

**A CONSEQUENCE OF THE EPISTEMOLOGICAL
HOLISM OF QUINE
AND A REALIST/REVISIONIST INTERPRETATION
OF QUANTUM LOGIC:
SCEPTICISM**

BY

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B.Sc, B.A, B.Litt (Hons) , M.A, BLitt (Hons)

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THE NATURE OF PH/LOSOPHY: THINGS MY LECTURER AINT THE BALLS TO TELL ME; A

SOCIOLOGY AND PHILOSOPHY OF
PHILOSOPHY; COGNITIVE THOUGHTS AND ANTHROPOLOGICAL REFLECTIONS,
DEMONSTRATING THE END OF PHILOSOPHERS &PHILOSOPHY,

EPISTEMOLOGY: AGUIDE TO PHILOSOPHY: EPISTEMOLOGICAL ESSAYS BY COLIN LESLIE
DEAN & DAVID STEPHEN OVENDEN ON DESACARTES, HUME KANT, NIETZSCHE, DILTHEY,
FOUCAULT, FEURERBACH, FREUD & MARX

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SUMMARY

Quine argues that the laws of classical logic could be revised. Certain findings in quantum mechanics indicate that the laws of classical logic have to be revised. This thesis argues that if we make certain restrictions, or assumptions, and Quine's epistemological holism is correct then with the revision of the laws of classical logic we end up with scepticism. If we assume that: 1) a realist ontology; 2) and that the realist/revisionist interpretation of quantum logic is correct, then based upon Quine's epistemological holism we end up with scepticism. This scepticism means that there can not be any certainty in regard to the validity of the inferences which are drawn from classical logic.

This thesis shows that Quine's arguments for the revision of the laws of classical logic come from three sources: his epistemological holism; his inductions from the history of science; and his denial of analyticity as equated with apriority. It is shown that in quantum mechanics the anti-realists argue that quantum logic doesn't refer to the logical structure of reality but only gives meaning to the results of measurements. Conversely the realists argue that quantum logic does mirror the structure of reality. The preservationists argue that this mirroring only applies to the micro-world; but the revisionists argue, in opposition, that it applies to the macro-world.

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INTRODUCTION

“Once the validity of inference [as a foundation for truth] was denied...perception [as a foundation for truth] could not stand for long on its own feet.”¹

¹ K. N.Jayatileke, 1980, p.89.

Thesis

This thesis argues that if we make certain restrictions and if Quine's claims for the revisability of the laws of logic and his epistemological holism are correct, then this has profound consequences for the whole philosophical enterprise. I will argue that with certain restrictions Quine's attack undermines the whole validity of philosophical argument by claiming that there is no logical necessity. With the undermining of logical necessity, the ground is cut beneath the feet of philosophers' arguments. This undermining results from the fact that with the denial of the logical necessity of their argument philosophers arguments and reasonings have no epistemic certainty. A consequence for an holistic of this lack of logical necessity and revisability of the laws of logic is that we are left with scepticism

This scepticism means that there can be no certainty in regard to the validity of any philosophical inference. Consequently foundationalist philosophy and foundationalist philosophical argument, or in other words philosophy which seeks for certainty, becomes untenable. The restrictions it will be argued that have to be fulfilled in order to give validity to Quine's views and scepticism are three: 1) that quantum logic mirrors the structure of reality; its corollary 2) that metaphysical realism is the correct interpretation of quantum mechanics; and 3) that the logic of the macro-world is the same as the quantum logic of the micro-world. These three theses can be seen as characterising the realist-revisionist interpretation of quantum mechanics. If the realist/revisionist interpretation is correct then a consequence of this and Quine's claims is scepticism. Now because Quine looks for support for some of his arguments from quantum mechanics this thesis will focus in the main on the arguments some philosophers and scientists about quantum mechanics.

I should make mention of my methodological approach. The issues raised in this thesis are quite complex and there are quite differing or divergent arguments for and against these issues. These issues are: epistemological holism; metaphysical realism² and anti-realism³; essentialism and anti-essentialism; does logic mirror reality; revisionist interpretations of quantum logic⁴; preservationist interpretations of quantum logic⁵. Now to avoid becoming enmeshed within these debates I make certain assumptions for this thesis. I do not argue that epistemological holism, or metaphysical realism, or logic does mirror reality or that the revisionist interpretation is correct. What I do instead is assume that ‘if’ they are tenable then certain consequences, particularly scepticism, follow for Quine’s views. In this regard by only arguing that ‘if’ these perspectives are tenable I then avoid entering into the argument for or against these perspectives.

At the start I should note what I mean by scepticism. The notion of uncertainty was a central problem for Descartes who in putting forward his sceptical notion of doubt sought to arrive at a rebuttal of scepticism by offering certainty. In this regard the notion of uncertainty is a central tenet of scepticism. A. Quinton notes that “different species of scepticism are distinguished in two principle ways: by reference either to the methods of inquiry whose reliability is questioned or to the kind of objects whose knowability is doubted.”⁶ Unger in his book “Ignorance: A case for Scepticism” distinguishes two forms of scepticism similar to Quinton: epistemological scepticism ie we can know nothing⁷; and scepticism about rationality ie we can never be reasonable in anything.⁸ It is this scepticism in regard to rationality, or the method of inference that this thesis argues

² Putnam makes the point that is the idea that “truth involves a correspondence to fixed ‘objects’ and ‘properties’” (Putnam, 1995, p.v)

³ Gibbins points out that this is the idea that quantum logic does not refer to the structure of reality but only to measurements. Gibbins, 1987, pp 104-106, pp.143-163.

⁴ Revisionists: argue that that quantum mechanics requires that classical logic should be replaced by quantum logic.

⁵ Preservationists argue that that quantum logic is only applicable to the micro-world and not the macro-world. In other words quantum logic applies to the micro-world and classical logic applies to the macro-world.

⁶ A. Quinton (1992), p.289.

⁷ P. Unger (1975), p.245.

⁸ *ibid.*, p.242.

Quine's arguments lead to. In outlining these two forms of scepticism⁹ Unger relies upon the idea that nothing is certain so in this regard once again the notion of uncertainty is a central concern of scepticism. Thus the scepticism of this thesis is based upon the notion of uncertainty. It is claimed that Quine's arguments lead to a scepticism in regard to inference as method of inquiry and the concomitant idea of scepticism in regard to rationality itself. In other words the arguments of this thesis and the scepticism put forward deals with the reliability of the method of inference. This thesis argues that Quine's arguments lead to the result that inference is not a reliable method of inquiry because there is no certainty in regard to the claims that can be drawn from logic. Thus this thesis argues a scepticism in regard to the method of inference.

