

RATIONALITY AND THE ETHICS OF LOGIC

Logic is a science of reason...a science a priori of the necessary laws of thought, not in regard to particular objects, however, but to all objects in general;—hence a science of the correct use of the understanding and of reason in general, not subjectively, however, i.e., not according to empirical (psychological) principles for how the understanding does think, but objectively, i.e., according to principles a priori for how it ought to think.

—Immanuel Kant<sup>1</sup>

[T]he word Logic in its primal sense means the Science of the Laws of Thought as expressed. Considered in this sense, Logic is conversant about all thought which admits of expression; whether that expression be effected by the signs of common language or by the symbolic language of the mathematician.

—George Boole<sup>2</sup>

The logical notions are embedded in our deepest nature, in the very form of our language and thought, which is presumably why we can understand some kinds of logical systems quite readily, whereas others are inaccessible to us without considerable effort... if at all.

—Noam Chomsky<sup>3</sup>

If sheer logic is not conclusive, what is?

—W.V.O. Quine<sup>4</sup>

Which logic do we use to assess the consequences of different logics?... Regress threatens. Is the super-logic ... a priori, or incorrigible?

—Stewart Shapiro<sup>5</sup>

<sup>1</sup> Kant, *The Jäsche Logic, Lectures on Logic*, J.M. Young, trans. (New York: Cambridge, 1992), pp. 521–640, at p. 531.

<sup>2</sup> Boole, “Logic and Reasoning,” in *Studies in Logic and Probability* (London: Watts, 1952), pp. 211–29, at p. 212.

<sup>3</sup> Chomsky, *Language and Problems of Knowledge* (New York: Columbia, 1988), p. 99.

<sup>4</sup> Quine, *Philosophy of Logic* (Cambridge: Harvard, 1986, 2<sup>nd</sup> ed.), p. 81.

<sup>5</sup> Shapiro, “The Status of Logic,” in Paul Boghossian and Christopher Peacocke, eds., *New Essays on the A Priori* (New York: Oxford, 2000), pp. 333–66, at p. 338.

When studying reasons we study normative aspects of the world. When discussing rationality we discuss our perceptions of, and responses to, reasons. Our ability to reason is central to our rationality in all its manifestations.

—Joseph Raz<sup>6</sup>

Logic and ethics are fundamentally the same, they are no more than duty to oneself.

—Otto Weininger<sup>7</sup>

This essay is about human rationality, logic, and the connection between them. On my view, this connection is both constitutive and mutual. More precisely, I defend the broadly Kantian thesis<sup>8</sup> that logic is the result of the constructive operations of an innate cognitive capacity that is necessarily shared by all rational human animals, and governed by categorically normative principles. I call this thesis *Kantian constructivism in logical theory* (KCLT).<sup>9</sup> In section I, I sketch a picture of the nature of logic that connects it directly with human psychology. Here I propose that all rational humans innately possess a cognitive faculty that is preconfigured for representing logic by virtue of its containing a single universal “protologic” which is used for the construction of all logical systems, and which is distinct in structure from all classical or nonclassical logical systems. In section II, I argue that logic is intrinsically normative, that the intrinsic normativity of logic is generally consistent with logic’s being the science of the necessary relation of consequence, and in particular that the intrinsic normativity of logic is consistent with the existence of the protologic. In section III, I argue that the protologic also provides a set of unconditional prescriptive laws, or “categorical imperatives,” for human reasoning. Finally, by way of conclusion, I briefly argue that my account of the intrinsic categorical normativity of logic supplies a crisp and effective reply to an obvious worry: If rational human animals are inherently logical animals, then how could they ever make logical mistakes?

<sup>6</sup> Raz, *Engaging Reason* (New York: Oxford, 1999), p. 75.

<sup>7</sup> Weininger, *Sex and Character* (London: Heinemann, 1906), p. 159.

<sup>8</sup> By this I mean only that that my theory of rationality and logic shares some basic themes and theses with certain parts of Kant’s Critical philosophy. But of course my theory is intended to be independently philosophically justified and motivated; and also it is not in any way intended to be an interpretation of or commentary on Kant’s logical writings.

<sup>9</sup> See John Rawls, “Kantian Constructivism in Moral Theory,” this JOURNAL, LXXVII 9 (September 1980): 515–72, and sections II–III below.

Quite apart from the Kantian affinities, all of this is well supported by contemporary cognitive science and logical theory. But if I am correct, then there are also some fairly radical foundational implications for cognitive science and logical theory alike.

#### I. THE RATIONAL, THE LOGICAL, AND THE PSYCHOLOGICAL

As I said in the Introduction, the central claim of this essay is the thesis of KCLT: logic is the result of the constructive operations of an innate cognitive capacity that is necessarily shared by all rational human animals, and governed by categorically normative principles. KCLT connects the logical and the psychological intrinsically and reciprocally. But the dual idea that logic is intrinsically psychological and that human psychology is intrinsically logical has a long and troubled history in the philosophical, logical, and psychological traditions alike. From Antoine Arnauld's and Pierre Nicole's *Art of Thinking* (1662), through Immanuel Kant's *Jäsche Logic* (1800), J.S. Mill's *System of Logic* (1843), and George Boole's *Investigation of the Laws of Thought* (1854), right up to the appearance of Gottlob Frege's revolutionary *Begriffsschrift* (1879), logic and psychology seemed to be, if not precisely the same subject, then at least theoretically married to one another. But the much-celebrated attack on "logical psychologism"—the explanatory reduction of logic to empirical psychology—at the end of the nineteenth century brought about a nasty divorce. According to the leaders of the attack, Frege and Edmund Husserl, this parting of the ways was a simple matter of irreconcilable differences: the principles or laws of logic are absolutely necessary while the laws of empirical psychology are only contingent generalizations; logic is true while empirical psychology deals only with human belief; logic is a fully formal or "topic-neutral" science while empirical psychology focuses only on the species-specific or individual contents of mental states; logical knowledge is a priori or independent of all sense experience while empirical psychological knowledge is a posteriori or dependent upon experience; and so on. Thereafter "pure logic," pursued in armchairs by philosophers and philosophically-minded mathematicians, went one way; and "experimental psychology," pursued in laboratories by men in white coats, went diametrically another. To make things worse, as Elliot Sober aptly observes, "while the psychologists were leaving, the philosophers were slamming the door behind them."<sup>10</sup>

<sup>10</sup> Sober, "Psychologism," *Journal for the Theory of Social Behavior*, VIII (1978): 165–92, at p. 165.

In my opinion the view that logic and psychology are fundamentally at odds with one another could not be more mistaken. On the contrary, if I am correct there is a necessary link between logic and psychology, despite the fact that logical psychologism is false. This brings me back to the first part of KCLT: *that logic is cognitively constructed by rational human animals*, in the sense that all rational humans innately possess a cognitive faculty that is preconfigured for representing logic, by virtue of its containing a single universal *protologic* which is used for the construction of all logical systems, and which is distinct in structure from all classical or nonclassical logical systems. I call this subclaim *the logic faculty thesis*. The logic faculty thesis draws explicitly but not uncritically on some ideas of Kant, Boole, W.V. Quine, Noam Chomsky, and Stewart Shapiro.

Obviously the fundamental notion lying behind the logic faculty thesis is that of a rational animal. For my purposes animals are *sentient living organisms* and for simplicity's sake I shall assume unless otherwise specified that all animals are *sound*, that is, intact and mature. Even so, only some animals in this sense are rational. On my view, rational animals are rule-following,<sup>11</sup> intentional (that is, possessing capacities for object-directed cognition and purposive action), volitional (possessing a capacity for willing),<sup>12</sup> self-evaluating, self-justifying, self-legislating, reasons-giving, reasons-sensitive, and reflectively self-conscious—or for short, “normative-reflective”<sup>13</sup>—animals, whose inner and outer lives alike are sharply constrained by their possession of concepts expressing strict modality. Modality in the philosophical sense comprises the concepts of necessity, possibility, and contingency. Strict modality, in turn, includes the concepts of logical necessity (truth in all logically possible worlds), epistemic necessity (certainty or indubitability), and deontic necessity (unconditional obligation or “the ought”). So to put the first part of KCLT yet another way, logic is cognitively constructed by all and only those human normative-reflective animals who are also in possession of concepts expressing strict modality.

This approach to rational animals substantively invokes the concept of rationality. An unfortunate but pervasive feature of the

<sup>11</sup> See Jonathan Bennett, *Rationality* (Indianapolis: Hackett, 1989).

<sup>12</sup> See Harry Frankfurt, “Freedom of the Will and the Concept of a Person,” in *The Importance of What We Care About* (New York: Cambridge, 1988), pp. 11–25; and Brian O’Shaughnessy, *The Will: A Dual Aspect Theory, Volumes 1-2* (New York: Cambridge, 1980).

<sup>13</sup> See Robert Audi, *The Architecture of Reason* (New York: Oxford, 2001), chapters 1–2 and 4–5; and Raz, chapters 1–4.

*philosophy* of rationality, however, is that it does not operate with either a univocal or generally-accepted sense of the term ‘rationality’.<sup>14</sup> Reasonable people, including specialists on rationality, are both muddled and also in sharp disagreement about the very concept of rationality. So in order to avoid troublesome ambiguity and state my commitments explicitly I need to make some basic distinctions, and orient my view in relation to them.

The first basic distinction is between (a) the *mentalist* sense of rationality, and (b) the *procedural* sense of rationality. In the mentalistic sense, rationality is a complex psychological capacity for logical inference and insight, and also for practical deliberation and decision-making. By contrast, in the procedural sense, rationality is a complex formal property of a certain class of mechanical, mathematical, computational, or logical processes, namely the property of being (i) well formed and (ii) either provable and recursive (Turing-computable), valid (truth-preserving), or sound (valid with true premises).<sup>15</sup> The crucial difference here is that rationality in the mentalistic sense is such that all of its manifestations are conscious, whereas some processes are rational in the procedural sense without being in any way conscious.

