The Universality of Logic: On the Connection between Rationality and Logical Ability
Author(s): Simon J. Evnine
Source: *Mind*, New Series, Vol. 110, No. 438 (Apr., 2001), pp. 335-367
Published by: Oxford University Press on behalf of the Mind Association
Stable URL: http://www.jstor.org/stable/2660166
Accessed: 22/09/2011 10:51

The Universality of Logic:

On the Connection between Rationality and Logical Ability

SIMON J. EVNINE

I argue for the thesis (UL) that there are certain logical abilities that any rational creature must have. Opposition to UL comes from naturalized epistemologists who hold that it is a purely empirical question which logical abilities a rational creature has. I provide arguments that any creatures meeting certain conditions—plausible necessary conditions on rationality—must have certain specific logical concepts and be able to use them in certain specific ways. For example, I argue that any creature able to grasp theories must have a concept of conjunction subject to the usual introduction and elimination rules. I also deal with disjunction, conditionality and negation. Finally, I put UL to work in showing how it could be used to define a notion of logical obviousness that would be well suited to certain contexts—e.g. radical translation and epistemic logic—in which a concept of obviousness is often invoked.

There are certain logical abilities that any rational creature must have. I call this thesis the Universality of Logic (UL). In this paper, I intend to argue for UL constructively by showing just why and how rationality demands certain specific logical abilities. I shall begin by looking at a source of opposition to UL, in order to locate it better in the current philosophical landscape and underline the interest and importance of the thesis. Next, I shall deal with some methodological issues surrounding my arguments for UL. This will involve addressing such questions as: what is a rational creature?; and, what are logical abilities? As a result, we will be led to a certain weakening of UL. Then, I shall argue for the weakened version of UL constructively, by demonstrating the universality of certain particular logical abilities. Finally, I shall examine some of the consequences of UL for other areas of philosophy, focusing on the light that UL can shed on the notion of logical obviousness.

1. Opposition to the Universality of Logic from naturalized epistemology

I develop UL here against a background of opposition to it stemming from naturalized epistemology. This opposition has been most force-

Mind, Vol. 110 . 438 . April 2001

fully advanced by Christopher Cherniak (1986). Cherniak's work has been widely influential, having been referred to approvingly by such notable epistemologists as Alvin Goldman (1986), Stephen Stich (1990) and Barry Stroud (1979). Cherniak argues that which logical abilities a creature has depends on natural facts about its psychology. Natural facts about a creature's psychology are contingent and knowable only a posteriori; hence, there are no a priori truths about what psychology a creature has, and so no a priori truths about which logical abilities it has. Cherniak thinks that individuals or species are characterized by feasibility theories. These theories essentially consist of feasibility orderings, orderings of inference types in terms of the ease and success with which inferences of those types are typically performed. Different creatures may be characterized by different feasibility orderings. It will be an entirely empirical question which feasibility theory best describes a given creature.

It is not at all implausible to think that there are differences between groups (and between individuals within a group) as to the extent of their logical abilities. Ordinary humans do better than even the best chimps, and there may be creatures that stand to humans as we do to chimps.[1] What is striking about Cherniak's position, and what seems to be accepted much too quickly by those who cite his work, is that the absence of a priori constraints on the logical abilities of rational creatures allows that there could be creatures whose feasibility ordering was an inversion of, say, a typical human's. This means there might be creatures capable of doing advanced logic who are yet unable to make inferences of the form '*A* and *B*, therefore *A*', owing to the fact that this type of inference is beyond their logical powers. This consequence is explicitly embraced by Cherniak and the other epistemologists to whom I have referred.

Put in terms of Cherniak's position, UL implies that there are a priori constraints on which feasibility theories characterize rational creatures. No feasibility ordering that places those logical abilities that are universal as too difficult to perform can correctly characterize the logical abilities of any rational creature.[2]

[1] For some discussion of this possibility, see Evnine (1999).

[2] One of the few explicit attempts to argue against Cherniak's position of which I am aware is by Biro and Ludwig (1994).

2. Methodological issues in arguing for the Universality of Logic

The present section will be devoted to some methodological issues that must be settled before we address substantive claims about which logical abilities are universal.

The basic goal is to show that there are some logical abilities that must be possessed by any rational creature. The most satisfactory way to do this is constructively, i.e. to provide arguments that particular logical abilities must be possessed by any rational being. I shall attempt to do this for four sets of logical abilities connected with the concepts of conjunction, conditionality, disjunction and negation. What will such arguments look like? They must start from conditions implied by something's being rational and show that any being that satisfies those conditions must possess particular logical abilities. In other words, a constructive defence of UL will take off from an analysis of what it is to be a rational creature. This immediately presents us with a huge problem, for the notion of rationality is itself highly controversial. There is little overall agreement about exactly what such a notion implies. We thus risk a situation in which we end up begging all the important questions.

One way out of this problem would be to argue in favour of a given analysis of rationality, but this does not seem a fruitful direction to take. We can, of course, elaborate and explicate different analyses of the concept, but attempting to argue for one of them is too large a task (and itself risks degenerating into stipulation or question-begging). What I propose to do, then, is this. I shall attempt to provide a number of arguments each of which will show that there are particular logical abilities that must be possessed by any creature meeting certain specified conditions. These conditions will, I believe, be plausible candidates for necessary conditions on rationality in at least one clearly recognized sense of that term; but, in accord with the problems noted in the previous paragraph, I shall not undertake to argue for this. Putting these arguments together, we will obtain a defence of a weakened version of UL. The weakened version will be: if such-and-such conditions are necessary for rationality, then any rational creature must have such-and-such logical abilities.

Supporting this weakened version of UL will accomplish two goals. First, the weakened version of UL, together with the proposition that the various conditions on the basis of which certain logical abilities are shown to be universal really are necessary for rationality, implies the stronger version of UL. As I have said, the conditions invoked are plausible candidates for necessary conditions on rationality, so I hope that many readers will find the conditional thesis argued for here all that is needed to derive its consequent. This goal has further significance from a dialectical perspective. The opponents of UL within naturalized epistemology do not, for the most part, give any indication that they reject the conditions on rationality on which I rely. So if the various arguments I give below are sound, then they ought to be persuasive for those opponents.

The second goal accomplished by even the weakened version of UL is this. The various arguments that establish possession of specific logical abilities on the basis of certain conditions will provide some indication of just what a creature must be like (or not be like) if it is not to have those logical abilities. If one has a sound argument that shows that any creature meeting a condition C_n must have certain logical abilities, then anyone claiming that a rational creature may lack those logical abilities will be committed to holding that a creature may be rational and yet not satisfy C_n. This is important because it should help counter a tendency to invoke, rather breezily, the claim that there are no logical abilities such that any rational creature must possess them. Maybe so, if the conditions laid down here are not necessary conditions on rationality; but if philosophers had a clearer idea of just how odd a creature would have to be not to possess those abilities, they might be a little more cautious in invoking the idea that creatures could be proficient logicians and yet unable to use *modus ponens*.

A second methodological point is this. I have so far talked generically about the possession of logical abilities. This rubric covers many diverse kinds of things. We can possess logical concepts, believe logical truths, make or understand inferences, use inference rules, 'see' or grasp implications and incompatibilities, etc. The various phenomena divide naturally into two groups, concept possession and all the others. Broadly speaking, the phenomena in the second group concern conceptual roles since they depend on logical concepts featuring in beliefs, inferences, incompatibilities, etc. Since they shall play a large part in the following, I shall take inference rules as representative of conceptual roles. We may then inquire into the generic notion of logical abilities by asking the question: what is the relation between possession of logical concepts and the use of, or ability to use, inference rules? The answer to this question raises a number of complex issues.

To say of a creature that it makes, or accepts, or is prepared to make inferences of a given form seems to presuppose possession of the logical concepts that feature in inferences of that form. For example, to say that a creature accepts inferences of *A* from (*A* and *B*) presupposes that it possesses the concept of conjunction. It could not even entertain propositions of the form (*A* and *B*) without possessing that concept. This suggests that an attempt to argue for UL should take the form of trying to show that any rational creature must possess certain logical concepts. In order to do that, one would need some account of what it is to possess a logical concept and here, in many cases, we seem quickly to be brought round in a circle.[3] For it has seemed to many that the individuation of certain logical concepts is to be explained in terms of inference forms (or other conceptual roles). At the very least, which inferences a creature is prepared to make, and perhaps which inferences it finds obvious, are seen as contributing to the individuation of its logical concepts. We thus have a problem: if we attempt to discuss the acceptability of inference rules, we are thrown back on concept possession, while if we attempt to discuss concept possession, we are directed to inference rules. What we need is some way of dealing with concept possession and conceptual role in one go.

