Possibility and Reality: Metaphysics and Logic

edited by

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Introduction

The dialectics of possibility and reality is an old philosophical theme. In contrast to the empirical sciences that deal with reality, philosophy has sometimes been called – for instance by Christian Wolff and Bertrand Russell – the science of the possible. Philosophy started grappling with this problem in metaphysics. Aristotle for one introduced the dichotomy between *dynamis* and *energeia* which played a crucial role not only in this own metaphyical system but also in those of the middle ages (*potentia – actus*). Later the focus of the discussion of the modalities shifted to the field of logic, without however losing its specifically metaphysical impetus.

Ontology has from its very inception been dealing with the *modes of being* which include possibility, reality and necessity. The *modes of judgement*, the distinction of "grades of validity", on the other hand, lie in the center of the logician's terrain. For any proposition p, it may be *possible that p is true* or it may be *necessary that p*, or p may be *contingently true*. The parallelism between the metaphysical and the logical distinctions is obvious. And this is no wonder since we usually try to capture reality when we form our judgements, so judgements refer to reality. How is a mode of judgement (a grade of validity) connected with the ways things are? Can logic as a field of its own remain ignorant of "the problem of being"? These are the questions that form the background against which the contributions in this volume are to be read.

However, the conceptual analysis of possibility and reality is by no means a trivial task. In logic, possibility is often identified with what is *thinkable without contradiction*. This concept of possibility is very wide and easily includes the contents of our dreams and

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phantasies. Our everyday notion of possibility refrains from equating the thinkable with the possible, it is much narrower and closer to what might be called a concept of *real possibility*. Third, the widest and at the same time most problematic concept of possibility is given if one holds that anything is possible, that is, if one assumes that even the most fundamental principles could be violated, even if this is beyond your power of imagination or thinking. If we take it, for instance, that the principle of non-contradiction necessarily applies all thinkable cases, this does not entail that the principle is itself necessary, because there is nothing else from which it may validly be derived.

There is no agreement in philosophy or science about the concept of reality. On the one hand, science seems to take for real only those appearances that can be measured. On the other hand, we may ask to what extent biology – which has been proclaimed the leading science of the 21st century – is compatible with such an idea of reality, as many biological phenomena seem hard to align with the quantitative-mathematical concept of reality. Moreover, some people suggest that our common conception of reality is better captured by a kind of philosophy that renounces the objective, quantitative concept of reality of the sciences and emphasises the subjective nature of our thinking. Regarding all reality as experienced by the self, life philosophy claims that the scientific ideal of observing reality *per se* is unattainable for human beings. Yet another view can be got from traditional metaphysics which often allows for a doubling of realities, where the facticity of our daily life is considered to be an epiphenomenon of a higher, hidden way of being. Such a doubling has been known from the very beginnings of Western philosophy – to be found in Parmenides for example – and gave rise to the problematic distinction between a "true" or "right", and a "false" or "pseudo"-reality.

Another way of addressing the issue is to directly confront possibility with reality by asking: What precisely is meant when we say that *there is a possibility that p*? Which ontological status can be accorded to possibilities? Do they exist in a secondary or in-

ferior sense? Do they constitute something in between being and non-being? In what way does the possible exist? Is the possible a certain objective quality of matter? Does it make sense to say that the marble statue has always existed in the marble block, and that the sculptor just served as the liberator of its form? This would amount to saying that the marble statue – notwithstanding its being an artefact – has always objectively existed within the marble block as a possibility, independently of the existence of the sculptor, or of any human being for that matter. In such a context the statue would have to be considered as a proper object.

Metaphysical reasoning has always tried to solve the old puzzle of the ontological status of modalities, and the debate keeps on flourishing. Nowadays we can distinguish three basic ontological positions. *Modal realism*, eminently represented in the work of the late David Lewis, argues that possibilities do objectively exist. Against this, *modal nominalists* argue that it does not make any sense to hold that the merely possible (which is not realized) exists. A third basic ontological position is marked by *modal constructivism* with its idea that possibilities do exist, but only as constructions of the human mind, that is, only subjectively.

In ordinary language use, we do not seem to have any problems to utter statements about *possibilia* with a definite claim to truth – without thereby making a conscious choice of any ontological theory. Moreover, it seems completely natural to talk of the objective truth of certain counterfactual conditionals ("if he had fallen off this bridge he would have died"). Problems arise only if one ascends to the level of an ontological *theory* of modalities. If the constructivist claims, for instance, that possibilities are only constructed by our minds, where does the claim to objective truth of the above-mentioned counterfacuals come from? A modal realist tries to defend the thesis that nonexistent possible things are "really there", in some sense. But obviously, it is difficult even to formulate this thesis without being caught in contradictions.

Prima facie, it looks paradoxical that we should spend most of our time dealing with possiblity rather than reality. On the other hand,

it was not only Heidegger who thought that just this inclination is part of human nature. The better we know the possibilities the more efficient are our plans and actions relating to reality: The knowledge of what may happen under such-and-such conditions helps us in our attempts to shape reality. It is true that, loosely speaking, today's reality is at the same time tomorrow's possibility. Everything that is thought to be *possible* in the future depends on what is *real* today, and is in fact determined by it (to a certain extent at least). However, that reality determines possibility and not the other way round is a substantial and controversial thesis. There are many metaphysicians who consider it more plausible to assume that it is possibility that contains the germs of reality.

Modal logic and analytic ontology have long been working on the exploration of modal principles. Discovering the principles with the help of which one can understand the possible as possible means at the same time explaining possibility with the help of necessary laws.

Uwe Meixner opens the discussion of the problematic of the modalities as treated by the continental tradition of metaphysics, a discussion which is at the same time meant to establish a bridge to present-day philosophizing. The first, historical part of Meixner's paper presents a brief history of the concept of necessity from the time of antiquity to the present. Meixner shows that the conceptions of necessity in antiquity had four main sources: matter-necessity, form-necessity, efficiency-necessity, and purpose-necessity. Special attention is accorded to the syncretistic concept of the necessity of fate, and its transformations from the beginning of antiquity to its end. Meixner points out that already in antiquity we find the conception of proof-necessity, as well as the distinction between intrinsic and extrinsic necessity. At present, three of the original four main sources of conceptions of necessity, have dried up, leaving only form-necessity still active. The second part of Meixner's contribution is dedicated to the development of a rigorous theory of form-necessity (or nomological necessity, broadly conceived), at the end of which a skeptical note is struck regarding laws of nature.

The contribution by **Markus Hundeck** is concerned with Spinoza's metaphysical conception of the one substance and his doctrine of freedom. In this system, possibility may be thought of as an "abbreviation" of reality. The reality of the one substance is structured as a functional connectedness (as in Ernst Cassirer) which shifts all metaphysics to the realm of logic. With the help of a principle of logical space that was developed in David Lewis's *Counterfactuals*, Hundeck suggests to interpret Spinoza's metaphysics of the one substance in a functional way als reality. He asks whether there are possible worlds with a "degree of reality" equal to that of the world which we conceive of as our reality. Talk about the possibility of possibilities in Spinoza's system aims at a change of human self-understanding, and is thus the possibility that wants to become reality.