It should be noted that scepticism results from a realist metaphysics and is not applicable to an anti-realist position. Dancy notes that the realist position argues that there are evidence-transcendent truths; as he states " ...the realist believes that there are evidence-transcendent truths, truths whose obtaining lies beyond our powers of recognition."¹⁰ On the other hand the anti-realist denies this claim of the realist since he argues that there is not a real world which lies beyond or behind the world that we know. For the anti-realist, as Dancy notes, believes that our world is the only recognisable world.¹¹ Where the realist believes in a correspondence or verificationist notion of truth ¹²the anti-realist believes in a form of pragmatism. The anti-realist argues "...that our understanding of the sentences in our language must have been acquired in situations which we learnt to take as warranting the use of those sentences; sentences in which those sentences are to count as true."¹³ B.Taylor notes "...anti-realism uses non-classical truth conditions or warrants ie certifications which could actually be obtained by a sufficiently systematic enquirer."¹⁴ In other words the meaning of a sentence is determined by the situations which we say make

⁹ It should be noted that the arguments of Unger for his scepticism don't play a part in this thesis. The claim of scepticism is only made on the basis of the consequence of Quine's arguments.

¹⁰ *ibid*, p.19.

¹¹ *ibid*, p.19.

¹² *ibid*, p.18-22.

¹³ *ibid*, p.19.

it true Now the idea that our understanding of the meaning of sentences is determined by the situations which count in favour of them being true has a hidden assumption. This assumption is that the structure or syntax of these sentences is based upon classical logic. Now if as we have seen the anti-realist interpretation of quantum logic is correct and quantum logic only deals with the meaning of experiment then this means that the structure or syntax of the sentences which give sense to experiment must now be structured by, not classical logic, but quantum logic. In this regard under an anti-realist approach classical logic has only a pragmatic usefulness, a usefulness which has to be abandoned in favour of quantum logic at the level of quantum mechanical experiment. Thus quantum mechanics brings about the situation that a condition which must count in favour of a sentence being true, at the level of quantum mechanical experiment, is the revisability of classical logic via quantum logic. This pragmatic adoption of either classical logic or quantum logic depending upon the circumstances which count in favour of the truth of their adoption does not lead to a scepticism in regard to the validity of any inference because the anti-realist is not making any ontological claim about reality but only arguing that under some situations classical logic or quantum logic are pragmatically useful.

Now as we have seen the anti-realist interpretation of quantum logic does not concern any ontological claim about reality. In this regard the anti-realist denies the realist claim that it is possible that the world is different from the way we think it is. In this regard anti-realism is not susceptible to scepticism because, as Dancy notes , “...anti-realism offers a perspective from which there is no possibility of a global scepticism about understanding, but also... there is no room for a global scepticism about justified belief either.”¹⁵ Anti-realism is not susceptible to global scepticism because where the realist argues that it is possible that the world is, unknown to us, different from the way we think it is, the anti-realist rejects this claim. For the anti-realist sentences do not make ontological claims that can be verified or not against reality but instead are only verified by the conditions we say

¹⁴ B.Taylor (1996, p.5)

¹⁵ J.Dancy, op.cit p.20.

count in favour of them being true. Thus we see that scepticism stems from a realist position.

The position of Quine in regard to realism or anti-realism is complex. Hookway notes that there are tensions “...between realist and anti-realist themes in Quine’s work.”¹⁶ These claims of realism and anti-realism, as Hookway notes, are the “... anti-realist [argue] that some sentences are not to be understood as describing the nature of reality, and the realist claim[s] that some are.”¹⁷ In ‘Identity, Ostension and Hypostasis’, Quine clearly states an anti-realist position. In this article Quine argues that the standard for appraising a conceptual scheme is not a realist one but is instead pragmatic. As Quine states, “[o]ur standard for appraising basic changes of conceptual scheme must be, not a realist standard of correspondence to reality, but a pragmatic standard...”¹⁸ Nevertheless Hookway notes, that in “... From a Logical Point of View, we can find grounds for unease about this ... anti-realist reading of Quine’s writings.”¹⁹ These grounds are according to Hookway based upon a number of Quine’s arguments. Quine argues that “...concepts are language, and the purpose of concepts and of language is efficacy in communication and prediction. Such is the ultimate duty of language, science and philosophy, and it is in relation to that duty that a conceptual scheme has finally to be appraised.”²⁰ Hookway’s understanding of this claim is that it is realist. Hookway states “[H]ere Quine’s empiricism intervenes to assign a meaning to the ‘pragmatic’ which puts into question the claim that the presence of pragmatic considerations in scientific growth is in tension with a realist construal of science. Pragmatism requires us to ensure that our beliefs are answerable to experience.”²¹ In Word and Object Hookway argues that Quine exhibits “... his more robust realism.”²² Hookway notes that in Quine’s review of Ways of Worldmaking Quine “...increasingly describes himself as a realist.”²³

¹⁶ C.Hookway, 1995, p.56.

¹⁷ *ibid*, p.206.

¹⁸ W.V.O.Quine, 1953, p.79.

¹⁹ C.Hookway, *op.cit*, p.52.

²⁰ W.V.O.Quine, *op.cit*, p.79.

²¹ C.Hookway, *op.cit*, p.53.

²² *ibid*, p.54.

²³ *ibid*, p.52.

Quine adopts two positions: a holism in regard to meaning at the non-observational level and an atomism at the observational level.²⁴ Simply, Quine's holism argues that the meaning of each sentence depends on the meaning of the others. Quine's atomism means that observational sentences can be individually verified.²⁵ Now it is in regard to this atomism that Dancy argues that Quine is a realist.²⁶ and an adherent of verificationism.²⁷ In this regard Quine is seen as being, as Dancy notes again, a foundationalist.²⁸ Now it is maintained in this thesis that Quine's realism and arguments for epistemological holism and the revisability of logic in fact bring about the consequence of scepticism or uncertainty in regard to inference and as a result undermine logic as a foundation for truth. In other words Quine's arguments bring about the consequence that no inference can be justified.

It should be noted that I am not going to argue that Quine himself would argue for scepticism, since as is well known he espoused what is called a 'naturalised epistemology'. What I do argue is that Quine's claims in fact leads to the conclusion of scepticism if the realist/revisionist interpretation of quantum mechanics is correct.

It should be noted that in a certain degree Quine's arguments result in a *reductio*. Quine's arguments are made up of two parts: *a priori* arguments for the revision of logic based upon his epistemological holism; a posteriori arguments based upon support from science. Quine in using *a priori* arguments for the revision of the laws of logic thus uses the very principles of logic which that he seeks to reject; thus a *reductio*. But when Quine does not use *a priori* arguments but instead steps outside the area of *a priori* argument and makes claims based upon his inductions from the history of science he thus avoids a *reductio*.

