidable. Still, even without all those missing parts, my two basic points should have unfolded their persuasive power: that we should base the topic on ranking theory as the best account of conditional belief, and that by studying the many ways in which conditionals express conditional belief we can unify the field

in a more straightforward and embracive way than is hitherto to be found in the literature. If so much were acknowledged, we would have good reason to elaborate on all the missing details.

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