Sigmund Bonk transfers the crucial question of the ontological status of modality to the relation between the past and the present. Most people will certainly tend to assign full reality only to the present and understand the past to be that which is simple *not there* any more. That the theoretical problem is acutally much more subtle is shown by Bonk with the help of representative examples of the history of philosophy. According to a well established philosophical tradition the very possibility of metaphysics depends on insights which are *a priori* in the sense of 'nonempirical', as it were nonformal and necessary. A famous example is Anselm's argument that God exists because the negation of this meaningful proposition leads to the following contradiction: "God, i.e., the absolutely perfect being, lacks the perfection of real or substantial being. (It would be imperfect to exist only in dependence of the figments of human imaginations)." Bonk's essay presents Hans Jonas's argument for the enduring presence of the past. The latter's endeavour to revive metaphysical thinking in our "postmetaphysical era" (Habermas) culminates in the thesis that the past is not gone but remains existent in the mind of God. This proposition is argued to be a condition of our speaking meaningfully about the past and can therefore, like Anselm's, be called a necessary truth. Bonk elu-

cidates Jonas's argument, confronts it with similar suggestions by other philosophers (Schopenhauer, Proust, Bergson, Sheldrake) and concludes with a critical appraisal.

There is a very special reason for breathing fresh life into the discussion of possibility and reality. Every day we have to deal more and more with *virtual reality*, something intuitively reminiscent to the concept of a *possible world*. This very fact suggests, in a simple but challenging way, that we are witnessing today a dramatic shift of emphasis from the real to the "merely" possible. The question addressed by **Vítězslav Horák** is whether computer simulations consistute *only* a possible world or whether they have to be acknowledged as a *reality sui generis*. Plato claims in several passages of his dialogues that the ontological status of pictures, as genuine epiphenomena of the real things, is lower than the status of material objects. With this claim, he puts empirical reality into the position of an essential measure not only for the correctness but also for the reality of pictures, where pictures are considered just as simple representations of the real. To substantiate this point, he refers to the causal relation between thing and image. But should we decide the problem of representation on the level of the pure description of a picture – on the level of *what it is* – or on the level of *how* a picture *is being used*? Horák argues that virtual reality is a new but representative case of pictures. The fact that there are two very different ways of using virtual reality – scientific modelling and fictional animation – shows that reference to the real world is not an essential characteristic of pictures. In this sense pictures can be seen as autonomous objects which are not true or false *per se*. More precisely, *we* only *infer* the falsehood and unreality of the contents of pictures *with regard* to the real world on the basis of *our* assumption that reality is a natural measure of all pictures. Authors like Frege or Wittgenstein tried to show that to be an assertion is not a descriptive characteristic of a sentence, but something that fully depends on the intentions of the speaker. Why should pictures be different in this respect?

The theme of *possible worlds* is discusssed today mostly in logic.

Jaroslav Peregrin gives an introduction to possible worlds by means of a non-technical perspective on their different practical applications. We live in a world; but we keep contemplating and conjuring up other worlds – in the arts, sciences and in philosophy. Peregrin's contribution is an examination of the reasons of our doing so and of the nature of the worlds thus conjured up. Three reasons are distinguished: In some cases (especially in the arts) we do this because we simply enjoy it; in other cases we do it for the sake of 'deepening our perspectives'; and, last but not least, we also do it for the purpose of checking how things might work and how people might fare in counterfactual circumstances. Peregrin concludes that it is both very important and very interesting to try to find out in how far such worlds can be explained away in terms of the actual, 'tangible' world (as contemporary naturalistic philosophers do). Thus there is a sense in which we do deeply need other worlds – not only in the arts, but also in the sciences and the humanities.

Ondrej Majer notes that the notions of possibility and probability are closely related in many respects. The domain of a probability function is a set of possible events which might or might not be realized. A distribution of probability values over these events gives a quantitative representation of the possibility of the events' happening. A question then naturally arises: Does every kind of possibility allow for a quantitative probabilistic representation? Majer's reply to this question crucially depends on the interpretation of probability that we choose, i.e., on the way probability captures the notion of uncertainty in both everyday and scientific practice. Majer discusses in a non-technical manner the relation of possibility and probability, and more specifically, the behaviour of objective, subjective and logical interpretations of probability in the framework of possible worlds.

The Czech logician Pavel Tichý chose a particular version of possible world semantics for his system of Transparent Intensional Logic (TIL). **Vladimír Svoboda** outlines Tichý's conception of logical space and discusses some of its specific features. Svoboda argues that although some of the tenets of the system may seem

somewhat controversial, an investigation of the framework draws our attention to important metaphysical questions, and provides interesting insights into the nature of modal statements of various kinds. In the final part of his paper Svoboda focusses on several kinds of modal statements and suggests how they may be explicated within the framework of TIL suitably conceptually amended.

František Gahér exhibits the different connotations that the concepts of necessity and possibility carry in everyday language and in logic as a specialized discipline. In ordinary discourse, the terms 'necessary' and 'possible' are usually related to empirical modalities, which are very different from the logical ones. Many examples confirm the hypothesis that we never speak of logical modalities except in the context of scholarly logical discourse. If we say in an ordinary discussion that something is (*really*) *possible* or (*really*) *impossible,* we do not mean anything like *logically conceivable* or *logically inconceivable.* On the other hand, for an adequate account of the logical modalities, it is important to distinguish between the modal and the temporal variety. According to Gahér, the Stoic definitions of modalities describe them as empirical, i.e., as proper subclasses of logical modalities. Scientific necessity, explicated as an atemporal property of propositions, is only one among many models for empirical modalities (even though it is a basic one).

The contribution by **Hannes Leitgeb** addresses a related issue. Leitgeb's question is whether metaphysical modalities can be represented successfully within formal scientific languages, and if so, how this is to be done. Although Quine's arguments in favour of the inadmissibility and irrelevance of such modalities are seen to be non-conclusive, it is still argued that there are currently no adequate options at hand of how such a scientific representation might be carried out. Leitgeb considers various possible forms of representation, including first-order representations with or without new logical vocabulary, and operator representations where sentential operators are either employed on the object language level or on the level of the metalanguage. For each case Leitgeb is able to show that one either lacks informative ontological axioms for possibilia,

or informative logical axioms or meaning postulates for some primitive modal expressions. In view of these deficiencies, he suggests that parts of the language that is currently used in metaphysical theories should be reconstrued in terms of quantifications over mathematical entities, which might thus be used as *Ersatz* possibilia.

According to Davidson's method of truth in metaphysics, everything that allows most of the sentences of a language or theory to be true can be said to exist. The fact that we share a common language, or theory, and a logic applied to it, is supposed to guarantee that our picture of the world cannot be basically false. Moreover, on a larger scale it must even be *objectively* true. In contrast, from a certain (Martin-Löfian) intuitionist point of view our world consists of everything that we have done. Focussing on epistemology, this amounts to the assertion that our world consists of everything that we have proved. Roughly speaking, proof becomes a method in metaphysics. **Guido Löhrer** shows that on the one hand, this position faces the problem of omniscience (Fitch's argument). On the other, actual limitations of our knowledge would make the world appear limited in such a way that world and knowledge would have to develop *pari passu*. In order to avoid both consequences, Löhrer argues, it seems one should require modalizing the conception of proof. He investigates whether this correction leads to a consistent picture and whether it helps us to avoid the problems which arise for the Davidsonian method of truth.