It is also quite useful to distinguish, within the mentalistic sense of rationality, between (a<sub>1</sub>) the mentalistic rationality of *animals*, (a<sub>2</sub>), the rationality of mental *episodes or acts*, and (a<sub>3</sub>) the rationality of mental *states*. The important contrast here is that it is possible for something to be a rational animal by having an overall mental capacity for rationality, yet fail to be occurrently rational with respect to some of its mental episodes or mental states, as in the case of someone who completely loses his temper temporarily. Conversely, it is possible for an animal to be occurrently rational with respect to some of its mental episodes or states, but lack an overall mental capacity for rationality, as in the case of certain sorts of mental illness. This point in turn implies another useful distinction, again within the mentalistic sense of rationality, between (a<sub>5</sub>) an animal’s mental

<sup>14</sup> See, for example, Alfred R. Mele and Piers Rawling, eds., *The Oxford Handbook of Rationality* (New York: Oxford, 2003).

<sup>15</sup> See George Boolos and Richard Jeffrey, *Computability and Logic* (New York: Cambridge, 1996, 3<sup>rd</sup> ed.). Gödel’s incompleteness theorems may be taken to show that validity and soundness outrun provability and computability. The precise character of logical validity will vary according to whether the logic is classical or nonclassical, and within nonclassical logics, according to whether the logic is either merely a conservative extension of classical logic or a deviant logic. What this means is that not all rational procedures are classically logically valid.

*capacity* for rationality, and (a<sub>6</sub>) *occurrent* rationality with respect to the mental episodes or mental states of an animal. And finally, for completeness, we can also distinguish, within occurrent mentalistic rationality, between (a<sub>7</sub>) the occurrent rationality of mental episode or state *types*, and (a<sub>8</sub>) the occurrent rationality of mental episode or state *tokens*. Here the contrast is that it is possible for a certain mental episode or state type—say, righteous anger—to be rational when tokened in in some contexts, but fail to be rational when tokened in others.

The second basic distinction is between (c) the *meeting-the-minimal-standards* sense of rationality, and (d) the *meeting-the-maximal-or-ideal-standards* sense of rationality. In the meeting-the-minimal-standards sense, rationality means either possessing a psychological capacity for rationality or meeting the well-formedness conditions for being a rational procedure of the relevant sort. By contrast, in the meeting-the-maximal-or-ideal-standards sense, rationality means either perfectly using a psychological capacity or else perfectly satisfying the provability/computability-conditions, validity-conditions, or soundness-conditions of the relevant sort of rational procedure. The crucial difference here is that in the meeting-the-minimal-standards sense, irrationality means lacking the basic conditions necessary for rationality, hence *nonrationality*; whereas in the meeting-the-maximal-or-ideal-standards sense, irrationality merely means falling short of perfect rationality.

The third and last basic distinction is between (e) the *principled* sense of rationality, (f) the *holistic* sense of rationality, and (g) the *instrumental* sense of rationality. In the principled sense, rationality means the possession of a capacity for generating or recognizing necessary truths, a priori beliefs, strictly universal normative rules, nonconsequentialist moral obligations, and categorical “ought” claims.<sup>16</sup> Put in historical terms, this is the *Kantian* conception of rationality, according to which “reason is the faculty of a priori principles.” By contrast, in the holistic sense, rationality means the possession of a capacity for systematically seeking coherence (or, to use a familiar term-of-art, “reflective equilibrium”) across a network or web of beliefs, desires, emotions, intentions, and volitions.<sup>17</sup> In

<sup>16</sup> What I am calling “principled rationality” is closely connected with the traditional notion of “pure reason”; see, for example, Laurence Bonjour, *In Defense of Pure Reason* (New York: Cambridge, 1998).

<sup>17</sup> See Rawls, “The Independence of Moral Theory,” *Proceedings and Addresses of the American Philosophical Association*, XLVIII (1974): 5–22; and Rawls, *A Theory of Justice* (Cambridge: Harvard, 1971).

historical terms, this is the *Hegelian* conception of rationality, according to which “the truth is the whole.” And finally in the instrumental sense, rationality means the possession of a capacity for generating or recognizing contingent truths, a posteriori beliefs, contextually normative rules, consequentialist obligations, and hypothetical “ought” claims.<sup>18</sup> Put historically, this is the *Humean* conception of rationality, according to which “reason is the slave of the passions.”

The crucial three-way difference here is that whereas in the principled sense, rationality means generating or recognizing rules that are absolute or *unconditional*, by contrast rationality in the holistic sense means generating or recognizing rules or laws that are merely thoroughly interdependent or *mutually conditioned* (hence none of those rules or laws can be more necessary or certain or binding than the modally or epistemically weakest proposition in the total holistic network of rules or laws), and by another contrast rationality in the instrumental sense means generating or recognizing rules that are merely empirically regular or *conditional* (hence none of those rules or laws can be fully necessary or certain or binding).

Unless otherwise noted, in what follows I will focus primarily on the mentalistic, meeting-the-minimal-standards, and principled senses of rationality. This is not to say that I reject or wish to depreciate in any way the procedural, meeting-the-maximal-or-ideal-standards, holistic, or instrumental senses of rationality. On the contrary, I am saying only that rationality in the senses I am primarily interested in *should not be confused with* other fundamentally different senses of rationality.

Now the class of normative-reflective animals in possession of concepts expressing strict modality would appear to be at least extensionally equivalent with the class of rational humans; and even if (as seems very likely) it is not intensionally equivalent for the simple reason that the cognitive capacities required for the possession of concepts expressing strict modality are multiply embodyable,<sup>19</sup> nevertheless those humans who are rational will constitute a central case or paradigm. I am assuming that it is a primitive fact, yielded directly by

<sup>18</sup> See Martin Hollis and Robert Sugden, “Rationality in Action,” *Mind*, cii (1993): 1–35; Donald C. Hubin, “The Groundless Normativity of Instrumental Rationality,” this *JOURNAL*, xcvi, 9 (September 2001): 445–468; Robert Nozick, *The Nature of Rationality* (Cambridge: Harvard, 1993); and Herbert Simon, *Reason in Human Affairs* (Stanford: University Press, 1983).

<sup>19</sup> For me, something is “multiply embodyable” just in case it is a cognitive structure that can occur in two or more distinct biological individuals, natural kinds, or artificial living kinds. A good intuitive example of the latter would be the “Nexus VI replicants” in Ridley Scott’s classic science fiction film *Blade Runner* (1982).

the reader's capacity for introspection, that there *are* some rational humans. So I am proposing to explain the nature of logic by taking human rationality seriously. More precisely, I am proposing to explain the nature of logic by taking rationality seriously, and to take rationality seriously by taking human rationality seriously. And what we reach at the end of this explanation is the thesis that something protological is built innately into human rationality itself.

Logic, by which I mean *formal* logic, is the science of the necessary relation of consequence between the premises and the conclusion of valid arguments: there is no possible world such that all the premises are true and the conclusion false.<sup>20</sup> Since at least the time of C.I. Lewis's *Survey of Symbolic Logic*, it has been known that the "second-order" or "higher-order" logic of Russell and Whitehead's *Principia Mathematica* (so-called because it permits quantification into predicates and over properties, functions, and sets) can be modified in various ways.<sup>21</sup> This remains true, and true in spades, for classical or elementary logic, that is, bivalent truth-functional first-order quantified polyadic predicate calculus with identity. In her pathbreaking 1974 book *Deviant Logic*, Susan Haack helpfully collected these modifications together under the comprehensive heading of "alternative" or "non-classical" logics.<sup>22</sup> And she also very helpfully distinguished, within nonclassical logics, between (1) extensions of classical or elementary logic, and (2) deviant logics.

Briefly put, extensions of elementary logic introduce nontrivial changes (changes other than mere notational variation) that preserve all the logical constants, valid sentences, theorems, valid inferences, and laws of elementary logic. By contrast, deviants of elementary logic introduce nontrivial changes that do *not* preserve all the classical or elementary logical constants, valid sentences, theorems, valid inferences, and laws. Less briefly put, an extension of classical or elementary logic involves the addition, deletion, or redefinition of classical logical constants, interpretation rules, axioms, or inference rules such that all the tautologies, theorems, valid inferences, and laws of ele-

<sup>20</sup> Philosophers of logic often distinguish between *syntactic consequence* or provability, and *semantic consequence* or necessary truth-preservation. I accept that distinction, but for convenience will use 'consequence' simply to mean semantic consequence.

<sup>21</sup> See Lewis, "Alternative Systems of Logic," *Monist*, XLII (1932): 481–507; and Rudolf Carnap, *The Logical Syntax of Language*, Amethe Smeaton, trans. (London: Routledge and Kegan Paul, 1937).

<sup>22</sup> See Haack, *Deviant Logic* (New York: Cambridge, 1974), chapter 1; Haack, *Deviant Logic, Fuzzy Logic* (Chicago: University Press, 1996), chapters 1 and 9; and Graham Priest, *Introduction to Non-Classical Logic* (New York: Cambridge, 2001).

mentary logic still hold, along with some additional ones. For instance, the “calculus of strict implication” devised by Lewis,<sup>23</sup> and the different axiomatic modal logics developed by Lewis,<sup>24</sup> Saul Kripke,<sup>25</sup> and others, are extensions in this sense.