Here is a schematic, and idealized, description of the strategy I shall use in the arguments for universality that follow.[4] I shall assume that there is associated with each logical concept a set of canonical inference rules.[5] I mean to leave it vague what it is for an inference rule to be canonical for a given logical concept. Roughly, the idea is that certain inference rules are associated with their respective concepts in a special way, a way that is somehow more immediate than other roles in which that concept may feature. It is not a requirement on a rule's being canonical for a concept that a possessor of the concept have any concept of canonicity, or even of validity. The canonical status of the rule for the concept, however it is to be explained, may be manifested in inferential behaviours, or dispositions thereto, that do not suffice to give the possessor of the concept an explicit grasp of the nature of rules, validity or canonicity.

One way of understanding canonical inference rules is in terms of rules that give the meanings of the logical constants that feature in them, or (to speak in the material mode) that individuate the relevant concepts. Gentzen (1935), for example, held that the introduction rules

[3] I should note that throughout this paper I mean by 'concept possession' the ability to have thoughts of which the given concept is a component. It should nowhere be taken to imply a discursive ability such as being able to give an account of the nature of the concept.

[4] My strategy is heavily indebted to Peacocke (1987).

[5] As always in this section, it must be remembered that inference rules are only one example of a range of conceptual roles that may be relevant.

for logical constants in his natural deduction system determined the meanings of those constants. A number of other philosophers were drawn to this position, or variants of it (Popper 1946/7; Popper 1947; Kneale 1956). This view on the meaning of logical constants was subjected to a serious attack by Arthur Prior (1960). Prior described an alleged logical constant, 'tonk', defined by inference rules which would either violate the transitivity of deducibility or else show that anything was deducible from anything. The challenge to the holders of the Gentzen view was that they would have no way of denying the validity of the offensive 'tonk'-inferences, since they were valid for 'tonk' by definition. The exact moral of Prior's attack, and whether it effectively refutes the idea that logical constants may be defined by inference rules, has been much debated, but it does nothing to challenge the general, and vaguer, idea of canonical inference rules. Even if one accepts Prior's strictures against the Gentzen-style view, there seems a clear and intuitive sense in which the inference of *p* from (*p* and *q*) seems to bear a special and direct relation to the concept of conjunction not borne by the inference from (*p* and *q*) of not-(not-*p* or not-*q*), though the latter is equally valid. This will be enough for my purposes. Thus, the first stage of the arguments to follow will be to identify canonical conceptual roles for the logical concepts under discussion. In two cases, those of conjunction and conditionality, the canonical roles I fix on will not, I imagine, be controversial. The roles fixed upon for disjunction and negation may be a little more controversial but not, I hope, overly so. In all cases I shall assume that the canonical roles fixed on are valid for the given concepts.

Suppose, then, that we have a given logical concept, *CON*, with an associated canonical role, *R*. I shall next attempt to show that any creature meeting a certain condition (a condition intended to be a plausible necessary condition on rationality) must have a concept, *X*, for which *R* is canonical. It is this second stage of the argument that carries the real philosophical weight, for it is here that the attempt to forge a connection between rationality (or some plausible necessary condition thereon) and a given logical ability is made.

A third, and crucial, stage is still required. For even if we have so far succeeded in showing that any creature satisfying a given condition must have a concept *X* for which *R* is canonical, it may be objected that we have not yet shown that that concept is *CON*. There is not even any guarantee that *X* is a concept for which *R* is valid. Perhaps, it will be alleged, there are creatures who are sufficiently logically deviant (or imbecilic) that they have a concept of disjunction and yet take the inference from (p or q) to p to be valid, or even canonical, for that concept. (Perhaps they treat disjunction as if it were conjunction.) Such an objection makes dubious sense, in my opinion, but we must be clear that, and how, we are ruling it out. We shall rule it out by an application of the Principle of Charity. The appropriate version of the Principle tells us that, wherever possible, we should take someone's logical concepts to be such that the inferences it takes to be canonical (or non-discursively treats as canonical) for those concepts are indeed valid for them. Thus, if *CON* is a concept for which *R* is the associated canonical (valid) inference rule, and a creature has a concept *X* for which *R* is canonical (these are the results of the first two stages of the argument), then the third stage tells that if there is a concept for which *R* is valid (as we know there is, since we have already established that *R* is canonical and valid for *CON*), then *X* is a concept for which *R* is valid. Since *X* is then a concept for which *R* is both valid and canonical, there seems no basis on which to deny that *X* is *CON*.

Notice that this third stage of the argument would be trivial if we took the Gentzen view about the relation of canonical inferences to the concepts they apply to. If the canonicity of an inference rule was determinate for the identity of the concept featuring in it, then the fact that a creature had a concept, *X*, for which a rule *R* was canonical, would ensure that *X* was *CON*, if *R* was canonical for *CON*. Thus, if the Gentzen approach could be successfully defended against Prior's objections, it would provide a particularly smooth way of establishing the third stage of the argument. The appeal to the Principle of Charity would, in effect, be pro forma only.[6] On the other hand, if we show that a creature has a concept *X* with which it makes and accepts inferences of the form *R*, but cannot show that *R* is canonical for *X*, then the appeal to the Principle of Charity risks proving too much; for it will make it difficult (though not necessarily impossible) to show that a creature could ever misuse logical concepts.[7] So the success of the strategy depends on showing that whatever conditions on rationality we appeal to imply that a creature not only has a concept with which it is able to make inferences of the kind *R*, but that those inferences are genuinely canonical for that concept.

[6] Even if the Gentzen approach could be defended against Prior's objections, however, it should be noted that, in all of the cases I discuss below except that of conjunction, the roles I take to be canonical are too sparse to individuate concepts to the degree of determinacy found in the concepts of typical logical systems. Thus, if they were to be taken as individuating concepts at all, those concepts would have to be seen as higher-order families of more determinate concepts.

[7] This, of course, is a version of the familiar objection to the Principle of Charity, that it makes it hard to explain error and irrationality.

This last point is particularly important because it is just here that the description of the arguments I will be giving is idealized. I do not know how, in general, to show that, for an arbitrary concept of a given creature, certain inferences are canonical for that concept. Peacocke, whose work I am drawing on heavily here, talks about how certain inferences are primitively obvious: 'the impression of obviousness is primitive in the sense that it is not consequential upon [one's] acceptance of some more primitive principle; nor upon iterated application of any single principle; nor upon any other belief not already presupposed in grasp' of the propositions featured in the inference (1987, pp. 154–5). But this cannot help in the context of the given project, for I am attempting to draw conclusions about rational abilities in advance of any empirical psychological questions. Yet it is empirical psychology that would be needed to establish whether an inferential principle was primitively obvious in Peacocke's sense.

The best approximation I can make to showing that an inference rule is canonical for a concept of some creature is this. Each of the arguments I shall give will show that any creature meeting a certain condition must have a concept with which it is able to make inferences of a certain kind, *R*. If the context provided by such an argument in which the agent must be able to make inferences of kind *R* is sufficiently unspecialized, basic, or fundamental (I leave all these notions undefined), then it will be plausible to treat *R* as canonical for the concept involved. To do otherwise would be to assume that the creature might, in some very basic context, rely on a concept for which the needed inferences were not canonical, but secondary or derived. While it is not impossible that a creature should, in some very basic and fundamental contexts, use a concept for which the inferences needed in that context were secondary or derived, this would certainly be odd.[8]

Returning to a general assessment of the strategy, it might be thought that my strategy would be undercut by the fact that Cherniak, one of the most outspoken critics of UL, explicitly denies the existence of canonical inference rules for logical concepts.[9] He allows that two crea-

[8] The impression of oddity would be even stronger for creatures subject to evolutionary pressure since one might expect evolution to favour the development and acquisition of concepts for which needed inferences were canonical in order to minimize the chances of logical error in important situations. But needless to say, relying on evolutionary claims would be contrary to the a prioristic spirit of this paper.

[9] In fact, what he explicitly argues against is the stronger, Gentzen thesis that there are inference types that *define* logical concepts, but his objections to this would clearly carry over to the weakened version of this view discussed above, according to which logical concepts are more vaguely associated with canonical roles.

tures can both possess the same concept, say conjunction, even though they are prepared to make no inferences in common with it. Underlying this is a commitment on Cherniak's part to what he calls a cluster view of the individuation of logical concepts. For a given concept there will be a set of inferences that are valid for it and a set of inferences that are not (presumably both sets will be infinite). What is required for a creature to have a given logical concept is that it be prepared to make some inferences from the first set and to reject some (or perhaps all?) from the second set. Cherniak is thus committed to a wide account of the individuation of logical concepts on which there cannot be distinct but logically equivalent concepts.