Wolfgang Hinzen investigates whether the conceivability of a Turing Test passer reveals the essence of thinking. Would it reveal what mind really is, in relation to body? Hinzen argues against such conclusions and their functionalist logic. According to Hinzen, Turing's method, – which is to provide a mechanical model rather than a conceptual analysis – is entirely consistent with regarding human psychology not as a 'special science' having its idiosyncratic generalizations, as in machine functionalism, but as a part of physics and chemistry. Put differently, this method leaves the actual organization and laws governing the specifically human mind as an

important theoretical and empirical issue. On this path, however, no conceptual issues concerning mind versus body arise.

Conditionals, as we use them in natural language, are expressions of restricted necessity. Since David Lewis's seminal book on counterfactuals, the idea has been widely accepted that conditionals are expressions of a necessity that is *variably strict*: in the sense that 'if A then B' means that of all the worlds that verify A, we focus on the ones that are closest to the actual world, and test whether they verify B as well. Conditional necessity, however, admits of various interpretations, just as unconditional necessity does. The most relevant distinction for the interpretation is perhaps that between metaphysical and epistemic necessity. **Hans Rott**'s contribution addresses the question whether there is a way to tell conditionals referring to metaphysical necessity from conditionals referring to epistemic necessity. Rott argues that *by default*, subjunctive conditionals refer to the former while indicative conditionals refer to the latter. Accordingly, he sketches different ways of resolving the potential conflict of the antecedent clause with (what the speaker thinks is) the history of the real world. Temporal reasoning turns out to be necessary for the understanding of the difference between metaphysical and epistemic conditionals. For conditionals referring to the future, however, most of the distinctions collapse.

It is the purpose of this book to bring together approaches that have long been working in less than splendid isolation. Some papers focus on historical research, some are primarily systematic. Some belong to the tradition of traditional ("continental") metaphysics, some to modern ("analytic") logic. Another main aim of this volume is to begin to unify reseach contexts that were artificially split for decades of separation by the iron curtain. The authors in this book are philosophers from Czechia and Slovakia on the one hand and from the Southern parts of the German-speaking countries on the other hand, a combination that is very much in line with the efforts of the University of Regensburg to further and strengthen the academic links and co-operation with our Eastern European colleagues. We strongly believe that it is both necessary and possible

to bridge the gaps, real or only perceived, in European philosophy today, and we hope that the present volume will be seen as a modest contribution to this large undertaking.

The following persons and institutions helped us a lot in our efforts to making this volume possible. First of all, we wish to express our gratitude to the Vielberth Foundation for generously funding the conference at which early versions of most of the papers collected here were presented. Thanks are due to Andreas Eidenschink, Andreas Gasser, Gerit Hoppe and Jakob Rott for their help at various stages of the organization of this conference. Brigitte Weininger did a great job in efficiently preparing the final versions of the text, including the fine tuning of the LaTeX files. We thank Dr. Rafael Hüntelmann of Ontos-Verlag and the four editors of the Series *logos* for their responsiveness to our idea of publishing this volume. Last but by no means least, we are grateful to the the Philosophical Faculty I and the Steering Committee of the University of Regensburg for the financial support that was necessary for transform this book from a mere possibility into full reality.

Hans Rott

Variably restricted necessity: Truth and fiction in the interpretation of indicative and subjunctive conditionals

1. Introduction

Philosophers as diverse as Christian Wolff, Bertrand Russell and Wolfgang Spohn have called philosophy the science of the possible. Since necessity is the dual of possibility – 'necessary' means 'not-possible-that-not' –, philosophy may equally well be called the science of the necessary. Unfortunately, 'possibility' and 'necessity' are ambiguous terms which can mean very different things. There are many kinds of necessities: logical, deontic, conceptual, mathematical, historical, physical, metaphysical and epistemic necessities. We need not discuss here what this means for the thesis that philosophy is concerned with "the possible". In this paper we will be concerned with the latter two, metaphysical (or ontic) and epistemic (or doxastic) necessities.

So far, both possibility and necessity meant only the *unrestricted* modalities here. It is a natural question to ask whether similar distinctions can be found if we turn to *restricted* or *conditional* necessity. The prototypical construction for expressing restricted necessity in natural language are conditionals.

In this paper I want to advocate and illustrate a thesis which seems rather obvious, if not outright trivial to me (Rule 4 below). The thesis is not new, it can indeed be found earlier in the literature. But I have experienced enormous difficulties in convincing various

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other people of the truth of the thesis. So the thesis may not be true, or at any rate, may not be obvious at all. For preparation, let us start by reviewing a few earlier accounts of conditionals.

2. Truth, necessity and variable strictness in conditionals

The debate about conditionals started famously with the Stoic philosophers. Philo advocated a truth-functional analysis of conditionals, while Diodorus Cronos opted for a modalized interpretation.

> Philo says that a sound conditional is one that does not begin with a truth and end with a falsehood .... But Diodorus says it is one that neither could nor can begin with a truth and end with a falsehood. (Sextus, *Pyrrhoneiae Hypotyposes*, II, 110–112, quoted from Kneale and Kneale 1962, 128–129)

Philo refers only to the actual truth values of the antecedent and the consequent, Diodorus to their possible truth values ('could nor can'). Frege, in his famous essay *Über Sinn und Bedeutung*, used the Philonean conditional:

> In the sentence
>
> 'If the Sun has already risen, the sky is very cloudy'
>
> ...it can be said that a relation between the truth-values of antecedent and consequent clauses has been asserted, viz. that the case does not occur in which the antecedent stands for [*bedeute*] the True and the consequent for the False. (Frege 1892, 167)

Frege claimed that the meaning of a subjunctive conditional is a compound of the meaning of the indicative conditional plus a denial of the truth of the antecedent.

> The situation is similar [to the situation regarding subordinate causal clauses with 'because'] in the sentence

> 'If iron were less dense than water, it would float on water'.
>
> Here we have the two thoughts that iron is not less dense than water, and that something floats on water if it is less dense than water. The subsidiary clause again expresses one thought and a part of the other. (Frege 1892, 170)

No modalization of conditionals is suggested by Frege. In contrast, Clarence Irving Lewis opted for a full modalization when developing his logic for *strict conditionals* (Lewis and Langford 1932). One way of making his idea more precise is to say that a conditional *If A then B* is true if every way of A becoming true is at the same time a way of B becoming true, or more formally: If all worlds that verify A are worlds that verify B as well. B is not necessary per se, but *necessary given* A.

