

## HUME'S SURPRISE AND THE LOGIC OF BELIEF CHANGES\*

Preprint version of a paper published in *Synthese* **117** , pp.275-291 (1999).

ABSTRACT. If the logic of belief changes is extended to cover belief states which contain both factual and normative beliefs, it is easily shown that *a change of a factual belief (an 'Is') in a mixed belief state can imply a change of a normative belief (an 'Ought') in the same state*. With regard to Hume's so-called 'Is-Ought problem', this means that one has to distinguish its statics from its dynamics. When this is done, it becomes clear that changes of factual beliefs can, for rational reasons, have far-reaching normative consequences. Similarly, a change of a factual belief can imply a change of a value belief.

I guess nobody knows how many times the passage below from Hume's *Treatise* has been quoted. It contains the famous claim, sometimes called *Hume's law*, that from purely descriptive propositions no imperative can be deduced. Let me say at once that I am not going to discuss whether or not Hume's law is true. That I take for granted. Instead I will discuss whether this fact gave him - and gives us - any reasons to be surprised in the way he was (see the part of the quotation which I have italicized).

In every system of morality, which I have hitherto met with, I have always remark'd, that the author proceeds for some time in the ordinary way of reasoning, and establishes the being of a God, or makes observations concerning human

affairs; when of a sudden, *I am surpriz'd to find*, that instead of the usual copulations of propositions, *is*, and *is not*, I meet with no proposition that is not connected with an *ought*, or an *ought not*. This change is imperceptible, but is, however, of the last consequence. For as this *ought* or *ought not*, expresses some new relation or affirmation, 'tis necessary that it shou'd be observ'd and explain'd; and at the same time that a reason should be given, for what seems altogether inconceivable, how this new relation can be a deduction from others, which are entirely different from it.<sup>1</sup>

It is hard to know who Hume had in mind. He did not tell us who "the authors" referred to were. Probably, he thought of philosophers since he talks about "every *system* of morality". But I think we can infer that he also thought that a lot of ordinary people commit the mistake of inferring 'Ought' from 'Is'. But in this, at least, I will argue, he was wrong. His basic mistake is that he does not distinguish between the statics and the dynamics of the Is-Ought problem. We should not only ask 'Can Is imply Ought?', we should also ask 'Can a *change* of Is imply a *change* of Ought?'. The difference between these two questions can be made clear by a very brief presentation of some concepts in the so-called 'logic of belief changes'.<sup>2</sup>

### **The Logic of Belief Changes**

The most fundamental concept of the logic of belief changes is that of *belief set*. However, there are beliefs which are factual, and there are beliefs which are normative. I do believe a lot of things about the world; I believe that a lot of factual propositions are true. But I also believe that some imperatives ought to be followed. All my factual beliefs, taken together at a particular moment, are called my *epistemic state* at that moment, all my normative beliefs may be called my *normative state*. Hitherto, most investigations of belief changes have dealt with epistemic states. Such states are regarded as modelled by *sets* whose *elements are propositions* (or sentences) which describe the contents of the beliefs at hand; these sets are

belief sets. Mostly, it is assumed that the sets are consistent and contain all the logical consequences of its propositions. Peter Gärdenfors, one of the pioneers in this area of study, has concocted the following story in order to convey what the abstract logic of belief changes concretely can be about.<sup>3</sup> I take his permission, though, to shorten the story a little.

Once upon a time there was a man who thought that he had bought wedding rings of 24 carat gold. Two jewelers had, independently of each other, assured him of this. However, one day, when he was repairing his boat, he noticed that sulfuric acid stained his ring. Since he knew that sulfuric acid cannot stain gold, he was surprised. He had believed that something like this could not occur. A test on his wife's ring gave the same result. Her ring was also stained by the acid. He also checked that it really was sulfuric acid he had been working with. Since he believed in science in general and chemistry in particular, he had to change both his belief that the wedding rings were of 24 carat and his belief that the jewelers had not been lying.

I am now going to fit this story into a schema which is appropriate for my purposes, although it differs from Gärdenfors's symbolism and way of handling it. The story can be divided into four stages. First, the relevant part of the man's initial epistemic state is described as a set of believed propositions, and then, second, a contingent change is introduced. In the third stage logic comes in. Here, a new and secondary change is regarded as rationally required by the first change. When all the changes and non-changes are taken into account together, we get, as a fourth stage, a new and revised epistemic state of the man. There are two states connected by a change consisting of two steps. I want to structure the story as follows.

