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"Logic" nominally belongs to the classical trivium, the common ground, the crossroads of traditional liberal education, through which all educated persons would travel. But what sort of "logic" should or could fill that role today?

Many teachers of logic today feel pulled in what seem two different directions: towards the more apparently practical utility of the emerging "informal logic" agenda; and towards the more apparently rigorous canon of formal logic, be it deductive or inductive. These alternatives are neither mutually exclusive nor exhaustive of the possibilities of what might constitute an organon for the liberally educated person today. I will review some salient approaches to teaching logic, and some salient issues attending those approaches, focusing on issues regarding the utility of formal deductive logic in modern symbolic guise.

Since assessments of the utility of anything entail some specification of the purposes to which it is to be put, debate about the utility of any logic curriculum needs to address the specific educational goals, target skills, and worldly tasks at which it is aimed. I wish to suggest that the variety of worthy tasks, skills, and goals at issue is wider than current dispute over the utility of formal logic expressly allows. My intention here is not to argue for one or another approach, but to show that issues regarding the utility of one approach as compared with another are no more open and shut than the issue of what constitutes the priority objectives of liberal learning.

Alternative Approaches to Teaching Logic and Logical Reasoning

Many virtues and skills come under the honorific rubric of "logical" reasoning; and perhaps even more parade under the banner of "critical" thinking. Approaches to teaching logic for purposes of enhancing transferable or generic reasoning skills can vary as much as do the subject matters called "logic" and the many purposes to which reasoning is put. While the subjects thought to enhance logical acumen may no longer include Latin, they conceivably include contemporary analogues of the philosophical, literary, historical, and rhetorical studies covered by the way in traditional Latin curricula. My own skepticism about the value of once being required to take several years of Latin was met by a rhetorical question: "Was not Caesar a great problem-solver and
Cicero a master of eloquent argumentation?” My doubts were not allayed. But logical discipline is surely not a monopoly of standard logic curricula.

Suppose, however, that we are specially concerned with teaching basic and widely applicable tools and techniques of logic, and in the most express and direct fashion. Suppose we take the business of logic, for the present and at minimum, to be the study of criteria, rules or methods for distinguishing good arguments from bad. Suppose we try to leave aside methods for appraising the truth of claims specific to specialized disciplines. What, then, would we teach in the way of logic, and how? Some rough distinctions are ready to hand that can make a difference to what is taught.

An argument, at minimum and for present purposes, is a set of statements, some of which (the premises) purportedly support some other claim (the conclusion). An argument purportedly provides some sort and degree of conditional warrant for its conclusion: In so far as its premises are evidently true or credible, one has some reason to accept the conclusion. Some evidentiary connection is posited between the premises and conclusion: such evident credibility as the premises possess is somehow passed along or “lent” to the conclusion. Conditions that need be satisfied for some such connection to obtain are at least a large part of what logic is generally about.

Evidentiary connections can vary in strength and definition and, accordingly, different sorts of subject matter can be distinguished in logic. Common distinctions found in and among logic curricula are those between ‘deductive’ and ‘inductive’ logic, ‘formal’ and ‘informal’ logic.

Deductive Logic

One very special kind of evidentiary connection that can obtain between the premises and conclusion of an argument is, variously, deductive validity, logical implication, consequence, or entailment. An argument that is deductively valid purports the strongest possible conditional warrant for its conclusion: If the premises are true, the conclusion is not just metaphorically ‘lent’ some ‘support’; it is absolutely guaranteed to be true. A useful converse relation also obtains: If a set of statements (say, a theory) logically implies a false or otherwise unacceptable consequence, then at least one of the statements must be false or likewise unacceptable.

This connection between a set of statements (say, the premises of an argument) and some logical consequence (say, the conclusion of the argument) has nothing to do with the content or actual truth or falsity of the statements. Deductive validity is accountable rather to logical form, to certain structural features of the statements in question. This fact facilitates a useful distinction between questions of what ‘follows logically’ and questions about what is true or false, a distinction that is useful for purposes of appraising the logical connection between the premises and conclusion of an argument independently of being able to decide the truth of the matters at issue. More generally, assessing relations of logical consequence or logical implication is certainly an important task in any field of inquiry, and to this end deductive theory provides an ap-
paratus for abstracting significant elements of logical form from natural language arguments and everyday discourse.

So, for example, the following argument is valid, and this is by virtue of its having a certain *logical form*, depicted to its right.

A. 1) If you are illiterate you are not reading.
   2) You are illiterate.
   Therefore, 3) you are not reading.

The fact that statements (2) and (3) are false does not affect the validity of the argument: If (2) as well as (1) were true, (3) would *have* to be true. Of course, (A) is not seriously intended as an argument in the sense of an attempt to convince you of its conclusion. Not all good arguments are meant to convince or to persuade. In any case, whether we regard (A) as a serious or interesting argument does not change the logical connection between statements (1) and (2) and statement (3): (1) and (2) together logically imply or entail (3). Moreover, what is of interest about this connection is that any statements having the forms (1') and (2') would together logically imply a statement of the form (3').

In the following argument the premises and conclusion all happen to be true:

B. 1) If you are illiterate you are not reading. B'. 1') If I, not R
   But, 4) you are not illiterate. 4') Not I
   So, 5) you are reading. 5') R

Close your eyes and the conclusion, statement (5), is false, while the premises remain true. Hence, this argument is invalid. But not just because of any accident or fact about the world that momentarily renders the conclusion false while the premises are true. It is invalid so far as the logical form of the argument (B') fails to *guarantee* a true conclusion, given true premises. We know this about the argument form (B') irrespective of anything we may know about the truth-value of the particular claims asserted in argument (B). Argument form (B') fails to guarantee the truth of its conclusion, given true premises, if *any* argument of that form can have true premises and yet a false conclusion. Knowing nothing about you or the truth of statements (4) and (5), I know that argument (B) is invalid so far as its relevant logical form, say (B'), is the same as the following argument's, (C'):

C. 6) If I'm on the moon, C'. 6') If M, not V
   I'm not on Venus. (True)
   7) I'm not on the moon. (True) 7') Not M
   Therefore, 8) I'm on Venus. (False) 8') V

Demonstrate the fact as you will, any argument whose relevant form is the same as (B') or (C') is invalid so far as it is evidently possible for an argument of that form to have true premises and a false conclusion.
Formal Symbolic Logic

Deductive logic is 'formal' insofar as it typically attributes validity or invalidity to logical form and looks to discover rules governing the use of those logical expressions that are crucial to the logical form of arguments. For example, the crucial elements of logical form singled out in the previous arguments—were the sentential connective 'if' and the negation term 'not'. The validity or invalidity of those arguments—can be accounted for by the way sentences in the argument were constructed and combined using 'if' and 'not'.