However, C.I. Lewis's notion of a strict conditional is now generally agreed to be *too* strict as a model for ordinary language conditionals. Another problem is that both truth-functional and strictly modalized conditionals validate a few logical inference schemes that can be regarded as paradigmatic non-validities for natural language conditionals: Strengthening the antecedent, transitivity and contraposition. Since David Lewis's (1973) seminal book on *Counterfactuals*, in which these inference schemes were highlighted, most researchers have adopted the idea that conditionals are expressions of a necessity that is further restricted. On this account, *If A then B* only means that of all the worlds that verify A, the ones that are most similar to the real world verify B as well. Similarity is modelled formally (for example) by the a system of nested spheres of possible worlds centred around the real world. We do not have to check all A-worlds but only worlds up to a certain degree of similarity with the real world. Which of them we have to check depends on the content of the antecedent. Thus conditionals are *variably strict*.

Since the 1970s much further work has been done, without any consensus emerging about the right interpretation of conditionals. A particularly interesting point concerns the similarities and differences between conditionals in the indicative and those in the subjunctive mood. On the face of it, this should not present too

much of a problem – they are both conditionals after all –, but in fact many researchers have given up on the project of unifying the semantics for both kinds of conditionals. There are various aspects to be considered that are hard to combine in a single approach, and some examples seem to demonstrate that there is a big gap in meaning between the two classes.

I have come to think that my own earlier work on conditionals captures only some very limited aspects of the use of conditionals in natural language.[1] Logical analyses are often defended by the argument that one has to abstract from many distracting factors in order to discern any "logic" behind the phenomena at all. However, my earlier proposals do not seem to me to serve well as idealizations of the true state of affairs any more. I failed to pay attention to some important intuitive distinctions, partly because my papers were written under the influence of writers like Stalnaker (1975) and Gärdenfors (1979) who from the very beginning intended their analyses to apply to both counterfactuals and 'open' conditionals. The systematic reason for my aiming at a general, unified analysis of conditionals lies in the methodological hypothesis that semantics can and should be designed in a compositional way. It seems most natural to assume that the *if-then* construction should have a unique meaning, and that any differences in meanings between concrete conditionals should be explained by the presence of other lexical items or syntactical features – such as, most prominently, the conditionals' grammatical mood.

I will now discuss a number of rules of thumb that are very well-known from the literature on conditionals. I will sketch an argument to the effect that only an integration of temporal reasoning into hypothetical reasoning will help us understand how the distinctions between various kinds of restricted modalities become relevant for the interpretation of conditionals.

[1] Rott (1986, 1989, 1991, 1997).

3. The acceptance status of the antecedent

Let us start with the most obvious idea. There is a strong feeling in speakers of English that usually indicative and subjunctive conditionals differ precisely with respect to the attitude taken by the speaker to the truth value of the antecedent (and possibly also of the consequent) of the conditional.

Rule 1 Indicative conditionals are "open" conditionals; they express that the agent (thinks that he) is ignorant about the truth value of the antecedent. Subjunctive conditionals are "belief-contravening" conditionals (or "counterfactuals"); they express that the agent (thinks that he) knows that the antecedent is false.

Examples are not hard to come by. He who says "If Smith passed on a copy of the contract to the press, he will be fired" signals that he does not know whether Smith actually passed on the contract to the press. By contrast, if you say "If Smith had passed on a copy of the contract to the press, he would be fired", you imply that you are prepared to deny that Smith passed on the contract.

More often than one might expect, however, the acceptance status of the antecedent is not quite clear. What I have in mind here is not a failure of the agent's introspective capacities, nor a case of vagueness regarding the concept of belief. Consider the following variant of Adams's (1970) famous example:

(1) If Oswald had not killed Kennedy, then Kennedy would have left Dallas unhurt.

It seems that a rational subject can perfectly well accept this conditional, and at the same time accept

(2) If Oswald did not kill Kennedy, then someone else did.

We should not try to "solve" the problem by simply stipulating that if only people were sufficiently clear about the acceptance

status of the antecedents, they would never face the difficulty represented by seemingly incompatible conditionals like (1) and (2).[2] But then, if the agent is prepared to accept both of these conditionals simultaneously, does he believe that Oswald killed Kennedy, or doesn't he?

We note that in (2) there is quite some temptation to improve the formulation by saying "If Oswald *really* didn't kill Kennedy ..." in the antecedent, or to formulate the consequent with a modalizing "...then someone else *must have* killed him." In a situation like that, it seems that the speaker does believe (weakly or firmly) that Oswald killed Kennedy, but he is at the same time well aware that this belief might turn out to be wrong after all, and he is ready to accept relevant evidence to the contrary. This is a sound, fallibilistic attitude, and in fact precisely the type of attitude that reasonable people take towards most of their beliefs.

Thus Rule 1 is not strong enough to dismiss the simultaneous acceptance of pairs like (1) and (2). Although the rule has a strong initial plausibility, it cannot explain away the difference between indicative and subjunctive conditionals. There is more to this example than just the difference between "open" and "belief-contravening" antecedents.

4. Ontic and epistemic conditionals

The following example is due to Hansson (1989, 117–118).[3] Suppose that one Sunday night you approach a small town which you know has exactly two hamburger restaurants (and no other place selling snacks). Just before entering the town you meet a man eating a hamburger. You have good reason to accept the following indicative conditional:

(3) If restaurant A is closed, then restaurant B is open.

[2] This is what I did in Rott (1986, 357); footnote 18 of that paper alleviates the harshness of my suggestion there.

[3] Hansson does not use the example for the analysis of conditionals.

Suppose now that after entering the town, you see that restaurant A is in fact open. If the difference between indicative and subjunctive conditionals lay only in the acceptance status of the antecedent, we could just change the grammatical mood and keep the conditional. That is, we would accept the corresponding subjunctive conditional

(4) If restaurant A were closed, then restaurant B would be open.

However, it seems intuitively clear to me that we are *not* justified to accept this conditional.[4] The owners of the two hamburger restaurants may well decide on their opening hours entirely independently, so there is no reason to believe that A's being closed makes it any more probable for B to be open. The topic of (4) is a counterfactual scenario: *What would have happened if* the owner of A had decided not to open his restaurant on that Sunday night.[5]

The example confirms authors who have held that grammatical mood tells us something about whether a conditional is concerned with *learning*, i.e., with changes of beliefs about a certain stage

[4]The judgement is less clear for the variant

> If restaurant A had been closed, then restaurant B would have been open.

because the past perfect in the antecedent may be interpreted as indicating that the conditional expresses something doxastic (much like "If it had turned out that restaurant A is closed, ...").