²⁴ J.Dancy op.cit, p.101.

²⁵ *ibid*, p.101

²⁶ *ibid*, p.108.

²⁷ *ibid*, p.101.

²⁸ *ibid*, p.101.

Foundationalism usually argues that there are basic sui-generis beliefs from which other knowledge can then be derived. These sui-generis beliefs are those beliefs which need no support from other beliefs for their justification; they are not reducible to other beliefs because these beliefs stand on their own feet. As Dancy notes “these beliefs constitute our epistemological foundations.”²⁹ These basic beliefs thus are the foundations of all other beliefs and inferences drawn from them. Dancy notes that there are a number of foundationalist theories. There is what he calls ‘classical foundationalism’³⁰ which is based upon the idea of infallible basic beliefs. There are foundationalist theories which are not based upon the notion of infallible basic beliefs.³¹ What these theories and ‘classical foundationalism have in common is that’...all basic (non-inferential justified) beliefs concern the nature of the believers present sensory data.”³² Dancy notes that a form of foundationalism is also possible which “...avoids the traditional [classical] view that epistemology is an enterprise of starting from one’s own case and building on that.”³³ Nevertheless Dancy outlines arguments, based upon Quine’s idea of the indeterminacy of translation, which seek to show that all forms of foundationalism are untenable.³⁴ Now this thesis will seek to show the same untenability of foundationalism but from a direction different from Dancy and to my mind more devastating for foundationalism and the whole of philosophy. This direction is based upon Quine’s arguments for the revisability of logic. To my mind if logic can be revised this then will attack the whole foundation upon which philosophy, including foundationalism, rests namely the epistemic status of logic itself. If the laws of logic are revisable then there can be no certainty in regard to the truth claims of any inference drawn from these laws of logic. As an inference drawn from a premise via the unrevised laws of logic may be different from an inference drawn from the same premise via the revised laws. In this regard because logic may be revised logic can have no epistemic status in regard to generating certain truth. If logic has no epistemic status, or in other words is not a means for certain knowledge or truth, then no philosophical

²⁹ J.Dancy, 1996, p.53.

³⁰ *ibid*, p.53.

³¹ *ibid*, pp.64-65.

³² *ibid*, p.82.

³³ *ibid*, p.82.

³⁴ *ibid*, pp.97-109..

argument, foundationalist or anti-foundationalist can be justified to be certain. This consequence of Quine's arguments for the revisability of logic thus leads us in the direction of scepticism. Rorty notes this point when he argues that "Quine has argued in detail...a conception of philosophy which has nothing to do with certainty."³⁵ Rorty maintains that Quine's claims that no statements are immune from revision upsets those professional philosophers who are "...frightened by the epistemological sceptic."³⁶

The scepticism resulting from Quine's arguments and a realist/revisionist interpretation of quantum mechanics, this thesis will argue, has profound consequences for the whole of philosophy, including Quine's arguments, let alone the foundationalist / anti-foundationalist debates. If the principles of logic are revisable, as Quine argues, then there cannot be any certainty to the arguments or inferences philosophers generate. This in effect undermines philosophy itself or at least one of philosophy's pretensions. This point to my mind Quine did not appreciate as Rorty notes that Quine for all his arguments for the revision of logic still believed that "...logic [is] the essence of philosophy."³⁷ Now it was seen above that according to the foundationalist it is assumed that if the non-inferential belief is justified then because inference is considered to be valid we will end up with a justified inferential conclusion. Now if the inferences have no certainty, due to the fact that the logical principles which derived the inferences have no epistemic certainty, because they could be revised, then no matter whether the starting non-inferential beliefs are basic beliefs there can be no certainty drawn from any inferential conclusion. If the principles of logic can not generate certainty, then empiricist and rationalist arguments have no epistemic status because there is no certainty that their arguments are not revisable. As Jayatilleke notes "Once the validity of inference [as a foundation for truth] was denied...perception [as a foundation for truth] could not stand for long on its own feet."³⁸ Thus my approach is to argue that if the principles of inference

³⁵ R.Rorty, 1979, p.171.

³⁶ *ibid*, p.181.

³⁷ *ibid*, p.172.

³⁸ K.N.Jayatilleke, 1980, p.89.

cannot generate certainty in regard to the truth of the inference drawn from these principles then Dancy's line of anti-foundationalist arguments become superfluous. This is because with the revisability of the principles of logic it does not matter whether non-inferential basic beliefs are tenable; since inference cannot give us any certain conclusions regardless of the tenability of the starting premises.

Two philosophers who have leveled attacks at the rationalist or inferential justification of knowledge are Quine and Ayer. The logical empiricist Ayer and the empiricist/pragmatist Quine. Ayer sought, in Language Truth and Logic, to "...destroy the foundations of rationalism."³⁹ Ayer notes that there are two ways to destroy rationalism and substantiate empiricism. The first way is to show that the truths of logic "...are not necessary truths..."⁴⁰ and the second to show that the truths of logic are "...empty of all factual content..."⁴¹ Ayer adopts the second. Ayer argues that the truths of logic are analytic and as such necessary truths because the truths of logic are true by convention.⁴² As such Ayer argues that the truths of logic are empty of factual content and as a consequence rationalism is destroyed. Quine on the other hand, in 'Two Dogmas of Empiricism', attempts to destroy inferential justification by arguing that the truths of logic are not necessary. Also in 'Truth by Convention' Quine, in contradistinction to Ayer, argues that the truths of logic are not due to convention.⁴³

Where Ayer and Quine sought to undermine inferential justification by arguing that the truths of logic are not analytic I sought, in The Nature of philosophy, to undermine the validity of any inference including those of Ayer and Quine by arguing that logic by its own standards is not and cannot be an epistemic condition for truth. I argue that when logic becomes self-reflexive ie when it analyses itself in terms of its own standards ends

³⁹ A.J.Ayer, 1990, p.66.

⁴⁰ *ibid*, p.65.

⁴¹ *ibid*, p.65.

⁴² *ibid*, p.80.