By contrast, a deviant logic involves the addition, deletion, or redefinition of classical logical operators, interpretation rules, axioms, or inference rules such that *not* all the tautologies, theorems, valid inferences, and laws of classical or elementary logic still hold. Deviant logics include intuitionist logics, which reject the classical or strong law of excluded middle;<sup>26</sup> relevance logics, which reject the classical conditional or classical validity;<sup>27</sup> three-valued, many-valued, truth-value-gapped, and fuzzy logics, which all reject the classical or strong law of bivalence;<sup>28</sup> “free” and “meinongian” logics, which reject unrestricted existential generalization;<sup>29</sup> paraconsistent logics, which allow contradictions to occur as theorems without entailing every sentence; and dialethic logics, which are both paraconsistent *and* reject the classical or strong laws of noncontradiction and bivalence by allowing some truth-value “gluts” or true contradictions.<sup>30</sup> Extensions of elementary logic, while promoting some genuine changes to classical logic, are conservative. But a deviant logic is radical and *flouts* classical or elementary logic in one way or another.

This vividly raises the question: Given the various nonclassical logics and especially the deviant logics, what should we then say about the nature of logic?

Most philosophers of logic hold that there are three and only three mutually exclusive options for answering this question. The first option is to be a *diehard classicist* and insist that classical or elementary

<sup>23</sup> See Lewis, *Survey of Symbolic Logic* (Berkeley: California UP, 1918), chapter V.

<sup>24</sup> See Lewis and C.H. Langford, *Symbolic Logic* (New York: Dover, 1959, 2<sup>nd</sup> ed.).

<sup>25</sup> See Kripke, “Semantical Analysis of Modal Logic I, Normal Propositional Calculi,” *Zeitschrift für mathematische Logik and Grundlagen der Mathematik*, IX (1963): 67–96; and Kripke, “Semantical Considerations on Modal Logic,” *Acta Philosophica Fennica*, XVI (1963): 83–94.

<sup>26</sup> See L.E.J. Brouwer, “Historical Background, Principles, and Methods of Intuitionism,” *South African Journal of Science*, XLIX (1952): 139–146; Haack, *Deviant Logic*, chapter 5; and Priest, *Introduction to Non-Classical Logic*, chapter 6.

<sup>27</sup> See Priest, chapters 9–10.

<sup>28</sup> See Haack, *Deviant Logic*, chapter 3; and Haack, *Deviant Logic, Fuzzy Logic*, pp. 229–58.

<sup>29</sup> See Haack, *Deviant Logic*, chapter 7.

<sup>30</sup> See Priest, *In Contradiction* (Boston: Martinus Nijhoff, 1987); Priest, chapters 7–8; Priest, “The Logic of Paradox,” *Journal of Philosophical Logic*, VIII (1979): 219–41; and Priest, “What Is So Bad about Contradictions?,” this JOURNAL, XCV, 8 (August 1998): 410–426.

logic is the One True Logic and that the nonclassical logics are not really and truly logic. The second option is to be a *diehard nonclassicist* and insist that one or another of the nonclassical logics is the One True Logic and that all other logics including classical or elementary logic are not really and truly logic. And the third option is to be an *unconstrained pluralist* by (a) denying that there is any One True Logic, whether classical or nonclassical, and (b) asserting that the several different logics are all equally acceptable.<sup>31</sup>

Perhaps the strongest argument in favor of the diehard classicist option is Quine's thesis that all linguistically competent human speakers find the logical constants, logical truths, and proof procedures of classical logic "obvious, actually or potentially, (*op. cit.*, p. 82) because they are intrinsic to the very practice of translation:

Take the...case of trying to construe some unknown language on the strength of observable behavior. If a native is prepared to assent to some compound sentence but not to a constituent, this is a reason not to construe the construction as conjunction. If a native is prepared to assent to a constituent but not the compound, this is a reason not to construe the construction as alternation. We impute our orthodox logic to him, or impose it on him, by translating his language to suit. We build the logic into our manual of translation. Nor is there cause here for apology. We have to base translation on some kind of evidence, and what better? (*op. cit.*, p. 82)

It follows directly from this that if someone attempts to deny some fundamental law of elementary logic (say, the classical or strong law of noncontradiction<sup>32</sup>), then she cannot be intelligibly regarded as offering a genuine challenge to classical logic. If classical logic is built into our manual of translation, then the challenger must instead be regarded by us as meaning something different by the logical words she uses than we do by the very same words:

What if someone were to reject the law of non-contradiction and so accept an occasional sentence and its negation both as true? An answer one hears is that this would vitiate all science. Any conjunction of the form ' $p \cdot \sim p$ ' logically implies every sentence whatever; therefore

<sup>31</sup> See, for example, Haack, *Deviant Logic*, p. 26.

<sup>32</sup> As I understand them, the strong laws of noncontradiction, bivalence, and excluded middle are as follows:

Strong Noncontradiction: For every sentence  $S$ , ' $S$  and not- $S$ ' is not true.

Strong Bivalence: For every sentence  $S$ ,  $S$  is assigned one and no more than one of the two truth-values, true and false.

acceptance of sentence and its negation as true would commit us to accepting every sentence as true, and thus forfeiting all distinction between true and false. In answer to this answer, one hears that such a full-width trivialization could perhaps be saved off by making compensatory adjustments to block this indiscriminate deducibility of all sentences from an inconsistency. Perhaps, it is suggested, we can so rig our new logic that it will isolate its contradictions and contain them. My view of this dialogue is that neither party knows what he is talking about. They think they are talking about negation, ‘ $\sim$ ’, ‘not’; but surely the notation ceased to be recognizable as negation when they took to regarding some conjunctions of the form ‘ $p \cdot \sim p$ ’ as true, and stopped regarding such sentences as implying all others. Here, evidently, is the deviant logician’s predicament: when he tries to deny the doctrine he only changes the subject.<sup>33</sup>

Against Quine’s diehard classicism, however, it seems to me that it cannot be seriously denied that both extended and deviant logic (even such highly deviant systems as dialethic logic) are really and truly logic. This is because we must accept, I think, that any non-classical logic (an NCL, for short) is really and truly logic just in case the following three conditions are satisfied:

- (I) *The formal logic condition.* The NCL is a science of the necessary relation of consequence.
- (II) *The representational adequacy condition.* The NCL’s proposed extension of, or deviation from, classical logic is based on its being able accurately to represent in the format of symbolic logic some apparent linguistic facts that are not represented within classical logic: for example, strict implication or modality, constructibility of proofs, relevance, vagueness, future contingency, nonexistent objects, paradoxes, and so on.
- (III) *The localization of application condition.* The NCL’s scope of application is restricted to all and only those language domains containing the apparent nonclassical linguistic facts that it represents.

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Strong Excluded Middle: For every sentence  $S$ , ‘ $S$  or not- $S$ ’ is true.

It is possible to reject strong excluded middle without challenging strong bivalence (for example, intuitionism); to reject strong bivalence without challenging strong excluded middle (for example, dialetheism); to reject strong noncontradiction without rejecting strong excluded middle (for example, dialetheism again); and to reject strong bivalence without rejecting strong noncontradiction (for example, three-valued logic).

<sup>33</sup>Quine, p. 81.

Conditions (I) to (III) say, truistically, that nonclassical logics are logics that apply to the nonclassical linguistic domains they adequately represent. So nonclassical logic is really and truly logic, and diehard classicism is wrong. But diehard nonclassicism has the same problem in the reverse direction. It cannot be denied that classical or elementary logic is really and truly logic, since the three conditions of formal logic, representational adequacy, and localization of application are all trivially satisfied by elementary logic for apparent classical logical linguistic facts.

Are we then forced into the all-embracing arms of the unconstrained pluralist option? No. This is because it seems to me that Quine overstates his case in favor of diehard classicism, and that a slightly weaker version of Quine's argument in fact strongly supports a distinct fourth option that is neither diehard classicism, nor diehard nonclassicism, nor unconstrained pluralism. This fourth option asserts that *neither* is it true that there is One True Logic, whether elementary logic or nonclassical logic, *nor* is it true that the several different logics are all equally acceptable.

Suppose then that we accept that *some one single logic* is "obvious, actually or potentially" because it is (among other things) built into the very practice of translation, but also that this logic is itself neither strictly speaking classical or elementary logic nor strictly speaking nonclassical logic (whether extended or deviant), because it is structurally distinct from any classical or nonclassical logical system. Indeed, it is not a logical *system* as such, but instead a single set of *schematic logical structures*, in the form of a coherent repertoire of metalogical principles and logical concepts. Furthermore, it is presupposed by every logical system whatsoever. This is because it is a *protologic*, in the sense that it is used for the construction of every actual or possible logical system. Such a universally presupposed constructive logic would be *somewhat* like Quine's own "sheer logic," but with Quine's diehard classicism subtracted out. More precisely, it would be *quite* like Shapiro's "super-logic," the logic that we use for the internal analysis and cross-logic evaluation of the plurality of logics, which is also unrevisable and a priori. The protologic, as I am conceiving it, is unrevisable and a priori precisely because its total set of schematic logical structures determines what will *count* as a possible logical system, and because some knowledge of this set of structures must also be consciously *available* to thinkers if they are to be able to justify assertions or claims made about any classical or nonclassical logic. So the protologic is both constructively and epistemically presupposed by every logical system.