Formal logic is typically *symbolic* if only because it is practically convenient (for purposes, say, of easy pattern recognition and formal manipulation) to depict crucial logical elements of natural language in some tractable standard notation. Even with simple conditional statements it is convenient to reduce the logical force or import of the variety of conditionalizing expressions found in ordinary language to some standard, precisely definable and tractable symbolic form.

Symbolic logic provides tools not only for construing the validity or invalidity of arguments but also for sorting out a variety of claims about what 'follows logically' from what. It can be useful to understand the purely logical form and import of statements, quite apart from knowing their truth or falsity—especially when the matter at hand is controversial, the truth of the matter is elusive, and one is not sure what to believe.

For example: Suppose a person is wondering whether a human fetus can be shown to have a right to life. She is not at all sure what to believe on this somewhat metaphysical issue, but she does think that, *unless* it turns out that a fetus has no right to life, abortion is wrong. In any case she cannot help feeling that abortion is just *not* right. A quarrelsome friend then claims that she is effectively committed to a position on the right-to-life issue after all, and had better face up to it. That is, he claims in effect that propositions (9) and (10) logically commit her to (12), as follows:

\[ D. \]

\[ 9') \text{Unless it's the case that} \\
\text{fetuses have no right to} \\
\text{life, abortion is not right.} \\
\text{But 10') abortion isn't right.} \\
\text{Therefore, 11') it's not the case} \\
\text{that fetuses have no right to life} \\
i.e., 12') fetuses do have a right to life \]

Is it true that she is logically committed to believe (12) if she believes (9) and (10)? Do (9) and (10) logically entail (12)? Is (D) a valid deduction?

Suppose her friend, while trying to argue for abortion and raise doubts in her mind about (10) by capitalizing on her doubts about (12), holds that abortion is not wrong *unless* fetuses have a right to life. But, he must confess, he thinks fetuses *do* have a right to life. She presses the point that he must, then, logically concede that abortion is wrong, on the following deduction:
E. 13) Unless fetuses have a right to life, abortion is not wrong.
But, 12) fetuses do have a right to life.
So, 14) abortion is wrong.

Is she right?
The foregoing hypothetical dispute is not about the truth or falsity of statements about the rights of fetuses or the rights and wrongs of abortion. It is rather about the logical connections among the propositions in question. The dispute hangs in part on some conditional connection, (9) or (13), that each disputant posited between putative rights of fetuses and the rights or wrongs of abortion. In fact, each party is arguably wrong about what the other is logically committed to concede: Arguments of the forms (D') and (E') are, on one account anyway, invalid. This may or may not be clear from the 'sound' or logical 'ring' of the arguments as given in ordinary language. The crux of the matter here is how we interpret the precise logical force of the ordinary expression 'unless'. Symbolic logic often legislates the dispute as follows.

Conditionals of the form (9') 'Unless not R, not A' have the same logical force, the same logical meaning as statements of the form 'A only if not R', 'If A, not R', and 'If R, not A'. Why this should be so may require some study and justification, but the point can be illustrated by the following deductive sequence of logically equivalent statements, any one of which both is true and 'follows logically' from any other:

F. 15) If it's raining out, it's not dry out.
16) It's raining out only if it's not dry out.
17) It's not raining out unless it's not dry out.
18) Unless it's not dry out, it's not raining out.
19) If it's not the case that it's not dry out, it's not raining out.
20) If it's dry out, it's not raining out.

Whatever actual sentences the sentential variables 'R', 'A', 'D' symbolize is supposedly of no account to the logical force of these equivalent conditional statements, to the logical relation posited between the sentences connected by 'if', 'only if', or 'unless'—unless, that is, one wishes to argue the logical force of 'unless' expressions. At bottom then, statement (9) may be seen to have an equivalent logical form to that of statements (1), (6) and statements (15)-(20). It is convenient to represent the logical force of these diverse conditional expressions in a standard way, with a single symbol, say an arrow '$\longrightarrow$'. The logical form of arguments (B) and (D) may then be readily represented as, at bottom, the same:
Arguments of the form (B') are not valid; neither, then, is any argument of the form (D'), so far as the underlying logical form of (B') and (D') are equivalent, as represented by (B") and (D"), above. We see likewise that arguments of the form (E') are invalid:

\[
\begin{align*}
E'. & \text{ Not } W \text{ unless } R \\
R & \text{ } \\
\hline \\
W & \\
\end{align*}
\]

(E') is invalid so far as an argument with the same underlying logical form (E") can have true premises but a false conclusion:

If you're a whale, you're a mammal. (True)
You are a mammal. (True)
So, you're a whale. (False)

Or equivalently:

You're not a whale unless you're a mammal. (True)
You are a mammal. (True)
So, you're a whale. (False)

(The argument just given is one case on which to argue that a sentence of the form, 'Not P unless Q' should be construed as equivalent to 'P only if Q' and not as 'P if Q' or even 'P if and only if Q'. Since the proper interpretation of 'unless' is often context dependent, this is not the whole story for the interpretation of 'unless'; but granting some ambiguity or context-dependence to the logical force of an expression does not gainsay the value of symbolic logic for helping to sort it out.)

Deductive logic, formal and symbolic, is concerned with discovering and demonstrating various sorts of logical form and logical connectedness, such as define the validity/invalidity of arguments, the relation of logical implication or consequence, and familiar properties such as consistency/inconsistency and logical dependence/independence. Judgments about these sorts of formal logical relations seem to play an important role in everyday reasoning and argument, as well as in more rigorous mathematical reasoning. Since these logical relations are conveniently defined and studied with the aid of symbolic notation, symbolic deductive logic is one thing we might teach—say, to improve the deductive components of critical reasoning skills, or as a model of logical rigor and precision.
Non-deductive Logic

Deductive logic studies only some, undoubtedly important components of what can make arguments or reasoning good or bad. Deductive validity is one virtue arguments might have; but it is certainly not the only virtue of interest. And often it is not of interest at all: An argument need not be deductively valid in order for it to provide sufficiently good warrant for its conclusion. Of course, the deductive component of reasoning (what all deductive logic has to teach us about logical connectedness) is not limited to making arguments valid. But deductive validity is neither necessary nor sufficient to make an argument good and convincing for most practical purposes.

We often deal with the question of whether a claim is warranted simply by considering whether 'good reasons' or 'good evidence' can be given for it, without bothering to construct elaborate, let alone formally valid arguments. What constitutes 'good reason' or 'good evidence' for accepting a given claim may depend on the norms of the field in which the claim is made, and so constitute part of a specialized discipline. For example: Is the reason that doing $x$ will conduce to a greater amount of happiness for a greater number of people than any alternative action a good reason to believe that $x$ is the moral thing to do? This is a question for moral theory and epistemology.