Cherniak's view individuates logical concepts implausibly broadly, in my opinion. But in fact, for dialectical purposes, Cherniak's position here is irrelevant. For if Cherniak denies that being able to make certain particular inferences is necessary for possessing a logical concept, it is, nonetheless, sufficient on his view. My strategy will thus establish what is, on his view, a sufficient condition for possessing a given concept and being able to use it in certain specified ways. Yet another reason for not being worried by Cherniak's position here is that the only support he gives for it is his denial of UL. Of course, his view on the individuation of logical concepts does not follow from this denial alone, but requires the further, controversial premiss that creatures who are described by even radically different feasibility orderings may nonetheless share various logical concepts. But the fact that his view on the individuation of logical concepts depends on the denial of UL would, by itself, render it question-begging as a weapon against that thesis.

Having given this detailed and idealized description of the arguments to come, I shall not be overly concerned to squeeze them into the described schema. It will be obvious enough how what I say below meets the requirements of the first two stages of the strategy. The third stage, the final application of the Principle of Charity, is invariant across all the different arguments, so I shall not mention it each time.

There are three final short points to make about the arguments to follow. First, each of these arguments opens up quickly into areas of philosophy initially quite remote from our present subject. I cannot hope to follow up, in a paper of this size, all the issues that would need to be dealt with in each case. So I offer the arguments in a highly provisional spirit. They are intended to show the kinds of things that are needed to put the universality of logic on a firm footing. Secondly, despite the similarity of some of the arguments (I'm thinking particularly of the one about disjunction) to traditional empiricist arguments about the acquisition of concepts, none of the arguments is intended as genetic. How we come by our various logical concepts, or whether they are indeed innate, is a quite different issue from the one I am concerned with. Finally, although the extent of human rationality has been subject to much debate since the work of Kahneman and Tversky (Kahneman, Slovic and Tversky 1982), I simply take it as axiomatic that (normal, adult) humans count as rational creatures. Accordingly, all the conditions laid out below must apply to humans. This will turn out to be important.

3. Some initial necessary conditions on rationality

As I mentioned above, I will present various arguments, each starting from given conditions that will provide the premisses of the argument, that any creature meeting those conditions must possess a certain logical concept and be able to employ it in its canonical conceptual role. There are two conditions, however, which will apply to all the following arguments. Even if they do not function as premisses in the arguments, their stipulation will rule out some possible counter-examples of an extremely bizarre nature. The conditions are these:

(C_1) x is located;

(C_2) x has beliefs.

I define 'located' as having a single spatial location within the universe (and I take this, in turn, to imply existence in time). The following entities are thus ruled out of discussion by (C_1): the universe itself; God (at least on traditional monotheistic conceptions); and beings with a spatially discontinuous existence (the Borg collective, for example, from the television series *Star Trek: The Next Generation*), though not all forms of spatial discontinuity would be problematic for the following arguments. Note that the condition does not require materiality; the kind of disembodied beings described in Hart (1988), whether or not they are us, would satisfy it.

Condition (C_2) is more controversial. As is well known, some contemporary philosophers of mind, so-called eliminativists, hold that folk psychology is a badly mistaken theory and that human beings do not have beliefs (or similar psychological states) at all. If so, the imposition of (C_2) means that the only beings within our ken that we more or less all agree are rational would fail to be included in the scope of the following arguments. That, I take it, would be disastrous. For this reason, ideally, I would like to be able to drop (C_2). The trouble is that since logical operations typically modify sentence-like entities, it is difficult to see how even to frame the thesis that some logical abilities are universal without being able to describe beings as standing in relations to such sentence-like entities that allow, as the sentence-like entities themselves allow, the application of the usual kinds of logical operations. The paradigm of such relations, of course, is belief. (I assume that eliminativists will not be appeased by a switch to some other relation such as entertaining, supposing, assuming, etc.)

I cannot see what could be meant by describing a being with no propositional representations as rational. But for any who can, (C_2) will seem to impose a very substantive limitation on the conclusions reached about universality. If I could see a way to state my desired conclusion without presupposing (C_2), then I would be happy to try and argue for it without its assumption. By way of consolation, (C_2) does not require any particular theory about what it is to have beliefs. Thus instrumentalists like Dennett, language-of-thought advocates like Fodor, and all those in between can agree that human beings typically satisfy (C_2).

4. Conjunction

I come now to the arguments that certain logical abilities are indeed universal, in the sense that any creature meeting certain conditions must possess them. In the present section, I shall deal with conjunction. I take the canonical facts about conjunction to be given by its usual introduction and elimination rules. We must therefore produce a condition (and one that is a plausible necessary condition on being rational) that will enable us to argue that any creature meeting that condition must have a concept, *Conj*, for which the following inference rules are canonical:

(1) Infer *A* from *Conj*(*A*,*B*);

(2) Infer *B* from *Conj*(*A*,*B*);

(3) Infer *Conj*(*A*,*B*) from *A* and *B*.

The condition that will enable us to establish this is:

(C_3) x is able to grasp theories.

By this condition I mean only that a creature be able to have a view about some aspect of its world. It is a condition that was as surely satisfied by people in the Stone Age as by those who now work on complex scientific theories.

Sometimes theories are treated simply as conjunctions of propositions. In that case, it follows trivially that a creature that is able to grasp a theory is able to grasp conjunctive propositions. More often, theories are treated as sets of propositions. What is involved in grasping a set? It is not sufficient to grasp a set that one grasp each of its members. Sets are intuitively explicated as a number of things taken together, or considered as one. Grasping a set therefore requires that one grasp its members together, as a unity. The kind of unity generally involved in a set has proven difficult to describe in terms that are both non-metaphorical and non-set-theoretic. However, in the case where the members of the set are propositions, we have at hand a perfectly well-understood, non-metaphorical, non-set-theoretic way of understanding them as a unity: conjunction. Thus, where a theory is understood as a set of propositions, I suggest that grasping a theory equally requires grasping a conjunctive proposition.

Although I have just talked of grasping *conjunctive* propositions, what the argument so far strictly shows is that a creature satisfying (C_3) must be able to grasp propositions that are truth-functionally equivalent to conjunction. Although (1)–(3) will be valid for any concept truth-functionally equivalent to conjunction, they will not necessarily be canonical for it. In concrete terms, what this means is that, for all we have said so far, a creature might grasp, as a theory, a set of propositions bound with a logical connective truth-functionally equivalent to conjunction and yet not recognize that a theory entails each of its individual components and is entailed by them together. What we still need to show is that the logical concept that unites the several propositions of a theory is one such that a creature having that concept must treat inferences of the form (1)–(3) as canonical for it.

A set is individuated by its members. Hence, if a theory is a set of propositions, that theory is individuated by the propositions in that set. To grasp a set of propositions *as* a set, one must therefore recognize that the individual components are necessary and that they are jointly sufficient, for a grasp of just that set (i.e. just that theory). Without understanding this, one could not be said to have a grasp of the particular unity that constitutes the given set or theory. The logical glue that binds the various propositions into a set or theory, therefore, is one for which (1)–(3) must be canonical. If each individual proposition is necessary to the identity of the given unity, then one must be able to infer it from that set—which gives us (1) and (2)—and if they are jointly sufficient then one must be able to infer that unity from them—which gives us (3).[10]

It might be objected that, depending as it does on the notion of set, the argument, if good, will show that any creature capable of grasping theories must have some understanding not only of conjunction but of set theory. Yet set theory is only a recent development in our intellectual history and followed millennia in which people were perfectly well able to grasp theories without knowing anything about set theory. The ability to grasp theories, therefore, cannot entail what I have alleged it entails.

This objection is clearly right in so far as it holds that people have held theories about things long before they developed set theory. But my argument does not require that graspers of any theory must thereby also have some developed set theory. It holds only that they must have some concept of a set. Set theory itself developed as the attempt to formalize this concept. Despite the well-known problems about the relations between our pre-theoretic concept and the concept as it figures in axiomatic set theory, there is no reason to deny that set theory is a development of a concept that long pre-dates it.

5. Conditionality

No other cases fall into place as easily and unqualifiedly as does conjunction. I turn next to conditionality. I take the only canonical fact about conditionality to be the inference rule *modus ponens*. We must therefore show that any creature meeting a given condition must have a concept, *Cond*, for which the following is canonical:

(4) Infer *B* from *Cond*(*A*,*B*) and *A*.