INITIAL EPISTEMIC STATE:

- a: The wedding rings are made of pure gold.
- b: The jewelers did not lie when they said that the rings are made of gold.
- c: Sulfuric acid does not stain gold.
- d: Sulfuric acid does not stain the wedding rings. (d is entailed by a, b, and c.)

PRIMARY CHANGE (which creates a contradiction):

exchange d for d': Sulfuric acid stains the wedding rings.

SECONDARY CHANGE (which resolves the contradiction):

exchange a for a': The wedding rings are not made of pure gold.

exchange b for b': The jewelers lied.

NEW EPISTEMIC STATE:

a', b', c, and d'.

If the first change (d' replaces d) were the only change, a contradiction would arise in the epistemic state. Therefore, *rationality requires a second change* in which the contradiction is removed. One change of an epistemic state implies another change of the same state. Or, as we may also phrase it: *A change of an Is may imply a change of another Is*. As formal-logical derivations are valid or invalid independently of the truth-values of the premises, a secondary change of an epistemic state is rational or irrational independently of the rationality of both the initial state and the primary change. Of course, pure logic does not imply one and only one secondary change. From a logical point of view, the contradiction could equally well have been removed by taking away the belief that sulfuric acid does not stain gold. Philosophers who study this kind of logic try to find more substantive principles by means of which the secondary changes can be deduced. They assume that beliefs can be ranked according to their degree of *epistemic entrenchment*. For instance, it might be required that the second change should in some sense be as small as possible (this requirement is sometimes called the criterion of informational economy<sup>4</sup>). Happily, however, we need not dive into the problems of how to find uniquely determined new states. We can rest content with noting that the primary change of the epistemic state logically implies *some* secondary change of it.<sup>5</sup> As long as we stay within formal logic, we get *indeterminacy of belief revisions*. But that is acceptable for the purpose at hand.

In the example above, the new state is a *revision* of the initial one, but the new state could have been merely an *expansion* or a *contraction*. A completely new belief could (together with the logical consequences) simply have been added to the initial set; or one of the beliefs in the initial set could (together with the relevant logical consequences) simply have been removed.

Changes of normative belief states can also be fitted into my four stage schema. I will show it by means of an example. Once again I pick an example from Gärdenfors's book; an example which he, in turn, has borrowed from R. Hilpinen. It is about a father who one day suspends one of his own rules.

INITIAL NORMATIVE STATE:

- a: The children may watch TV only if they eat their dinner.
- b: The children may eat their dinner only if they do their homework.
- c: The children may watch TV only if they do their homework. (c is entailed by a and b)

PRIMARY CHANGE (which creates a contradiction):

- add d: Today, the children may watch the TV without doing their homework.

SECONDARY CHANGE (which resolves the contradiction):

- exchange a for a': The children may *normally* watch TV only if they eat their dinner.
- exchange c for c': The children may *normally* watch TV only if they do their homework.

NEW NORMATIVE STATE:

- a', b, c', and d.

The introduction of the norm d creates a contradiction between d and the universal norm c. Turning c into a norm with exceptions (c') is not sufficient to remove the contradiction from the normative belief state, since c is entailed by a and b. *One* of these norms has to be changed, too. The first change of normative state logically implies *some* second change of

normative state. In the schema above, I took this indeterminacy and the *normative entrenchment problem* away by a decisional fiat. The new normative state entails that the children may, today, skip their homework and watch TV, but they are not allowed to eat dinner. The example is meant to illustrate not only changes of family norms but derogations and amendments of legal codes, too. In all such cases *a change of an Ought can imply a change of another Ought*.

### **Mixed States**

Let us now proceed to *mixed* belief states. First we shall take a look at belief states which contain both factual propositions (Is-beliefs) and norms (Ought-beliefs) as elements, and then go on to belief states which contain both factual propositions and value judgements (Value-beliefs). As far as I know, such states have not hitherto been discussed among logicians of belief revisions. Again, an extremely simple example can bring home the basic point I want to make. The primary change is a change of factual belief. It consists of first believing that someone was drunk a particular night and then believing that he was not drunk.

INITIAL MIXED STATE:

*Bridge principle*: All legal punishments have to be based on some law-breaking action and on a consideration of the whole legal system.

*Ought-a*: If someone drives a car when drunk, he should be put in jail.

*Is-a*: Thrasy-machus was drunk when he drove his car last Saturday.

*Closure clause*: All relevant laws and all relevant actions have been considered.