There is, however, a lot of generalizable wisdom about what constitutes good or bad inference and argument. This wisdom about ordinary reasoning, subjected to a certain amount of systematic and theoretical scrutiny is typically taught under rubrics like "informal logic," "fallacies," and "inductive logic."

Informal Logic

Many if not most of the virtues and vices in everyday reasoning are not directly accountable to logical form, deductively construed. Error in reasoning may derive from misuse of language (e.g., equivocation) and error may be avoided by an understanding of linguistic pitfalls (e.g., ambiguity). Accordingly, logic texts and curricula often contain studies of definition, and of such misuse of language as can lead to faulty reasoning. For example, while the concepts of logical contradiction and contrariety are part of the study of formal deductive logic, understanding contradictories or contraries in everyday guise requires linguistic as well as deductive acumen: 'Wrong' and 'right' can be construed as analytically contradictory terms, and 'obligatory' and 'wrong' as analytical contraries; in order to dispute or make use of either of these logical claims one needs to know the meaning of the terms as well as the formal logic of contradictories and contraries.

Informal logic texts also typically offer taxonomies of 'informal fallacies' for wary consideration. The study of informal fallacy, error in reasoning not merely or readily accountable to the violation of formal deductive canon, often suffers from a lack of any very precise theory or technique for distinguishing fallacies—say, a fallacious *ad hominem* from a non-fallacious one. (Often, as in a law court, facts about a person constitute good reason to impugn a statement made by the person. For example: When a witness is known to be an inveterate liar, biased, or a non-expert, an 'argument against the man' is a good argument.
against the acceptability of his testimony.) Nonetheless, the analytical study of paradigmatic cases of informal fallacy may contribute useful rules of thumb for assessing everyday arguments. And drawing studious attention to paradigmatic fallacies may well help to make students more wary of crudely fallacious habits of thinking—even if the rules of inference and evidence involved are more subtle and elusive than taxonomies of fallacies suggest. Schwartz has put the problem with the fallacy-taxonomy approach in nice perspective:

Fallacy labels have their use. But even the best fallacy books fail to provide useful criteria for applying the labels. Just when for example, is an Appeal to Authority fallacious? Some are fallacious; most are not. A fallacious one meets the following condition: The expertise of the putative authority, or the relevance of that expertise to the point at issue, are in question. But the hard work comes in showing that this condition holds. One might as well speak of an Empirical Fallacy: Some appeals to empirical data are fallacious, although most are not, and the fallacious ones are those in which the reliability or relevance of the putative data is in question, the hard work being the establishment of this last condition.

The kind of hard work in the theory of fallacy that Schwartz refers to has been forthcoming in the developing field of informal logic. Epistemological concerns regarding how notions of relevant evidence and non-formal evidentiary warrants operate within the structure of argumentation generally have long been the focus of Stephen Toulmin's work in the theory of argument. Rules of pragmatics or ordinary language usage constitute a kind of informal logic by which we appraise everyday implications, the logic of conventional or conversational implication (what Grice calls 'conversational implicature'). Rules of conversational implication (of what may be taken as legitimately implied or inferred in pragmatic contexts of ordinary conversation) go beyond those governing valid deductive implication. Appraising conversational implication requires an understanding of the pragmatic norms governing the interactions of the context of discourse with conventional language usage. Examples of some pragmatic concerns of informal logic follow.

One maxim of conversational logic is 'Be relevant!' One sort of informal fallacy is 'irrelevant reason'. I would seem to be committing this fallacy and violating the forementioned maxim if, in response to a request for an argument to show that it is really true that $2 + 2 = 4$, I gave the following argument:

\[
\begin{align*}
G. & \quad 21) \quad 2 + 2 = 4 \text{ or I'm a monkey's uncle.} & \quad G'. \quad P \text{ or } Q \\
& \quad 22) \quad I'm \text{ not a monkey's uncle.} & \quad \text{Not } Q \\
& \quad \text{So, } 23) \quad 2 + 2 = 4. & \quad P
\end{align*}
\]

This argument is formally valid. It is also sound, in the sense that it both is valid and has true premises. The conclusion of a sound argument, by the definition of 'validity', must be true. Could one ask for anything better than a sound argument in support of any proposition? Of course. One could ask, for example, that it not be question-begging, and that it provide relevant as well as true
premises in support of its conclusion. Even if it's strictly true that no argument having the logical form \((G')\), along with true premises, can possibly have a false conclusion, it seems a little odd and misleading to say that \((23)\) 'follows from' or is in any way warranted by \((21)\) and \((22)\). The premises of \((G)\) are in no obvious way relevant evidence for the truth of the conclusion.

Formal deductive logic may be especially well suited to provide some apparatus for a relevant and rigorous proof of \(2 + 2 = 4\). But the classical theory of deductive validity provides no ready explanation of what is wrong with arguments like \((G)\). While logicians may have a precise formal theory of the elusive notion of 'relevance' as it pertains to 'entailment', our intuitions about what all 'follows logically' are not satisfied by the ordinary notion of deductive validity; and 'relevance logic' is beyond the usual scope of introductory formal logic.7

Informal-logical norms may be operating where we detect that arguments are quite bad, even though valid (as above), and where we detect that arguments are perfectly good, even though they neither are expressly valid nor even want to be. The following example is adapted from Grice.8

Jack is standing by an obviously immobilized car with its hood up, when Jill happens along. Jack laments, "I don't know what's wrong. I guess I'll have to hail a ride home." Jill replies:

H. 24) But there's a garage just around the corner.

Assuming that Jack and Jill are observing certain maxims of conversational implication (or 'implicature'), Jill may be taken to have made some perfectly legitimate inferences (e.g., that Jack was referring to car trouble, isn't in a rush to get home, etc.) and to have offered Jack, in effect, a very good argument for not hailing a ride home yet.

Whatever the norms that make Jill's tacit inferences and elliptical argument good or 'logical', they are not simply formal deductive ones. It is quite another matter whether the reasoning implicit in \((H)\)—its tacit assumptions and conclusions, including the operative maxims of conversational logic—is really a tacitly valid deduction, or, in any case, best reconstructed in valid deductive form for full appraisal and analysis: It can be argued that formal logic plays an important role in the explication of conversational 'implicatures'.9

'Informal logic' covers quite a range of non-formal factors governing ordinary, everyday reasoning. Johnson and Blair have discussed the difficulties of defining this field of logical studies, and explore its importance as a field of logic distinct from formal, symbolic logic.10 Exploration and codification of the norms governing this diverse territory—semantics, informal fallacy, pragmatics, notions of relevance, and good evidence—is in any case one direction 'logical' studies can take.