[5]In my opinion, the rejection of the subjunctive conditional (4) is not at all sensitive to whether you have seen that B is in fact closed. The only thing needed for my point is that you have *not* seen that B is open. — Question: Would you still accept the indicative conditional (3) after having seen that A is open? Suppose that all you have seen is that restaurant A is lit and that there are several people working in it (no hamburgers thus). Although it does not look like that, it is still possible that these people are just cleaning personnel or a crew shooting a film in this restaurant. So you should keep yourself prepared to learn that A is not open after all. In Hansson's version of the story you would still keep (3). In the variation of the story described in Rott (1991) where the evidential role of the hamburger is replaced by a shimmering light perceived from a distance, you would lose (3) – even though the new observation that A is open does not contradict any of your previous beliefs.

the real world, or with *hypothetical* developments of the real world. This leads us to formulate the following default rule:

Rule 2 Indicative conditionals are usually to be interpreted as doxastic conditionals. Subjunctive conditionals are usually to be interpreted as ontic conditionals.[6]

A similar example is due to Tor Sandqvist.[7] Although originally designed to show that a consistent revision (an addition of information that involves no correction of an error) may lose accepted conditionals, it illustrates the force of Rule 2. Consider a big switch with three positions, L ("left"), C ("center"), and R ("right"). First, suppose that some reliable person tells you that the switch is not in position R. So you accept

(5) If the switch is not in position C, then it is in position L.

Then you are allowed to have a look at the leftmost part of the switch, and you can see that it is not in position L. This observation is completely consistent with all your previous beliefs. Since you (hopefully) trust your own eyes more than the person that has informed you about the switch's not being in position R, you now accept:

(6) If the switch is not in position C, then it is in position R.

Notice that the indicative mood is used in (6), even though you think that the switch is in fact in position C. The corresponding subjunctive conditional would not be acceptable. Conditional (6) does not provide us with information about what the world is or would be like under certain conditions. If in fact the switch were not in position C, this would certainly not *cause* its being in position R. (6) rather tells us something about the way we would revise

[6]The distinction between doxastic and ontic conditionals is due to Lindström and Rabinowicz (1995). I use 'ontic' here as a synonym for 'metaphysical', and I (sloppily) use 'epistemic' as a synonym for 'doxastic' in this paper.

[7]Presented in a talk at the ILLC in Amsterdam, March 1999.

our belief upon learning that, contrary to our current beliefs, the switch is not in position C. At the moment of uttering the indicative conditional (6), we believe that the switch is in position C. (6) reflects that our evidence against its being in position R is weaker than our evidence against its being in position L.

In sum, Sandqvist's example shows that there are cases in which Rule 2 overrides Rule 1.

The very formulation of the two rules leaves us with *a puzzle*. The acceptance status of the antecedent appears to be independent of the ontic or epistemic content of a conditional. If that is true, the rules stated cannot both be correct. Two grammatical modes cannot faithfully encode two independent binary properties (which obviously allow for four combinations).

There are, indeed, also exceptions to Rule 2. First, in accordance with Rule 1, conditionals with antecedents about future events, whether epistemic or ontological, are mostly indicative conditionals. For conditionals about the future it is hard to pinpoint any substantial difference between epistemic and ontic readings. The future is open, and we cannot possess any direct knowledge of it. The only epistemic handle for evaluating conditionals about the future is provided by our knowledge of the laws of nature. And it is exactly the same laws of nature that are used to flesh out subjunctive what-would-have-happened-if scenarios.[8] It will soon become clear that, importantly, there is no such coincidence between ontic and epistemic readings in conditionals with antecedents about the past.

Other exceptions to Rule 2 are provided by subjunctives used in reductio arguments (or arguments that come very close to reductio arguments): "If it were (really) true that Peter ran the mile in

[8]Sometimes subjunctive conditionals about the future serve as stylistic variants of their indicative counterparts, especially if the antecedent event is suggested to be unlikely: "If he won the competition tomorrow, his career would be irresistible." In some aspects the future is even *completely* determined by the past (e.g., the birthdays to come next week, cf. Jackson 1987, 66), and conditionals dealing with such aspects of the future behave exactly like conditionals about the past.

3:40 minutes, he would be faster than the world champion" or "If it (really) were the case that Peter ran the mile in 3:40 minutes, he would be faster than the world champion". When the consequent is supposed to be an absurd proposition and the reductio argument is successful, then the falsity of the antecedent is taken to be established. This is clearly epistemic reasoning. The subjunctive mood just indicates that the antecedent is ultimately – after successful completion of the reductio argument – considered to be very unlikely. Notice that phrases like "it is true that" or "it is the case that" are not redundant in this example, but substantially facilitate the interpretation of the subjunctive conditional as an epistemic one. In cases like this, Rule 1 seems to be stronger than Rule 2.

5. Revisions, updates and the Ramsey test

Rule 1 relates conditionals to the speaker's belief state. There is yet another rule of thumb that relates a conditional to the speaker's potential ways of changing his beliefs. According to the *Ramsey test*, so-called after a footnote in Ramsey (1965, 247), a conditional is evaluated with respect to the speaker's current belief set K and his dispositions to change that belief set in response to new information. More precisely, "If A then B" is acceptable in K if and only if B is included in the belief set that results from changing K so as to accommodate A. It is an important question to ask what methods of belief change should be employed for the Ramsey test.

The next rule draws on the distinction of "revisions" and "updates" as introduced by Katsuno and Mendelzon (1992).[9] Suppose a new piece of information, A say, is to be processed on the basis of a given set K of beliefs. The distinction between revisions and updates is most transparent if A is consistent with K.

In a revision, A is a new piece of information about the real world as it is at a given point of time (the world is static). This information cuts off from the set of doxastically possible worlds

[9]This distinction is closely related to the distinction between conditionalisation and imaging in probabilistic belief change (Lewis 1976).

those that do not verify A. Our assumption that A is consistent with the set of prior beliefs guarantees that there is at least one possible world left. Logically speaking, a revision in the consistent case just means adding A to K and drawing all logical consequences from this enlarged set of beliefs.

In an update, A is a new piece of information about (the post-condition of) a real change that has taken place in the world. This information changes, as it were, every doxastically possible world individually by "letting it develop" into a world that verifies A. Non-A worlds thus often develop into A-worlds that had not been doxastically possible before – even if there are other A-worlds compatible with the prior beliefs. Therefore, an update does not just consist, logically speaking, in the addition of a new sentence, but substantially changes the content of the prior belief set K – even if A is consistent with K.

Let us illustrate the distinction by an example. Suppose we know that there are *either* apples *or* bananas on the table in the next room, but not both. Now mother comes in and says: "I have put apples on the table." Our new information state depends on the way we interpret this utterance. If the utterance is a report of an earlier action, then it provides new, additional information about the same old world that has not changed, so we perform a *revision*. In this case we know that there are just apples on the table, and no bananas. Things are different if mother wants to tell us that she has just now put apples on the table. The world has changed then. It is still possible that besides apples there are also bananas on the table. The original either-or sentence is not acceptable any longer – although this sentence is of course compatible with mother's utterance that she has put apples on the table. An *update* is effected when there is new information about a change in the world. In contrast to a revision, an update does not simply lead to the elimination of those possible worlds that are incompatible with the new information, but it leads (through 'world-by-world revision') to the consideration of new worlds that had so far been excluded.[10]

[10] In this picture, "worlds" are momentary snapshots of what is the case. They

Notice that there is nothing intrinsic to mother's statement that initiates a revision or an update. The crucial question therefore is: When should we interpret a piece of information as one to be revised with, and when should we rather interpret it as one to be updated with?