*Ought-b*: Thrasy-machus should be put in jail.

(The imperative Ought-b is entailed by the other beliefs, but *not* by Ought-a and Is-a alone. This is due to the fact that Ought-a is part of a larger legal system which may contain paragraphs saying that if the drunk driver is below a certain age, or if he had been forced to

drink, etc., then he should not be put in jail. That is why the bridge principle and the closure clause are needed as premises, too; see also the section below entitled 'Bridge Principles and Closure Clauses'.)

PRIMARY CHANGE (which creates a contradiction):

exchange Is-a for Is-a': Thrasymachus was sober when he drove his car last Saturday.

SECONDARY CHANGE (which resolves the contradiction):

exchange Ought-b for Ought-b': Thrasymachus should not be put in jail.

NEW MIXED STATE:

*Bridge principle*: All legal punishments must be based on some law-breaking action and on a consideration of the whole legal system.

*Ought-a*: If someone drives a car when drunk, he should be put in jail.

*Is-a'*: Thrasymachus was sober when he drove his car last Saturday.

*Closure clause*: All relevant laws and all relevant actions have been considered.

*Ought-b'*: Thrasymachus should not be put in jail. (This imperative is entailed by the other beliefs in the new state.)

As in the purely normative example (about children and TV-watching) in the preceding section, the indeterminacy of the implied second change is cancelled by pure decision. The contradiction caused by the primary change could, for instance, also have been removed by adding another law which would have sentenced Thrasymachus to jail. However, the interesting thing with the example remains, namely that whereas the primary change is a change in a factual belief, the secondary change is a change in a normative belief. Most fundamental truths of ordinary formal logic are trivial, and so is the following statement which I consider to be a truth of the logic of belief changes: *A change of Is can imply a change of Ought*. I have nothing to say about the kind of principles (entrenchment, informational and normative economy, simplicity, etc.) that are needed in order to move

rationally from the first change to a *specific* secondary change; this paper is not aiming at a systematic analysis of the way in which factual and normative premises interact in "mixed" reasoning.

The Humean dictum that *Is cannot imply Ought*, should in the logic of belief changes be interpreted as meaning that a pure epistemic state cannot possibly imply a normative state. This is true both from a static and from a dynamic point of view. A change of *Is* in a pure epistemic state can only give rise to a new pure epistemic state. That claim is not affected by the fact that the opposite is true for *mixed* belief states. The italicized conclusion in the last paragraph should be specified into the following statement: *A change of Is in a mixed belief state can imply a change of Ought in the same state.*

The last statement means that there are at least some situations in which we ought not to be surprised to find that people move smoothly from "the usual copulations of propositions, *is* and *is not*" to propositions that are connected "with an *ought* or an *ought not*". I would like to remind the reader of Bertrand Russell's old remark about general principles. It is as applicable to the logic of belief changes as it is to arithmetic and formal logic.

In all our knowledge of general principles, what actually happens is that first of all we realize some particular application of the principle, and then we realize that the particularity is irrelevant, and that there is a generality which may equally truly be affirmed. This is of course familiar in such matters as teaching arithmetic: 'two and two are four' is first learnt in the case of some particular pair of couples, and then in some other particular case, and so on, until at last it becomes possible to see that it is true of *any* pair of couples. The same thing happens with logical principles.<sup>6</sup>

All my teaching experience verifies that, for most beginners in logic, it is easier to follow the left derivation than the right one below.



All human beings are mortal

Socrates is a human being

-----

Socrates is mortal

All S are P

a is S

-----

a is P

Just as we can follow grammatical rules long before we become aware of them, we can follow rules of deduction before we become aware of them. In particular, the principle of non-contradiction is unconsciously at work for most people most of the time. Those who know nothing about grammar and logic need not speak and write ungrammatically and think illogically. And those who know the rules do not, usually, care to mention them. In our everyday discussions premises are hidden en masse. With these remarks in mind, let us look for kinds of situations which may conform to the four stage schema by means of which I have described rational changes of mixed belief states. And such situations are not hard to find. They are part and parcel of both political discussions (aiming at new laws) and of formal trials.

When a solicitor and an attorney are discussing, they are either trying to change, or trying to prevent a change, of the factual beliefs of the judge and the jury. The total belief set of each of the persons involved is a mixed state where the normative parts (the laws) are regarded as unchangeable. Put mildly, these real situations are of course much more complex than my exemplification earlier. There are more factual beliefs and there are more normative beliefs, and each belief may in itself be much more complex. Nonetheless, as far as I can see, something like the four stage schema must be operative in these complex cases, too.