**Inductive Logic**

Inductive logic presumably studies what makes inductive arguments good or bad. But what is an 'inductive' argument? Argument about this matter remains inconclusive. (Perhaps because it is inductive?) One definition of 'inductive'
argument is negative: Inductive arguments are non-deductive. This is to say at least one interesting thing about them: To be good—or good enough—so-called inductive arguments do not have to provide a valid deductive connection between their premises and conclusions. An inductive argument purports only that if its premises are true or credible, then there is some evidence for the truth or credibility of its conclusion. But there is a problem with defining argument types according to what they—the arguments—purport, since arguments rarely have minds of their own. Moreover, how, on this account, is inductive logic different from informal logic generally?

One venerable tradition has it that deductive arguments can be spotted by virtue of having 'general' premises and 'specific' or 'particular' conclusions, whereas the converse is true for inductive arguments. But this view is both mistaken and irrelevant to the assessment of the evidentiary connection of either sort of argument.11

The view that arguments come somehow pre-classified into the world, born either as deductive or inductive (as animals are born either male or female) with or without certain birth defects (like invalidity or a weak evidentiary connection) is as misleading as it may be popular. Many arguments are recognizable as intentional or typical paradigms of deductive or inductive arguments, especially those designed as such for textbooks. These arguments' authors clearly intend their arguments to be appraised by one sort of criteria (deductive) or another (inductive). Most arguments we meet everyday are authored by people who either don't know of any distinctions among evidentiary connections or do not have one in mind. The intention of the author of an argument is, in any case, not a matter of logic, and it may or may not be a relevant factor in trying to evaluate an argument. Whatever the intentions of their authors, most arguments in ordinary settings need to be reconstructed and filled out a bit before they can be suitably evaluated. In many cases, whether to reconstruct an argument with expressly deductive or inductive pretensions is a matter of choice, a policy decision that can hark to various purposes of evaluation and may well disregard the intentions of the author.

The question, ultimately, is not so often 'What sort of argument is this'? but rather 'How are we to explicate, reconstruct and evaluate this argument—according to deductive canon? or inductive? or some other? or some combination'? The answer to this question will depend on our purposes, and on normative considerations well beyond the competence of argument taxonomies.

Inductive logic, broadly construed, is at least concerned with criteria for evaluating the strength of evidentiary connections that obtain in the absence of deductive validity, connections between the premises and conclusion of an argument that need not be made deductively valid in order to provide some evidentiary support for the conclusion of the argument. Inductive logic in a more narrow and familiar sense is concerned with a specific sort of non-deductive evidentiary connection, inductive probability: When the premises of a good inductive argument are true, they do not guarantee the truth of the conclusion, as
in a valid deductive argument, but lend it some degree of probability.

Unlike deductive validity, the conditional warrant or evidentiary connection provided by good inductive arguments, probability, can vary in strength. As with purportedly deductive arguments, whether this evidentiary connection obtains or not, and to what degree, is not a function of the truth-value of the premises. But, unlike the case of deductive arguments, it does not seem to be accountable to the logical form of the argument either.12

This may be illustrated by examples from a familiar family of inductive argument: arguments that generalize or extrapolate from past observations about some class of phenomena to predictions or conclusions about future or yet unobserved cases of the kind. Inferences of this sort of course underlie innumerable everyday expectations: that day will break again tomorrow, that objects will fall when dropped, that toothpaste will come out when we squeeze the tube, etc. Here's a prosaic example of an inductive argument that, clear to commonsense, provides perfectly good warrant for its conclusion, even though this is not so by virtue of any obvious construal of its logical form:

I. 25) Every match flame examined
    so far has had the property of being burning hot to the touch.

Therefore, it's likely that 26) every match flame unexamined
    is burning hot to the touch.

Just why the conclusion (26) is warranted as likely, given the truth of (25), is not obvious, and is wanting some study, as shown by the following arguments, which like (I) have true premises and the same apparent logical form (I'). (The first example, (J), is drawn from Quine and Ullian and the second, (K), from Nelson Goodman; both are discussed by Quine and Ullian.)13

J. 27) Every moment of my life so far has had the property of being followed by further living.

Therefore, it's likely that 28) every moment of my life yet to come is (to be) followed by further living.

Now (J) is clearly not a good argument for my immortality, even though it offers in evidence a true premise representing an exhaustive examination of past cases and has the same apparent form as (I). If simply making the logical form of the argument valid (by the addition of some suitable premise) were sufficient to warrant the conclusion, we could make good inferences like (I) about any arbitrary properties whatever. But we cannot, as shown by consideration of argument (K), of the form (I'), below.

Taking some liberty with Goodman's example, I will take something to be grue just in case either it has already been examined and is green all over or it is as yet unexamined and is blue all over. We assume that there is no problem in principle in making inferences about complex, disjoint contrary properties; for
example, the complex commonsense property of being flame-like: Something is flame-like if either it has been touched with one's hand and is burning hot, or it has not yet been touched with one's hand but is extinguished when deprived of oxygen.

K. 29) Every emerald examined so far has had the property of being grue. Therefore, it's likely that 30) every emerald yet unexamined is grue.

While the truth of (J)'s premise is no evidence whatever for the likelihood of its conclusion, matters are even worse with (K): (K)'s premise actually provides overwhelming evidence that its conclusion is false. This is Goodman's paradox: Contrary to what constitutes a good argument, if (K)'s premise is true, then it is (overwhelmingly) likely that its conclusion is false. (K)'s premise is true: Every emerald examined so far has been grue, because it has, of course, been examined and is green all over. And precisely because every emerald so far examined has been green (and, hence, grue) we reasonably expect that no emerald yet unexamined is grue (and, hence, blue): We reasonably expect that every emerald yet unexamined is in fact green, not blue (and, hence, not grue). What's gone wrong with argument (K), which seems to be of a form with (I) (which in its own right seems quite strong) is a serious puzzle for the theory of inductive inference.

What makes inductively construed arguments demonstrably good or bad can be a matter for much philosophical head-scratching and a matter for rather technical, specialized study in inductive logic. It is surely a generally relevant logical study in its own right, and even one in which formalization of arguments can play a crucial role (as Wesley Salmon's paper in this volume illustrates so well).

Clearly, there is quite a variety of approaches to teaching 'logic' if only because there is such a variety of norms and issues regarding what counts as good argument or logical thinking. I have provided a bit of illustration to suggest some key points of relevance for the common approaches broadly surveyed above. Points of relevance can surely be found for all of them, and others. But priorities among the learning objectives to which they are respectively relevant are surely arguable; and questions about either the theoretical adequacy or practical utility of any of these approaches on the introductory level abound. Difficult trade-offs are apt to be required, on the introductory level and within the span of a single term course, among comprehensiveness in surveying salient approaches, theoretical competence, rigor, and applicability in practice.

