

# PHILOSOPHY OF LOGIC AND LANGUAGE

## WEEK 8: LOGIC AND REASONING

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## OVERVIEW

This week, we'll look at the connection between logic and reasoning.

I'll distinguish the claim that logical principles describe how we in fact reason from the claim that they describe how we *should* reason.

And I'll look at some difficulties for both claims. In particular, I'll look at a famous challenge pressed by Gilbert Harman.

## A DESCRIPTIVE ROLE?

Do logical principles describe how we do in fact reason? There is considerable empirical work suggesting that they don't — not straightforwardly, anyway.

Consider the **WASON SELECTION TEST**. Imagine a set of cards, each containing a letter on one side and a number on the other.

Four of the cards are on the table. The first shows the letter "A", the second "G", the third the number "6", and the last "9".

The rule is, *If there is a vowel on one side, there is an even number on the other*. Which cards should you turn over?

Most people answer: the cards showing "A" and "6". But the correct answer is: the cards showing "A" and "9".

The rule is of the form, *If P then Q*, and the cards "P", "Not P", "Q", "Not Q".

It is only violated by combinations of "P" and "Not Q". So these are the only cards we need to check.

There is strong evidence from empirical psychology that humans are extremely bad at even quite simple deductive reasoning tasks.

The combined results from over 65 experiments by different researchers reveal that 97% of subjects endorse *modus ponens*, but only 72% endorse *modus tollens*...

...that 63% endorse the fallacy of affirming the consequence, and that 55% endorse the fallacy of denying the antecedent.

This seems to show that we do not generally reason in accordance with the principles of logic — something that is not surprising to logic teachers!

But the issue is not quite so straightforward. People seem to perform much better on other versions of the Wason selection task.

Suppose, for example, that party goers have cards specifying their age on one side, which get stamped on the other when they buy alcohol.

The rule is, *If one side shows a stamp, the number on the other side is greater than 17.*

Four cards are on the table. The first is stamped, the second is not, third shows the number "22", and the last shows "17".

Which cards should you turn over? This time, most people give the correct answer — the stamped card and the one showing "17".

But the form of the problem is exactly the same as in the previous case: the rule is of the form, *If P then Q*, and the cards "P", "Not P", "Q", "Not Q".

This suggests a **DUAL PROCESS** view of human reasoning. One process is fast, automatic, making little demand on cognitive resources, and sensitive to context.

The other process is relatively slow, controlled, cognitively demanding, and *insensitive* to features of the context.

Our failure to perform well on the first Wason selection task strongly suggests that logical principles do not govern the operation of the first process.

But what about the second? The second process is the sort of process employed consciously, and with some difficulty, by reflective agents.

We might think that logical principles *do* describe how this process operates — the problem is that we don't ordinarily use it.

## A NORMATIVE ROLE?

Whether or not logical principles are *descriptive* of human reasoning, it might be thought that they are in some way *normative* for human reasoning.

Suppose I believe that either the butler or the professor did it. And suppose I come to learn that the butler has an alibi.

My beliefs logically entail that the professor did it. And if I go on to form the belief that he did, then I appear to reason **CORRECTLY**.

If I instead go on to form the belief that the professor did *not* do it, while retaining my initial beliefs, I reason **INCORRECTLY**.

Some philosophers (Kant, Frege) have made a further claim, that logic is not just normative for reasoning, but *constitutively* normative for thought.

The idea is that logic is not just a source of norms that govern reasoning, i.e. norms that determine whether or not reasonings are correct or incorrect...

...but that is in some way constitutive of reasoning that it is subject to logical norms, i.e. that something counts as reasoning only if it is subject to logical norms.

Consider an analogy. Certain rules and aims are normative for chess: the pieces *ought* to be moved in such and such ways, with the aim of checkmating one's opponent.

That is: in playing chess, one is subject to criticism if one does *not* move the pieces in such and such ways, and is not aiming to checkmate one's opponent.

These norms also seem to be *constitutively* normative for chess: one counts as playing chess only if one's actions are subject to these norms.

(Consider the difference between chess and schmess, in which the aim is not to checkmate one's opponent, but to *be checkmated by her*.)