What Hume's law claims in the realm of norms, *Moore's law* (if I may coin a term) claims in the realm of values: It is impossible to define the concept of good in terms of concepts which denote natural properties. If someone breaks Moore's law, he commits the naturalistic fallacy. Moore's law also means that from purely descriptive propositions no evaluational proposition can be deduced. The structural similarity with Hume's law is obvious.<sup>7</sup> In order to move from factual beliefs to value beliefs without committing the naturalistic fallacy, one

needs something like the concept of good-making characteristics as made famous by R.M. Hare.<sup>8</sup>

When we speak of good strawberries, of good motor-cars, and of good people, there is always an implicit or explicit connection between the concept good and some purely descriptive traits; different descriptive traits in each of the three cases, of course. Without good-making characteristics the word good cannot be applied. In itself it merely represents commending in general.<sup>9</sup> However, as soon as there are good-making characteristics a logic of value revision similar to that of norm revision enters the scene. In cases where there is only one good-making characteristic, and where this characteristic is explicit, it functions in the same way as the law in the Thrasymachus case above. In fact, I doubt that in real life there are cases of this simplicity, but we can look upon the following example as a mere thought experiment made in order to bring out the kind of logic I want to highlight. Instead of norm beliefs (Ought-x) we now have value beliefs (Value-x). The example shows that *a change of Is in a mixed belief state can imply a change of Value belief in the same state.*

INITIAL MIXED STATE:

*Bridge principle:* Goodness is always dependent upon some possibly interacting good-making characteristics.

*Value-a:* People who never lie are good people.

*Is-a:* Socrates never lied.

*Closure clause:* All relevant good-making characteristics have been considered.

*Value-b:* Socrates was a good man. (This evaluation is entailed by the other beliefs in the state.)

(Value-b is *not* entailed by Value-a and Is-a alone since Value-a may be part of a larger whole of interacting good-making characteristics. That is why the bridge principle and the closure clause are needed as premises, too.)

PRIMARY CHANGE (which creates a contradiction):

exchange Is-a for Is-a': Socrates once lied to Xanthippe.

SECONDARY CHANGE (which resolves the contradiction):

exchange Value-b for Value-b': Socrates was not a perfectly good man.

NEW MIXED STATE:

*Bridge principle:* Goodness is always dependent upon some possibly interacting good-making characteristics.

*Value-a:* People who never lie are good people.

*Is-a':* Socrates once lied to Xanthippe.

*Closure clause:* All relevant good-making characteristics have been considered.

*Value-b':* Socrates was not a perfectly good man. (This evaluation is entailed by the other beliefs in the new state.)

When, as in normal cases, there are a lot of interacting good-making characteristics, the application problem can be overwhelming. But that does not alter my claim that even in such contexts it holds true that *a change of Is can imply a change of Value*. Once again, though, it should be noted that the *specific* secondary change described is not implied by the first change which creates a contradiction in the belief set. For instance, a secondary change which brings in the concept of a white lie may rescue Socrates.

Changes of evaluations in which so-called "thick" value concepts are used, admit of schemas similar to the last one. Our step into such concepts can also be guided by Hare. He wrote:

Although with 'good' the evaluative meaning is primary, there are other words in which the evaluative meaning is secondary to the descriptive. Such words are 'tidy' and 'industrious'. Both are normally used to commend; but we can say, without any hint of irony, 'too tidy' and 'too industrious'. It is the descriptive

meaning of these words that is most firmly attached to them; and therefore, although we must for certain purposes class them as value-words (for if we treat them as purely descriptive, logical errors result), they are so in a less full sense than 'good'.<sup>10</sup>

As 'good' needs good-making characteristics, evaluative meaning in general needs such characteristics. In words where the evaluative meaning is secondary, the commending meaning and the descriptive meaning are so tightly mixed up that it really needs a philosopher to take them apart. Gossip, for instance, trades on "thick" value words. From the logical-eye point of view, in such words evaluative premises are suppressed all the time. The fusion of evaluative and descriptive meaning in them is often so intimate that it is impossible to talk of the descriptive meaning of the word without using the word itself.

I have this time extracted my example from some pages of a philosophy book where the concept of emotive meaning is introduced.<sup>11</sup> The belief state in question belongs to a man who thinks that he has a generous friend named Persson, but who because of new information about Persson's family dependants, has to revise his value belief.

