IFL: Logicbite 1

What is logic?

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In the opening sentences of *IFL*, I give a couple of slogans chararacterizing the core business of logic. Yes, logic is a broad subject without clear boundaries, shading off into philosophy on one side, and into mathematics, linguistics, computer science on other sides. But we can reasonably say that its central concern is the evaluation of arguments: and I go on to try to explain the kind of evaluation that logicians are primarily interested in.

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But rather than just summarize my own introductory remarks about the business of logic, let's hear another voice. Here is a particularly clear account from Warren Goldfarb in the Introduction to his *Deductive Logic* (2003):[1]

> Logic is the study of principles of reasoning. It is concerned not with how people actually reason, but rather with how people ought to reason if they wish to ensure the truth of their results. That is, by "principles of logic" we mean those that yield correct reasoning. Moreover, the principles of logic are general: they do not govern reasoning in one specific subject matter or another, but with reasoning as it applies to any and all areas of study.
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> Reasoning is a matter of drawing conclusions, or inferring. Hence in logic we are often concerned with arguments, that is, inferences from premises[2] to conclusions. An example familiar since antiquity is this:
>
> > All persons are mortal.
> > Socrates is a person.
> > Therefore, Socrates is mortal.
>
> The first two statements are the premises; the third is the conclusion. (Of course, in everyday life, arguments are seldom laid out quite so neatly. That is a rhetorical matter, and not our concern here.) The argument is a *deductively valid* argument: the conclusion follows logically from the premises. This feature is often characterized in intuitive terms, in several different ways: if the premises are true then the conclusion must be true; it is impossible that the premises be true and the conclusion false; the truth of the premises assures the truth of the conclusion; to commit oneself to the truth of the premises is *ipso facto* to commit oneself to the truth of the conclusion. Much of this book is devoted to the project of assessing arguments which claim to be deductively valid, but to do this we also have to analyze what it means to say that a conclusion logically follows from premises. The task is to formulate a precise and rigorous definition to replace the intuitive characterizations.

We can take away two initial points from this. First, logic is interested in evaluating the *reasoning* in an argument, judging the quality of the *inference move* that is made in going from the premiss(es) to the conclusion. Of course, faced with an argument up for consideration, we'll usually also want to know whether it starts from true premisses (if the input into your reasoning

[1] I'm changed a couple of occurrences of 'deductive' to 'deductively valid', to make his terminology consistent with mine. Warren Goldfarb teaches at Harvard, is a logician, one of the editors of Kurt Gödel's *Collected Works*, and also an influential historian of early analytical philosophy, writing on Frege, Russell and Wittgenstein.

[2] Boring pedantry: 'premises' as in Goldfarb, or 'premisses' as in *IFL*? Your choice, though I think my double-'s' usage is the majority one among logicians. Did you know that Chaucer, he of the *Canterbury Tales*, did an English translation of Boethius' *The Consolation of Philosophy*? And *he* uses the double-'s', writing "I se wel that it folweth by strengthe of the premysses". And that's what logic is about, what folweth by strengthe of the premysses!

is hopelessly wrong, then it doesn't matter how well you reason, your conclusion is likely to be hopelessly wrong too – garbage in, garbage out). But the logician's focus is going to be on how you reason once you get started; assuming the premisses are true (for the sake of argument, as we say), what can you correctly deduce?

Second, we are going to be particularly interested in reasoning which aspires to be *deductively valid*, meaning that if the premises are true then the conclusion just has to be true too – we are going to be particularly interested in kinds of reasoning which are, as they say, necessarily truth-preserving (truth in, then necessarily truth out). But note, not all good reasoning can aspire to deductive validity. Often, we have to make do reasoning that is reliable enough, but where the conclusion isn't absolutely guaranteed by the premisses.