This fundamental point requires more elaboration. To say that some single universal set of schematic structures is constructively presupposed by every member of a plurality of formal systems of some definite sort (say, mathematical systems or linguistic systems), does not in and of itself guarantee that this set of schematic structures is unrevisable and a priori. Take, for example, the crucially analogous case of natural language. The mere fact that, say, Chomsky's universal grammar is constructively presupposed by every natural language does not in and of itself guarantee that the universal grammar is consciously available to competent speakers of a natural language, whether in the form of noninferential beliefs (also called "intuitions" if they are either *prima facie* compelling or intrinsically compelling) or inferential beliefs. But the case of logic is crucially different. This is because competent thinkers must be able to (try to) *justify* the assertions they make, and logical principles and concepts are always more or less consciously explicit in the connections between reasons for believing and the beliefs based on those reasons. What I mean is that the "because" in "I believe that  $Q$ , because of the fact that  $P$  (or: because it seems to me very likely that  $P$ , and so on)" is necessarily a *logical* "because": it says that something (that is, that  $Q$ ) *logically follows* from something else (that is, that  $P$ ). So all justification is, to some extent, conscious logical justification. And this obviously also covers the specific case in which justification is concerned with conscious beliefs *about* logic. To justify any assertion is to invoke conscious logical beliefs; so to justify any assertion about logic is to invoke conscious logical beliefs about logic; but nothing will count as a logic unless it presupposes the protologic; therefore in order to justify any assertions about any logic, we must invoke conscious logical beliefs about the protologic. In this way the protologic is unrevisable and a priori because it is not only constructively but also epistemically presupposed by every logic.

If this proposal is correct, then the unconstrained pluralist option is also ruled out, because the single universally (constructively and epistemically) presupposed protologic is *not* on a par with any of the many logical systems. On the contrary, the single universally presupposed protologic is—to use Kantian language for a moment—the *condition of the possibility of there being informative natural language discourse (including of course translation) and reasoning (including of course theories) in the first place.*

Now of course the \$64,000 question becomes: What is the precise structural description of the protologic? This, however, is a question that obviously cannot be answered within the scope of this essay. I will allow myself to admit here that it *seems* to me that the following four

metalogical principles, together with the logical concepts implicit in them, are at least good *candidates* for belonging to the protologic:

- (i) *The weak principle of validity*: an argument is valid if it is impossible for all of its premises to be true and its conclusion false.
- (ii) *The weak principle of noncontradiction*: not every sentence is both true and false.<sup>34</sup>
- (iii) *The weak principle of logical truth*: a sentence is logically true if it comes out true under every possible uniform reinterpretation of its nonlogical constants.
- (iv) *The weak principle of the transfer from logical truth to valid proof*: a proof from a set of premises to a conclusion is valid if the corresponding classical conditional of its underlying argument is logically true.

Each of these principles is a weak or minimal version of a basic metalogical principle of classical or elementary logic. My rationale for tentatively proposing the inclusion of these weak or minimal classical metalogical principles in the protologic is the (to me) very plausible thought that while every extended or deviant variant on classical logic adds something to or subtracts something from classical logic, *no* logical system can reject absolutely *all* of classical logic and still *remain* a logic. This in turn would suggest that the protologic, among other things, captures a weak or minimal classical “core” that is preserved in every classical or nonclassical system. So the protologic would also to that extent capture the *core* of classical logic.<sup>35</sup> But that is as far as I am willing to go.

This is not an evasion; it is simply the scientific division of labor, and a little theoretical modesty too. My intention in this section so far has been to argue that a protologic must exist, and to spell out the basic features that the protologic will intrinsically possess: it is a single universal set of schematic logical structures, in the form of a repertoire of metalogical principles and logical concepts, that possesses an overall structure distinct from every classical or nonclassical logical system, and is used for the construction of every classical or nonclassical system; and it is unrevisable and a priori precisely because it is both constructively and epistemically presupposed by every

<sup>34</sup> See also Hilary Putnam, “There Is at Least One A Priori Truth,” in Putnam, *Realism and Reason: Philosophical Papers, Volume 3* (New York: Cambridge, 1983), pp. 98–114.

<sup>35</sup> See also Ken Warmbröd, “Logical Constants,” *Mind*, cviii (1999): 503–38.

logical system. But this ambitious claim having been (let us assume for a moment!) accepted, then there must then be a scientific division of labor. This is because the question of the precise structural description of the protologic is an intrinsically *formal-logical* question, not a *philosophical* question, and this essay—to the extent that it is about logic, as one of its two basic topics—deals only with philosophical logic and the philosophy of logic, and is *not* an essay in formal logical theory. Furthermore I am not a professional logician, so I am not competent to undertake this further investigation, even if I wanted to. It is also the case that if what I am going to argue in the last part of this section is sound, then the question of the precise structural description of the protologic is in part an irreducibly *empirical* question, in that it will depend on some factual results in the psycholinguistic part of cognitive psychology. These somewhat negative points should be regarded as carrying a definitely positive scientific upshot, however. For if I am correct, then the \$64,000 question of the precise structural description of the protologic constitutes a new and important joint research program for logicians and cognitive psychologists.

Let me suppose for the purposes of argument that the existence of the protologic has been successfully established. Now I want to propose that the protologic is innately contained in a human cognitive faculty for logical representation, namely the logic faculty. And I want to argue for this claim empirically, by an extension of Chomsky's psycholinguistics.

According to Chomsky's psycholinguistics, whether in its early "transformational" version, or in its later and canonical "principles and parameters" version,<sup>36</sup> what is called a "phrase-structure" grammar (which is a grammar that decomposes all sentences into immediate constituents such as noun phrases, verb phrases, adjectival phrases, prepositional phrases, and so on, according to the rules) applies to each natural language.<sup>37</sup> The phrase-structure grammar of each natural language differs significantly from every other. If, by analogy with classical or elementary logic, we think of the phrase-structure grammar of our own language as "classical" or "elementary," then necessarily every other natural-language grammar is either an

<sup>36</sup> See, for example, Chomsky, *Syntactic Structures* (The Hague: Mouton, 1957); Chomsky, "Review of B.F. Skinner's Verbal Behavior," *Language*, xxxv (1959), 26–58; Chomsky, *Aspects of the Theory of Syntax* (Cambridge: MIT, 1965); and Chomsky, *Knowledge of Language* (Westport, CT: Praeger, 1986).

<sup>37</sup> See, for example, Vivian Cook and Mark Newson, *Chomsky's Universal Grammar* (Cambridge: Blackwell, 1996, 2<sup>nd</sup> ed.); and John Lyons, *Introduction to Theoretical Linguistics* (New York: Cambridge, 1968).

“extension” of it (if it preserves the same set of phrase-structure rules as our language but adds more—as in idiolects and dialects) or else a “deviant” of it (if it lacks or modifies some of the phrase-structure rules of our language—as in foreign languages). Yet Chomsky thinks that all of these as it were classical or elementary, extended, and deviant phrase-structure grammars presuppose a single set of underlying principles and concepts. This set of principles and concepts constitutes a generative universal grammar (UG) that is realized in all particular natural language grammars, yet in different ways, by setting certain formal parameters differently for each natural language.

Let me now apply this Chomskyan idea to the protologic. I have argued that the protologic consists in a single set of schematic logical structures, in the form of a coherent repertoire of metalogical principles and logical concepts, that is constructively presupposed by every logical system whatsoever, and is unrevisable and a priori (or epistemically presupposed). My proposal is that *the protologic stands to the many classical or elementary, extended, and deviant logics, precisely as Chomsky’s UG stands to the many native, idiolectic or dialectic, and foreign natural languages*. It needs to be particularly re-emphasized that the protologic is *not* to be identified with classical or elementary logic, or indeed with any nonclassical logic, just as the UG is *not* to be identified with the grammar of one’s native language, or indeed with the grammar of any other language. Therefore just as the UG is a super-grammar or sheer grammar that is nonempirically implicit in the construction, internal analysis, and cross-language comparison (which may be either consciously or nonconsciously available to speakers) of all natural languages, so too the protologic is a super-logic or sheer logic that is not merely nonempirically but also unrevisably implicit in the construction, internal analysis, and cross-logic comparison (which must be consciously as well as nonconsciously available to thinkers) of all classical or nonclassical logical systems.

According to Chomsky’s view, cognitive mastery or knowledge of a natural language is a person’s “linguistic competence,” which expresses her possession of an innate, universally-shared “language faculty” within her total cognitive capacity:

[O]ne of the faculties of the mind, common to the species, is a faculty of language that serves the two basic functions of rationalist theory: it provides a sensory system for the preliminary analysis of linguistic data, and a schematism that determines, quite narrowly, a certain class of grammars. Each grammar is a theory of a particular language, specifying formal and semantic properties of an infinite array of sentences. These sentences, each with its particular structure, constitute the language

generated by the grammar. The languages so generated are those that can be “learned” in the normal way. The language faculty, given appropriate stimulation, will construct a grammar; the person knows the language generated by the constructed grammar. This knowledge can then be used to understand what is heard and to produce discourse as an expression thought within the constraints of the internalized principles, in a manner appropriate to situations as these are conceived by other mental faculties, free of stimulus control.<sup>38</sup>

Furthermore, according to Chomsky, linguistic competence in this sense is to be sharply distinguished from “performance,” or the actual use of language in concrete contexts. Performance is notoriously variable and partially determined by external, contingent factors. Competence, by contrast, consists in the construction and possession of a comprehensive mental representation of a natural language, which Chomsky also calls an “internalized language” or “I-language.” The I-language is constructed by means of the innate “schematism” that is the generative UG:

Let us define “universal grammar” (UG) as the system of principles, conditions, and rules that are elements or properties of all human languages not merely by accident but by necessity.... Thus UG can be taken as expressing “the essence of human language.” UG will be invariant among humans. UG will specify what language learning must achieve, if it takes place successfully.... What is learned, the cognitive structure attained, must have the properties of UG, though it will have other properties as well, accidental properties. Each human language will conform to UG. If we were to construct a language violating UG, we would find that....it would not be learnable under normal conditions of access and exposure to data (*ibid.*, p. 29).

For the purposes of my argument in this section I am quite prepared to assume without further ado that Chomsky’s psycholinguistics is on the whole well supported both philosophically and empirically. But what is *most* important for my account is the fact that Chomsky holds (in effect, if not precisely in name) that what I am calling the protologic is built right into the UG, hence built innately into our innate language faculty. As he puts it in the text quoted as one of the epigraphs for this essay:

The logical notions are embedded in our deepest nature, in the very form of our language and thought, which is presumably why we can understand some kinds of logical systems quite readily, whereas others are inaccessible to us without considerable effort...if at all.

