Introduction: Logic, Philosophy, and Philosophical Logic

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1   Philosophy as Logic

It has been many years since Bertrand Russell provocatively identified philosophy with logic. Although some logicians and philosophers continue to accept Russell's thesis, not least because it bears the stamp of Russell's authority in both fields, most commentators today prefer to describe the relationship between logic and philosophy as more complex. If logic remains important to philosophy, and philosophy to logic, it is undoubtedly because of what each can offer the other as an autonomous discipline.

Logic is no longer the monolithic edifice to which Russell could point in 1914, when in *Our Knowledge of the External World*, he made his famous observation that: "[E]very philosophical problem, when it is subjected to the necessary analysis and purification, is found either to be not really philosophical at all, or else to be, in the sense in which we are using the word, logical" (1914: 42). When contemporary philosophers speak of logic, they generally mean to refer to any of a variety of alternative formal symbolisms that can be used to formulate particular aspects of the formal inferential structures of language, including but not limited to languages in which philosophical ideas are conveyed. While logic is a useful tool in clarifying and perspicuously representing philosophical reasoning, many philosophers believe that there are areas, indeed, most parts, of legitimate philosophical inquiry, that have nothing directly to do with the specialized study of formal symbolic logic. Such a conclusion is especially plausible when philosophy is viewed broadly to include literary as well as scientific projects, particularly those that do not use or take any special notice of logic and mathematics, and that may even disclaim efforts to arrive at the truth about any philosophical subject, as in certain outgrowths of postmodern philosophy. Russell also feels the need to qualify the identification of philosophy with logic, adding immediately after his statement quoted above: "But as the word 'logic' is never used in the same sense by two different philosophers, some explanation of what I mean by the word is indispensable at the outset" (1914: 42).

The fact, as Russell observes, that philosophers have many different ideas of logic constitutes one of the most fundamental problems for philosophical logic and the philosophy of logic. To define the concept of logic, to understand the diverse kinds of systems that have been considered logics, and to arrive at a satisfactory definition of

the concept of logic that applies alike to Aristotelian syllogisms, Boolean algebras, Frege's *Begriffsschrift*, Whitehead and Russell's *Principia Mathematica*, and unlimitedly many nonstandard formal systems, and informal logic in several traditions, grading off into rhetoric, argumentation theory, and discourse analysis, is a formidable task. What makes all of these projects logical, a part or different forms of logic, or distinct logics? A working definition that may be correct if somewhat uninformative as far as it goes is to say that logic in any of its manifestations is the systematic study of principles of correct reasoning. The principles of logic can then be explored formally or informally, and by any of a number of different styles of exposition, some of which may be highly specialized in dealing with very particular areas of reasoning.

Logic is both a symbolism for the expression of the formal structures of thought and an inference mechanism for calculating and drawing conclusions from assumptions in reasoning. The dual nature of logic has figured prominently in the range of issues that have come to be associated with the problems of philosophical logic.

2   Logic and Philosophy of Language

A primary source of problems in philosophical logic is the analysis of language. Philosophers are interested in language and semantics or theory of meaning for a number of reasons. The problems and methods of applied logic in studying the philosophy of language are directly associated with the traditional domain of philosophical logic.

Language facility distinguishes human beings from other animals we know of, higher primates who have been taught by humans to make limited use of sign-language and computer push-button languages notwithstanding. Philosophers interested in human nature and what makes our species unique in the animal kingdom as a result are attracted to problems of understanding language as a way of gaining insight into the human condition. The complexity of language and the difficulty of formulating an adequate theory of meaning for ordinary and scientific language by itself is a sufficient invitation for many philosophers to answer the challenge of articulating a philosophical semantics. More importantly, logicians and philosophers in the analytic tradition have considered unclarities in the expression of philosophical ideas to be the foundation of philosophical puzzles and paradoxes, and have accordingly sought to solve, avoid, or at least gain a better perspective on the problems by way of the theory of meaning.