INITIAL MIXED STATE:

*Bridge principle:* Noone can be a generous man or a spendthrift without having some corresponding good-making characteristics.

*Is-a:* Persson often treats me to a beer.

*Is-b:* Persson has a normal income.

*Is-c:* Persson has normal expenditure.

*Closure clause:* All relevant generosity-making characteristics have been considered.

*Value-a:* Persson is generous. (This evaluation is entailed by the other beliefs in the state.)

PRIMARY CHANGE (which creates a contradiction):

exchange *Is-c* for *Is-c'*: Persson has an extremely high family expenditure.

SECONDARY CHANGE (which resolves the contradiction):

exchange Value-a for Value-a': Persson is a spendthrift.

NEW MIXED STATE:

*Bridge principle:* Noone can be a generous man or a spendthrift without having some corresponding good-making characteristics.

*Is-a:* Persson often treats me to a beer.

*Is-b:* Persson has a normal income.

*Is-c':* Persson has an extremely high family expenditure.

*Closure clause:* All relevant spendthrift-making characteristics have been considered.

*Value-a':* Persson is a spendthrift. (This evaluation is entailed by the other beliefs in the new state.)

Again, we have an example in which a change of a factual belief implies a change in a non-factual belief in a mixed belief state.

Political discussions are very much concerned with factual questions. Income structures, budget deficits, possible work incentives, causes of environmental pollution, etc., are all matters of fact. Surprisingly seldom, I guess Hume should say, is a norm or a value as such discussed. In my view, politicians, in spite of their different ideologies, often regard the same characteristics as good-making. The *explicit* discussion can be purely factual because everybody, both those who are discussing and those who are listening, intuitively knows that changes of factual beliefs sometimes are followed by rational changes of value beliefs.

The Is-Ought logic and the Is-Value logic which I have described are, I claim, with us most of the time, whether we are aware of it or not. They represent logics for rational changes of mixed belief states. And I am pretty sure that the total belief state of every human being is a mixed state. This view, by the way, is in perfect harmony with Hume's view of the human nature. According to him, normally, our natural feelings of sympathy and our tendency to be benevolent give rise to a moral order. In the theory of knowledge, belief revisions of pure epistemic states may be the only interesting ones; and in the philosophy of jurisprudence,

belief revisions of pure normative states may be the only interesting ones; but in our everyday life we grapple with belief revisions of mixed states.

### **Bridge Principles and Closure Clauses**

Once noticed, the point made with regard to the Is-Ought problem and the Is-Value problem is trivial. I think that every coming system of logic of revisions of mixed states has to take it into account in some way or other. I am not, however, the first one to notice this interaction between *changes* in factual convictions on the one hand and *changes* in normative and evaluative convictions on the other hand. There are at least two philosophers who have noticed it, Hans Albert and Knut-Erik Tranøy.<sup>12</sup> Albert has written the following.

The belief that, because of their autonomy, ethics and actual morality cannot be subjected to criticism based in knowledge arises presumably from a vacuum fiction such as the one which played a role in our analysis of epistemological problems: from the assumption, that is, that at a certain point in time we have to make a decision about our fundamental system of values as a whole, and we must do this in complete isolation from all considerations unrelated to value, and thus from all considerations of knowledge. Only after this fundamental decision has been made might cognitions be introduced for practical applications, i.e., for so-called technical questions. But a situation requiring a decision of this kind never in fact arises. Particular value convictions always appear in combination with knowledge. ... New ideas and experiences can lead us to restructure our cognitive system in some particular manner and in this way also to change our system of values. It is true, as we know, that one cannot without more ado deduce a value judgement from a factual statement; but particular value judgements can certainly turn out to be incompatible with particular previously held value convictions *in the light of a revised factual conviction*. A critical application of

the above-mentioned bridge principles is one means of exposing such incompatibilities.<sup>13</sup>

Although both Albert and Tranøy wrote about the problem some thirty years ago, their views seem not to have affected the presentations of 'the is-ought gap' in many introductory books to moral philosophy. Mostly, the authors of such books merely note that in formal-logical derivations a normative premise is needed in order get a normative conclusion.<sup>14</sup> I think that traditional presentations of Hume's law easily give rise to the *vacuum fiction* which Albert wanted to combat. The growing awareness that, beside ordinary formal logic, there is also a logic of belief changes will, I hope, change this unhappy state of affairs.