<sup>38</sup> Chomsky, *Reflections on Language* (New York: Pantheon, 1975), pp. 12–13.

To avoid confusion, we must distinguish between (i) the most-deeply-cognitively-embedded logical notions being described by Chomsky here, which I am identifying with the innate protologic, and (ii) what Chomsky specifically calls “Logical Form” or LF<sup>39</sup> in the context of the current version of his psycholinguistic theory, “the minimalist program.”<sup>40</sup> LF is a level of natural-language representation in Chomsky’s current model of linguistic competence that (i) combines both the underlying logical form of the sentences of a given natural language and their underlying semantic interpretations, and (ii) is related to phonological structure by means of syntactic structure. Still, LF *presupposes* the most-deeply-cognitively-embedded logical notions, or what I am calling the innate protologic.

In any case, the Chomskyan idea of “logical notions [that] are embedded in our deepest nature, in the very form of our language and thought,” or the idea (to use my twist on it) of the innate protologic, leads directly to the further idea of a “logical competence”<sup>41</sup> that is presupposed by linguistic competence. On this extended Chomskyan picture, every linguistically competent being constructs an internalized logic or “I-logic”<sup>42</sup> for the representation of the “natural logic”<sup>43</sup> of her own natural language, just insofar as she constructs an I-language for the representation of the grammar and semantics of her own natural language. In other words I am asserting that that every linguistically competent being constructs a *logic of thought* just insofar as she constructs a *language of thought*. But the crucial point for right now is that the innately-grounded logic of thought, as well as every other logical system whatsoever, both constructively and epistemically presupposes the protologic, just as any creature’s innately-grounded I-language, as well as every other language whatsoever, constructively presupposes the UG.

<sup>39</sup> See Norbert Hornstein, *Logic as Grammar* (Cambridge: MIT, 1984); and Robert May, *Logical Form* (Cambridge: MIT, 1985).

<sup>40</sup> See, for example, Chomsky, *The Minimalist Programme* (Cambridge: MIT, 1995); and Chomsky, *New Horizons in the Study of Language and Mind* (New York: Cambridge, 2000).

<sup>41</sup> See John Macnamara, *A Border Dispute: The Place of Logic in Psychology* (Cambridge: MIT, 1986), chapter 2.

<sup>42</sup> Both the notion of an internalized logic and the term ‘I-logic’ are mine: but they obviously mimic Chomsky’s “internalized language” or “I-language.”

<sup>43</sup> A natural logic is the logic that expresses our actual reasoning procedures. See M. Braine, “On the Relation between the Natural Logic of Reasoning and Standard Logic,” *Psychological Review*, LXXXV (1978): 1–21; and George Lakoff, “Linguistics and Natural Logic,” in Gilbert Harman and Donald Davidson, eds., *Semantics of Natural Language*, (Boston: Reidel, 1972), pp. 545–665.

This concludes my empirical argument for the logic faculty thesis, from Chomsky's psycholinguistics. Again, the nub of the argument is that on the assumption that Chomsky's psycholinguistics is factually true, then it entails the truth of the logic faculty thesis. This also means, however, that there is an irreducibly empirical component in the logic faculty thesis, and that the precise structural description of the protologic will depend in part on empirical results in cognitive psychology. So if I am correct, then there is a new and important joint research program for logicians and cognitive psychologists, built right on top of Chomskyan psycholinguistics, that consists in working out the precise structural description of the protologic.

## II. THE ETHICS OF LOGIC

By "the ethics of logic," I mean *the normativity of logic*. Normativity, as such, consists in the fact that there is a set of ideals, standards, guides, recommendations, commands, rules, principles, laws, and so on (hence "norms"), that govern human beliefs and intentional actions. Norms imply the existence of human values. Human values are, roughly speaking, whatever *matters* to human animals: whatever humans consciously care about, need, desire, prefer, choose, put their practical, affective, or cognitive faith in, and intentionally act for the sake of. As I will construe it, the normativity of something *X* is expressed by saying that there is something humans *oughtto* (or *may*) *believe or dobecause of X*. In other words, the normativity of *X* is the role *X* plays in the giving of reasons for human belief or intentional action, that is, in the justification of human belief or intentional action. More precisely then, *X* is normative if and only if *X* can be directly cited as a reason for human belief or intentional action, or anyhow is intrinsic to some reason for human belief or intentional action.

In a logical context, normativity consists in a certain relation between logic and human reasoning. To say that logic is normative is to say that humans *ought* to reason soundly or validly (more generally, cogently). Otherwise put, the normativity of logic consists in the fact, if it is a fact, that the justification of human beliefs or intentional actions depends on our ability to reason cogently. *If it is a fact*. Closer inspection reveals that there are various philosophical options with respect to the normativity of logic.

The first and most basic set of options, a binary pair, concerns the fact (if it is a fact) of logic's normativity itself. The options here divide as to whether logic is either (1A) a *normative* (that is, prescriptive or evaluative) science, or else (1B) a *non-normative* (that is, descriptive or factual) science.

Assuming that logic is normative, there is a further binary pair of options that divide as to whether the normativity of logic is either (2A) an *intrinsic* (that is, a necessary, relational or nonrelational) feature of it, or else (2B) an *extrinsic* (that is, an accidental, relational or nonrelational) feature of it.<sup>44</sup>

A third binary pair of options also falls under the assumption that logic is normative, and divide as to whether logic has either (3A) *categorical* (that is, unconditional, noninstrumental) normativity, or else (3B) *hypothetical* (that is, conditional, instrumental) normativity. This distinction can be expressed by saying that something *X* is categorically normative if and only if humans ought to believe or do *Y* because of *X* under all sets of circumstances and primarily because of *X* alone; whereas something *X* is hypothetically normative if and only if humans ought to believe or do *Y* because of *X* only in certain circumstances and primarily because of something else *Z*.

The third pair combines with the second pair to provide a fourth and seemingly exhaustive set of options, all under the assumption that logic is normative. Thus logic is either (4A) *intrinsically categorically normative*, (4B) *extrinsically categorically normative*, (4C) *intrinsically hypothetically normative*, or (4D) *extrinsically hypothetically normative*. These options in turn map fairly smoothly onto various historically real philosophical doctrines about the nature of logic.

The general idea that logic and human reasoning or human thinking are normatively connected goes at least as far back as the Cartesian logicians of Port Royal in the seventeenth century. Arnaud and Nicole construed logic as *l'art de penser*, or the art of thinking.<sup>45</sup> According to this view, the nature of logic is that it tells us how we ought to reason or think if we want to be good metaphysicians, mathematicians, or natural scientists. Logic is strictly a systematic means to this end: in effect, a *technology* of thinking. So the Port Royalists held that logic is intrinsically hypothetically normative (and thus falls under (4C)). Essentially the same view was later defended in

<sup>44</sup> For convenience, I focus on options that assume the normativity of logic. But strictly speaking, since something can be both intrinsically *non-F* and also extrinsically *F* (that is, in relation to something else), this opens up the possibility that logic is both intrinsically non-normative and also extrinsically normative. In fact, as we shall see, most recent and contemporary writers of introductory logic textbooks hold that logic is intrinsically non-normative and also extrinsically normative.

<sup>45</sup> See Arnauld and Nicole, *Logic or the Art of Thinking*, Jill Vance Buroker, trans. (New York: Cambridge, 1996); Stephen Gaukroger, *Cartesian Logic* (New York: Oxford, 1989); and William Kneale and Martha Kneale, *The Development of Logic* (New York: Oxford, 1984), pp. 315–20.

the mid-nineteenth century by Mill.<sup>46</sup> The logic-as-technology-of-thinking view, for reasons that I will mention shortly, went down in flames at the turn of the twentieth century along with logical psychologism, but has been resuscitated in a contemporary context by logical nonfactualists or expressivists, who hold that the nature of logic is prescriptive, instrumental, and social: the laws, truths, and proofs of logic are nothing but ways we ought to talk when logicizing, and we logicize in order to serve the ends of more basic human practices, such as belief formation.<sup>47</sup>

The sharply different idea of logic as the science of “the laws of thought” goes back to Kant in the eighteenth century. It was later picked up by Boole in the mid-nineteenth, and again by Frege in the late nineteenth and early twentieth, for example:

Like ethics, logic can also be called a normative science. How must I think in order to reach the goal, truth?... [T]he task we assign logic is only that of saying what holds with the utmost generality for all thinking, whatever its subject matter. We must assume that the rules for our thinking and for our holding something to be true are prescribed by the laws of truth.<sup>48</sup>

[The laws of logic] have a special title to the name ‘laws of thought’ only if we mean to assert that they are the most general laws which prescribe the way in which one ought to think if one is to think at all.<sup>49</sup>

On the Kant-Boole-Frege view, logic is the universal, topic-neutral, a priori science of the necessary laws of truth, and also a pure normative science based directly on rationality itself. Logic tells us *how we ought to reason or think in every possible set of circumstances because this is required by the nature of rationality*. So logic is intrinsically categorically normative (and thus falls under (4A)): logic is a moral science. For convenience, I dub this the *moral science conception of logic*.

Ironically enough, despite Frege’s explicit support for the moral science conception of logic, that conception did not survive the late nineteenth and early twentieth century critique of psychologism

<sup>46</sup> See Mill, *System of Logic* (London: Longmans, Green, and Co., 1879); and Edmund Husserl, *Prolegomena to Pure Logic*, in *Logical Investigations*, Volumes 1–2 J.N. Findlay, trans. (London: Routledge and Kegan Paul, 1970), Volume 1, pp. 51–247, at p. 76.