The claim is not that one must *obey* these norms in order to count as playing chess. It is possible to cheat, or to try to lose.

The claim is only that, in playing chess, if one doesn't obey the relevant norms, then one is subject to some sort of critical assessment.

Similarly, in reasoning, if one doesn't obey the norms of logic, then one is subject to some sort of critical assessment: one reasons **INCORRECTLY**.

Just some rules may be normative for chess playing, without being constitutively normative for it — e.g. *get one's queen out early?* — ...

...so too logic may be normative for reasoning without being constitutively normative for it. But is logic even normative for reasoning?

# HARMAN'S CHALLENGE

Gilbert Harman raised an important and influential challenge to the idea that logic has any special role to play in reasoning.

Harman thinks that the view that logic *does* have a special role rests on a confusion between logic and theories of reasoning.

**LOGIC** is about the principles underlying the relation of logical consequence or, as Harman puts it, implication.

Theories of **REASONING**, by contrast, are theories about the principles by which agents should form and revise their beliefs.

The principles of logic are not directly about beliefs; rather, they are about *non-psychological* relations among sentences or propositions.

**HARMAN'S CHALLENGE:** Given the difference between logic and reasoning, why think that the former has anything special to do with reasoning at all?

(Is there any scope for taking issue with the characterisation of logic and/or theories of reasoning that gives rise to the challenge in the first place?)

(Certain logics *are* directly about beliefs, e.g. the AGM model of belief revision — named after its founders: Alchourrón, Gärdenfors, and Makinson.)

(Harman either overlooks or dismisses these sorts of logics. The sort of logic he has in mind is, broadly speaking, simply classical logic.)

(Also, Harman is assuming a certain, broadly internalistic conception on which theories of reasoning are concerned with principles that agents are, roughly speaking, *aware* of.)

(In what follows, I'll largely set these sorts of issues to one side and focus on the question whether Harman's challenge can be met head on.)

A first pass: in reasoning, we're trying to acquire *true* beliefs and avoid *false* ones, and what are primarily true or false are the *contents* of our beliefs.

These contents stand in certain logical relations — of consistency and consequence. Awareness of these relations seems to be very relevant to reasoning:

- If my beliefs are true, so are their logical consequences.
- If my beliefs are inconsistent, at least one of them is false.

Harman doesn't really disagree with this. But he thinks that it fails to show that logic has any special role to play in reasoning. His argument has two parts.

## PART ONE

How, exactly, is logic relevant to reasoning? One way to try to spell out the idea is via the following **BRIDGE PRINCIPLES**:

**LOGICAL IMPLICATION PRINCIPLE (IMP):** If it is a logical consequence of S's beliefs that A, S ought to believe that A.

**LOGICAL CONSISTENCY PRINCIPLE (CON):** S ought to avoid having logically inconsistent beliefs.

Against **IMP** and **CON**, Harman offers various counter-examples designed to show that they can at best be *default* rules, holding all else being equal.

First, counter-examples are based on **BELIEF REVISION**. If I believe that P, that if P then Q, then it is a logical consequence of my beliefs that Q.

**IMP** thus entails that I ought to believe that Q. But the rational thing for me to do *may* be to give up one of my prior beliefs, rather than form the belief that Q.

Second, counter-examples based on **CLUTTER AVOIDANCE**. If I believe that P, it is a logical consequence of my beliefs that P or Q, for arbitrary proposition Q.

**IMP** thus entails that I ought to believe that P or Q. But it would be a waste of cognitive resources to clutter up my mind with most such beliefs.

Third, counter-examples based on rational responses to certain paradoxes. Harman discusses the case of the Liar Paradox. Perhaps the clearest is that of the **PREFACE PARADOX**.

Suppose I write a book about the philosophy of logic. It consists of a series of propositions,  $P_1, P_2, \dots, P_n$ , each of which I believe.

For any given proposition  $P_i$  in the series, I am extremely confident that it is true. But I also have extremely good reason to think that Q: that I have made a mistake *somewhere*.

$P_1, P_2, \dots, P_n$  and  $Q$  cannot all be true. So **CON** seems to imply I should give up some belief.