Introducing another voice, here is Paul Teller making that last point in his *Modern Formal Logic Primer* (1989).[3]

> In any argument worth its name, we must have some connection or relation between the premises and conclusion, which you can think of intuitively in this way:
>
> > Ordinarily, the premises of an argument are supposed to support, or give us reasons, for believing the conclusion.
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> A good way of thinking about logic, when you are beginning to learn, is to say that logic is the study of this reason-giving connection. ...
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> In order to see our subject matter more clearly, we need to distinguish between inductive and deductive arguments. Argument (1) is an example of a deductive argument. [Teller's example was
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> (1) (a) Adam just got an 'A' on his logic exam.
> (b) Anyone who gets an 'A' on an exam is happy.
> So, (c) Adam is happy.]
>
> Compare (1) with the following:
>
> (2) (a) Adam has smiled a lot today.
> (b) Adam has not frowned at all today.
> (c) Adam has said many nice things to people today, and no unfriendly things.
> So, (d) Adam is happy today.
>
> The difference between arguments (1) and (2) is this: In (1), without fail, if the premises are true, the conclusion will also be true. I mean this in the following sense: It is not possible for the premises to be true and the conclusion false. Of course, the premises may well be false. (I, for one, would suspect premise (b) of argument (1).) But in any possible situation in which the premises are true, the conclusion will also be true.
>
> In argument (2) the premises relate to the conclusion in a different way. If you believe the second argument's premises, you should take yourself to have at least some fairly good reasons for believing that the conclusion is true also. But, of course, the premises of (2) could be true and the conclusion nonetheless false. For example, the premises do not rule out the possibility that Adam is merely pretending to be happy.

[3] I first got to know Paul Teller about the time I was starting to write the first edition of *IFL*, when I didn't know his book; he warned me how ridiculously long it takes to knock an introductory logic text into shape . . . How right he was! His own book, which I can recommend for parallel reading, is now freely available for download at tellerprimer.ucdavis.edu. Paul Teller is a philosopher of science, well known for a very good book, *An Interpretive Introduction to Quantum Field Theory*: but as his logic book shows, he can write very approachably about much less scary stuff!

Logicians mark this distinction with the following terminology:

> *Valid Deductive Argument*: An argument in which, without fail, if the premises are true, the conclusion will also be true.
>
> *Good Inductive Argument*: An argument in which the premises provide good reasons for believing the conclusion – the premises make the conclusion likely – but the conclusion might be false even if the premises are true.[4]

What do we mean by calling an argument 'deductive' or 'inductive', without the qualifiers 'valid' or 'good'? Don't let anyone tell you that these terms have rigorous definitions. Rather,

> We tend to call an argument 'Deductive' when we claim, or suggest, or just hope that it is deductively valid. And we tend to call an argument 'Inductive' when we want to acknowledge that it is not deductively valid but want its premises to aspire to making the conclusion likely.

The basic distinction that Teller is after should be clear enough. For example, you reason on the basis of past experience that the next airplane flight is safe to take, and the next cup of coffee you drink won't poison you. That's the sort of reasoning that we have to trust our lives to, day in day out. But a bird can fly into the engine. And I've slipped in a tasteless poison to make the logical point that inductive reasoning even from very strong evidence about what's happened in the past doesn't absolutely guarantee that its conclusion is true ....

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So I've highlighted two distinctions. First, we contrast (i) assessing the premisses of an argument for their truth or falsity with (ii) evaluating the quality of the reasoning from the premisses to the conclusion. Second, focusing on (ii), we draw a contrast between those good inferences which are deductively valid and those which can only render their conclusions likely enough to rely on in the circumstances. Our concern in *IFL* is going to be deductive validity, as explained in the opening chapters.

Goldfarb highlighted two other points which I haven't yet commented on. First he said "the principles of logic are general". And yes of course, we want our study of deductive reasoning to reveal principles of suitably general application, and I hint at the end of Chapter 1 of *IFL* how we can get some generality into the story. But second, Goldfarb also says "they [i.e. the principles of logic] do not govern reasoning in one specific subject matter or another, but with reasoning as it applies to any and all areas of study." And this is a new idea: it's not just that the principles of logic have some generality, but that they apply to *all* kinds of deductive reasoning on any topic – they are, in a phrase, 'topic-neutral'. I shelve discussion of this second, stronger, idea until Logicbite 5/*IFL* Chapter 6.

And with that by way of orientation, now read *IFL* Chapters 1 and 2!

[4] Repunctuated for clarity