<sup>47</sup> See, for example, Michael Resnik, “Logic: Normative or Descriptive? The Ethics of Belief or a Branch of Psychology?,” *Philosophy of Science*, LII (1985): 221–38; and Resnik, “Ought There to be but One Logic?,” in B.J. Copeland, ed., *Logic and Reality: Essays on the Legacy of Arthur Prior* (New York: Oxford, 1996), pp. 489–517, at pp. 510–14.

<sup>48</sup> Frege, “Logic [1897],” in Frege, *Posthumous Writings*, P. Long et al., trans. (Chicago: University Press, 1979), pp.127–51, at p. 128.

<sup>49</sup> Frege, *Basic Laws of Arithmetic* M. Furth trans. (Berkeley: California UP, 1964), p. 12.

which Frege himself initiated. Not too surprisingly, this was mainly Husserl's doing. In the *Prolegomena to Pure Logic*, Husserl vigorously rejects not only logical psychologism, but also the intrinsic normativity of logic. If sound, this rejection rules out the very ideas of both the intrinsic categorical normativity of logic (that is, (4A)) and also the intrinsic hypothetical normativity of logic (that is, (4C)), thus dispensing with Kant, Boole, Frege, Arnaud and Nicole, Mill, and contemporary logical nonfactualists in one fell swoop. More positively expressed, Husserl claims that logic is an intrinsically nonnormative, descriptive, or factual science (and thus falls under (1B)).

Following Husserl, most recent and contemporary writers of introductory logic textbooks start from the assumption that the intrinsic normativity of logic is as questionable as logical psychologism. So logic is an intrinsically non-normative, descriptive, or factual science. But at the same time they also hold that logic is *extrinsically* normative, in relation to everyday human reasoning.<sup>50</sup> According to these writers, we rational humans *ought* to follow logical rules, either because this is required by rationality itself (and rationality is extrinsic to logic) or because it promotes other important human interests. In other words, for these writers, despite the fact that logic is an intrinsically non-normative science, it remains either extrinsically categorically normative (and thus falls under (4B)) or extrinsically hypothetically normative (and thus falls under (4D)). In other words, they hold that despite the fact that logic is essentially the science of the necessary relation of consequence, or the science of proof, or the science of truth, or whatever, nevertheless it is a *very good thing indeed* to study logic.

This brings us to Otto Weininger. Weininger thinks that obeying the laws of logic is something we ought to do precisely because it belongs to the strict moral duties we have towards ourselves. He thereby holds that logic is intrinsically categorically normative (and thus falls under (4A)), but for reasons quite different from those found in the moral science conception of logic. According to the moral science conception, logic is intrinsically categorically normative because it is based on rationality itself (hence rationality is intrinsic to logic) and is also an *integral part of* human morality, namely the part that consists in justifying moral judgments and decisions, including direct moral arguments and reflective equilibrium. But Weininger takes the much stronger view that logic is *iden-*

<sup>50</sup> See, for example., Stephen Barker, *Elements of Logic* (New York: McGraw Hill, 1980, 3<sup>rd</sup> ed.), p. 4; Irving Copi, *Symbolic Logic* (New York: Macmillan, 1973, 4<sup>th</sup> ed.), p. 2; and Wesley Salmon, *Logic* (Englewood Cliffs, NJ: Prentice Hall, 1963), p. 8.

*tical with human morality.* Weininger's extreme view, in turn, seems to have been personally shared by the early Wittgenstein:

[Wittgenstein] used to come to see me every evening at midnight, and pace up and down my room like a wild beast for three hours in agitated silence. Once I said to him: "Are you thinking about logic or about your sins?" "Both," he replied, and continued his pacing.<sup>51</sup>

In the rest of this section and the next, I sketch and defend a broadly Kantian and cognitivist version of the moral science conception of logic. As I do so however, it is crucial to remember that the moral science conception of logic and the highly moralistic Weininger-Wittgenstein conception of logic are distinct.

As I mentioned, Husserl's *Prolegomena* effectively prevented the transmission of Frege's moral science conception of logic into mainstream European and Anglo-American twentieth century philosophy, by attacking the thesis that logic is intrinsically normative. Husserl has three basic objections to the intrinsic normativity thesis.<sup>52</sup> First, logical laws, truths, and proofs are not framed by logicians in normative terms (for example, as imperatives), but rather purely in alethic modal terms (for example, as necessary laws, truths, or proofs). Second, every normative discipline presupposes a more basic theoretical discipline that establishes the existence and nature of the facts that are taken to have the relevant normative properties. So even if there are normative disciplines connected with logic, logic itself is needed as a distinct non-normative science in order to ground those normative disciplines. And third, the thesis that logic is normative entails logical psychologism, and logical psychologism is false: so it is also false that logic is intrinsically normative.

Husserl's first objection can be seen to fail as soon as we note that in natural deduction systems (for example, Gentzen's<sup>53</sup>), logical inference rules are explicitly expressed as Rylean "inference-tickets" or generalized permissions. And even in Frege's *Begriffsschrift*, which is an axiomatic system, inference rules are explicitly not accorded the status of truth bearers but instead are assigned a normative role.<sup>54</sup> So there is no inconsistency in ascribing alethic modal properties and normative properties to logical language within one and the same

<sup>51</sup> Russell, *Autobiography* (London: Unwin, 1975), p. 330.

<sup>52</sup> See Husserl, *Prolegomena to Pure Logic*, chapters 1–3.

<sup>53</sup> See Gerhard Gentzen, "Investigations into Logical Deduction," in *The Collected Papers of Gerhard Gentzen*, Mary Szabo, trans. (Amsterdam: North Holland, 1969), pp. 68–131.

<sup>54</sup> See Thomas Ricketts, "Frege, the *Tractatus*, and the Logocentric Predicament," *Philosophers' Annual*, VIII (1985), 247–59.

logical system. Indeed, since it is a general feature of logical consequence or entailment that every logical truth follows from any set of premises including the empty set of premises, then for every logical truth in every logical system there is a corresponding permission to infer that sentence from any set of premises. So for every logical truth in every logical system a corresponding normative sentence carrying the same logical force can be formulated.

Husserl's second objection fails because it has a false assumption. He assumes that to claim that logic is intrinsically normative is automatically to make a reductive claim to the effect that logic is "nothing over and above" some set of normative facts. Assuming such a reduction, it would indeed follow that logic could be legitimately framed in alethic modal terms only if normative logical disciplines had a non-normative logical grounding. Now it is true that some versions of the thesis that logic is intrinsically normative are indeed reductive. Most noncognitivist theories of logic, for example, can plausibly be read as reductive. But clearly it is also possible consistently to hold (1) that logic is a non-normative discipline in the sense that every logic explicitly contains within itself language that is intrinsically descriptive or factual, (2) that logic is *also* a normative discipline in the sense that every logic explicitly (as in natural deduction systems, and in some axiomatic systems) or implicitly (as in other axiomatic systems) contains within itself language that is intrinsically prescriptive or evaluative, and (3) that the nonnormative and normative parts of logic are complementary (so for every logical truth in every logical system, there is a corresponding normative sentence legitimating an inference to that sentence from any set of premises, and conversely) and mutually irreducible. On this nonreductive approach, logic is intrinsically descriptive *and* intrinsically prescriptive.

This leaves us with Husserl's third objection, to the effect that the intrinsic normativity of logic entails logical psychologism. And here is where the distinction between hypothetical and categorical normativity is crucially salient. Logical psychologism is a form of scientific naturalism that consists in the explanatory reduction of logic to empirical psychology.<sup>55</sup> Now Husserl makes the correct point that some forms of logical psychologism also assert the thesis that logic is intrinsically normative. Mill's theory of logic, for example, shows that it is possible to hold both that logic is intrinsically hypothetically normative and that logic is explanatorily reducible to empirical psychology. And it also seems to be true that if one

<sup>55</sup> See Robert Hanna, *Rationality and Logic* (Cambridge: MIT, forthcoming), chapter 1.

wants to hold that logic is intrinsically normative *and also* that it is explanatorily reducible to empirical psychology, then one must also hold that logic is intrinsically *hypothetically* normative, because both require that logic is dependent on contingent facts of some sort, whether actual human interests or the natural facts. But the plain truth is that not every theory that takes logic to be intrinsically normative is psychologistic: at least some versions of the thesis that logic is intrinsically *categorically* normative are nonpsychologistic,<sup>56</sup> including Kant's and Frege's normative theories of logic. Take for example Kant's normative theory of logic. Kant holds that the logical "ought" has the same deontic force as the moral "ought":

In logic...the question is not about *contingent* but about *necessary* rules; not how we think, but about how we ought to think.<sup>57</sup>

What I call applied logic...is thus a representation of the understanding and the rules of its necessary use *in concreto*, namely under the contingent conditions of the subject.... General and pure logic is related to [applied logic] as pure morality, which contains the necessary moral laws of a free will in general, is related to the doctrine of virtue proper, which assesses these laws under the hindrances of the feelings, inclinations, and passions to which human beings are more or less subject.<sup>58</sup>

Kant's ethics, in turn, explicitly states that moral prescriptions *inherently fail* to be strictly determined by either actual human interests or the natural facts. It is built into the very idea of pure practical reason that the categorical imperative or moral law is universally binding on rational beings, including all rational humans; that the categorical imperative is underdetermined by all actual or possible human interests or natural facts; and that a rational agent is capable of acting not merely in accordance with but also *from* the categorical imperative and (if necessary) in opposition to all actual or possible human interests and all actual or possible natural facts.<sup>59</sup>

<sup>56</sup> It is also true that some versions of the thesis that logic is intrinsically hypothetically normative are non-psychologistic. See, for example, Resnik, "Logic: Normative or Descriptive? The Ethics of Belief or a Branch of Psychology?" Still, every psychologistic theory of logic holding that logic is intrinsically normative must also hold that logic is hypothetically normative.