The more precise and theoretically scrupulous an approach, the less handy or obviously practical it can be for improving everyday reasoning. And vice versa. The unique superiority of any one approach would be hard to establish, since none is an all-purpose logic and there is no indisputably supreme educational or reasoning objective for which one approach is uniquely suitable. The shared objective of distinguishing good reasoning or argument from bad is complex and ill-defined.

Where critical, theoretical understanding of logical norms is wanted for
their scrupulous or correct application, surveys of an array of approaches run the danger of being theoretically facile, as well as ineffective for teaching practical, transferable skills. Teaching critical scruples and enhancing certain logical sensibilities, short of facilitating actual reasoning skills, is perhaps a worthy goal in its own right; but not one that by itself will dictate one approach over another. It is not surprising that rationales for taking any one approach or mix of approaches to teaching logical thinking often default, at bottom, to the tastes, preferences or customs of individual instructors.

Strong rationales can be given for promoting—or demoting—various approaches to teaching logic or logical reasoning, as papers contained or cited in this volume attest. While we have not really begun widely and systematically to confront the empirical issues attending the question of what in the way of logic is best to teach for liberal educational purposes (as Thomas Tomko reminds us in his paper on assessing formal logical competence), we probably have not attended enough to the value-theoretic disputes as to what those educational purposes ought to be or what in practical terms they mandate.

Among the objectives of logic instruction competing for priority at the crossroads of liberal education today are certain incommensurables: These include various orders of theoretic understanding, on one hand, and the improvement of skill in "everyday" argument on another. Even the tools and skills taught in the classical trivium were not aimed exclusively at quotidian intellectual tasks; the trivium was preparatory for the higher, theoretic learning of the day as well. Of course, when the classical trivium was fashioned, the problem of practical relevance (to say nothing of shrinking enrollments) was not a preoccupation. Needless to say, times and exigencies have changed. But we neglect the classically "liberal" goals of theoretic understanding and rigor at some peril.

The Limitations and Utility of Formal Deductive Logic

The emphasis in this volume on formal logic or the formalization of inference and argument (be it deductive or inductive) is intended not only as a contentious bias but also as a re-examination of the presumption of formal logic to merit a prominent place at the crossroads of liberal learning. This seems timely in view of the growing interest in "informal" logic and the understandable desire to render logical training relevant to argumentation in practical life. In particular, the utility of formal deductive logic is perhaps in danger of being underestimated as liberal arts curricula strive, however admirably, to develop everyday practical or professional relevance. Against the developing diversity of approaches to teaching logic for liberal educational purposes, and against the diversity of arguably "liberal" educational goals—not all of which are concerned with everyday argument or quotidian issues—I wish simply to invite reconsideration of the utility of formal deductive logic, particularly in its elementary symbolic guise. (Elsewhere in this volume I try to provide more extended argument and illustration respecting the claim of formal symbolic logic to a place at the crowded crossroads of higher learning.)
For example, Frederick Suppe has argued that elementary symbolic logic can be made relevant to liberal education if taught as a basis for understanding automata theory and, thereby, as a conceptual basis for understanding how computers—undeniably important fixtures of contemporary life—work.\textsuperscript{14} Patrick Suppes sees the deductive theory of proof or logical inference as relevant to psychology and the social sciences as well as to mathematics.\textsuperscript{15} These are more specialized, theoretic applications than the vague if more practical one of improving the appraisal or construction of everyday arguments. It is in these latter regards that the utility of formal symbolic logic is perhaps most open to doubt and dispute.

Logicians often demur regarding the adequacy of formal logic for analyzing interesting arguments that occur in natural language:\textsuperscript{16}

...formal logic is not a practical means for evaluating genuinely problematic arguments.\textsuperscript{17}

The formal languages of classical logic were devised to account for mathematical reasoning, and serve very well to express mathematical material, but very often it is difficult or impossible to render colloquial English in these languages.\textsuperscript{18}

I challenge anybody...to show me a serious piece of argumentation in natural languages that has been successfully evaluated as to its validity with the help of formal logic....The customary applications are often careless, rough, and unprincipled, or rely on reformulations of the original linguistic entities under discussion into different ones...through processes which are again mostly unprincipled and ill understood.\textsuperscript{19}

Such remarks bespeak fairly high standards of sophistication for construing the subtleties of arguments in natural language, standards even entry-level students should of course not be encouraged to slight. As Patrick Suppes reminds us, by way of arguing for a more direct formalization of arguments in English (in this volume), the syntactic structure of predicate logic bears little resemblance to the syntactic structure of natural language. On the syntactic level alone, whatever the level of sophistication or subtlety of the argument in question, the contortions one has to go through in trying to capture an argument's predicate-logical form are often unnatural if not indeed torturous. Moreover, as Frederick Suppe argues, often “to apply formal logic to evaluate even...validity, we have to resort to a fair degree of philosophical analysis.”\textsuperscript{20}

Points well taken. But from the fact that easy or adequate translations from natural into an artificial formal language (like first-order logic) are difficult or impossible to come by, it does not follow that very useful lessons cannot be taught or learned in the attempt.

Assuredly, formal logic alone is not sufficient for the reconstruction of any very problematic argument in apparently valid form. Of course a lot of yet “unprincipled and ill understood” intuition, good common sense, linguistic artifice and philosophic insight are involved. But from the fact that formal and non-formal analysis must go hand in hand, Frederick Suppe concludes that the ef-
fort at formal reconstruction is "superfluous." Whether it is superfluous or not at least depends on what lessons one wishes to teach. It is a point of interest here that Suppe could not teach the lesson he wishes about the analysis of "genuinely problematic" arguments without resort to formal reconstruction. Formal analysis presupposes philosophic analysis; and, in Frederick Suppe's case, vice versa. Is this a vicious circularity? I think it can be, in Goodman's sense, virtuous. It cannot, however, be dispelled by dismissing formal analysis from the complex task of argument appraisal. The dismissal of the utility of formal reconstruction may be a logician's luxury, an extravagance only those who have already mastered the formal tools of the deductive art (and seen their limitations) can afford. That the formal, symbolic analysis of arguments requires some philosophic reflection is to say that the formal analysis of arguments offers an opportunity for philosophic education. Why not embrace and teach it as such?

In many cases, philosophic analysis itself requires a degree of formal deductive discrimination beyond the reach of the formally untutored. Simple but typical examples are the disputes about logical consequence in arguments (D) and (E) above. Such disputes permeate the philosophic literature.