The term *bridge principle*, which I have used in my examples, is a term which both Albert and Tranøy used (their differences notwithstanding<sup>15</sup>). For me (and for them, I think), a bridge principle is a statement which in some fundamental way connects factual beliefs with norms and/or values. In the book quoted, Albert formulated two bridge principles, a *Postulate of Realizability* and a *Postulate of Congruence*. The former postulate is the old maxim 'Ought implies Can', the latter is more indefinite but says that incongruities between cosmology and ethics cannot be allowed. In Albert's words: "The assumption, for example, that there are higher beings in heaven who have the right to issue commands of any kind to human beings, and that they have delegated this right to the head of a tribe or a state, is indeed compatible with certain sociocosmic world views, but according to our present state of knowledge, it would be subject to criticism on the basis of a Postulate of Congruence".<sup>16</sup> Also in my view, very much of modern Western secularization has occurred thanks to a bridge principle like this.

Tranøy used the 'Ought implies Can' principle to show that "Certain types of scientific, or well grounded, insights will, in certain situations, fairly directly *generate* moral norms without offending either our logical or our moral sensibilities".<sup>17</sup> In particular, he claimed that scientifically based changes in our conceptions of what the vital needs of children, handicapped people, and homosexuals are, have rationally implied changes in our moral attitudes towards the corresponding groups.<sup>18</sup>

With regard to the statement 'Ought implies Can', Albert's and Tranøy's views in a simple way resolve the old question whether it is a normative, a factual, or an analytic statement. It is none. 'Ought implies Can' is a bridge principle.

I will end this section with a little detour from Hume's law and Hume's surprise into the logic of *theory* changes. Closure clauses were necessary elements in my examples of (secondary) changes of norms and values which belong to *mixed* belief states. But they are necessary even for some secondary changes of factual beliefs within *pure epistemic* states. Much in the logic of belief changes starts with contradictions, which gives it a link to Karl Popper's falsifiability methodology. A Popperian falsification is a contradiction between a theory and a basic statement. In some cases, however, such a contradiction can only arise if a closure clause is added to the theory at hand. I have tried to focus attention on this fact before, and I have argued that these clauses have a character which destroys Popper's intimate link between falsification and theory rejection.<sup>19</sup> A closure clause is a kind of auxiliary hypothesis, but a *very* special one. C.G. Hempel has made exactly the same point, but he chose another name for the clauses, he called them *provisoes*.<sup>20</sup> I have to be brief here, but nonetheless, I think I can show the similarity between the changes in the mixed states presented above and a change in an epistemic state which contains a prediction in Newtonian mechanics.

A Newtonian prediction is not based merely on initial conditions and Newton's three laws of motion plus the law of gravitation, there is also a *principle of superposition* for forces. And this principle, just like the bridge principles used, needs to be supplemented by a clause which says that everything of relevance for the principle has been taken into account. In order to get a prediction we must *close* the situation and assume (a) that all laws, i.e. all the different kinds of forces, have been taken into account, and (b) that all relevant initial conditions have been taken into account. Compare the following case of *a change of Is which implies a change of another Is* with the earlier descriptions of *a change of Is which implies a change of an Ought* and *a change of Is which implies a change of a Value*.

Once upon a time, the predicted orbit of Uranus was falsified. However, none of Newton's laws, nor any initial conditions, were rejected. The closure clause was revised and new initial conditions were allowed to enter the belief state. An hypothesis that there was an hitherto



unknown planet (Neptune) who affected Uranus entered the stage, and was later on confirmed.

INITIAL EPISTEMIC STATE:

*Superposition principle:* The resultant force equals the vector sum of the partial forces.

*Natural laws:* Newton's three laws of motion plus the law of gravitation.

*Initial conditions:* Various properties of the sun and the planets.

*Closure clause:* All laws and all relevant initial conditions are listed above.

*Prediction:* A description of the orbit of Uranus, D1. (D1 is entailed by the other beliefs in the epistemic state.)

PRIMARY CHANGE (which creates a contradiction):

exchange D1 for a description of the observed orbit, D2.

SECONDARY CHANGE (which resolves the contradiction):

add a new belief: There is an unknown planet, Neptune.

revise the closure clause so that this new belief is taken into account.

NEW EPISTEMIC STATE:

*Superposition principle:* The resultant force equals the vector sum of the partial forces.

*Natural laws:* Newton's three laws of motion plus the law of gravitation.

*Initial conditions:* Various properties of the sun, the old planets, and the assumed Neptune.