<sup>57</sup> Kant, *The Jäsche Logic*, p. 529.

<sup>58</sup> Kant, *Critique of Pure Reason*, A54–55/B78–79.

<sup>59</sup> See Kant, *Groundwork of the Metaphysics of Morals*, in *Practical Philosophy*, Mary Gregor, trans. (New York: Cambridge, 1996), pp. 37–108.

So Kant's normative theory of logic entails that logical prescriptions are neither dependent on actual human interests nor logically strongly supervenient on the natural facts. That is, it entails that his logic is nonpsychologistic:

Pure logic...has no empirical principles, thus it draws nothing from psychology.<sup>60</sup>

Some logicians...do presuppose *psychological* principles in logic. But to bring such principles into logic is just as absurd as to derive morals from life.<sup>61</sup>

Kant's logic and ethics are of course controversial. The relevant point here however, is not whether Kant's logic and ethics are *defensible*, but instead whether the thesis that logic is intrinsically categorically normative is *intelligible*. So Husserl's third objection does not apply to at least some views holding that logic is intrinsically categorically normative.

Rejecting Husserl's three objections to the intrinsic normativity of logic leaves open a window for Kantian constructivism in logical theory, in three ways. First, KCLT asserts that despite the fact that every classical or nonclassical logical system is a non-normative, factual, or descriptive science of the necessary relation of consequence, it *also* has a normative part corresponding directly to its non-normative part. This can be easily seen in natural deduction systems, which explicitly contain inference rules; and it is also implicit in the very idea of a logical truth, which corresponds to a permission to deduce it from any set of premises. But even more fundamentally this can be seen in the fact that the protologic, as a set of logical principles and concepts for constructing logical systems, is inherently normative precisely insofar as it is a set of schematic permissions to construct logical systems *in just these ways and not in other ways*. The protologic does not tell us how rational humans actually *do* construct logical systems under real-world conditions. Similarly, Chomsky's UG is a *prescriptive* and not a descriptive grammar: it tells us how humans are *permitted* to construct natural languages by virtue of their innate cognitive endowment for language, not how they actually *do* construct their natural languages under real-world conditions. Second, KCLT asserts that the non-normative and normative parts of logic are mutually complementary and mutually irreducible. Third, KCLT asserts that the protologic is intrinsically categorically normative for human reasoning: in other

<sup>60</sup> Kant, *Critique of Pure Reason*, A54/B78.

<sup>61</sup> Kant, *The Jäsche Logic*, p. 529.

words, that the protologic supplies “basic a priori rules of rationality.”<sup>62</sup> It is the third claim that is most important and most controversial. The task of the next section is to argue for it.

### III. LOGIC AS A SYSTEM OF CATEGORICAL IMPERATIVES FOR REASONING

Before getting down to the argument itself however, I want to pursue a little further the parallel between KCLT on the one hand, and Kant’s own logic and ethics on the other, as a way of elaborating the thesis that logic is intrinsically categorically normative. In her seminal essay, “Morality as a System of Hypothetical Imperatives,” Philippa Foot directly and vigorously challenged all forms of Kantian ethics.<sup>63</sup> Reduced to its essentials, Foot argues that Kant’s categorical imperative is an overly rigid, overly abstract, and ultimately empty bit of formalism: since it provides no motivation for following it, the categorical imperative fails to yield genuinely action-guiding principles. Universal prescriptivism of any sort fails. Only a system of hypothetical imperatives, that is, a system of practical commands or prescriptive rules based explicitly on natural or empirical facts about particular human needs and aims given under particular social-historical conditions, can genuinely guide action.

Morality, says Foot, is more akin to rules of etiquette than it is to a system of categorical prescriptions (*Ibid.*, p. 164). Rules of etiquette are codes of conduct for highly localized and relatively unimportant human practices. The only difference between etiquette and morality is the extent to which members of the broader human community have achieved a certain wide solidarity or shared caring about the relevant practices. So morality is nothing but “optimally well-entrenched” or “globalized” etiquette, that is, etiquette that has established itself across all significant human practices, in the sense that all or most of the members of the human community have explicitly or tacitly adopted its otherwise merely local aims as “common aims.” Given these common aims, and *only* given these common aims, a set of hypothetical, conditioned, or instrumental moral prescriptions will follow.

A precise analogue of Foot’s complaint against Kantian ethics can be found in the conventionalist theory of logic. According to logical conventionalism, one can (whether individually or socially) create and adopt any logical system one likes by stipulating a certain set of logical axioms or postulates, and also the rules of formation, trans-

<sup>62</sup> See Ralph Wedgwood, “The A Priori Rules of Rationality,” *Philosophy and Phenomenological Research*, LIX (1999): 113–31, especially at p. 128.

<sup>63</sup> Foot, “Morality as a System of Hypothetical Imperatives,” in *Virtues and Vices* (Berkeley: California UP, 1978), pp. 157–73.

formation, and interpretation. And it is a central feature of logical conventionalism that what motivates the formal system's creation and adoption is not itself cognitive or theoretical: indeed, it is essentially noncognitive or interest-driven, hence voluntaristic or at least pragmatic. This view is nicely encapsulated in Rudolf Carnap's famous declaration in section 17 of *The Logical Syntax of Language*.

In the foregoing we have discussed several examples of negative requirements... by which certain common forms of language—methods of expression and of inference—would be excluded. Our attitude to requirements of this kind is given a general formulation in the *Principle of Tolerance*: *It is not our business to set up prohibitions, but to arrive at conventions.... In logic there are no morals. Everyone is at liberty to build up his own logic, i.e., his own form of language, as he wishes (op .cit., p. 51–52).*

The very idea of an intrinsically categorically normative logic is undermined, Carnap thinks, by the existence of nonclassical logics. We must be radically open to the unlimited possibilities for creating alternative logics and to the diverse human motivations for modifying and challenging classical logic. In other words for Carnap, at least where logic is concerned, “anything goes.”

But there is an obvious way in which Carnap's conventionalism fails. As Quine famously argued, in order to give a conventionalist definition of logical truth, conventionalism must presuppose and use preconventionalized logic, and thereby logically stultifies itself.<sup>64</sup> Foot's conventionalist conception of morality suffers from an analogous problem. If morality is to be interestingly different from mere etiquette, that is, if one is to crank up a local system of hypothetical imperatives into a truly global system that applies even to *prospective* and *possible* members of our community, then one must presuppose and use the very idea of a categorical imperative. For in terms of its syntactic or semantic structure a “globalized” hypothetical imperative is nothing but a *relativized* categorical imperative. That is, a globalized hypothetical imperative to do *A* is nothing but a categorical imperative (“Everyone ought to do *A*”) containing within its scope a material antecedent condition which is an arbitrarily-chosen set of *human interest postulates*, call that set ‘ $\Gamma$ ’:

Everyone ought (If  $\Gamma$ , then to do *A*).

Similarly, a hypothetically or relatively logically necessary sentence *H* is nothing but a relativized logical necessity. That is, *H* is nothing

<sup>64</sup> See Quine, “Truth by Convention,” in *The Ways of Paradox* (Cambridge: Harvard, 1976, 2<sup>nd</sup> ed.), pp. 77–106.

but the consequent of a logically necessary material conditional containing within its scope an antecedent material condition which is an arbitrarily-chosen set of theoretical postulates (for example, meaning-postulates, scientific laws, and so on), call it ‘ $\Delta$ ’:

Logically necessarily ( $\Delta \rightarrow H$ ).

Here is the moral of the story. Just as you cannot rationally escape from pre-conventionalized logic by making logic conventional at the level of your object-language (since pre-conventionalized logic inevitably returns to haunt you in your metalanguage), so too you cannot rationally escape from categorical imperatives by making morality hypothetical or conventional at the level of first-order ethics (since categorical, pre-conventionalized morality inevitably returns to haunt you in your metaethics). And in a long footnote added to “Morality as System of Hypothetical Imperatives” in 1977, Foot as much as admits this:

Kant’s thought seems to be that universal rules are universally valid in that they are inescapable, that no one can contract out of morality, and above all that no one can say that as he does not happen to care about the ends of morality, morality does not apply to him. This thought about inescapability is very important, and we should pause to consider it. It is perhaps Kant’s most compelling argument against the hypothetical imperative, and the one that may make Kantians of us all (*op. cit.*, p. 171)

And the same point goes, I hasten to add, for logic. To say that logic is intrinsically categorically normative is simply to say that logic is rationally humanly inescapable, or at least to say that *the protologic* is rationally humanly inescapable (as justification for this claim, see the argument for the intrinsic categorical normativity of the protologic to follow shortly).

In any case Foot seriously but instructively misinterprets Kantian ethics, as Onora O’Neill has shown.<sup>65</sup> It is a mistake to think of Kant’s categorical imperative as a superstrong first-order principle for action (or what Kant calls a “maxim”), that is, as an all-purpose practical decision procedure or algorithm. On the contrary, the categorical imperative is a second-order procedural principle applying universally to maxims. Negatively described, the categorical imperative is a filter for screening out bad maxims; positively described, it is a constructive protocol for correctly generating maxims, given the multifarious array of concrete input materials to practical reasoning,

<sup>65</sup> See Onora (Nell) O’Neill, *Acting on Principle* (New York: Columbia, 1975); and O’Neill *Constructions of Reason* (New York: Cambridge, 1989).

including beliefs, desires, habits, personal situation, social-historical context, and so on. Thus the categorical imperative says, roughly:

Act *only* according to those maxims that every rational human being could adopt, and that remain consistent with our innate rational capacity for constructing and acting upon maxims.

This version of Kantian ethics is what O'Neill, extending and modifying the work of John Rawls, aptly calls "Kantian constructivism."<sup>66</sup> The crucial point is that we cannot say in advance of actual practical reasoning processes just *which* maxims will turn out to be permissible or obligatory, but we can know a priori that any maxim that will count as action-guiding *must* have a format or structure that is determined by the categorical imperative.