⁴³ W.V. O.Quine, 1964, p.343 states "...logic is needed for infereing logic from the conventions"

up in self contradiction. Logic ends in paradox as it negates the very thing it requires to make the negation and that it requires for its existence, namely an essence belonging to an object. I maintained that logic requires an object which must have fixed immutable properties, namely an essence. It is argued that if an essence cannot be found then the object cannot be identified and thus does not exist. Now I argues logic infact denies this essence and thus denies the object that logic needs for its existence. Consequently I argues that “Logic’s negation of the object of logic in fact undermines logic’s own value as an epistemic condition... This undermining is due to logic violating it’s own law of non-contradiction. By the law of non-contradiction something cannot be A and not A simultaneously if it is then by the law of contradiction it cannot be a truth claim. Logic... requires an essence, say A, for its applications but logic negates this essence ie not A, the very thing it requires to make the negation; thus a paradox... Thus logic makes itself untenable as an epistemic condition of truth.”⁴⁴

SYNOPSIS

In chapter one I will argue that Quine’s attack upon the analytic/synthetic distinction is comprised of two parts. These two parts are based upon two different ideas as to what analyticity is defined to be. In the first part he rejects the notion of analyticity by rejecting the idea of semantic necessity, or analyticity defined to be due to meaning. In the second part Quine rejects analyticity defined to be ‘true come what may’, a definition which Putnam argues equates analyticity with apriority. Now I will argue that it is only the second attack which in effect supports Quine’s claim that the laws logic could be revised. This claim it will be shown is supported by Putnam and Quine himself. This second attack, it will be argued is based upon empiricism. The notion that all truth is derived from experience. Quine it will be argued believes that the laws of logic could be revised because the world could be described by other forms of logic. In other words Quine’s claim for the rejection of the laws of logic boils down to the claim that the world could cause us to abandon some or all of our beliefs in the laws of logic. Thus it will be shown that Quine’s claim for the revision of the laws of logic is not so

⁴⁴ C.Dean in C.Dean & D.S.Ovenden 1998, pp.xx1x-xxx.

much a philosophical sequence of deductive arguments as it is a line of argument based upon induction from the history of science and his empiricism. This line of argument is built upon a coherence theory of truth, or what is called by Dancy Quine's epistemological holism. From this epistemological holism and inductions from the history of science Quine formulates his arguments for the revision of the laws of logic. It will be shown that Quine argues that the law of contradiction and the law of the excluded middle could be rejected or revised. Quine does not give reasoned arguments for these claims but only speculative inferences from the current state of theoretical orientations in quantum mechanics. One further law of logic which Quine rejects is the law of identity. Quine argues that science itself argues that this notion, is like the gods of Homer, a myth.

In chapter two I will outline arguments which support Quine's claim that the laws of classical logic could be revised. I will present arguments from two areas: from relativity physics and quantum mechanics. Relativity physics it will be shown denies the notion of the object. This is in agreement with Quine. From the arguments that physics offers for the rejection of the object via a rejection of the idea of fixed properties I will note Putnam's argument that the rejection of the object means that the whole of classical logic must be revised. When it comes to quantum mechanics I will outline Putnam's arguments that quantum logic may cause revisions in classical logic. In these areas of study the law of the excluded middle is rejected, in some cases the law of non-contradiction is revised. I will show that this area of quantum logic is complex. There are some who argue that quantum logic applies to both the macro world and the micro world. Some argue conversely that quantum logic only applies to the micro world. There are some who see quantum logic realistically ie as referring to the logical structure of the world and others who see it anti-realistically ie only referring to our measurements. I will argue in this chapter that it is only the realist/revisionist interpretation of quantum logic which lends support for Quine's claims that the laws of logic could be revised at the macro level. If the realist/revisionist interpretation is correct then scepticism becomes the consequence of the revisions of the laws of classical logic. Thus these findings from relativity physics and quantum logic via a

realist/revisionist interpretation will lend support to Quine's thesis and the inevitable sceptical conclusions in regard to the validity of inference. Now it should be noted this scepticism is perhaps an unintended consequence of Quine's thesis.

In chapter three I will outline how the epistemological holism leads to scepticism if the laws of logic are revised. In this chapter I will give support from Papineau and O'Hear to the view that if we assume epistemological holism then once the laws of logic are revised we end up with uncertainty in regard to any inference which is drawn. I will outline examples which show how this uncertainty manifests itself. I will show how if we revise the law of non-contradiction the law of identity and the law of the excluded middle then the inference drawn from within an holistic system collapse into uncertainty

In the conclusion I will 1) outline the arguments presented in the previous chapters and 2) present an argument for the consequences of this scepticism. I will argue that if epistemological holism is tenable and the laws of logic are not necessary then all the principles of logic, and the inferences drawn from them, have no certainty as an epistemic condition for truth. Consequently philosophy as a discipline of reasoned argument becomes untenable because there can be no certainty as to the necessity of any of its inferences.

CHAPTER ONE

THE REVISABILITY OF LOGIC

“... [in] our conservative preference for revisions which disturb the system least ... perhaps, lies the ‘necessity which the laws of mathematics and logic are felt to enjoy.’”¹

¹ W.V. O, Quine, 1952, p.x111.

PREAMBLE

Dancy notes that “...foundationalists distinguish between inferential and non-inferential justification.”² In non-inferential justification what justifies non-inferential knowledge is the idea that there are basic beliefs, epistemological foundations, which concern our experience, which, being infallible, can be used to support other beliefs³. In regard to inferential justification foundationalists argue that “..the inferentially justified beliefs are justified by appeal to non-inferential ones ie the basic experiential ones.”⁴ The question Dancy asks is how are the principles of inference themselves justified.⁵ On this issue Russell argued that the principles of inference are justified because they are *a priori*.⁶ It will be seen that Quine rejects the idea that the principles of logic are *a priori* because according to Quine the principles of logic are not *a priori* based but are instead a posteriori based and as such revisable.

In his book The Central Questions of Philosophy Ayer notes that it is generally thought the truths of propositional logic, predicative logic, and set-theory are logically necessary due to their logical form.⁷ In regard to analyticity due to logical truth, namely the principles, or laws of logic, Quine in his article ‘Two Dogmas of Empiricism’ puts forward the doctrine of the *revisability of logic*. As Quine states “... reevaluation of some statements entails reevaluation of others, because of their logical interconnections - the logical laws being in turn simply certain further statements of the system, certain further elements of the field. Having reevaluated one statement we must reevaluate some others which may be statements logically connected with the first or may be the statements of logical connections themselves.....no statement is immune from revision. Revision even of the logical law of the excluded middle has been proposed.”⁸ Ayer points out that the list of

² J.Dancy1996, p.212.

³ *ibid*, pp.54-55

⁴ *ibid*, p.62.

⁵ *ibid*, p.212.

⁶ *ibid*, p.212.

⁷ A.J.Ayer, 1991, p.195.