Novice discussion in philosophy is typically peppered with charges of contradiction and inconsistency. A little formal analysis can go a long way in showing whether these charges are justified or, as is often the case, confused perceptions of different disorders—or just expressions of sheer disagreement. Making good on a charge of inconsistency often requires some formal artifice in the reconstruction of the position in question. The derivability of a flat-out contradiction is one nice test of inconsistency. Deriving explicit contradictions often requires a lot of clarification and amplification of a position. These tasks also call for the exercise of philosophic and linguistic judgment. But ultimately we want to see a derivation. So it would be nice if students of philosophy knew what one looked like and how to work at producing one. Symbolic logic at least provides a heuristic framework and clear model for this task, and there's no rule that says it must be taught in a philosophically insensitive way. Being practiced in fingering exercises and scales does not itself make for musical virtuosity; being practiced in formal derivations, in drawing out consequences in careful, explicit and manifestly valid steps, does not itself make for philosophic virtuosity; but often enough, the latter cannot do without the former.

One reason the attempt at the formal reconstruction of arguments is useful is precisely because of the way it fails and, hence, forces explicit, cautious consideration of philosophic issues regarding the soundness or logical strength of a position. One way to come to appreciate the well touted difficulty of establishing the "logical" competence of argumentation is to play critically with its reconstruction within some formal framework. Lessons respecting the difficulty of the task are worthy ones. And rough approximations to formal rigor, even simplified models of formal analysis, can be instrumental in generating philosophic insights in a disciplined, organized way and in sorting out issues and ambiguities where logically untutored analysis often bogs down in
Massey has demonstrated the difficulties of conclusively distinguishing invalid from valid arguments, and the misleading nature of the claims of introductory logic texts to “prove” invalidity. A fundamental difficulty lies with making good on the claim that one has in fact fully revealed the relevant logical form of any given argument.

The classic example is the valid syllogism (L), which appears to be invalid when reconstructed in sentential logic (L’):

L. 31) All men are mortal.
    32) Socrates is a man. 
    Therefore, 33) Socrates is a mortal.

L’. P
    Q
    R

Some further “higher order” logic is required to reveal enough of the logical form of (L) to show its validity. Thus, an argument whose sentential-logical form is represented by (L’) might well be shown valid if analyzed according to some other correct logical theory. How are we to know that this is not true of any other apparently invalid arguments—say, arguments (B), (C), (D), or (E), all of which were declared invalid above because their sentential-logical forms (B’) through (E’) seemed demonstrably invalid? How, in principle, are we to show that there is not some yet undeveloped logical theory according to which some one of a given argument’s possible forms can be reconstructed and construed as valid? And how can we pretend to teach formal logic as a tool for distinguishing good arguments from bad with this issue unresolved?

This difficulty is less troublesome if our enterprise is expressly to reconstruct arguments in evidently valid form relative to some established logical theory. Whether or not this reconstructive exercise will issue in a sufficiently accurate or formally revealing paraphrase of the original argument in natural language, it can nonetheless be an instructive heuristic constraint on the search for plausible constructions of unstated logical connections, assumptions or underlying normative principles.

The objective of formal reconstruction need not be to throw an argument out of court for being “invalid.” Nor is the point merely to perform an act of charity in behalf of an argument’s author, in order to be true to the author’s intentions or to maximize the argument’s presumption to persuasiveness. The objective need not be simply to adjudicate either the validity or persuasive strength of the argument—especially since it is not at all clear that these two properties are, often enough, happily related.

Framing a position in the form of a valid deductive argument will as often reveal weakness as enhance soundness or persuasiveness: Previously unstated premises wanted for validity may often be obviously unacceptable. While constructing valid arguments can require great ingenuity and logical acuity, it is in theory a trivial matter: All manifestly circular arguments are manifestly valid. Constructing a manifestly sound argument is another matter, requiring more than deductive ingenuity and validity. Not all valid, nor even all sound arguments, are rationally convincing: The premises of a valid argument may in
fact be true but not evidently so or even plausible. Sound arguments may also be question-begging. Further, not all rationally convincing arguments need be deductive, let alone valid. Hence, the persuasive function of valid deductive argument is far from obviously its strong point.

There are, for example, several coherent alternative positions pro and con the permissibility of abortion. One clear way of defining any one of them is to frame it in the form of a valid deductive argument showing just what conclusion one wants to advocate on the basis of exactly what premises. Oftentimes, when students are forced to do this, they find that their actual position is not what they thought it to be. They may find, for example, that they cannot get the conclusion they want on the basis of the assumptions they are willing to make. To that extent they really do not know what position they hold. Skill at constructing manifestly valid deductive arguments can help one to get clear on his own or another's purported position.

Often, then, an argument, as well as its author, is sufficiently unclear as to exactly what wants to be assumed or concluded, that the prime objective in argument reconstruction is not to render the argument more persuasive, but rather more modestly analytical and exploratory: For example, to discover what sorts or forms of assumption are necessary or sufficient to support a given conclusion within the overriding constraint of evident validity. That the warranty of validity employed is system-relative does not gainsay the heuristic utility of the enterprise. This enterprise, played against other non-formal constraints (e.g., plausibility of premises, immunity to counter-example), is to make presumed yet unclear logical connections as precise and explicit as possible, to see what strategic options are open, and to tease out the relevant issues lying quietly within the alternative or tacit assumptions of an argument.

Here some elementary formal constraints are surely better than none. The fact that there is no one way to parse, paraphrase or reconstruct an argument does not mean that there are no instructive ways, or no guidelines for the analysis of arguments within the constraint of some evidently valid deductive form.

Error in ordinary deductive reasoning is accountable to several factors (semantic, pragmatic) besides being untutored in the standard formalities of deductive logic. But, vulnerability to many sorts of elementary deductive error and logical confusion in ordinary reasoning contexts can be readily diminished by some elementary logical tutoring.

Not all deductive reasoning contexts are ordinary, however. Some require more reflective logical care and stricter formalities than others: for example, contexts of philosophic reasoning and argument. Here we want more explicit formal artifice and resort to stricter logical legislation than in ordinary or everyday argument.

For purposes of modeling reasoning tasks that require something stricter than ordinary conversational conventions, symbolic logic provides a useful discipline. One practical objection to teaching symbolic logic is the time required to learn its new and abstract language. But with properly programmed
instruction this task can be made easy if not even enjoyable. There is practical advantage to learning some formalizing artifice: for explicitly formulating presumed or ambiguous logical connections, for abstracting from the rich variety and ambiguity of ordinary language expressions, for sorting out the logical force of assertions, for putting some semblance of clear logical structure into arguments, for trying to see beyond those distracting features of the content and context of arguments that commonly lead to logical error and confusion.