Conditionality, however, is not analogous to conjunction in at least one important way. In the case of conjunction, the requirement that the concept make valid (1)–(3) narrowed down the range of possible candidates for the concept to those truth-functionally equivalent to conjunction. Conjunction was then picked out from this equivalence class by the further requirement that (1)–(3) be canonical for the concept. But if, as I maintain, the only canonical fact about conditionality is given in (4), then we do not have an initial determination of a truth-functional

[10] There are some fussy details here over which I am riding roughshod. (1)–(3) describe a two-place logical operator, whereas the idea of a theory as a conjunction of propositions (or as their set) treats conjunction as an operator of variable polyadicity. Since I can see no reason for thinking that conjunction is essentially an *n*-placed operator, for any $n>1$, the canonical rules (1)–(3) should ideally be rephrased in terms of an indefinite number of propositional schematic letters.

equivalence class of concepts. There are many different conditionals, truth-functional and non-truth-functional, for which (4) is canonical.

In fact, this meagreness of canonical facts pertaining to conditionality is a good thing. Classical logic has the material conditional, but it would be a mistake to argue that any rational creature must have a concept of *material* conditionality. Both psychological research and the anecdotal experience of logic teachers show that many humans have great difficulty with material conditionality. One obvious interpretation of this difficulty is that such people do not have, and in many cases cannot acquire, that concept. What we should strive to show, then, is that any creature meeting some plausible necessary condition on rationality must have one of a family of concepts (of which material conditionality is one) for any of which (4) is canonical.

What is the appropriate condition? I take the following condition to provide the basis for the argument:

(C_4) *x* is able to make and understand some inferences.

By 'making inferences' I do not just mean that a creature will acquire certain beliefs on the basis of others, behaviour that could be adequately modelled by a calculating machine, but that it should do so with some reflective understanding of what it is doing. (*Mutatis mutandis* for 'understanding inferences'.)

Note that no questions are begged by introducing (C_4) at this point. Our overall goal is to show that any creature meeting certain conditions must be able to make and understand certain particular inferences (and possess other logical abilities). It will not vitiate this to require, as one of the relevant conditions, that such creatures must be able to make and understand some unspecified inferences. It is simply to restrict the scope of our conclusions to what may be called minimally logically sophisticated creatures. But in fact, if the argument of the previous section is good, we have an argument that (C_4) is satisfied by any creature that satisfies (C_1)–(C_3). We could therefore dispense with (C_4) as an independent condition. I retain it, however, for the sake of perspicuity.

The way in which (C_4) implies possession of a concept for which (4) is canonical is this. To be able to make or understand an inference, one must understand that the conclusion is reached owing both to the supposition of the premisses and the existence of a relation between the premisses and the conclusion. Where the premisses are abbreviated as *A* and the conclusion as *B*, this means that to make or understand an inference, one must have a concept, *Cond*, that relates the premisses to the conclusion, *Cond*(*A*,*B*) and is such that, in virtue of this relation, one can infer *B* from *A* and *Cond*(*A*,*B*). To put it simply, to make or understand an inference, one must see that the conclusion is in some sense conditional on the premisses.

This simple argument requires a number of comments and clarifications. First, I noted above that, given the argument of the previous section that any creature meeting (C_1)–(C_3) must be able to make and understand inferences of the forms (1)–(3), any creature satisfying (C_1)–(C_3) will automatically satisfy (C_4). In fact, we now see that the connection between the concept of conjunction and a concept of conditionality is more substantial. In the previous paragraph I talked of a relation of conditionality between the premisses of an argument and its conclusion. Strictly speaking, though, the first relatum of that relation is the premisses 'taken together', that is to say, their conjunction. There are, of course, single premiss arguments, and the argument of this section will show that any creature that can make or understand even single premiss arguments must have a concept of conditionality for which (4) is canonical, and this independently of whether the arguments about conjunction in the previous section are good. But if a creature is able to make and understand many-premiss arguments, then we have another way of showing that such a creature must also have a concept of conjunction.

A second point is this. The relation between conditionality and validity is a controversial topic.[11] Some philosophers caution us to keep them well apart, while others see a very close connection between them. Obviously, my argument here puts me in the latter camp. But I have not confused the two concepts. I pointed out that one concept for which (4) would be canonical is the material conditional. But the validity of an argument must consist in more than the truth of the material conditional consisting of the conjunction of the premisses as antecedent and the conclusion as consequent. What this means is that although I have argued for the universality of some concept of conditionality on the basis of an ability to make and understand inferences, this does not guarantee that all concepts of conditionality that might satisfy this requirement are sufficiently strong to provide a concept of logical validity. In other words, a creature meeting (C_4) must have some concept of conditionality on that basis, but may not have any concept of logical validity as such. As with the failure of the argument to establish that all rational creatures must share the concept of material conditionality, the failure to guarantee that all rational creatures must have a concept of logical validity is an advantage. For it is by no means obvious that all

[11] See Sanford (1989, pp. 121-41) for discussion of this issue.

humans, let alone all possible beings meeting (C_4), *do* have such a concept.

Thirdly, it should be noted that the argument does not, strictly, show that, for each creature meeting (C_4), there is a single relation of conditionality that underlies all the inferences it is prepared to make or accept. What the argument does show is that each such creature must have *at least one* concept of conditionality for which (4) is canonical. It remains an open question whether, if a creature in fact had several concepts of conditionality, it would have to recognize them as varieties of a common type. Presumably, it would so recognize them if it had a higher order concept of inference under which it classified the various inferences (relying, in turn, on its various concepts of conditionality) it was prepared to make and accept. This point will apply, *mutatis mutandis*, to the arguments relating to disjunction and negation. It would also apply to the case of conjunction if one allowed that there could be distinct concepts that were truth-functionally equivalent and for all of which (1)–(3) were canonical. However, if there are such distinct concepts, their differences have been of no interest to logic. In the case of conditionality (and the cases of disjunction and negation to follow), since the canonical role at issue does not determine a single concept at the level of interest to logicians, the possibility that a creature might have distinct concepts all of which share a canonical role is real and interesting.[12]

A final observation I wish to make is this. The essence of the argument for conditionality that I made was that to make any inference at all, a creature must have a concept of conditionality, since in any inference the conclusion is conditional on its premisses. But my argument should not be confused with the view that all arguments are enthymematic and depend for their validity or their persuasiveness on a premiss that is a conditional the antecedent of which is the conjunction of the other premisses and the consequent of which is the conclusion. This is the view that Lewis Carroll criticized effectively in a famous paper (Carroll 1895). I have made no claim that the ability of an argument to convince one of its conclusion, let alone its validity, depends on the acceptance of such a conditional. Obviously the argument '*p* and *q*, therefore *p*' is valid, and a creature with a concept of conjunction is rational in accepting it, without the provision of the further premiss 'if *p* and *q*, then *p*'. My argument was only that one cannot understand what an argument is, and hence make or accept inferences, without a concept of conditionality.

[12] The referee for this journal pressed me to clarify the issues in this paragraph.

6. Disjunction

So far, the kinds of inference rules that have been taken as instances of canonical facts about logical operators closely mirror the typical introduction and elimination rules of natural deduction systems. With disjunction, things are different. The introduction rule for disjunction in natural deduction systems is usually this:

(5) From *A* infer (*A* or *B*).

Though this is simple and straightforward, it will not do as a canonical fact about disjunction. The reason is that research shows that many humans, even after being coached in inclusive truth-functional disjunction, fail to accept inferences of this form.[13] We cannot try to show that any rational creature must have a concept with which it makes inferences of the form (5) when the only examples of rational creatures with which we are acquainted typically fail to have any such concept. The usual elimination rule,

(6) If *C* is derivable from *A* and a set of assumptions *S*, and *C* is derivable from *B* and S, then infer *C* from (*A* or *B*) and *S*,

is implausibly complex to characterize a universal logical ability.

A more likely candidate for a canonical rule for disjunction is *modus tollendo ponens*:

(7) From (*A* or *B*) and not-*A*, infer *B*.

However, from our present point of view, (7) is problematic. The problem is that in order to show that a creature had the relevant conception of disjunction, we would need an independent way of establishing that it had a concept of negation. There is no problem in principle with doing this, and indeed, in the next section, I shall give an argument for the possession of a concept of negation based on the same condition that I will use in this section to establish the universality of disjunction. This same approach, however, provides a way of showing the universality of disjunction in a way that is independent of negation, and I take this to be preferable.

In fact, the tactic I will use with respect to disjunction is adapted from an idea proposed by Gilbert Harman (1986), and taken up by Christopher Peacocke (1987), in dealing with the conceptual role of negation. So far, the only conceptual roles for logical operators that we have been considering are their roles in inferences. In treating negation, Harman suggests that we consider, besides inference rules, incompati-

[13] See Braine, Reiser, and Rumain (1984, pp. 346–6 and p. 354) and Osherson (1975).

bility or exclusion rules. This allows one, for example, to characterize negation as a concept *Neg* such that *A* and *Neg*(*A*) are incompatible, or mutually exclusive. This gets at the essence of negation much better than the somewhat complex introduction and elimination rules provided for it in natural deduction systems. (I shall follow this up in the next section.)