This is undoubtedly part of what Russell means in pronouncing all of philosophy properly so-called identical with logic. Symbolic logic has been the tool of choice for philosophers investigating the properties of language in philosophical logic, because it is itself a language whose syntax and semantics are at the disposal and under the control of the logician where they can be better studied in more ideal abstract terms. A formal system of logic considered as a language has definite advantages over colloquial discourse as a model of how language works, where its factors are more readily discerned and rigorously formulated independently of the ambiguities and etymological confusions that are endemic to natural language, which, as Ludwig Wittgenstein aptly remarks in the *Tractatus Logico-Philosophicus* (1922: 4.002), "is a part of the

human organism and is not less complicated than it." Even for philosophical logicians who do not seek to replace ordinary language with an ideal language like Frege's *Begriffsschrift* or Whitehead and Russell's *Principia Mathematica*, but, like Wittgenstein, hope to understand how language generally is capable of expressing meaning, the use of symbolic logic has remained an indispensable instrument in philosophy of language. The fact that logic lends itself to more sharply and univocally defined distinctions makes it convenient for the analysis of concepts in philosophy, including the semantic principles by which logical formulas are themselves precisely interpreted. The usefulness of logic in philosophical applications has played a major role in the development of symbolic logic, which in turn has opened up new possibilities for logic's use in refinements of philosophical techniques.

How, then, has the partnership between philosophical logic and philosophy of language taken shape? In too many ways for the story to be told in a summary that does not distort the true riches of ingenuity, invention, and discovery on the part of philosophers and logicians in the annals of recent and contemporary analytic philosophy. Nevertheless, something of the flavor of work in this exciting field can be conveyed from a brief discussion of a few well-chosen examples. We turn next to consider some instructive concrete possibilities.

3 Modes and Methods of Philosophical Logic

Logic is formal, and by itself has no content. It applies at most only indirectly to the world, as the formal theory of thoughts about and descriptions of the world. Logic can be used in many ways to state, clarify, and express ideas, and to authorize the derivation of consequences, when its formulas are assigned substantive content in application. Although logic in its pure form is unfreighted with philosophical truths, it can contribute in definite ways to the clarification and solution of philosophical problems.

Philosophical logic often combines an application of logical symbolisms with a commitment to specific philosophical ideas. Symbolic logic, even in its purest form, is also not entirely free of philosophical ideology, although some logicians have made it their mission to try to make logic as neutral a vehicle as possible for the unbiased expression of the logical form of philosophical disagreements on every conceivable topic, including those most closely related to the conceptual presuppositions of classical logic. To the extent that substantive philosophical positions are built into the interpretation of symbolic logic, the use of logic in addressing philosophical problems may seem highly effective and convincing. In that case, of course, it is not logic alone that is doing the work, but whatever philosophical theses have been packed into its symbolism.

There is often a temptation to use philosophical logic in this way. A logical notation is loaded with philosophical cargo to enable it to appear at least to make progress against outstanding philosophical problems. Logic as a branch of mathematics deservedly carries a certain authority in intellectual disputes. We should recognize, however, that when a logical formalism appears to solve a philosophical problem, it seldom does so by itself, but only by virtue of the philosophical ideas it is used to express. That being the case, we need to question whether the philosophy shouldered by philo-

sophical logic is sound or faulty, just as we would need to do if we had set about considering the philosophical issues directly without the intervention of a symbolic logical notation. If logic helps the cause of clarifying and solving or avoiding philosophical problems, it does so thanks largely to the ability of its formal structures to sort out and more clearly represent a choice of philosophical ideas, and not by means of substantive philosophical assumptions hidden in the background of a particular logical system.

In his "Introduction" to Wittgenstein's *Tractatus*, Russell recognizes the potential of a logical symbolism to clarify philosophical concepts. He states: "a good notation has a subtlety and suggestiveness which at times make it seem almost like a live teacher. Notational irregularities are often the first sign of philosophical errors" (1922: 17–18). The value of an adequate logical notation is that it provides information about the logical form of the ideas it expresses. It can call attention to logical structures that might otherwise be overlooked in informal expression, including tipoffs about conceptual inconsistencies. This, after all, is a primary pragmatic justification for the use of symbolic logic. It teaches us things that we could not (or not as easily) learn without its formalisms. Such discoveries are often made as logicians explore the scope and expressive flexibility of a formal system. They emerge in the study of a formalism's mathematical multiplicity, in Wittgenstein's terminology, its shared isomorphism or lack thereof with the features of thought or discourse it is supposed to formalize, together with its internal logical interrelations and deductive consequences.