But it seems quite rational for me to maintain belief in each of  $P_1, P_2, \dots, P_n$  and also in  $Q$ .

Fourth, counter-examples based on **EXCESSIVE DEMANDS**. Logical consequences of, and inconsistencies among, my beliefs may be impossible for me to detect.

**IMP** entails I should believe such consequences, and **CON** that I should avoid such inconsistencies. But assuming ought implies can, these claims are false.

## PART TWO

The second part of Harman's argument concerns a further point about **IMP** and **CON**: they employ notions of *logical* consequence and inconsistency that most people don't grasp.

Most people have some conception of what it is for one belief to be a consequence of another, and for a set of beliefs to be inconsistent.

So most will recognise:

1.  $P$  and *If P then Q* jointly imply  $Q$ .
2.  $A < B$  and  $B < C$  jointly imply  $A < C$ .

And also recognise:

3. *Not P, P or Q, Not Q* are inconsistent.
4. *A is completely red* and *A is completely green* are inconsistent.

But few people are able to distinguish the first of each pair as involving a distinctively *logical* kind of consequence or consistency.

It is, Harman thinks, therefore a mistake to think that *logic* has any special role to play in reasoning.

Recall the dual process hypothesis that we have two reasoning processes, one fast, automatic, and sensitive to context, the other slow, controlled, and insensitive to context.

We saw that empirical work, e.g. on the Wason selection test, suggest that logical principles play no role in the first of these processes.

The second part of Harman's argument suggests that they don't play any distinctive role in the second process either.

They might play a role in the second process of those of us who've been trained in logic, but that's about it.

This second part of Harman's argument leaves the idea that logic has a *normative* role untouched, however.

To attack that idea, we need to look more closely at the first part of the argument: the counter-examples to **IMP** and **CON**.

## BRIDGE PRINCIPLES

The obvious way to respond to the first part of Harman's argument is to come up with better bridge principles than **IMP** and **CON**.

I won't try to do that here. Instead, I'll try to identify some of the key ways in which candidate bridge principles may differ from one another.

The point of a bridge principle is to explain the connection between (a) facts concerning logical consequence or consistency and (b) norms governing agents' doxastic attitudes towards propositions.

It will take the form of a conditional, where the *antecedent* specifies certain facts concerning logical consequence or consistency...

...and the *consequent* specifies the relevant normative claim about agents' doxastic attitudes towards propositions.

For example, **IMP** can be thought of as having the form:  
If  $P_1, \dots, P_n \models A$  then: if S believes  $P_1, \dots, P_n$ , S ought to believe A.

John Macfarlane identifies three central ways in which other bridge principles might differ from this one.

First, they may employ a different **DEONTIC OPERATOR**: S is *permitted* or *has reason* to believe A.

Second, they may employ a different **POLARITY**: S ought *not* to believe A.

Third, since the consequent of the bridge principle typically employs a conditional, they may differ with respect to the **SCOPE** of the operator.

For example, in one variant of **IMP**, the operator takes wide scope:

If  $P_1, \dots, P_n \models A$  then: it ought to be the case that (if S believes  $P_1, \dots, P_n$ , S believes A).

In another, the operator governs both the antecedent and the consequent separately:

If  $P_1, \dots, P_n \models A$  then: if S ought to believe  $P_1, \dots, P_n$ , S ought also to believe A.

Bridge principles may also differ from **IMP** in terms of the doxastic attitudes they concern. In particular, they may employ **DEGREES OF BELIEF** instead of **BELIEFS**.

## SUMMARY

We've looked at the idea that logical principles play a descriptive role, characterising how we in fact reason.

In light of experimental data concerning, e.g., the Wason selection test, this looks initially implausible.

But the issue is complicated by the so-called dual process hypothesis, that humans employ two, radically different reasoning processes.

We also looked at the idea that logical principles play a normative role, somehow characterising how we *should* reason...

...and at the stronger, Kantian thesis that being subject to logical assessment is constitutive of thought.

We finished off with Harman's challenge, designed to show that logic has no *special* role to play in reasoning, descriptive or normative, at all.