What is the appropriate exclusion rule concerning disjunction? If we try and adapt (7) we get:

(8) (*A* or *B*) and not-*A* exclude not-*B*.

This, of course, doubles our problem with (7) since we now have negation occurring on both sides of the rule. By contrast, the following is much simpler:

(9) (*A* or *B*) and *A* exclude *B*.

(9), though, unlike (7) and (8), is valid only for exclusive disjunction (appropriately enough, since it is an exclusion rule). I shall therefore confine myself to exclusive disjunction, and argue that any creature meeting a certain condition must have a concept, *Disj*, for which the following rule is canonical:

(10) *Disj*(*A*,*B*) and *A* exclude *B*.

The specified condition is this:

(C_5) *x* deliberates.

The objects of deliberation are one's taking of various courses of action. That is, one deliberates about whether one shall do *y* or whether one shall do *z*. Taking a course of action, or doing *y*, is, presumably, an event. But since, by condition (C_2), all creatures within the scope of this discussion have propositional attitudes, there is no harm in taking the objects of deliberation as the propositions corresponding to one's taking various actions. Corresponding to the course of action of my doing *y* is the proposition that I do *y*.

Now the argument that any creature that satisfies (C_5) must have a concept governed by (10) is this. Deliberation is, essentially, a process of choosing, or trying to choose, among incompatible alternatives. If the alternatives were not incompatible, it would be unclear what was involved in deliberating over which to take.[14] One who deliberates, therefore, must be able to relate various alternatives in such a way that the realization of one excludes the realization of the others.[15] If, as suggested, we take these alternatives as propositions, that means that one who deliberates must be able to relate propositions in such a way that the obtaining of one excludes the obtaining of the others. This requires a concept behaving as *Disj* does in (10).

This argument for the possession of a concept of exclusive disjunction by all creatures capable of deliberating is silent on whether such a concept must be truth-functional or not. As with the conditional, this silence seems to me appropriate. As mentioned above, inferences that are valid for a purely truth-functional (inclusive) disjunction are routinely rejected by people and this suggests they lack such a concept. If so, our argument would have proved too much by requiring all deliberators to have a concept of truth-functional disjunction. Nonetheless, a purely truth-functional concept of disjunction would be adequate for deliberation, so long as it was exclusive.

There is a long-running argument over whether disjunctive terms in natural languages, such as the English 'or', represent inclusive or exclusive disjunction. In arguing, as I have, that any creature capable of deliberation must have a concept of exclusive disjunction, I do not mean to imply that the English 'or' does, in fact, primarily represent exclusive disjunction. For even if all speakers of English, as creatures presumably meeting (C_5), must have a concept of exclusive disjunction, this is consistent with there being no term of English given over to representing only that concept.

7. Negation

In this section, I shall consider negation. Negation is, for several reasons, the most difficult of the usual logical concepts to deal with. All of the standard logical principles governing negation, Excluded Middle, Non-Contradiction, Double Negation, *Ex Falso Quodlibet*, etc., have been challenged by proponents of different forms of negation. There is, therefore, little one can appeal to about negation without becoming embroiled in substantive controversy over its nature. Compare the situation with the conditional, another logical concept over which debates have raged. Proponents of all different varieties of conditionals agree that *modus ponens* is a valid rule for a

[14] One may, of course, deliberate over whether to eat cake, ice cream, or both, and this, it may be suggested, shows that the alternatives of eating cake and eating ice cream are not incompatible. But if eating both is a genuine alternative, then the options of eating cake and eating ice cream must be understood as eating cake only and eating ice cream only.

[15] As with conjunction, (10) describes a two-placed operator, whereas the argument in the text implies the possession of an operator with variable polyadicity. Again, (10) should be rephrased in terms of an indefinite number of propositional schematic letters.

conditional.[16] But a more basic problem with negation is that it introduces a polarity that seems to resist capture by anything other than itself. As Richard Sylvan puts it:

> Negation is indefinable in positive terms ... By virtue of negation itself there are positives and negatives, elements of a multiple pole story. Now positive functors, in terms of which negation (and its circle) might pragmatically be defined, do not move outside the orbit of their respective aspects (positive or negative). Negation however changes polarity, whence its indefinability. Negation is, to repeat, so to vaguely say, *sui generis*. (Sylvan 1999, p. 305)

This has the consequence that any conditions on the basis of which negation might be shown to be universal are liable to seem as if they simply beg the question, as if they are already being described in terms of negation, or concepts very close to it.

As noted in the previous section, and following Harman, I shall take the canonical fact about negation to be given by an exclusion rule, rather than an inference rule. The usual introduction and elimination rules for negation in natural deduction systems are rather complex, making them unlikely to capture truly universal features of the concept. Some of them also require that negation be mentioned in the conditions of application for the rules. This would make it impossible to show that a creature had a concept for which those rules were canonical (or even merely valid), without our first being able to show that it had a concept of negation. Consequently, I shall take the canonical fact about negation to be that a proposition and its negation are mutually exclusive, or incompatible with each other. If we do not say too much about the nature of this exclusion, we seem to have something here that all parties to the debate over the nature of negation can agree to.[17] This approach seems to capture the essence of negation, as Sylvan's remarks on polarity suggest.[18] We are therefore looking to show that any creature meeting certain conditions must have a concept, *Neg*, for which the following is canonical:

(11) *A* and *Neg*(*A*) are mutually exclusive.

[16] A few philosophers have challenged the validity of *modus ponens* for some conditionals. See, e.g., Lycan (1994).

[17] 'Opposition, manifested in contradiction, contrariety or other conflict or contrast, is at the core of negation' (Sylvan 1999, p. 305). See also Priest (1999, p. 103).

[18] Of course, this approach does not alleviate the difficulty discussed in the previous paragraph since exclusion itself depends on just the kind of polarity that negation is supposed to make possible.

There are a number of different avenues to showing the universality of negation, none of them, however, without some serious problems. I shall look at two here. As Sylvan goes on to point out, after the long quote above, there are various cases of exclusive pairs of positives, such as in/out, up/down, danger/all clear, living/dead, etc. If we introduce a condition that a creature has, for example, spatial concepts, not an implausible condition on rationality for creatures meeting the locatedness condition (C_1), then there will certainly be mutually exclusive pairs of beliefs of which such creatures are capable of having either, and such that it will follow from a grasp of the concepts involved (e.g. *up* and *down*) that the beliefs in the pairs are treated as mutually exclusive.

The trouble is that we have nothing here that deserves to be called a concept of negation, for negation is an all-purpose propositional function, not tied in its application to any particular range of concepts such as spatial concepts. We do, however, have an all-purpose opposition in the concepts of truth and falsity. Just like the pairs up/down, in/out, etc., truth and falsity are, by their nature, exclusive of each other.[19] If we introduce as a condition

(C_6) x has concepts of truth and falsity,

then we can argue that any creature meeting (C_6) must have a concept for which (11) is canonical, for falsity itself can be taken as the value of *Neg*.

There are at least two problems with this approach. It may be true by virtue of the nature of the concepts that anyone who has the concepts of truth and falsity must understand that they are exclusive in their application. It will, therefore, be canonical for the concept of falsity that 'it is true that *A*' and 'it is false that *A*' are mutually exclusive. But *Neg*, as it features in (11), is not a semantic concept. *Neg*(*A*) is exclusive not of the claim that it is true that *A*, but simply of *A*. Now this may be partially overcome if we also hold, as seems reasonable, that a grasp of the concept of truth ensures that one will accept a disquotational schema such as:

(12) It is true that *A* if and only if *A*.[20]

[19] This is exactly what dialetheists, such as Graham Priest, deny. So here is one point where I cannot help becoming embroiled in substantive debates over the nature of negation. However, I shall exempt myself from having to defend here the principle that no proposition is both true and false. See Priest (1999, pp. 108–9).

[20] If it is true that anyone who has a concept of truth must grasp (12), then it will also follow from satisfaction of (C_6) that a creature must have a concept of biconditionality (and hence of conditionality and of conjunction), thus providing further grounds for the universality of those

We will thereby obtain the result that any creature that has concepts of truth and falsity must, in virtue of those concepts, recognize, for any proposition *A*, that (i) *A* if and only if it is true that *A*, and that (ii) 'it is true that *A*' and 'it is false that *A*' are mutually exclusive. Yet there is still some logical work involved in putting these two claims together to yield the result that (iii) *A* and 'it is false that *A*' are mutually exclusive. So it remains open for someone to argue that even with possession of the concepts of truth and falsity, and even with a grasp of (i) and (ii), a creature might still not have a concept for which (11) is canonical.