Time seems to matter here. Let t_1 be the time index of the prior information state, that is, the time when the last belief change was performed and the current doxastic state was reached. At t_1, we are just aware of the fact that there are either apples or bananas on the table. Let t_2 be the time of mother's utterance. Further, let t_r be the time of mother's putting the apples on the table, that is, the time that is being referred to by the new piece of information. Then the following hypothesis may be a good candidate for the sought rule of interpretation: If $t_r < t_1$, then it is adequate to perform a revision, if $t_1 < t_r$, then we should perform an update. But is this hypothesis correct?

I will not venture to come up with a reply to this challenge here, but rather return to our main topic and formulate the next rule for the interpretation of indicative and subjunctive conditionals.

Rule 3 Indicative conditionals are usually to be evaluated with the help of revisions. Subjunctive conditionals are usually to be interpreted with the help of updates.

The reasoning that motivates this rule goes like this. As made explicit in Rule 2, indicative conditionals have an epistemic meaning, subjunctive conditionals are ontic conditionals. But revisions are purely epistemic operations, changes of information states about an unchanging world. In contrast, updates are changes of information states induced by changes in the real world. Therefore, so it seems, revisions are appropriate for indicative conditionals and updates for subjunctive conditionals.

A first and apparently forceful objection can be countered. An important result due to Peter Gärdenfors (1986) seemed to show

are not spread out in time.

that the Ramsey test interpretation of conditionals cannot be combined with the change operation of *revision*. On the other hand, the Ramsey test was shown to fit perfectly together with updates in the sense of Katsuno and Mendelzon (1992); see Ryan and Schobbens (1997), Grahne (1998), Crocco and Herzig (2002).

But this is only one of the many possible answers to Gärdenfors's theorem. Another answer, equally plausible in my opinion, is that revisions can perfectly well be combined with the Ramsey test, if one is clear about the fact that in a rich language that contains conditionals, revisions by information consistent with the current belief set are not just simple additions; see Rott (1989, 1991), Boutilier (1992) and Nute and Cross (2001). In particular, adding new information about "objective facts" may render some conditionals previously accepted implausible.

As an aside, let us have a slightly more systematic look at the question which objective sentences and which conditionals (interpreted by some variant of the Ramsey test) are preserved in revisions and updates which are not belief-contravening. Again restricting our attention to the case of an A which is consistent with K, the possible worlds model for revisions and updates immediately yields the following:

- if A prompts a revision of K and conditionals "If B then C" are evaluated by means of the Ramsey test and updates (world-wise evaluation), then both the objective sentences and the conditionals that were accepted in K are preserved in the revised set.
- if A prompts a revision of K and conditionals "If B then C" are evaluated by means of the Ramsey test and revisions (holistic evaluation), then all objective sentences that were accepted in K are preserved, but not in general all conditionals.[11]

[11] If, however, the iterated revision method employed is "conservative revision", then the conditionals are preserved as well. See condition (∗3,4,9C) of Rott (2003, in particular p. 124) which implies that the revision of K by B is a

- if A prompts an update of K and conditionals "If B then C" are evaluated by means of the Ramsey test and either revisions or updates, then neither objective sentences nor conditionals are preserved.

So far we have found no reason to reject Rule 3. Still I think that it puts us on the wrong track. Recall Adam's Kennedy example, Hansson's hamburger and Sandqvist's switch. What is it that makes the difference between the indicative and the subjunctive conditionals? In their principal reading, the corresponding subjunctive conditionals are about changes in the world: about the giving up of an assassination plan, the closing of a restaurant or the shifting of the switch (this is the partial truth of Rule 2). They suggest it to be a settled fact that Oswald killed Kennedy, that restaurant A is open and that the switch is in position C. The antecedents do not suggest that someone asks the hearer to update his belief state by the assumption that a real change has taken place in the world. The interesting point is that the hearer can at the same time accept an indicative conditional with the same antecedent and a consequent which is incompatible with the consequent of the corresponding subjunctive conditional. The mere fact that an indicative conditional is acceptable indicates that the agent is not absolutely sure after all that the negation of the antecedent is true. He is at least quite ready to be open-minded about that matter and to suspend his belief in the negation of the conditional (this is the partial truth of Rule 1). The indicative conditional may even induce a contraction of the agent's set of beliefs.

In a possible worlds modelling without a temporal structuring that applies across different worlds, it is perhaps unavoidable to distinguish between revisions and updates and to make it seem that the methods are completely different. In the following sections, we will aim at showing that the difference does not concern fundamentals, but only concern two different ways of filling in a scheme that is common to both indicative and subjunctive conditionals.

subset of the two-fold revision of K first by A and then by B provided that A is consistent with K.

6. Levi's example

I will now make a new effort to attack the problem about indicative and subjunctive conditionals with the help of an example presented in a very long footnote in Isaac Levi's book *For the Sake of Argument* (1996, 300–302). Levi refers to the case as one of *Cross fantasy comparison*. The story is about a car ride from New York to Boston, where Jones, the driver, has a choice between two routes.

(A) Jones took the route from New York to Boston via Providence.

(A') Jones took the route from New York to Boston via Hartford.

An important piece of information is that the route via Hartford normally takes about half an hour less than the route via Providence.

Let us tinker with Levi's example a bit and suppose that the following facts have been established beyond any reasonable doubt, in a lawsuit say.

(C_1) Jones left New York at 11 a.m.

(C_2) Jones refuelled his car at 1:45 p.m. in Newton, a Boston suburb.

(C_3) Jones arrived in Boston at 2 p.m.

We conclude from the very well-confirmed sentences C_1 and C_3 which are that Jones's trip took him three hours.

Suppose now that we interview Jones about his trip and that as a result of the interrogation (including several plausibility checks) we strongly believe that Jones in fact took the way via Hartford (i.e., that A' is true). Now consider the sentence

(B) Jones's trip took him longer than three hours.

(which clearly contradicts the conjunction of C_1 and C_3), as well as the following (subjunctive) conditional:

> If Jones had taken the route via Providence, the trip would have taken him longer than three hours.[12]

or schematically,

> If A had been the case, then B would have been the case.

Taking into account everything we know about the case, we should accept this conditional.

Now, however, suppose that in the course of the lawsuit it turns out that Jones actually *did* travel via Providence. This means that A is *in fact* true. On the basis of this information which we presume to be unquestionably true, we must not conclude that B is true – even though we had previously accepted the subjunctive conditional "if A then B" for good reasons. The sentence that it took Jones as long as it actually took him (remember there is excellent evidence that the ride took him three hours) is not available for revision.

What is the lesson taught by this example? One might describe the situation by saying that *really accepting* the antecedent A (as opposed to merely hypothesizing A) undermines the acceptance of the conditional "if A then B", and it is for this reason that the latter cannot be used for performing a *modus ponens*. It has just turned out that travelling the route from New York to Boston via Providence does not at all times take more than three hours.

An alternative interpretation of the example, the one I find more adequate, is given by saying that the reasoning that backs the subjunctive conditional "if A then B" (i.e., the picturing of what *would* happen if A *were* true) is entirely different from the reasoning that is initiated when we come to know that A is *in fact true*.