Again, a simple case in point is the sort of dispute about logical consequence illustrated by arguments (D) and (E) above. It is not uncommon for intelligent people to find it difficult to understand what is being asserted in such disputes, let alone whether the assertions are correct. People commonly have difficulty understanding the logical force of statements or assertions about logical consequence when the crux of these logical matters lies with interpreting negations and conditionals.26

People commonly equate 'only if' with 'if', often for good pragmatic reasons, and have trouble construing 'unless' expressions. Adding some negations to the mixture can cause confusion on a very elementary level of logical construction. While there may be some dispute regarding the allowable logical force of 'unless' expressions in everyday contexts, there are useful and reasonable ways of legislating these disputes to avoid confusion in contexts where more analytic precision is wanted.27 While some latitude in construing the logical force of conditional expressions may be adequate for everyday purposes, more precision or stricter legislation is wanted for other analytic purposes, like formulating philosophic or legal assertions, definitions or principles as logically unambiguous constructions. Confusion about ordinary arguments like (D) and (E) are also then easily avoided or clarified.

It must be granted, of course, that the standard truth-functional analysis of the sentential connective 'if' and its conditionalizing cousins may seem quite peculiar to many. Anomalies resulting from this analysis are notorious.28 The standard account has it that conditionals of the form 'If P, Q' or, equivalently, 'P only if Q', 'Not P unless Q', are counted as true even when only the consequent (Q) is true, whenever the antecedent (P) is false, and even when both antecedent (P) and consequent (Q) are false. Is this troublesome? Some think so, and some think not.

The question here is whether any incompatibility between ordinary construals of conditionals and this piece of logical legislation makes any difference to the usefulness of standard elementary logic for disciplining the logical construction or reconstruction of arguments in expressly valid form. We might also worry about whether construing all conditionals as material conditionals does not in effect legislate in many cases that the false shall be true.

Of course, one may seek consolation in various apologia for material conditionality. For example, while it may seem odd to call the following statement true under the specified truth-conditions, it does not seem odd to allow that it at least is not false under any of the given conditions. Thus:
31) If you've failed to read this far, I'll eat my hat.

is surely not a false statement in case you have managed to read this far (so the antecedent is false) and I do not eat my hat (so the consequent is false). Since I made no claim whatever about the case where you manage to read as far as (31), I've made no false claim in that case. Similarly, in case you have read as far as (31) (so the antecedent is false) and I do eat my hat (so the consequent is true), (31) is not a false statement: I did not say I would not eat my hat in such a case.

What may be odd is to insist that all conditional statements be either true or false, rather than to allow that some can be neither or of no account. Can we not be assured in any case that the logic in question will not make true statements out of false ones, even if it makes true statements out of non-false ones?

Or is this consolation too easy? The following examples, (32)-(35), are variations on a case from Fogelin's discussion of logic and everyday language.29 Suppose we grant the existence of evil in the world. Then, according to the standard logic in question, the following statement

32) If there's no evil in the world, then God does not exist.

is counted true (just because its antecedent is false), as are the logically equivalent statements

33) God exists only if there is evil in the world.
34) God does not exist unless there is evil in the world.
35) If God exists, then there is evil in the world.

(just because their consequents are true). These statements suggest, by conventions of ordinary implication, that God's existence is somehow causally related to or dependent upon there being evil in the world; which is at least arguably false by definition (nevermind matters of fact). When the standard logic counts statements (32)-(35) as true, is it not legislating that the arguably false shall be true, making truth out of (arguable) falsehood?

Anomalous as these results may seem, the cause of the anomaly is not standard logic, but the failure to distinguish the material force of conditional sentences (and the purpose for which it is employed) from what is suggested or asserted by conditional statements in ordinary pragmatic contexts. Keeping the two distinct in one's mind, as formal logic allows, does no violence to ordinary language and the implications we draw from it. Keeping the material force of conditionals clearly distinct from what all 'if-then' statements suggest in everyday usage, we might sort the matter out as follows.

Material conditionality need not be taken as even part let alone all of the actual meaning of any conditional statement in natural language. Material conditionality is a piece of logical artifice, a useful way of treating conditionals according to a formal semantic model that allows us to account for the better part of our considered judgments about which forms of argument are valid and which are not. It is a professedly artificial way to construe conditionals, but to artful ends.
Conditional sentences like (32)-(35) are thus taken to posit a certain relation between the truth-values of their components; which relation happens to be very useful for capturing the 'truth-preserving' character of what we call 'valid' arguments. To this end, we look at conditional sentences like (32)-(35) rather abstractly, as if they asserted no more nor less than the following:

32’) If the antecedent of (32) is true, then its consequent is true
33’) The antecedent of (32) is true only if its consequent is true
34’) The antecedent of (34) is not true unless its consequent is true
35’) If the antecedent of (35) is true, then, etc.

None of these sentences is a statement about the truth or falsity of statements (32)-(35). None asserts anything about God or evil or what will be true or false about any connections we may posit between the respective existence of God and evil. If we have reason to think that statements (32)-(35) are false, we have reason, as a pragmatic matter, to avoid asserting them seriously. If we do assert (32)-(35), then we may be stuck with having asserted some odd connection (e.g., a causal one) between the existence of God and evil. For example, (32)-(35) could be taken to imply, respectively:

32*)-34*) The existence of evil is somehow necessary for the existence of God; God’s existence depends somehow on the existence of evil.
35*) God is somehow the cause or an embodiment or examplar of evil.

And there’s nothing very conditional at all about (32*)-(35*). The logic of material conditionals is indifferent regarding these matters of God and evil; just as it is indifferent to the rather different meanings of (32) and (35) when interpreted as (32*) and (35*): as (material) conditionals they are logically equivalent.

Understanding the logic of sentential connectives, truth-functionally construed, allows us, if anything, to be more critical and scrupulous in our use of language. To be able to make—and make artful use of—the distinction between the truth-functional force of an expression and its other dimensions of meaning is only to be more discerning, to appreciate the richer dimensions of natural language not captured in the more precise confines of our logical artifice. There is no reason that formal logic cannot be taught so as to enhance rather than confound one’s understanding of natural language.

That a bit of elementary deductive logic can help obviate, legislate or sort out logical confusions in ordinary or philosophic contexts is not gainsaid by the discrepancies between formal and natural language. The truth-functional force of a conditional statement is of course no more the sum of its possible interesting interpretations than the validity of an argument is the sum of its possible virtues. To adapt a line from e. e. cummings: Who pays attention only to the logic of things will never wholly understand you. Who pays any attention to the logic of things will discern that I have done an injustice to cumming’s line in
more ways than one, but will also discern that formal logic can be as essential to understanding (even poetry) as it is insufficient.