A second problem with this avenue for establishing the universality of negation is that falsity and negation are so obviously related that to argue that any creature with a concept of falsity must have a concept of negation has a serious air of begging the question. In a certain sense, this need not be a problem. After all, if the argument presupposes its conclusion, it is at least guaranteed to be valid. The real question will then become, how plausible is it to make (C_6) a condition on rationality? If we can argue that it is plausible, and if there is no real gap between falsity and negation, then in effect, we will have argued directly that a grasp of negation is a condition on rationality. I shall not attempt to argue directly that (C_6) is a condition on rationality, but there are two remarks I would like to make in this context. First, from a dialectical point of view (C_6) is in pretty good shape. It is not, typically, the kind of thing on the denial of which naturalized epistemologists base their opposition to UL. Cherniak, for example, never suggests that the existence of creatures with alternative feasibility orderings depends on creatures lacking concepts of truth and falsity.[21]

Secondly, it may be possible to derive (C_6) from other conditions already laid down on rationality. If so, then assuming that satisfaction of (C_6) does provide a sufficient condition for possession of a concept of negation governed by 11), we will have a real, non-question-begging argument from those other conditions. In fact, Donald Davidson (1975) makes an argument that having beliefs (i.e. satisfying our (C_2)) does

concepts. This seems like a lot of logic to build into the possession of a concept of truth, so perhaps we have a reason to be wary of asserting that a grasp of (12) must come with possession of the concept of truth.

[21] One naturalized epistemologist, Stich, does argue that the notion of truth is 'idiosyncratic', thus implying that there would be little or no reason to expect other rational beings to share it (1990, pp. 118ff.). As Goldman (1999, pp. 72–3) has noted, however, it is doubtful whether Stich is really here discussing truth. Since he takes truth to be a mapping from token belief states to the world, it is much more plausibly conceived of, as he himself says, as an interpretation function. His point is thus the familiar Quinean one that there are multiple ways of assigning truth conditions to belief tokens. This does not entail that there are many different alternatives to the concept of truth.

entail possession of a concept of truth (and hence satisfaction of (C_6), assuming that his argument extends to falsity as well as truth). His argument is that to have beliefs requires having a concept of belief, and that having a concept of belief requires having a concept of truth. Hence, having beliefs requires having a concept of truth. I shall not evaluate this argument here, but this line of thought strikes me as highly promising for our current purposes.

I turn now to a second avenue for establishing the universality of negation. This springs from our earlier discussion of disjunction. I said that deliberation involves incompatible alternatives. The nature of this incompatibility, as Peter van Inwagen (1983) notes, may stem from nothing more than an agent's decision not to take both of them. Thus, if I deliberate about whether to have ice cream or cake for dessert, that implies that I am not going to have both. But this may be only because I do not feel like both, or that I cannot afford both, or that both will provide me with an unacceptable number of calories. In other cases, the incompatibility may be physical. If I deliberate about whether to see in the New Year in Los Angeles or San Francisco, it is because I physically cannot be in both places at the same time.

In one prominent kind of deliberation, the incompatibility of the alternatives is of a logical variety. This is deliberation over whether or not to perform some action. If we continue to treat the alternatives in deliberation as propositions, such deliberation requires that one have a concept that modifies *any* given proposition that provides a suitable object of deliberation to produce another alternative which stands in a relation of mutual exclusion to the original alternative. In other words, it requires a concept that is governed by (11). All we need, therefore, to get the conclusion that any creature meeting (C_5) must have a concept of negation is the further premiss that any creature capable of deliberation is capable of deliberation about whether or not to perform an action.

As with the attempt to establish the universality of negation on the basis of the concepts of truth and falsity, so here too there is a sense of assuming what needs to be proved. If the relevant conditions include that a creature must be able to deliberate about whether or not to perform an action, this may seem like we need a premiss that a creature has a concept of negation in order to show that it must have a concept of negation. As indicated above, however, I think that this cannot be avoided. Another potential weakness with this means of establishing the universality of negation is that although it seems highly plausible that any creature capable of deliberation must be capable of deliberating over whether or not to perform some action, and not just between options the incompatibility of which is not a logical matter, I do not see any way to prove this.

8. Rationality and extensions of the Universality of Logic

In the previous four sections, I have been arguing that any creature meeting certain conditions must possess certain particular logical abilities. If one takes these conditions to form part of the correct understanding of what it is to be rational, then the arguments of the preceding sections will constructively support UL, the thesis that there are some logical abilities that any rational creature must have. The conditions have been introduced piecemeal and on an as-needed basis. Let us now look at them together and see what kind of a picture they add up to. The conditions were:

(C_1) x is located;

(C_2) x has beliefs;

(C_3) x is able to grasp theories;

(C_4) x is able to make and understand inferences;

(C_5) x deliberates;

(C_6) x has concepts of truth and falsity.

With the exception of (C_1), which stands a little apart from the concept of rationality, none of them are wildly off as candidates for necessary conditions on rationality. Almost certainly, of creatures within our ken, their joint satisfaction is limited to normal, reasonably mature human beings. But this does not show that they are too exacting for an account of rationality, since whatever one makes of the cognitive powers of dolphins, chimps or parrots, there is clearly some intuitive sense in which none of them are rational in the way that normal humans are. Certainly, from a dialectical point of view, the opponents of UL described in §1 do not see the challenges against UL as coming from creatures that fail to meet any of these conditions. Naturalized epistemologists who argue against UL rely on the possibility of hypothetical beings with alternative logical feasibility orderings, but a perusal of Cherniak's book *Minimal Rationality* does not reveal any indication that such hypothetical beings would fail to satisfy such basic conditions as those listed above.

It would be ideal if these conditions were not only individually plausible as necessary conditions on rationality, but also hung together in a satisfying, organic way. A few steps in this direction have already been indicated. A Davidsonian argument would show that (C_2) implies (C_6). Given the arguments above, both (C_3) and (C_5) imply (C_4). Roughly speaking, though, the conditions seem to fall into three sub-categories. (C_2), (C_3), (C_4) and (C_6) all concern what is traditionally called theoretical reason. (C_5) concerns practical reason. And (C_1) stands a little apart and concerns, in one particular way, the finitude of all creatures with which we are familiar. The question of the unity of these conditions thus involves the large issue of the unity of theoretical and practical reason, and how these depend on the metaphysical condition of locatedness. This is too large a theme to be pursued here. Suffice it to say that these conditions do not obviously not hang together. The fact that (C_5) implies (C_4) goes a little way towards seeing a link between theoretical and practical reason. And it is a familiar point that if there existed an infinite (and hence non-located) being, it would have no need of inference. Hence (C_4) supports (C_1). Doubtless (C_1) could be shown to be connected with other of the conditions as well.

Calling these conditions collectively (C), we can say that any creature meeting (C) must have the following logical abilities. It must have a concept of conjunction with which it is able to make the usual introduction and elimination inferences. It must have at least one of a family of concepts of conditionality, with which it is able to make inferences of the form *modus ponens*. It must have at least one of a family of concepts of exclusive disjunction, such that it takes *A* and (*A* or *B*) to exclude *B*. And it must have at least one of a family of concepts of negation, such that it takes *A* and not-*A* to be mutually exclusive.

This list of universal logical abilities is not meant to be exhaustive. Without going into even the minimal amount of detail of the cases so far examined, here are a few suggestions about how other logical abilities may be shown to be universal. The arguments I have given so far all concern propositional logical abilities. Clearly, quantification should be the next target. I suspect that Jaakko Hintikka's (1973) work on the game-theoretic semantics for quantifiers will provide a way of showing that any creature meeting a condition that it is able to search for things —or to find things—must possess specific quantificational abilities. Once we have quantification, we have objects, and the issue of identity arises. The canonical features of identity are happily well-agreed on, and I conjecture that the ability to track objects through time will imply the possession of a concept with those canonical features.

Among modal concepts, I suspect that possibility will prove to be entailed by some plausible condition on rationality.[22] In fact, I strongly think that the same condition that implies the universality of disjunction, namely the ability to deliberate, will imply the universality of possibility. This is suggested by van Inwagen (1983, p. 155), who holds that deliberation requires belief in the possibility of performing the actions about which one deliberates. Whether or not an argument like this can be made, there seems something right about a connection between disjunction and possibility. Typically, a belief in a disjunction is a belief that one of the disjuncts obtains, though one doesn't know which. It is thus a situation in which either of the disjuncts is possible. (Following this hint, one might find a plausible connection between the universality of conjunction and a concept of necessity.)