*Closure clause:* All laws and all relevant initial conditions are listed above.

*Prediction 1:* A description of the orbit of Uranus, D2.

*Prediction 2:* A description of the orbit of Neptune. (Both these predictions are entailed by the other beliefs in the new epistemic state.)

Both epistemic belief sets and mixed belief sets may need closure clauses in order to model our beliefs properly. The existence of such clauses does not affect the claim that *a change of Is in a mixed belief state can imply a change of Ought or of Value in the same state.*

## Objections

There are three overarching objections to my views which I would like to make short comments on. It might be said, a) that the belief states of most people contain contradictions and that, therefore, the logic of belief changes is on the wrong track; b) that only a minor part of our beliefs can be construed as a set of propositions; and c) that no beliefs at all should be construed as propositions. I take them in turn.

Firstly, I do think that most people's total belief states contain some contradictions, but that does not alter the fact that there is *also* in all of us a strong tendency to be consistent. None of my examples requires that the persons involved are totally contradiction-free. It is enough that *a relevant part* of their total belief states functions in the way I have described.

What, secondly, is a belief state, really? Obviously, at any moment, only a few of our beliefs appear as actual thoughts. One proposal, then, would be that belief states are actual thoughts plus *potential* thoughts. But, it can very well be argued, some beliefs do *never* appear even as potential thoughts, they appear as actual and potential actions or affections. Some beliefs are embodied beliefs. For instance, you can be said to believe that someone has been nasty to you although you never have such a thought even potentially, you just become irritated when you meet the nasty person. This notwithstanding, we can *model* belief states by means of propositions. The principle of non-contradiction can in many cases be described as an embodied belief. We act in accordance with it, without thinking of it.

Thirdly and lastly, someone may want to retort that there simply are no propositions in the sense required by the logic of belief changes. Modern Wittgensteinian philosophy of language has, it might be argued, taught us that concepts and propositions are not like things, and that our beliefs are not logically independent of each other. Therefore, one may continue, we

cannot view beliefs as elements in a set. The whole approach founders because of false atomist presuppositions. Be that as it may. Two things should here be noted. Hume himself had, no doubt, an atomistic view of propositions and beliefs. He regarded complex ideas as mere aggregates of simple ideas, and simple ideas as corresponding to simple impressions. Also to be noted is the fact that both formal logic and computer science handle propositions atomistically. And, surely, they have accomplished something. Independently of the true ultimate analysis of language, it is sometimes both possible and useful to treat propositions the way they appear to us, i.e. as self-sufficient entities.

Now I can end. Philosophers who believe in Hume's law have no reason to think that people violently violate the law in ordinary conversation. Surprised?

## NOTES

---

\* I want to thank Gunnar Andersson, Hildur Kalman, Sten Lindström, Conny Rönqvist, and Bertil Strömberg at the Department for Philosophy and Philosophy of Science in Umeå, as well as an anonymous referee, for criticisms which made me add or rewrite various paragraphs. The essentials of this paper were first presented at the convention "Philosophy Days" in Umeå, 7-9th of June, 1995, arranged by the Swedish Philosophical Association.

<sup>1</sup> Hume, D.: 1975, *A Treatise of Human Nature*, Oxford UP, London (Selby-Bigge), p 469.

<sup>2</sup> The term 'logic of belief changes' subsumes the terms 'logic of belief revision' and 'logic of theory change'. Readers not familiar with this kind of philosophy can get an introduction in the first chapters of P. Gärdenfors's (1988), *Knowledge in Flux. Modeling the Dynamics of Epistemic States*, The MIT Press, Cambridge, Mass., as well as in his paper (1992) 'Belief Revision: An Introduction', in *Belief Revision* (ed. P. Gärdenfors), Cambridge UP, Cambridge, p 1-28.

<sup>3</sup> Gärdenfors 1988, p 1.

<sup>4</sup> Gärdenfors 1988, p 53.

---

<sup>5</sup> Some philosophers working with the logic of belief revisions allow non-unique solutions. Their idea is that there are several equally reasonable revisions of epistemic states. See Lindström, S. & Rabinowicz, W. (1991), 'Epistemic entrenchment with incomparabilities and relational belief revision', *The Logic of Theory Change* (eds. Fuhrmann & Morreau), Springer, Berlin, p 93-126.

<sup>6</sup> Russell, B.: 1959, *The Problems of Philosophy*, Oxford UP, London, p 70-71.