Concluding Remarks

While it may be granted that elementary formal logic imposes significant constraints on what or how subtly we can argue within its precise but artificial confines, formal logical judgments pervade ordinary reasoning, formal concepts of logical consequence, consistency, etc., inform all critical thinking, and educated persons need to come to grips with these crucial formal notions in some reflective, explicit and rigorous if critical fashion. Artificially imposed formal constraints (like manifest validity) can, moreover, be useful as heuristic devices for discovering or limiting the search for important objects of analytical inquiry (like 'hidden' assumptions of 'underlying' normative principles). The notion of a 'heuristic' to which I appeal here is perhaps best defined in the problem-solving literature.\(^3\) I take it that, while elementary formal logic can provide neither precise algorythmic techniques for the reconstruction of arguments in evidently valid form nor unique uncontestable results, it can provide useful, even indispensable, heuristic constraints (as Thomas Schwartz and I attempt, respectively, to illustrate elsewhere in this volume).

Formal validity can be a useful constraint in the reconstruction and analysis of arguments because of the way it forces one to \textit{try} to be \textit{explicit} about presumed and questionable logical connections. It is what can be learned in the attempt, not always the adequacy of the final product, that I emphasize in teaching formal deductive tools and techniques, applied to philosophic arguments, at an elementary level.

While I take some formal artifice to be better than none, especially when wrestling with philosophic arguments, what manner of artifice is best is another, quite arguable matter. Useful formalization of arguments and evidentiary connections is not limited to deductive logic (as Wesley Salmon's paper in this volume illustrates); nor is standard first-order predicate logic the only or suitable choice. (Thomas Schwartz argues for a powerful version of the Venn-diagrammatic approach in his paper; and Patrick Suppes points the way for a context-free grammatical analysis of logical form.) Moreover, formal logical competence is hardly tantamount to the ability to translate fragments of natural language into an artificial language for purposes of purely formal manipulation (as is clear from Robert Ennis' exploration of the concept).

Whatever formal artifice and formal logical theory one chooses to teach, the choice must hark to the specific reasoning tasks one wants to instruct and to specific educational goals. It is the burden of the other papers in this volume to explore, in more detail than I provide here, instructive roles for formal logic among the liberal arts, against a variety of liberal learning goals.
Notes

1. One can of course argue the logical force of 'unless,' to the effect that the meaning of 'unless' is context-dependent, such that '...unless ---' may or must sometimes be construed as 'If ---, not ...,' sometimes as 'Not...only if ---,' and sometimes as 'Not...if and only if ---.'

For example: In order to preserve truth, we may be well advised to translate a) 'It's not raining unless it's not dry out' as 'It's raining only if it's not dry out' (thus treating the 'unless' clause as the consequent of a standard conditional and negating the would-be antecedent of the resultant conditional). But, conversely, in order to preserve truth, we are just as well advised to translate b) 'It's raining unless it's dry out' as 'If it's dry out, it's not raining' (thus treating the 'unless' clause as the antecedent of a standard conditional and negating the would-be consequent of the resultant conditional). If we were to translate b) equivalently to a), we would obtain 'It's not raining only if it's dry out' (or, equivalently, 'If it's not raining, it's dry out'), which is not always true.

Where commonsense cannot legislate how to translate 'unless' into one conditional form or another, we may be well advised to ask exactly what is supposed to be necessary or sufficient for what. For example: If someone accosts me with a gun and says 'I'll shoot you unless you hand over your money'—and if I want to know what I can expect for my money—I am well advised to ask, 'You mean you won't shoot me if I hand over my money? Or, only if I hand over my money (in which case you may shoot me anyway)?' An effective reply on the part of my assailant would likely be: 'I mean that I will not shoot if, but only if, you hand over you money.' If I believe him, the conditions for saving my life are at least now more clearly specified. Rarely will the translation of 'unless' be a life-or-death matter, but commonsense and context may not always dictate its logical force.

Sometimes of course 'unless' is well translated straight-away as 'or.' (And then one might argue about the 'inclusive/exclusive' distinction.)


3. Thomas Schwartz, in an earlier draft of his contribution to this volume, "Logic as a Liberal Art."


9. See Grice, Fogelin, pp. 336-7, to the effect that conversational implicatures should be replaceable by evidently valid arguments.


11. See Bryan Skyrms' *Choice and Chance: An Introduction to Inductive Logic*, Second Edition (Belmont, CA: Dickenson, 1975), pp. 13-5, for some nice counter-examples to the traditional distinction between deductive and inductive arguments on the basis of the 'generality' of their premises and conclusions.

There has been on-going debate of how best to characterize the deductive-inductive distinction in recent issues of the *Informal Logic Newsletter*.

12. Formalization, for purposes other than construing arguments in valid deductive form, can of course play a crucial role in depicting and assessing evidentiary connections like inductive strength. Formalization of evidentiary connections is surely not the exclusive resort of deductive logic. See, for example, Skyrms' *Choice and Chance*, and Wesley Salmon's contribution to this volume, "In Praise of Relevance," on the concept of statistical relevance. John Woods and Peter Minkus debate the utility of formalization within the field of informal logic in their respective papers in Blair and Johnson's *Informal Logic: The First International Symposium*.


16. See William B. Griffith's "Symbolic Logic and Appraisal of Argument" (*Teaching Philosophy*, 1:1, 1975-76) for a pointed and summary critique of symbolic logic, as it is typically taught, for purposes of evaluating arguments.


20. Suppe, p. 60.


23. For illustration of the heuristic value of argument reconstruction within the constraint of evident validity, see my "Formal Logic and Philosophic Analysis" and Thomas Schwartz's "Logic as a Liberal Art" (both in this volume).


26. Again, for a sampling of the psychological literature, see the references in Note 24; especially, Johnson, and Wason and Johnson-Laird.

27. See Note 1.

28. For useful discussions of disputes surrounding material conditionality and the truth-functional treatment of other connectives, as well as for references to the major literature, see: Robert Ennis, "Conceptualization of Children's Logical Competence" in *Alternatives to Piaget*; Gary Bedell, "Teaching the Material Conditional" (*Teaching Philosophy*, 2:3-4, 1977-78); Bangs Tapscott, "Natural Deduction and Logical Translation" (*Teaching Philosophy*, 3:2, 1979-80.)


30. e. e. cummings, *100 Selected Poems* (New York: Grove Press, 1959), p. 35; cummings' lines read: 'who pays any attention/to the syntax of things/will never wholly kiss you.'


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