The kinds of arguments envisaged in this paper should not be thought of in any way as aiding in the demarcation of logic. There is no clear dividing line between arguments intended to show the universality of various logical concepts and those, like Kant's in the *Critique of Pure Reason*, intended to show the universality of various general, metaphysical concepts. The arguments given here, then, might be only the first stage of a much larger programme in which a connection is made between rationality and the possession and employment of various concepts.

9. An application of the Universality of Logic

I want now to turn to some implications UL has for other areas in philosophy. I believe that UL may, ultimately, shed light on traditional epistemological categories such as a priority and innateness.[23] For the remainder of this paper, however, I shall focus on a rather neglected concept from the epistemology of logic—logical obviousness.[24] The concept of logical obviousness surfaces in a number of places in philos-

[22] It is, of course, well-known that possibility and necessity are interdefinable with the aid of negation. But it cannot be taken for granted that any creature with concepts of possibility and negation must have the logical acumen to understand the definition of necessity in those terms, or to introduce a concept of necessity by definition in terms of possibility and negation. Thus it might be that a concept of possibility is universal in a way that a concept of necessity is not.

[23] Although I had not yet begun to think about UL, I dealt with the topic of innateness in a way that would dovetail well with UL in Evnine (1987).

[24] Many different things can be described as obvious: propositions, truths, inferences, consequences, etc. In order to get across my point fairly simply, I shall not heed the differences here and

ophy of which I shall give two examples. The first example comes from the theory of rational belief. Theorists of rational belief are divided over whether rational belief is closed under logical consequence. Without taking up this vexed issue, we may simply note that a much less controversial view is that rationality demands that we believe *some* of the logical consequences of our beliefs. Which ones? The natural answer is, those consequences that are obvious. So we find, for example, Nicholas Rescher arguing that one rule of epistemic logic should be: 'whenever p is an "obvious consequence" of two propositions q and r ... then from $B(x,q)$ [i.e. x believes q] and $B(x,r)$ as premisses we may infer $B(x,p)$ as the conclusion' (Rescher 1960, p. 46).

A second context in which the concept of logical obviousness occurs is radical translation. Quine argues that radical translation must be guided by the principle 'save the obvious'. Although he claims this extends even to the translation of non-logical parts of language, it is especially pertinent in the case of logic owing to the high incidence of obviousness in logic: 'every logical truth is obvious, actually or potentially' (Quine 1986, p. 82). The use of the principle 'save the obvious' in radical translation may have serious consequences for our ability to make sense of so-called deviant logics.

Such occurrences of the concept of logical obviousness require us to give some account of the notion (or failing that, to make clear that it remains primitive). There are, I think, two prominent approaches common in the literature. The first I call the psychological approach. The psychological approach makes obviousness relative to cognizing subjects, or groups of such subjects, such as species (and perhaps also to a time, though I shall ignore this parameter). The explication of obviousness is this: a proposition is obvious to a person if it is easy for that person to see that it is true (or obvious to a group if it is easy for members of the group to see that it is true). I call the approach psychological because what is supposed to make it easy for a person to see that a proposition is true are facts concerning the person's psychology or cognitive abilities.[25] Such an approach to logical obviousness is clearly part and parcel of the opposition to UL expressed by naturalized epistemol-

shall assume that an account that explains obviousness as applied to any one of these things can be naturally adapted to deal with the others.

[25] Robin Jeshion, in a recent suggestion, holds that a proposition p is obvious to a person A (at a time t) iff 'at t A finds p true on the basis of her conceptual understanding alone. Obviousness manifests an agent's conceptual understanding, at a given time, of the concepts in p' (2000, p. 345). Whether this counts as an example of what I am calling the psychological approach to obviousness depends on one's account of concepts and conceptual understanding.

ogists like Cherniak. By supposing that different creatures might be described by different logical feasibility orderings, Cherniak is implying that what is obvious to a creature with one kind of psychology may not be obvious to creatures with different kinds of psychology.

Quine himself seems to point in this direction for understanding obviousness, for he says, in the context of the remarks quoted above, that he is 'using the word "obvious" in an ordinary behavioral sense, with no epistemological overtones. When I call "1 + 1=2" obvious to a community I mean only that everyone, nearly enough, will unhesitatingly assent to it, for whatever reason' (1986, p. 82). Presumably behaviour is either constitutive, or a product, of a certain psychology, and Quine means to emphasize these causal, natural facts at the expense of any normative attempt to say what obviousness consists in ('no epistemological overtones', 'for whatever reason').

The second approach to understanding logical obviousness might be described as the formal approach. The formal approach, with its roots in proof theory, seeks to characterize obviousness not in psychological terms but in terms of the formal properties of propositions or inferences. For example, John Corcoran develops the notion of a logically rigorous proof and, as a means to characterizing that, of a logically rigorous rule of inference. What makes a rule of inference rigorous? As a tentative and avowedly insufficient explication, Corcoran suggests that a rule is rigorous only if, besides being effective and sound, it introduces or eliminates exactly one occurrence of a logical symbol (and not both), and its application involves only one kind of logical symbol (Corcoran 1969, p. 172). Thus, for example, the inference of *A* from (*A* and *B*) would be logically rigorous; that of *A* from not-not-*A*, or of (*A* and *B*) from not-(not-*A* or not-*B*) would not.

Rigour is a proof-theoretic, formal concept. Its connections with the epistemic notion of obviousness arise because one of the goals of logic, according to Corcoran, is to codify a special, idealized kind of proof. These are proofs which have the 'maximum amount of logical detail'. The final connection between the formal and the epistemic comes when Corcoran says that by codifying proofs with the maximum amount of detail, i.e. rigorous proofs, we will avoid codifying 'great leaps of logical intuition' (1969, p. 162).

Another version of the formal approach is held by Rescher. In the ellipses of the above quotation, he explains what it is for p to be an 'obvious consequence' of q and r: 'p can be obtained as a conclusion from q and r as premisses by only $n (n = 1,2,3$ or some other small number) inferential steps' (1960, p. 46). Here, obviousness is cashed out not in terms of the types of inferences involved, but simply their number.

While both the psychological and formal approaches to logical obviousness are legitimate and worthy of study, they seem inadequate in the contexts described above (despite the fact, as we have seen, that they are more or less explicitly advanced by the authors concerned). For example, to the extent that one understands obviousness in psychological terms, Quine's insistence on the principle of saving the obvious in radical translation seems to rest on an unwarranted empirical assumption that creatures we radically translate will have psychologies sufficiently similar to our own. Quine has been criticized on just these grounds by Cherniak (1986, p. 46). Without such an empirical assumption, the advice to 'save the obvious' fragments into two separate, not necessarily consistent, pieces of advice: save what is obvious to the translator; and save what is obvious to the object of translation. The first maxim is pretty clearly insensitive to the existence of substantial differences between the psychologies of various creatures, while the second maxim is likely to be unhelpful until we can succeed in translation, and hence will be useless as a guide to translation.

The problems with the use of the formal approach are harder to pin down owing to the variety of different versions of the approach.[26] Rescher's own gloss on 'obvious consequence' makes obviousness relative to a formal system, since the number of steps required to infer *p* from *q* and *r* will entirely depend on which inference rules are available. But even if we make the highly controversial assumption that humans typically reason by employing some formal system, there are the substantial empirical questions about what the rules of that system are, and whether other, different creatures might not use different sets of rules.

UL, I believe, gives us a third way of approaching logical obviousness, a way that will ultimately serve the needs of both Quine and Rescher better than either of the accounts they consider. To take a concrete example, I have argued that any creature able to grasp theories (and hence any rational creature, if this condition is accepted as a necessary condition on rationality) must have a concept for which the inferences given in (1)–(3) above are canonical. If so, then there is a good sense in which such inferences are obvious for any creature meeting the relevant conditions. We can thus define a conception of logical obviousness, call it universal obviousness, as follows. *A* is a universally obvious conse-

[26] It would require more discussion than is appropriate here to deal with the problems inherent in Corcoran's proposals. Suffice it to say that he himself judges his account of rigour to be certainly insufficient and perhaps even unnecessary.

quence of a set of propositions *B*, *C* ... iff *A* follows from *B*, *C*... by an inference that is such that all rational creatures must have a concept for which that inference is canonical. (Similar definitions could be given for the universal obviousness of logical truths, incompatibilities, etc.)[27]

It may be objected that since the notion of obviousness here defined is conditional, either on the rationality of creatures, or their satisfaction of a given condition, it is really just a very general form of the psychological approach. A consequence will be obvious for a given creature in virtue of facts about that creature's psychology: its ability to grasp theories, or its rationality. This objection may be accepted, so long as due attention is given to the fact that the kinds of conditions at issue here, rationality, the ability to grasp theories, the ability to deliberate, and so on, are not typical components of empirical psychological theories. It is, of course, an empirical question whether a given creature can grasp theories, whether it can deliberate, or whether it is rational. But these kinds of facts are much more general than the kinds of facts that naturalized epistemologists think we should investigate to answer questions about a creature's logical abilities. It seems highly likely that it could be established that a creature meets the conditions in (C) in advance of any progress on what is properly called a psychological theory.