Where this line of argument is heading should be fairly obvious. Just as a constructivist Kantian ethics can get around both the objections and the internal problems of moral conventionalism, so too KCLT can get around both the objections and the internal problems of logical conventionalism. And O'Neill even supplies us with a good map of the conceptual terrain I want to occupy:

The Categorical Imperative is the supreme principle of reasoning not because it is an algorithm either for thought or for action, but because it is an indispensable strategy for disciplining thinking or action in ways that are not contingent on specific and variable circumstances. The Categorical Imperative is a fundamental strategy, not an algorithm; it is the fundamental strategy not just of morality but *of all activity that counts as reasoned*. The supreme principle of reason is merely the principle of thinking and acting on principles that can (not "do") hold for all.<sup>67</sup>

O'Neill is saying that the basis for the construction of any rational scheme of principles, whether that scheme is to be thought-guiding (logic) or intentional action-guiding (morality), is the categorical imperative. As applied to intentional action, the categorical imperative says that any first-order action-guiding principle must be universalizable, nonexploitative, and so on. But as the logical cognitivist would put it, as applied to thought, the categorical imperative says that every reasoning process must conform to the protologic:

<sup>66</sup> See O'Neill, *Constructions of Reason*, chapter 11. See also Thomas Hill, "Kantian Constructivism in Ethics," *Ethics*, xcix (1989): 752–70; Rawls, "Kantian Constructivism in Moral Theory"; and Rawls, "Themes in Kant's Moral Philosophy," in Eckhart Förster, ed., *Kant's Transcendental Deductions* (Stanford: University Press, 1989), pp. 81–113.

<sup>67</sup> O'Neill, *Constructions of Reason*, pp. 58–59, emphasis added.

Think *only* according to those processes of reasoning that satisfy the protologic.

Thus according to KCLT, following the principles and concepts of the protologic is not only required by human reasoning, but is also a *strict duty* for all human reasoning. And even though any such process of reasoning constructed in our logic of thought and our language of thought by means of the protologic will always have a more or less limited application that is determined by the inescapably contingent creature-based and world-based constraints under which that reasoning process occurs, *nevertheless* reasoning according to the principles and concepts of the protologic remains an obligation for every rational human animal in every cognitive context whatsoever.

In this way, to say that “logic is a system of categorical imperatives for reasoning” is just to say that *the protologic is intrinsically categorically normative for human reasoning*. Here now is an explicit argument for this thesis.

- (1) Something is normative if and only if it can be cited as a reason for human belief or intentional action, or is intrinsic to some reason for human belief or intentional action. (From the definition of the concept of “normativity” in section 1.)
- (2) Every inferential justification of human belief or intentional action involves the logical entailment of some sentence describing a belief (call it a “belief report”) or an intentional action (call it an “action-report”) by premises that describe reasons for that belief or action (call them “belief premises” or “action premises” respectively). (Premise.)
- (3) The logical entailment of a belief report or action report by belief premises or action premises, as understood by a rational human agent, involves some or another concept of logical consequence in the agent’s logic of thought. (From (2), and the logic faculty thesis.)
- (4) The protologic enters intrinsically into every logical system insofar as it is both constructively and epistemically presupposed by every logical system. (From the logic faculty thesis.)
- (5) So the protologic enters intrinsically into every inferential justification of human belief or intentional action. (From (2) – (4).)
- (6) So the protologic is intrinsically normative. (From (1) and (5).)
- (7) The intrinsic normativity of the protologic is not instrumental, or based on actual human interests, because the protologic is not dependent on contingent facts, including of course actual human interests. (From the logic faculty thesis.)

- (8) Therefore the protologic is intrinsically categorically normative. (From (6) and (7).)
- (9) The protologic enters intrinsically into all human reasoning, because (i) the protologic is used and presupposed in the construction, self-analysis, and self-evaluation of each rational human cognizer's own logic of thought, and (ii) each rational human cognizer's logic of thought constitutes his processes of reasoning. (From the logic faculty thesis.)
- (10) Therefore the protologic is intrinsically categorically normative for human reasoning. (From (8) and (9).)

As I indicated in steps (1), (3), (4), (7), and (9), this argument relies heavily on the logic faculty thesis, which I have argued for in section I and need not defend again here. The only step that needs independent support is step (2). Here the simple rationale is that if I am inferentially to justify a belief of mine or an intentional action of mine then obviously I must offer reasons for that belief or intentional action, and just as obviously the premises describing those reasons must *logically entail*, under some or another version of logical consequence or entailment, a conclusion describing my belief or my intentional action. How *else* could I inferentially justify a belief or intentional action of mine? Inferential justification, or the inferential giving of sufficient reasons for some human belief or intentional action (and this captures the very pith and marrow of a rational "because") is obviously inherently *logical*, precisely because it is *inferential*.

It should be noted that the version of logical consequence or entailment by virtue of which my belief premises or action premises entail my belief report or action report, need not always be *classical* consequence or entailment (that is, the sort of consequence or entailment we find in elementary logic), but can in principle be any sort of classical or nonclassical consequence or entailment. KCLT does not say that any *particular* classical or nonclassical logic supplies categorical imperatives for all human reasoning. Instead KCLT says that any logical system we use in any sort of reasoning more or less implicitly, but always intrinsically, invokes the principles and concepts of the protologic as categorical imperatives for that reasoning.

#### IV. CONCLUSION

You have probably already thought of an obvious objection to my claim, which follows directly from my Kantian constructivism in logical theory, that rational human animals are inherently logical

animals in the sense that they are logical moralists. The objection is that I have falsely substituted an ideally rational, perfect, unhuman, Mr Spock-like (or Data-like, for younger Trekkies) reasoner for real, imperfect, rational *human animals*. But we all know from first-hand experience that we constantly reason inconsistently or invalidly, shift to mere rhetoric and sophistry when moved by our desires or emotions, get confused, and so on. And the well-known empirical research in cognitive psychology on “the reasoning tests,” and in particular on “Wason’s selection task,” shows clearly that humans of ordinary or higher intellectual ability are generally very bad at logical deduction tasks.<sup>68</sup> So you will say that we cannot possibly be inherently logical animals in the sense that we are logical moralists: How then could we ever make a logical mistake?

My reply is that the obvious objection is based on an error about how the word ‘logical’ functions in “logical animals”. ‘Logical’ as it used in this phrase is not primarily a descriptive term referring to any of the sciences of the necessary relation of consequence, that is, to any particular classical or nonclassical logical system, but instead is primarily a *prescriptive* term implicitly referring to the protologic. The protologic is intrinsically categorically normative for us, and there are good reasons to hold that we do indeed perfectly obey the protologic whenever we reason:<sup>69</sup> but it certainly does *not* follow that we always or even usually reason cogently under real-world conditions in relation to any particular classical or nonclassical logical system. As Boole very aptly remarks:

The...laws of reasoning are, properly speaking, the laws of right reasoning only, and their actual transgression is a perpetually recurring phenomenon. Error, which has no place in the material system [of physical nature], occupies a large one here. We must accept this as one of those ultimate facts.<sup>70</sup>

Objection that we do not actually reason thus. Reply: It is a mistake to suppose that the actual performances of our nature in any case fully

<sup>68</sup> See Peter Wason, “Reasoning,” in Brian Foss, ed., *New Horizons in Psychology* (Baltimore: Penguin, 1966), pp. 135–51; Wason, “Reasoning about a Rule,” *Quarterly Journal of Experimental Psychology*, xx (1968): 273–81; and Wason and Philip Johnson-Laird, *The Psychology of Reasoning* (Cambridge: Harvard University Press, 1972). Similar results have been discovered in connection with probabilistic reasoning tasks. See Daniel Kahneman, Paul Slovic, and Amos Tversky, eds., *Judgment under Uncertainty: Heuristics and Biases* (New York: Cambridge, 1982); and Tversky and Kahneman, “Extensional vs. Intuitive Reasoning: The Conjunction Fallacy in Probability Judgment,” *Psychology Review*, xc (1983): 293–315.

<sup>69</sup> See Hanna, chapter 5.

<sup>70</sup> Boole, *An Investigation of the Laws of Thought* (Cambridge: Macmillan, 1854), p. 408.

answer to its faculties and capacities. We are in all things constituted with reference to an ideal standard.<sup>71</sup>

In other words, rational human animals are creatures with very high logical standards in one sense (as regards our conception of an ideal logical reasoner); and with very high logical success rates in another sense (as regards the protologic); but, sadly, also with very low logical success rates in still another sense (as regards any particular constructed logical system, classical or nonclassical, given the multitude of nonlogical factors affecting logical performance in the real world<sup>72</sup>). The categorically normative “ought” governing logical reasoning performance certainly does not imply a factual “is.” The crucial general fact about our rationality in respect of logic is not our logical performance, but rather that reasoning cogently inevitably *matters* to us. Just as only an essentially moral animal would ever care about committing sins, so too only an essentially logical animal would ever care about committing fallacies. But just because by virtue of our being inherently moral and logical animals, it follows that we rational humans thereby care both constitutively and profoundly about morality and logic, that does not stop us from committing *lots and lots* of sins and fallacies. Alas.

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<sup>71</sup> Boole, “Extracts from a Paper Entitled ‘On the Mathematical Theory of Logic and on the Philosophical Interpretations of Its Methods and Processes’ (1855 or 1856),” in Boole, *Studies in Logic and Probability*, pp. 230–46, at p. 246.

<sup>72</sup> See, for example, Richard Griggs and James Cox, “The Elusive Thematic Materials Effect in Wason’s Selection Task,” *British Journal of Psychology*, LXXIII (1982): 407–20.