⁸ W.V.O, Quine, 1953, pp.42-43.

logically necessary propositions has been taken to include semantic necessities where the logical necessity is not due to their logical form but the meanings of its terms.⁹ This semantic, or linguistic notion of analyticity is likewise rejected by Quine. Thus as Dancy points out Quine rejects the notion of “...logical necessity, or conceptual necessity. necessity being thought of as being guaranteed true by logic or by the nature of our conceptual scheme or the meaning of our words.”¹⁰ Now the third form of analyticity which Quine rejects is a view, which Putnam argues, equates analyticity with the notion of the *a priori*.¹¹ On this point Putnam points out that though Quine in his ‘Two Dogmas’ speaks of analyticity rather than a priority he explicitly noted in ‘Carnap and Logical Truth’ that what he was rejecting was the notion of the *a priori*.¹²

Now Quine’s arguments against logical necessity are not based upon his arguments against semantic necessity. In other words Quine’s arguments for the rejection of semantic necessity don’t affect the status of the logical necessity of the truths of logic. As Putnam notes “... Quine’s attack on analyticity in “Two Dogmas of Empiricism” in a certain sense.... does not touch the truths of pure logic.”¹³ As Quine states himself “our problem, however, is analyticity and this is where the major difficulty lies not in the first class of analytic statements, the logical truths, but rather in the second class which depends on the notion of synonymy.”¹⁴ Quine’s views that the laws of logic are revisable are underpinned by his understanding of the findings of physics in particular quantum mechanics. It is from the area of science that Quine attacks logical necessity and consequently argues for the revisability of the laws of logic. Quine’s attacks upon the notion of the unrevisability of the laws of logic stem from his attack upon logical necessity via science and not upon his rejection of semantic necessity.

Quine’s arguments for the revisability of logic are in regard to ‘matters of fact’, or the way the world is. In other words Quine attacks the unrevisability of logic by arguing that

⁹ A.J.Ayer op.cit p.195.

¹⁰ L.Dancy op.cit, p.223.

¹¹ H.Putnam, 1985, p.90.

¹² ibid, p.98.

¹³ H.Putnam, 1995, p.248.

¹⁴ W.V.O, Quine, op.cit, p.24.

experience may cause us to revise the laws of logic. In other words ‘matters of fact’ about the world could repudiate the laws of logic and make us revise them. The laws which Quine explicitly nominate for revision are: the law of the excluded middle; the law of non-contradiction; and the law of identity or notion of essence. As we will see Quine’s arguments for the revisability of logic in his ‘Two Dogmas’ are made up of two parts: an *a priori* argument based upon his epistemological holism; and a posteriori arguments derived from his inductions from the history of science. In this regard Quine’s arguments for the revision of the laws of logic are both *a priori* and a posteriori. Consequently the a posteriori arguments they face the tribunal of experience for their validity.

Quine argues that the notion of an analytic statement, ie one “...which is vacuously confirmed *ipso facto*, come what may...”¹⁵, results from the false reductionist view that statements about the external world face the tribunal of confirmation singly.¹⁶ Quine argues in contradistinction for an epistemological holism, namely the view that our statements about reality face the tribunal of confirmation as a corporate body of statements. As Quine states “...our statements about the external world face the tribunal of sense experience not individually but only as a corporate body.”¹⁷ Quine argues that it is the reductionist view of confirmation which falsely generates the notion of an analytic statement ie one confirmed come what may. The reductionist argues that “each meaningful statement is equivalent to some logical construct upon terms which refer to immediate experience.”¹⁸ By seeing that the real situation is epistemological holism Quine argues that the notion of an analytic statement becomes null, since the distinction between analytic and synthetic statements cannot be drawn. On these points Quine states “...as long as it is taken to be significant in general to speak of confirmation and infirmation of a statement, it seems significant to speak also of a limiting kind of statement which is vacuously confirmed *ipso facto*, come what may; and such a statement is analytic...My present suggestion is that it is nonsense, and the root of this nonsense, to speak of a linguistic

¹⁵ *ibid*, p.41.

¹⁶ C.Hookway, 1988, p.37.

¹⁷ W.V. O, Quine, *op.cit*, p.41.

¹⁸ J.Ree, 1992, p.271.

component and a factual component in the truth of any individual statement. Taken collectively, science has its double dependence upon language and experience; but this duality is not significantly traceable into the statements of science taken one by one... But what I am now urging is that even in taking the statement as a unit we have drawn our grid too finely. The unit of empirical significance is the whole of science.”¹⁹ Epistemological holism amounts to the fact that “all sciences interlock to some extent; they share a common logic and generally some common part of mathematics, even when nothing else. It is an interesting legalism however to think of our scientific system of the world as involving enblock in every prediction. More modest chunks suffice, and so may be ascribed their independent empirical meaning, nearly enough, since some vagueness in meaning must be allowed for in every event.”²⁰ In this respect Quine is rejecting the idea that statements about reality face the verdict of truth by singly corresponding to reality. Thus he is in effect rejecting the correspondence theory of truth and placing in its place what amounts to a reformulation of the coherence theory of truth. In the final section of the ‘Two Dogmas’ Quine outlines his view of science once we adopt this epistemological holism.

Epistemological holism Quine argues means that there can be readjustments in the interior field of science ie in those ideas central to science due to conflict resulting at the periphery of science ie those ideas which are not central to science. As Quine states, “A conflict with experience at the periphery occasions readjustments in the interior of the field. Truth values have to be redistributed over some of our statements. Reevaluation of some statements means reevaluation of others because of their logical interconnections - logical laws being in turn simply certain further statements of the system, certain further elements of the field. Having reevaluated one statement we must reevaluate some others, which may be statements logically connected with the first or may be statements of the logical connections themselves. But the total field is so underdetermined by the boundary conditions, experience, that there is much latitude of choice as to what statements to

¹⁹ W.V.O.Quine op.cit, pp.41-42.

²⁰ W.V.O Quine, 1981, p.71.

reevaluate in the light of any singular contrary experience.”²¹ In this regard Quine is arguing that logical laws are just another system of statements in the total field of scientific statements. Further on in his outline of science without the ‘Two Dogmas’ Quine argues that the laws of logic could be revised.

Quine in offering this claim for the revision of logic goes to science for its support. Quine argues that no statement is immune from revision not even the statements of logic. Also Quine argues that there is no boundary between analytic and synthetic statements because no statement, including so called analytic statements, are immune from revision due to experience. Quine states this unequivocally when he says “...it becomes folly to seek a boundary between synthetic statements, which hold contingently on experience, and analytic statements, which hold what may... any statement can be held true come what may, if we make drastic enough adjustments elsewhere in the system. Even a statement very close to the periphery can be held true in the face of recalcitrant experience by pleading hallucination or amending certain statements of the kind called logical laws. Conversely, by the same token, no statement is immune from revision. Revision even of the logical law of the excluded middle has been proposed as a means of simplifying quantum mechanics; and what difference is there in principle between such a shift whereby Kepler superseded Ptolemy, or Einstein Newton or Darwin Aristotle?”²² Now, though scientific statements are underdetermined by experience, Quine argues that if revisions were to happen this would take place at the peripheries of science because, due to our tendency not to disturb the core statements of the system²³, “these statements are felt...to have a sharper empirical reference than highly theoretical statements of physics or logic or ontology.”²⁴ Thus for Quine the laws of logic though possibly revisable are so central to science that their revision would be resorted to as a last resort. Nevertheless Quine does argue that the law of the excluded middle could be revised. Similarly though Quine does

²¹ W.V.O, Quine, op.cit, pp.42-43.