<sup>7</sup> Some philosophers even identify the naturalistic fallacy thesis with Hume's law. See e.g. *A Dictionary of Philosophy*, Pan Books, London 1979, entry "naturalistic fallacy".

<sup>8</sup> Hare, R.M.: 1961, *The Language of Morals*, Oxford UP, London.

<sup>9</sup> Hare 1961, p 94 and 102.

<sup>10</sup> Hare 1961, p 121.

<sup>11</sup> Andersson, J. & Furberg, M.: 1984, *Språk och påverkan* (only in Swedish), Doxa, Lund, p 134-37.

<sup>12</sup> Albert, H.: 1985, *Treatise on Critical Reason*, Princeton UP, Princeton; in German, 1968, *Traktat über kritische Vernunft*, J.C.B. Mohr, Tübingen. Tranøy, K-E.: 1972, 'Ought' Implies 'Can': A Bridge from Fact to Norm?, part I, *Ratio* **14**, 116-30; 1975, part II, *Ratio* **17**, 147-75.

<sup>13</sup> Albert, H.: 1985, *Treatise on Critical Reason*, Princeton UP, Princeton , p 99-100.

<sup>14</sup> See for instance, Thomas, G.: 1993, *An Introduction to Ethics. Five central problems of moral judgement*, Hackett, Indianapolis, sections 6.1.1 and 30.1.1, and, Bergström, L.: 1990 (in Swedish) *Grundbok i värdeteori* (= Basics of Value Theory), Thales, Stockholm, chapter 1.4.

<sup>15</sup> There is at least one difference between the Popperian Albert and Tranøy. Tranøy regards 'Ought implies Can' in an anti-Popperian way as unrejectable, even if, of course, he also stresses that specific material versions of it are criticizable and rejectable.

<sup>16</sup> Albert 1985, p 99.

<sup>17</sup> Tranøy 1972, p 117.

<sup>18</sup> Tranøy 1975, p 164-165.

<sup>19</sup> Johansson, I.: 1980, 'Ceteris paribus Clauses, Closure Clauses and Falsifiability', *Zeitschrift für allgemeine Wissenschaftstheorie* **XI** 17-22.

<sup>20</sup> Hempel, C.: 1988, 'Provisoes: A Problem concerning the Inferential Function of Scientific Theories', *Erkenntnis* **28** 147-64.

## REFERENCES

- Albert, H.: 1985, *Treatise on Critical Reason*, Princeton UP, Princeton.
- Andersson, J. & Furberg, M.: 1984, *Språk och påverkan*, Doxa, Lund.
- Bergström, L.: 1990, *Grundbok i värdeteori*, Thales, Stockholm.
- Gärdenfors, P.: 1988, *Knowledge in Flux. Modeling the Dynamics of Epistemic States*, The MIT Press, Cambridge, Mass.
- Gärdenfors, P.: 1992, 'Belief Revision: An Introduction', *Belief Revision* (ed. P. Gärdenfors), Cambridge UP, Cambridge, p 1-28.
- Hare, R.M.: 1961, *The Language of Morals*, Oxford UP, London.
- Hempel, C.: 1988, 'Provisoes: A Problem concerning the Inferential Function of Scientific Theories', *Erkenntnis* **28**, 147-64.
- Hume, D.: 1975, *A Treatise of Human Nature*, Oxford UP, London (Selby-Bigge).
- Johansson, I.: 1980, 'Ceteris paribus Clauses, Closure Clauses and Falsifiability', *Zeitschrift für allgemeine Wissenschaftstheorie* **XI**, 17-22.
- Lindström, S. & Rabinowicz, W.: 1991, 'Epistemic entrenchment with incomparabilities and relational belief revision', *The Logic of Theory Change* (eds. Fuhrmann & Morreau), Springer, Berlin, p 93-126.
- Russell, B.: 1959, *The Problems of Philosophy*, Oxford UP, London.
- Thomas, G.: 1993, *An Introduction to Ethics. Five central problems of moral judgement*, Hackett, Indianapolis.
- Tranøy, K-E.: 1972, ' 'Ought' Implies 'Can': A Bridge from Fact to Norm?', part I', *Ratio* **14**, 116-30.
- Tranøy, K-E.: 1975, ' 'Ought' Implies 'Can': A Bridge from Fact to Norm?', part II', *Ratio* **17**, 147-75.

Department of Philosophy and Philosophy of Science  
Umeå University  
S-901 87 Umeå  
Sweden