Russell, in his own celebrated application of philosophical logic in the analysis of definite descriptions, in his essay "On Denoting" (*Mind* 1905), seems nevertheless to have decanted a significant amount of philosophy into a logical vessel in order to gain philosophical mileage from what appears to be purely logical distinctions. Russell's theory of descriptions has been enormously influential in the rise of analytic philosophy, to such a degree that F. P. Ramsey in his essay "Philosophy" was moved to eulogize it as "that paradigm of philosophy." The theory has indeed been a model for some of the best work in philosophical logic for over a century. It is worthwhile, therefore, to consider the theory in detail, to understand how it combines philosophy with logic, and the amount of labor borne by logic as opposed to the prior philosophical commitments deeply integrated into Russell's logic.

4   Logic as Philosophy in Philosophical Logic

We can identify at least three characteristics of Russell's theory that provide enduring guidelines for philosophical logic. Russell's breakdown of definite descriptions into an existence clause, uniqueness clause, and predication of a property to a uniquely denoted entity, using the devices of symbolic logic to conjoin these three formalized conditions, demonstrate the power of symbolic logic to present the analysis of a complex concept into more basic components for philosophical purposes. Russell's method has very properly been compared to that of an optical prism that takes a single beam of white light and breaks it up into its constituent spectrum of colors. The colors are not added or produced by the prism, but are there all along, inherent in the white light, although it takes a special instrument to reveal their presence. The same is true of definite descriptions, to which Russell applies symbolic logic in order to break apart

and discover by reflection the three conditions concealed within the apparently simple word 'the.'

This observation leads to the second noteworthy feature of Russell's analysis. Russell makes an inestimable contribution to the flowering of analytic philosophy by suggesting that the logical form of a proposition, as judged in terms of its superficial grammatical structure, is not necessarily its real, underlying form, appreciated by means of logical analysis. I cannot put the point better than Wittgenstein in *Tractatus* (1922: 4.0031), when he declares: "Russell's merit is to have shown that the apparent logical form of the proposition need not be its real form." Wittgenstein no doubt puts his finger on a major ingredient in the appeal of Russell's theory of descriptions. By suggesting that philosophical logic has as part of its project to uncover the real underlying or ulterior logical form of sentences in ordinary thought and language, Russell inspired generations of philosophers with a vision of logical analysis excavating the subterranean logical structures beneath the surface of colloquial discourse.

Third, Russell's theory is rightly dignified as a wellspring of contemporary analytic philosophy because of its dramatic use of logical methods in disambiguating philosophically equivocal linguistic expressions. Russell considers among others the problem of interpreting the sentence, 'The present king of France is not bald.' The dilemma he intuits is that if the sentence is taken to mean that there is a present king of France who is not bald, then the sentence should be false. To declare the sentence false, at least when we are operating within the parameters of ordinary language, wrongly seems to entail that there is a present hirsute king of France. Russell's genius in the theory of definite descriptions is partly seen in his recognition that symbolic logic permits the exact disambiguation of the scope of the negation operator that is blurred in everyday speech. He accordingly distinguishes between saying 'There exists one and only one present king of France and it is not the case that he is bald,' versus 'It is not the case that there exists one and only one present king of France and he is bald (or, it is not the case that he is bald).' The first sentence is false, but its proper negation is the second sentence, which does not commit the speaker to the existence of a hirsute present king of France.