²² *ibid*, p.43.

²³ *ibid*, p.44.

²⁴ *ibid*, p.44.

not say so clearly in his 'Two Dogmas', it is implied that the law of non-contradiction is also open to revision.

Thus while we see that Quine in 'Two Dogmas' does argue that the laws of logic may be subject to revision Dancy notes that in regard to the law of non-contradiction Quine has an ambivalent attitude. According to Dancy "in one mood Quine asserts that this law too is technically subject to revision, even if only in the most extreme and inconceivable circumstances. This is the mood of his 'Two Dogmas'. Later however Quine is willing to admit vestiges of unrevisability. He argues... that logical connectives do have a determinative meaning, and this makes it possible for Quine to allow...that the logical laws are true in virtue of the meanings of the logical connectives in them."²⁵ That Quine does argue that the connectives of logic do have determinate meanings is brought out by his statement in Word and Object where he states "we have settled a people's logical laws completely, so far as the truth-functional part of logic goes, once we have fixed our translations by the above criteria. Truths of this part of logic are called tautologies: the truth-functional compounds that are true by truth-functional structure alone."²⁶ In this regard Quine is arguing that this determinative meaning is a product of our semantic criteria. In Word and Object he states this, when he is discussing the possibility of pre-logical thinking, the claim of accepting the law of non-contradiction "...is absurd under our semantic criteria."²⁷ Quine argues that a system builder is not bound by the law of non-contradiction "if he [the system builder] were to accept contradiction he would so readjust his logical laws as to insure distinctions of some sort..."²⁸ Thus it is clear that Quine does argue that the law of non-contradiction could be subject to revision. Now though Quine argues that the laws of the excluded middle and non-contradiction could be revisable Quine categorically repudiates the notion of identity or essence.

²⁵ J.Dancy, op.cit, p.224.

²⁶ W.V.O,Quine,1960, p.60.

²⁷ ibid, p.58.

²⁸ ibid, p.59.

In Word and Object Quine argues that the notion of essence however venerable “...is surely indefensible; and surely...must go by the board.”²⁹ In From a Logical Point of View Quine states “to defend Aristotelian essentialism...is not part of my plan. Such a philosophy is as unreasonable by my lights as it is by Carnap’s or Lewis.”³⁰ Quine maintains that there are no necessary and sufficient properties belonging to an object. In Word and Object Quine argues that no properties are necessary or contingent. As Quine states “perhaps I evoke the appropriate sense of bewilderment as follows. Mathematicians may conceivably be said to be necessarily rational and not necessarily two-legged; and cyclists necessarily two-legged and not necessarily rational. But what of an individual who counts among his eccentricities both mathematics and cycling? Is this concrete individual necessarily rational and contingently two-legged or vice versa? Just in so far as we are talking reverentially of the object, with no special bias towards a background grouping of mathematicians as against cyclists, or vice versa there is no semblance of sense in rating some of his attributes as necessary, and others as contingent. Some of his attributes count as important and others as unimportant, yes; some as enduring and others as fleeting; but none as necessary or contingent.”³¹

Thus we see that for Quine the notion of Aristotelian essence is abandoned because there are no necessary and sufficient properties belonging to an object. The law of the excluded middle as well as the law of non-contradiction are open to revision. In this regard we see that Quine argues for the idea that the laws of logic are not immutable and as a consequence could be revised. It becomes difficult to see how statements like ‘ P iff Q ‘ ie P if and only if Q or ‘if P&Q then P’ could be revised or abandoned. Quine does not offer a logical demonstration of how these laws could be revised; what he does do is offer a psychological explanation, based upon his epistemological holism, which accounts for

²⁹ *ibid*, p.199-200.

³⁰ W.V.O,Quine, 1953, p.157.

³¹ W.V.O.Quine *op.cit*, p.199.

our belief in these laws. Simply Quine argues that these ideas are so embedded in our belief structures that it becomes psychologically inconceivable for us to abandon them.

Quine argues that this logical necessity rests upon as Hookway notes “...psychological or natural necessity.”³² Rather than logical necessity being due to the nature of our thinking process, ie the only way that we can think, logical necessity is due to the laws of logic as being psychologically central to our conceptual system. As Quine argues in Methods of Logic “our system of statements has such a thick cushion of indeterminacy, in relation to experience, that vast domains of law can easily be held immune to revision on principle. We can always turn to other quarters of the system when revision is called for by unexpected experiences. Mathematics and logic, central as they are to our conceptual scheme, tend to be accorded such immunity, in view of our conservative preference for revisions which disturb the system least; and herein, perhaps lies the ‘necessity’ which the laws of mathematics and logic are felt to enjoy.”³³ In this regard the laws of logic are only truths because they are part of our conceptual system. As Quine again notes “ for, it is certainly by virtue of that scheme that those laws [of logic] are central to it and it is by virtue of being thus central that the laws are preserved from revision at the expense of statements less strategically situated.”³⁴

In Word & Object Quine outlines a similar line of argument accounting for our belief in analyticity. Now Quine’s notion of analyticity in this work is the same as the notion of analyticity equated with apriority in his ‘Two Dogmas’. Quine introduces the term ‘stimulus-analytic’. Quine argues that analyticity is a statement confirmed “...come what may...”³⁵ Now he notes that “ one way to take ‘come what may’ as ‘come what stimulation may’.”³⁶ Now this according to Quine “...gives virtually the definition of stimulus analyticity.”³⁷ By stimulus meaning Quine means “the affirmative stimulus meanings of

³² C.Hookway, op.cit, p.47.

³³ W.V.O,Quine, 1952, px111

³⁴ ibid, p.xlv

³⁵ W.V.O, Quine, 1960, p.66

³⁶ ibid, P.46.