The concept of universal obviousness seems well suited to the purposes of both Quine and Rescher. With regard to radical translation, in any situation in which we have good reason to think that the creature we are attempting to translate is rational, that is, good reason to think it deliberates, grasps theories, etc., we can 'save the obvious' in translation without begging any questions. Those parts of 'our' logic that are genuinely universal can be read into the objects of translation quite legitimately, so long as those objects of translation meet the appropriate conditions on rationality. Such a method will, it must be admitted, give us a lot less than Quine wanted; it cannot rule out so-called deviant logics, since many deviant logics are consistent with those parts of logic that are universal. But this should be considered an improvement over Quine. For the method as now conceived retains the major Quinean insight that there are a priori limits on translation of rational creatures

27 It must be conceded that universal obviousness, as here defined, is not a comparative notion. In this respect it falls short of the ordinary conception of obviousness on which obviousness is comparative. Both the psychological and formal approaches retain this feature of the everyday concept. It is not clear, however, that UL could not ultimately yield a comparative notion of obviousness. It might turn out, for example, that the conditions on the basis of which individual logical abilities are shown to be universal were orderable in some epistemologically significant way. In that case, the definition of universal obviousness could be adapted to reflect that ordering.

without making substantive divergences concerning alternative logics into trivial misunderstandings.

A charge of circularity may be raised against the employment of the universal conception of obviousness in the context of radical translation. The maxim of radical translation that tells us to 'save the obvious' is one version of the Principle of Charity. Yet the results about the universality of various logical abilities were themselves established only by use of the Principle of Charity, since we relied on it to show that where creatures make inferences of types that are canonical for the concept involved in those inferences, we should interpret the concept (or individuate it) as one for which those inferences are valid. However, I believe there is no real circularity here, despite the use twice over of the name 'Principle of Charity'. The assumption that guided us at the beginning, that where people make inferences of a kind canonical for the concepts involved, we should take the concepts to be ones for which those inferences are valid, is quite different in kind from the principle 'save the obvious' on our understanding of that principle. For on our understanding, the principle 'save the obvious' no longer means only that we should translate people so that their inferences come out valid (or their assertions true). Rather, it involves being prepared to find, in the language and thought of those on whom we practise radical translation, certain specific logical concepts and inferences that we have established, by means of various positive arguments, as universal (or conditional on satisfaction of (C)) in their own rights.

Like Quine, Rescher too could benefit from the universal conception of obviousness. His employment of the concept of obvious consequence comes in the context of epistemic logic, or the theory of rational belief. Yet the relativity of his notion of obvious consequence to a formal system makes its relevance to the rationality of a given creature moot unless substantive empirical claims about the mechanisms of reasoning in that creature are established. Whether a purely formal approach, along the lines suggested by Corcoran, could serve the goals of epistemic logic, remains to be seen, since Corcoran's suggestions remain undeveloped. But in any case, the universal conception of obviousness seems well adapted to the needs of epistemic logic. It offers a standard for rational belief that is tied to what one may call forms of rational life that are sufficiently general to free epistemic logic from a dependence on empirical psychological theories and yet sufficiently concrete to confirm the relevance of an epistemic logic developed on its basis to the thought of actual creatures.[28]

[28] Many people have commented on versions of this paper over the years. Among them, I would

Department of Philosophy
California Polytechnic State University
San Luis Obispo
CA 93407
USA
sevnine@calpoly.edu

SIMON EVNINE

References

Biro, J. and Ludwig, K. 1994: 'Are There More Than Minimal A Priori Limits on Irrationality?'. *Australasian Journal of Philosophy*, 72, pp. 89–102.

Braine, M., Reiser, B. and Rumain, B. 1984: 'Some Empirical Justification for a Theory of Natural Propositional Logic'. *The Psychology of Learning and Motivation*, 18, pp. 313–71.

Carroll, L. 1895: 'What the Tortoise Said to Achilles'. *Mind*, 4, pp. 278–80.

Cherniak, C. 1986: *Minimal Rationality*. Cambridge, MA: MIT Press.

Corcoran, J. 1969: 'Three Logical Theories'. *Philosophy of Science*, 36, pp. 153–77.

Davidson, D. 1975: 'Thought and Talk' in his *Inquiries Into Truth and Interpretation*. Oxford: Clarendon Press, 1984, pp. 155–70. Originally published in in Guttenplan, S. (ed.), 1975. *Mind and Language*. Oxford: Oxford University Press.

Evnine, S. 1987: 'Innate Principles and Radical Interpretation'. *The Locke Newsletter*, 18, pp. 33–44.

——1999: 'On the Way to Language' in Hahn, L.(ed.) *The Philosophy of Donald Davidson*. Chicago: Open Court, pp. 289–304.

Gentzen, G. 1935: 'Investigations Into Logical Deduction'. *American Philosophical Quarterly*, 1, (1964) pp. 288–306. Originally published in 1935 as 'Untersuchungen über das logische Schliessen', *Mathematisches Zeitschrift*, 39, pp. 176–210 and 405–31.

Goldman, A. 1986: *Epistemology and Cognition*. Cambridge, MA: Harvard University Press.

——1999: *Knowledge in a Social World*. Oxford: Clarendon Press.

Harman, G. 1986: 'The Meanings of Logical Constants' in Lepore, E. (ed.) *Truth and Interpretation: Perspectives on the Philosophy of Donald Davidson*. Oxford: Blackwell, pp. 125–34.

Hart, W. D. 1988: *The Engines of the Soul*. Cambridge: Cambridge University Press.

specially like to thank Giovanna Pompele, Keith Abney, Tyler Burge, Kit Fine, Michael Jacovides, Dana Nelkin, and a referee for this journal.

Hintikka, J. 1973: *Logic, Language-Games and Information: Kantian Themes in the Philosophy of Logic*. Oxford: Clarendon Press.

Jeshion, R. 2000: 'On the Obvious'. *Philosophy and Phenomenological Research*, 60, pp. 333–55.

Kahneman, D., Slovic, P. and Tversky, A. 1982: *Judgment Under Uncertainty: Heuristics and Biases*. Cambridge: Cambridge University Press.

Kneale, W. C. 1956: 'The Province of Logic' in Lewis, H. D. (ed.) *Contemporary British Philosophy*. London: Allen and Unwin, pp. 237–61.

Lycan, W. 1994: 'Conditional Reasoning and Conditional Logic'. *Philosophical Studies*, 76, pp. 223–45.

Osherson, D.N. 1975: *Reasoning in Adolescence: Deductive Inference*. Logical Abilities in Children, vol. 3. Hillsdale, NJ: Erlbaum.

Peacocke, C. 1987: 'Understanding Logical Constants: A Realist's Account'. *Proceedings of the British Academy*, 73, pp. 153–200.

Popper, K. 1946/7: 'Logic Without Assumptions'. *Proceedings of the Aristotelian Society*, 96, pp. 251–92.

——1947: 'New Foundations for Logic'. *Mind*, 56, pp. 193–235.

Priest, G. 1999: 'What Not? A Defence of Dialetheic Theory of Negation' in D. Gabbay and H. Wansing (eds.) *What is Negation?* Dordrecht: Kluwer, pp. 101–20.

Prior, A.N. 1960: 'The Runabout Inference-Ticket'. *Analysis*, 21, pp. 38–9.

Quine, W.V. 1986: *Philosophy of Logic*. Cambridge, MA: Harvard University Press.

Rescher, N. 1960: 'Epistemic Modality: The Problem of a Logical Theory of Belief Statements' in his *Topics in Philosophical Logic*. Dordrecht: Reidel,1968, pp. 40–53. Originally published in 1960 in *Philosophy of Science*, 27, pp. 88–97.

Sanford, D. 1989: *If P, Then Q: Conditionals and the Foundations of Reasoning*. London: Routledge.

Stich, S. 1990: *The Fragmentation of Reason*. Cambridge, MA: MIT Press.

Stroud, B. 1979: 'Inference, Belief, and Understanding'. *Mind*, 88, pp. 179–96.

Sylvan, R. 1999: 'What is That Item Designated Negation?' in Gabbay, D. and Wansing, H. (eds.) *What is Negation*. Dordrecht: Kluwer, pp. 299–324.

van Inwagen, P. 1983: *An Essay on Free Will*. Oxford: Clarendon Press.