Although the distinction can also be indicated as here in a modified form of ordinary English, Russell finds that it is only in symbolic logic that the full force of placing the negation sign externally, with the entire proposition in its scope, as opposed to internally, governing only the predication of the property of being bald in the third clause of the formal analysis of the definite description, can be fully and unequivocally appreciated. In standard logical notation, the difference is formalized as that between $\sim(\exists x)(Kxf \,\&\, (\forall y)((Kyf \equiv x = y) \,\&\, Bx))$ as opposed to $(\exists x)(Kxf \,\&\, (\forall y)((Kyf \equiv x = y) \,\&\, \sim Bx))$. The difference in the scope of the negation, and the difference it makes in the truth values of the two propositions, is so immediately apparent as to powerfully iconically recommend the use of symbolic logic as a general method of clarifying logical obscurities and circumventing conceptual confusions.

Having acknowledged the strength of Russell's analytic paradigm, it may also be worthwhile to consider its underlying philosophical assumptions. Russell is interested not only in the truth value of sentences ostensibly designating nonexistent objects like the present king of France, but also in understanding predications of properties to fictional creatures, like Pegasus, the flying horse of ancient Greek mythology. Russell

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regards proper names like 'Pegasus' as disguised definite descriptions, which he interprets according to his three-part analysis as consisting of an existence claim, a uniqueness claim, and the predication of a property to the uniquely designated entity. If I say, then, that 'Pegasus is winged,' Russell interprets this sentence as falsely asserting that there exists a flying horse, there is only one flying horse, and it is winged. From this it appears to follow that something of metaphysical significance has been derived from Russell's skillful use of philosophical logic; namely, that it is false to say of any nonexistent object like Pegasus that the object has any of the properties attributed to it in myths, legends, or storytelling contexts.

If we look at the logical symbolism Russell employs, we see that in this case it reads: $(\exists x)(Fx \,\&\, (\forall y)(Fy \equiv x = y) \,\&\, Wx)$. The formula, it must be said, is supposed to be judged false only because the quantifier in $(\exists x)(Fx \ldots)$ is interpreted as meaning that there actually exists such an object in the logic's semantic domain that truly possesses the property F, of being a flying horse. Russell as a matter of fact has no way to construe an object like Pegasus in his logic other than as the value of an existentially loaded quantifier-bound variable. This is probably not the place to dispute with Russell about whether such a logical treatment of names like 'Pegasus' is philosophically justified or not. It is nevertheless important to recognize that Russell's evaluation of such sentences as false is predetermined by his existence presuppositional semantics for the 'existential' quantifier, and by the fact that his logic permits no alternative means of considering the semantic status of sentences ostensibly containing proper names for nonexistent objects. This makes it an altogether philosophically foregone conclusion that sentences like 'Pegasus is winged,' which many logicians would otherwise consider to be true propositions of mythology, are false. The point is that Russell is able to produce this philosophical result from his logical analysis of the meaning of the sentence only because the position is already loaded into the presuppositions of the syntax and semantics of his interpretation of formal symbolic logic. The interesting philosophical question that Russell would be hard-pressed to answer satisfactorily is whether his logic is philosophically adequate to the proper analysis of problematic sentences in this category. It is not a conclusion of logic alone that Russell advocates, whether correct or incorrect, but of an applied philosophical logic that is heavily but not inevitably imbued with a prior metaphysical commitment to an existence-presuppositional extensional syntax and semantics.

A good logical notation, as Russell says, can function philosophically much like a living teacher. As a pure formalism, however, logic is not an autonomous authority on any matter of philosophical truth. It has, in itself, no philosophical implications, and in its applications in philosophical logic, as Russell's example illustrates, it is capable of supporting only those philosophical conclusions with which it is deliberately or inadvertently invested by logicians. This, then, is another sense in which Russell in his most important contributions to philosophical logic identifies logic with philosophy.

5   On Philosophical Presuppositions and Copia of Logical Systems

The perspective we have arrived at in understanding the relation between logic and philosophy can help to answer a difficult question about the nature of logic and the status

of multiple logical systems. Why are there so many different systems of logic? Is there just one underlying logic, of which all the various systems are alternative partial expressions? Or are there many different logics that are related to one another by a network of partially overlapping family resemblances?