³⁷ Ibid, p.66.

a sentence...for a given speaker, as the class of all stimulations...that would prompt his assent.”³⁸ In other words a stimulus analytic statement is one which a person can find reasons for believing to be analytic. Quine goes further than this when he argues that we call “..stimulus-analytic just the sentences that are stimulus-analytic for almost everybody.”³⁹ Quine argues that this notion of ‘stimulus-analyticity’ explains what we have called analyticity.⁴⁰ According to Quine “...analyticity even in this improved sense will apply as much to ‘There have been black dogs’ as to ‘2+2=4’ and ‘No bachelor is married.’”⁴¹

Now what makes these sentences stimulus-analytic? According to Quine the answer is because society does not give us constant meanings to govern a word. As Quine notes, in regard to the word ‘bachelor’, “one looks to ‘unmarried man’ as semantically anchoring ‘bachelor’ because there is no socially constant stimulus meaning to govern the use of the word; sever its tie from ‘unmarried man’ and you leave it no very evident social determination, hence no utility in communication.”⁴² Now it is this collapse of communication that explains why we find it difficult to revise our laws of logic. The denial of analyticity throws us into psychological bewilderment. As Quine notes “one’s reaction to denials of sentences typically felt as analytic has more in it of one’s reaction to ungrasped foreign sentences....”⁴³

These arguments for logical necessity as being due to psychological or natural necessity are central to Quine’s arguments for the revisability of the laws of logic. Hookway makes the important point that “Quine’s position is secure if he holds that, whenever we talk of what can be doubted or about what must be believed, we are concerned with psychological- rather than logical- possibility, and if he holds that the systematic structure

³⁸ *ibid*, p.32.

³⁹ *ibid*, p.66.

⁴⁰ *ibid*, p.66.

⁴¹ *ibid*, p.66.

⁴² *ibid*, p.56

⁴³ *ibid*, p.66..

of our corpus of beliefs influence what it is possible for us to doubt at any time.”⁴⁴ Thus in this regard Quine’s epistemological holism allows Quine to explain how we come to believe in the necessity of logical laws.

Thus we see that the explanation Quine gives for the belief in logical necessity is not based upon some demonstration in logic. What is required for the belief in logical necessity is the fact that the statements of our conceptual system are interconnected with other statements in the system in an holistic manner such that it becomes inconceivable for us to imagine altering those core statements of logic. In other words a psychological explanation explains this intractability of our beliefs. As Hookway notes “a psychological explanation can be provided for all this. We do not require explanations that talk of conventionally adopted linguistic frameworks”⁴⁵.

Now Putnam in Words and Life notes that Quine “...has at times suggested that it is difficult to make sense of the notion of revising the laws of classical logic.”⁴⁶ Quine in ‘Carnap on Logical Truth’ states “deductively irresolvable disagreement as to logical truth is evidence of deviation in usage (or meaning) of words.”⁴⁷ Putnam makes the point that though Quine, in his Philosophy of Logic, seems to hold the view that the laws of propositional logic cannot be revised without losing simplicity he has later rejected this view.⁴⁸ Nevertheless Quine is unequivocal about the notion that the laws of logic could be revised in his ‘Two Dogmas’. From Quine’s arguments for the revision of the laws of logic it is seen that for Quine logic is an empirical science- an empirical science in the sense that if the laws of logic say anything about the world of experience or ‘matters of fact’ then this world will be the tribunal against which the laws are accepted or revised. And as we have seen Quine believes that the law of the excluded middle has been revised in the light of the findings of quantum mechanics. Nevertheless, for all Quine’s arguments

⁴⁴ C.Hookway, op.cit, p.40

⁴⁵ ibid, p.46.

⁴⁶ H.Putnam 1995, p.253.

⁴⁷ W.V. O, Quine, 1960, p.354.

⁴⁸ H.Putnam op.cit, p.262, no.8.

for the revisability of the laws of logic he believed as Rorty notes that “...logic [is] the essence of philosophy.”⁴⁹

Thus we see that Quine’s arguments for the revision of the laws of logic stem from three sources: his epistemological holism; his inductions from the history of science; and his denial of analyticity as equated with a priority. In offering these arguments Quine also outlines why there appear to be analytic/a priori statements. His arguments for why we accord special status to the analytic/apriori statement also accounts for why we find it difficult to revise the laws of logic. This account argued in effect that we are psychologically adverse to any alteration in our core beliefs; a sense of bewilderment sets in when we are confronted with denials of the laws of logic.

Now in chapter three we will investigate whether science does give support to Quine’s claims that quantum mechanics via quantum logic brings about a revision in the laws of logic. In this chapter I will look at the arguments in regard to quantum logic. These arguments will outline central questions which must be answered if quantum logic does give support for Quine’s claims. These issues are whether we interpret quantum logic realistically or anti-realistically; and also whether quantum logic is only applicable to the micro-world or whether it is applicable to the macro-world. It will be seen that Quine’s claims for the revision of logic only have support from quantum mechanics if we impose certain restrictions. Similarly chapter four will investigate what the consequences for inference are if epistemological holism is tenable. This chapter will argue that we cannot avoid the consequence of scepticism if epistemological holism is tenable and the restrictions imposed in chapter two are valid.

⁴⁹ R.Rorty, 1979.p.172.

CHAPTER TWO

LOGIC AS AN EMPIRICAL SCIENCE

“.. If we know what sorts of logical structures must be used to describe reality, we know something about the abstract structure of reality.”¹

¹ C.Hookway, 1988, p.80.

This chapter will look at Quine's claim that quantum mechanics shows that the laws of classical logic could be revised. This chapter will show that there are differing ideas in regard to the interpretation of just what quantum logic refers to. It will be shown that there are those who give a realist interpretation of quantum logic and others who give an anti-realist interpretation. There is also differing interpretation over the scope of quantum logic. Some argue, like the preservationists, that quantum logic is only applicable to the macro-world. Others like the revisionists argue that it is applicable to both the macro and micro- worlds. Now regardless of these differing interpretations it will be shown, based upon the arguments of Putnam, that quantum mechanics does require a revision of the laws of classical logic in order to make sense of the findings in quantum mechanics. This revision leads to a logic called quantum logic, but as I will show the scope and interpretation of this logic is an area of dispute.

Before we enter into the question as to what quantum logic is we must ask what is logic? Hookway points out three ways in which philosophers see logic. In some cases logic is seen as being used in regard to deduction.² Some see logic as contributing to an understanding of why valid arguments are valid as well an understanding of how meaning is generated in sentences.³ Others see logic as saying something about the structure of reality. Hookway makes the point that Kant argued that our language with its subject-predicate statements and conditional statements leads us to see reality as substances standing in a causal relationship with each other.⁴ Building upon this view Hookway notes that some philosophers believe that "...if we know what sorts of logical structures must be used to describe reality, we know something about the abstract structure of reality."⁵ It will be seen that it is this view of logic as mirroring reality that is central to the realist-revisionist's claims for the revision of classical logic.

² C.Hookway, 1988, p.77.

³ *ibid*, p.79.

⁴ *ibid*, p.80.

⁵ *ibid*, p.80.