[12] In natural language one would be inclined to express this statement by something with is equivalent for all practical purposes, viz.: "If Jones had taken the route via Providence, the trip would have taken him longer than it actually did." The consequent of this conditional is explicitly marked as counterfactual (or even "counterpossible"), and thus we'll never ever have to wonder whether we are ready to accept it as true. This reformulation would be suitable for the following discussion, but I want to avoid it because of the potential ambiguity between a *de re* and a *de dicto* reading of "than it actually did".

Hypothetical reasoning or supposing that something is true is a completely different affair from the updating of one's belief state. The example bears this out very clearly. In the beginning we were sure that under the *hypothesis* that the route via Providence was taken, the travelling time would have been longer than three hours. But later, given the new piece of information telling us that the route via Providence was *in fact* chosen, we realize that nothing more than three hours was needed for this very route.

My thesis is that the differences highlighted by this example are systematic ones. At least in belief-contravening ("counterfactual") cases, hypothetical or suppositional reasoning is systematically different from reasoning triggered by the receipt of a new piece of information (information that is seriously taken to be true).

If we start from the belief that Jones chose the way via Hartford and want to evaluate the conditional "if A then B" by *supposing* that A was true, we *imagine* a deviation from the real course of events that is as straight, smooth and unswerving as possible ("real" here means: thought to be real by us). Since as a rule the route via Providence takes half an hour longer than the route via Hartford, we have good reason for assuming that Jones would have arrived half an hour later (Fig. 1).

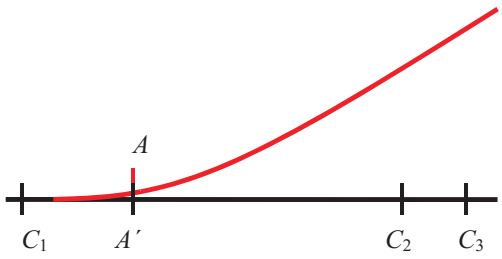

Figure 1: *Subjunctive mood – drastic deviations from reality (as perceived by the agent)*

However, starting from the belief that Jones chose the way via Hartford and confronted with the surprising *new information* that

Jones *actually* took the route via Providence, we would certainly keep our beliefs C_1, C_2 and C_3 which are backed by very reliable evidence. Consequently, we do not change our mind about the time that Jones needed for the ride (Fig. 2).

Figure 2: *Indicative mood – constrained deviations from reality (as perceived by the agent)*

In the *hypothetical reasoning* case, we preserve the earlier fact C_1 but after the hypothetical substitution of A for A', it is no desideratum *at all* to maintain the data C_2 and C_3. One rather goes for a course of events that is as straight, smooth and unswerving as possible. Another way of putting the same thing is to say that the revised path is as *normal*, i.e., as much in agreement with the laws of nature and with mundane normalities as possible. At the end of this path one may well end up in a situation that doesn't have much in common with the real situation. This stands in sharp contrast with the case of a *factual report*. If a reliable new piece of information makes the reasoner substitute A for A', any information that he possesses about particular facts of the time after A or A' have happened still has to be respected. So not only C_1, but also C_2 and C_3 will be retained. Moreover, the agent's beliefs or perceptions of the present situation are important, and need to be preserved as much as possible.

7. Time matters: A constructive proposal

My thesis is basically that a subjunctive conditional is about a hypothetical deviation, while an indicative conditional is about a factual report of the event described in the conditional's antecedent. In order to properly formulate the right rule of interpretation, I have to

confine myself to conditionals whose antecedents and consequents refer to events in space and time, where the time t_A referred to by the antecedent is earlier than the time referred to by the consequent (no "backtracking"). Moreover, the rule will prove to make a relevant distinction only if t_A lies in the past. Nothing at all will be said about atemporal conditionals dealing with logic, mathematics, rules of games, etc.

We will be talking about acceptance conditions for indicative and subjunctive conditionals. I have nothing to say about the much disputed question whether either kind of conditional possesses truth values. Let us take for granted the Ramsey test idea that conditionals are evaluated by reasoning under the assumption of the truth of the antecedent. The essential question then is: How exactly is this assumption made? How is one to accommodate one's current beliefs to the information specified by the antecedent?

I submit that time is extremely important if we want to understand the difference in evaluating subjunctive and indicative conditionals. I take Rule 2 to be basically correct, i.e., I proceed on the idea that the subjunctive mood marks an ontic conditional, while the indicative mood marks an epistemic conditional. In more detail, a good approximation of the right answer seems to me Rule 4:[13]

Rule 4 In evaluating a subjunctive conditional, the agent goes back mentally to the time t_A of the assumed antecedent event A and makes minimal adjustments of A's past so as to accommodate the happening of A as smoothly as possible. After this change has been performed, the agent is *completely free* to change any beliefs about the actual course of events after t_A. He follows the most plausible or probable trajectory conforming to the laws of nature ("the normal course of events" after

[13] For similar accounts in the literature on indicative and subjunctive conditionals see for instance Jackson (1977, in particular p. 9) on sequential conditionals in his *causal theory of counterfactuals*; Davis (1979, in particular p. 552) on the *Stalnaker principle* as applied to total or partial similarities; Thomason and Gupta (1980, in particular p. 72) on the twofold application of the *Past Predominance Principle*; and Ellis (1984, in particular p. 62) on varying selection functions and belief bases in so-called *Stalnaker/Ellis theories*.

> A). The endpoint of the hypothetical trajectory may well deviate drastically from the agent's representation of the present state of the actual world.
>
> In evaluating an indicative conditional, the agent goes back mentally to the time t_A of the assumed antecedent event A and makes minimal adjustments of A's past and of A's future so as to accommodate the happening of A as smoothly as possible. After this change has been performed, the agent may change his beliefs about the actual course of events as much as is required by A's having taken place. These changes are restricted, however, because the agent has to maintain those of his beliefs about particular matters of fact after t_A for which he possesses good evidence. In particular, the endpoint of the revised trajectory must be as close to the agent's representation of the present state of the actual world as possible.

Ambiguities in the resolution of the task of finding smooth transitions and, respectively, close approximations account for the fact that in evaluating conditionals, we usually have to consider multiple trajectories. This fact gives substance to the idea of a variably strict necessity. The conditional "If A then B" is true just in case every solution of the task of smoothly accommodating A (at time t_A), according to the recipe for subjunctive or, respectively, indicative conditionals, yields a trajectory that satisfies B (at time t_B).

Since different agents are in different belief states, it is clear that indicative (epistemic) conditionals are subjective. But different agents may equally well accept different subjunctive (ontic) conditionals with the same antecedent and contradictory consequents, without one of the agents being necessarily false. In contrast to the case of epistemic conditionals, this is not due to the agents' beliefs and the strength of the evidence available for these beliefs. The ambiguity is rather due to the different ways of adapting and manipulating the true history of the world before t_A so as to make A smoothly happen. David Lewis (1979, 47–48) gave an interesting discussion of the sort of considerations that are involved in mini-

mizing the changes of one history into another:

> That means that a similarity relation that combines with Analysis 2[14] to give the correct truth conditions for counterfactuals ..., taken under the standard resolution of vagueness, must be governed by the following system of weights or priorities.
>
> 1. It is of the first importance to avoid big, widespread, diverse violations of law.
> 2. It is of the second importance to maximize the spatio-temporal region throughout which perfect match of particular fact prevails.
> 3. It is of the third importance to avoid even small, localized, simple violations of law.
>
> It is of little or no importance to secure approximate similarity of particular fact, even in matters that concern us greatly.