If we consider work in contemporary theoretical logic at face value, there seem to be indefinitely many logics. Alethic modal logics are concerned with matters of necessity and possibility; doxastic logics are designed to explain the logical structures of belief states; epistemic logics are offered to formalize valid inferences about knowledge. There are specialized logics of quantum physical phenomena, deontic logics of obligation and permission, and many others. An important source of the proliferation of logical systems in contemporary logic and philosophy is in philosophical issues arising from dissatisfaction with classical logics in dealing with specific aspects of scientific and everyday reasoning. This is the basis for work in many-valued logics, free logic, relevance, and paraconsistent logics, and logics of beingless intended objects, that do not limit logical inference to existent entities in referring to and truly predicating properties of objects, and for the paraconsistent stance that logical inconsistencies need not explosively entail any and every proposition, but that contradictions can be tolerated without trivializing all inferences.

Applications of logic to philosophical problems of these kinds are a continuing basis for innovations in formal symbolic logic and the development of new nonstandard systems of logic. Logic is also concerned with abstract theoretical matters concerning its own formal symbolisms and the properties, such as the scope and limits of logical and mathematical systems considered as a whole, in the study of logical metatheory. The advance of logic has been nourished by its theoretical and practical applications in set theory, computer engineering, artificial intelligence modeling, formal semantics and linguistic analysis of scientific theory, philosophical argument, and colloquial language. There is valuable feedback between logical theory and practice, much as there is in pure and applied mathematics. The need for new formalisms is sometimes made urgent by the limitations of received systems that are only discovered when we try to apply them to real problems. At the same time, developments in symbolic logic that are undertaken purely for the sake of their theoretical interest frequently suggest new applications of logical analysis for which no need had previously been perceived.

The number of distinct logical systems inevitably raises the philosophical question of how the multiplicity of logics should be understood. Some logicians are partisan defenders of particular logical formalisms as the ideal single correct logic. Others are tolerant of many logics, adopting an attitude according to which particular formal systems may be appropriate for particular analytic tasks, but that no single logic or cluster or family of logics deserves to be called the one and only correct system of logic. Those who favor a single correct system of logic must either regard alternative logics as incorrect, however formally interesting, or else interpret them as representing conflicting incompatible opinions about the best and uniquely correct logical system. Such a contrast of philosophical positions about the nature of logic and the uniquely correct logic or plurality of alternative logics has positive analogies in the opposition of moral absolutism and moral relativism, and in questions of privileged objective truth versus subjectivism, perspectivalism, and syncretism in the theory of knowledge. It would not be surprising to find philosophers who incline toward relativism in ethics or epistemol-

ogy also to prefer a tolerant attitude about the peaceful coexistence of many different logical systems, and for their adversaries who think in terms of moral and epistemic absolutes to embrace a single correct logic that either defeats the ostensible alternatives, or resolves apparent conflicts between many if not all of them in a greater overarching synthesis.

Philosophy thrives on just such tensions and ambiguities, and philosophical logic is no exception. All of the diverse formal syntactical distinctions available in contemporary symbolic logic can be put to good use in clarifying philosophical ideas and drawing more precisely interpreted distinctions than are otherwise possible in ordinary language, or even in specialized but nonsymbolic philosophical terminologies. The methods of set theory, model set theoretical semantics, and axiomatizations of many types of philosophical concepts are among the widely used formalisms in present-day philosophical logic. The future will likely see more sophisticated logical machinery, and with it an even greater upsurge in the number and variety of logical systems and distinctive categories of logic and philosophical logics. If there is a logic of knowledge and a logic of moral obligation, then there can surely be multiple logics of deductively valid inference, each tailored to a particular philosophical conception of how even the most basic logical operations may be thought to function. We can nonetheless continue to expect that partisan champions in philosophical logic will want to refer to a preferred formalism as logic full stop, or as *the* one and only correct or underlying primary or essential logic. The awareness of philosophical commitment and presupposition even in the most rigorous abstract logical symbolisms, and of philosophical logic as an application of logic in which philosophical ideas are already deeply infused, can help to make logic a more powerful ally of philosophical analysis.

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