This is a valuable attempt to aggregate a variety of considerations into a single relation of overall similarity. Lewis, however, does not aim at a unified analysis of indicative and subjunctive conditionals. And he downplays the fundamental differences between the "values" of particular facts before the time t_A at which A is assumed to occur and the particular facts after that time. This difference was emphasized by Davis (1979). In particular, Lewis did not make it sufficiently clear that particular facts after t_A actually count for *nothing* in the case of subjunctive conditionals, but they need to be carefully respected in the case of indicative conditionals.

As we shall further illustrate in the next section, the difference between subjunctive and indicative conditionals is particularly clear in cases where the consequent is known or thought to be false. It is important to notice, however, that the difference is far less clear, and indeed seems to vanish, if the antecedent refers to an event

[14] "*Analysis 2.* A counterfactual 'If it were that A, then it would be that C' is (non-vacuously) true if and only if some (accessible) world where both A and C are true is more similar to our actual world, overall, than is any world where A is true but C is false." (Lewis 1979, 41)

that happens just at present or in the future. In this case the distinction between ontic and epistemic reasoning gets blurred, since the only evidence about the future course of events we can employ for the epistemic case consists of elements that are "ontologically relevant", such as laws of nature, regularities and habits – and these are exactly the criteria that are used in deciding which trajectories are considered to be straight and smooth. Since there is no extra information about contingent, particular matters of fact in the future, there are no special ties that would bind epistemic reasoning without binding ontic reasoning.

Overstating things a little, one can say that ontic conditionals, which are mostly construed with the subjunctive mood, are about *fiction*, and that epistemic conditionals which are mostly construed with the indicative mood are about *the truth* or, more exactly, about the truth as perceived by the agent. While the former require imagination, the latter require respect for the available evidence.

8. Back to examples

As Rule 1 states, the *indicative mood* in conditionals frequently indicates that the speaker does not know the truth value of the antecedent (and normally he does not know the truth value of the consequent either). The paradigmatic problem situation arises when A' is (firmly) believed to be true, but indicative conditionals with an antecedent A which contradicts the belief A' are still acceptable:

> If Jones has taken the route via Providence, then (still) it has not taken him longer than three hours.
>
> If A is the case, then (still) B is not the case.[15]

The antecedent of the indicative conditional prompts a line of reasoning that corresponds exactly to the reasoning that is prompted by a new piece of information. What is most relevant here is not

[15] "Still" in the consequent serves much the same purpose as "even if" in the antecedent.

"smooth" transitions or the preservation of laws and normalities but information about the actual course of the world, information about matters of particular fact that is supported by independent, "hard" evidence. The difference between indicative and subjunctive conditionals does not lie in the fact that one kind expresses some sort of "suppositional reasoning" and the other does not. Both kinds are amenable to an analysis in terms of suppositions. The difference is due to different ways the suppositions are made.[16]

The above analysis generalizes to many other cases. Here is a list of (variations of) examples that have featured in the relevant literature.

> If he had been there, he would have voted against the proposal. (Ramsey 1931, 249)
>
> If Mr. Khrushchev were in this room there would be someone here who does not understand English. (Mackie 1962, 71)
>
> If Oswald hadn't shot Kennedy in Dallas, then no one else would have. (Adams 1970, 90)
>
> If Nixon had pressed the button, there would have been a nuclear holocaust. (Fine 1975, 452)
>
> If the butler had done it, he wouldn't have used an icepick. (Stalnaker 1975, 145)
>
> If Hitler had decided to invade England in 1940, Germany would have won the war. (Stalnaker 1984, 105–106[17])
>
> If restaurant A were closed, this man would not be eating a hamburger. (Hansson 1989, 117–118)
>
> If Gorbachev had died in 1986, the reunion of Germany would not have been possible. (Rott 1989, 105)

[16] I am not convinced by Levi's (1986, 302) own analysis of his example of the car ride from New York to Boston as a comparison of two competing phantasies, nor do I agree with his casual diagnosis that the reasoning triggered off by a hypothetical supposition is indeed identical with the reasoning triggered off by the actual receipt of new information (Levi 1986, 4, 28, 66).

[17] This example is also discussed in Gärdenfors (1988, 166).

It does not cost too much imagination to conceive of situations in which these "counterfactuals" are perfectly acceptable intuitively (readers who find that difficult are invited to consult the original papers). In none of these cases, however, would we be ready to accept the consequence upon learning from a trustworthy source that, contrary to our beliefs, the antecedent is *in fact* true. Thus none of the corresponding indicative conditionals is acceptable:[18]

> *If he was there, he has voted against the proposal.
>
> *If Mr. Khrushchev is in this room there is someone here who does not understand English.
>
> *If Oswald didn't shot Kennedy in Dallas, then no one else did.
>
> *If Nixon pressed the button, there was a nuclear holocaust.
>
> *If the butler has done it, he didn't use an icepick.
>
> *If Hitler decided to invade England in 1940, Germany has won the war.
>
> *If restaurant A is closed, this man is not eating a hamburger.
>
> *If Gorbachev died in 1986, the reunion of Germany has not been possible.

The reason why these sentences are unacceptable, or simply wrong, is that in the situations described by the examples, it is *known* that the consequent is false, and it is hard to imagine any potential or real evidence that could overturn this knowledge. The different ways of interpreting subjunctive and indicative conditionals as sketched in Rule 4 explain the discrepancies.

[18] In Ramsey's example, it is known that the proposal was passed unanimously; in Mackie's example it is known that everyone present in the room has a good command of the English language; I trust that the other examples are self-explanatory.

9. Conclusion

Conditionals express variably restricted necessity, and as such they admit of various interpretations, just as expressions of unrestricted necessity do. The most basic distinction for this paper has been the distinction between *metaphysical* and *epistemic necessity*, and an important question is how to tell conditionals referring to metaphysical necessity from conditionals referring to epistemic necessity.

After reviewing several rules for the interpretation of indicative and subjunctive conditionals, the thesis that I have been proposing is that *by default*, subjunctive conditionals refer to restricted metaphysical necessity while indicative conditionals refer to restricted epistemic necessity (Rule 2). The thesis has to be qualified, however, since there is an interfering rule concerning the 'epistemic status' of the antecedent and the consequent clauses of the conditional, i.e., whether they are accepted, rejected or left undecided by the speaker (Rule 1). I have sketched different ways of resolving a potential conflict of the antecedent clause with (what the speaker considers to be) the history of the actual world (Rule 4). Temporal reasoning is necessary if we want to understand the difference between metaphysical and epistemic conditionals in terms of belief update operations. For conditionals referring to the future, the distinction collapses.

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