So what is quantum logic? Gibbins notes that quantum logic “...is nothing more than the closed subspaces of Hilbert space.”⁶ Now classical logic is Boolean. In Boolean notation the constant ‘.’, or Boolean product and ‘+’ or Boolean sum are used. What these mean can be understood from the following examples. According to O’Connor “...if “x” stands for the class of red things and “y” for the class of square things, then “xy” [ie “x.y”] stands for the product of the two classes, the things that are both red and square. And “x+y” stands for the class of things that are either red or square but not both.”⁷ With this notation in mind classical logic is Boolean because it obeys the Boolean rules: the commutative rule ie $x.y = y.x$, $x + y = y + x$; the distributive rule ie $x.(y + z) = (x.y) + (x.z)$, $x + (y.z) = (x + y).(x + z)$; the complement rule ie $x.x' = 0$, $x + x' = 1$; the duality principle ie if an expression is valid then the expression obtained by exchanging . and + and 0 is also valid; the idempotent laws ie $x + x = x$, $x.x = x$; the associative laws $x.(y.z) = (x.y).z$, $x + (y + z) = (x + y) + z$; the absorption laws; ie $x.(x + y) = x$, $x + (x.y) = x$ and the null laws $x + 1 = 1$, $x.0 = 0$ On the other hand Quantum logic is non-Boolean.⁸ Gibbins notes that the most important fact about quantum logic is that it rejects the axiom of the distributive law.⁹ In other words it rejects $p(q \vee r) = pq \vee pr$. Gibbins on this point out that in quantum logic the right-hand side of the expression $a \wedge (b \vee c) = (a \wedge b) \vee (a \wedge c)$ [where \wedge stands for conjunction] “... is logically stronger and always implies the left-hand side though not conversely. When this converse fails so does distributivity.”¹⁰

There are two ways in which philosophers and scientists interpret quantum logic. The realists regard quantum logic as saying something about the structure of reality. The anti-realists consider that quantum logic says nothing about the structure of reality but only refers to the logic of our measurements. In this regard quantum logic enables these anti-realist interpreters to give meaning to the sentences in which the results of measurements are

⁶ P.Gibbin, 1987, p.92.

⁷ D.J.O’Conner, 1992, p.52.

⁸ P.Gibbin op.cit, p.87.

⁹ ibid, p.93.

¹⁰ ibid, p.95.

couched. In this regard classical logic is still required to be revised in order to make sense of experiments.

Now the question is, “is there any empirical support or evidence to suggest that logic is an empirical science and is revisable?” The answer is to my mind yes. This support comes from two areas: relativity physics and quantum mechanics.

As we saw in the introduction Quine argued that science had rejected the notion of the object and regarded it as a myth. Physical objects are as mythical as the gods of Homer. As Quine notes “...physical objects are conceptually imported into the situation as convenient intermediaries-not by definition of terms of experience, but simply as irreducible posits comparable, epistemologically, to the gods of Homer.”¹¹ This claim of Quine is as we shall see supported by physics. Nevertheless there is some debate in philosophy in regard to the nature of the object. These debates centre around essentialists and anti-essentialists arguments. The essentialist argue that an object possess an essence ie characteristic properties. Conversely the anti-essentialists deny this. The essentialist Kripke argues that proper names are ‘rigid designators’ ie apply in all possible worlds.¹² These ‘rigid designators’ or proper names refer to essential properties of the object. These properties are based upon the composition and causal continuity of the objects.¹³ In the case of a person the rigid designator refers to the person born of a particular sperm and egg.¹⁴ In the case of a material object Kripke refers to gold as being defined by its scientific properties.¹⁵ Putnam notes that Kripke suggested that “...the old idea that science discovers necessary truths, that science discovers the essence of things was, in an important sense, right not wrong...”¹⁶ Against this essentialist view are the anti-essentialist arguments of Ayer. Ayer argues that assigning necessary

¹¹ W.V. O,Quine, 1953, p.44.

¹² S..Kripke, 1980, p.48.

¹³ *ibid*, pp.112-115.

¹⁴ *ibid*, p.113.

¹⁵ *ibid*, p.p. 117-118.

¹⁶ H.Putnam, 1985, p.55.

properties to objects is an arbitrary exercise.¹⁷ Ayer argues that the “...ways of identifying individuals by descriptions of their appearances, or their functions, or their behaviour, or their spatio-temporal positions...[don’t] pick out necessary propertie[s].”¹⁸ Now it would appear from the findings in relativity physics that science, in opposition to Kripke’s suggestion and in support of Ayer’s claim, argues that the notion of determinate properties, or essences are incorrect. This argument from physics has profound consequences for the nature of classical logic. Since if Quine is right about the rejection of the notion of an object having an essence this rejecting of the essence of the object has profound consequences for the whole nature of logic; since as Putnam argues with this negation the whole of classical logic will have to be given up.¹⁹ In this regard the rejection of the essence of an object by Putnam’s argument would mean that classical logic would have to be revised. This consequence would in fact support Quine’s claim for the revision of logic at the macro level and consequently give support for scepticism; in regard to the fact that with the revision of the laws of logic, at the macro level, any inference about the macro world based upon the classical laws of logic would then become uncertain in regard to its validity. Now it would require other examples and arguments from physics to substantiate this claim of Quine. Because Quine bases his claims on the findings of quantum mechanics this thesis will deal with quantum mechanics. Nevertheless to pursue these arguments from physics would be an interesting exercise. For if it could be demonstrated that these findings do give support for Quine’s claim then even if the realist/revisionist interpretation of quantum logic proves incorrect a relativistic interpretation may still support Quine and scepticism.

According to Putnam logic derives from metaphysics the belief in substances. As he notes, “We get at the very beginning of logic, a metaphysics accompanying it and conditioning it.”²⁰ Now this idea of a substance had the consequence that the substance had to have properties. As Putnam points out “the picture of substances and their predicates became the standard metaphysical picture of a world with fully determinate particulars characterised by their fully

¹⁷ A.J.Ayer op.cit, p.197.

¹⁸ *ibid*, p.197.

¹⁹ H.Putnam op.cit, p.273.

²⁰ *ibid*, p.272

determinate properties.”²¹ Now relativity physics through the assigning of properties to matter ie objects sees these properties as being due to the object’s relation with other objects not so much as intrinsic to the object or constituting its essence. In this regard science denies that objects have sui-generis determinate, necessary, and immutable properties or essence. An example is that the weight of an object is determined by its relationship to other bodies ie bodies with larger gravity changes the weight of smaller bodies. Similarly the colour of an object is dependent upon its relation to different light sources. In these cases the weight and colour of an object is dependent upon its relation to other objects. And thus an object’s weight and colour are not immutable necessary properties or essence of an object. On this point M. Born argues “the theory of relativity...has never abandoned all attempts to assign properties to matter...But often a measurable quantity is not a property of a thing, but a property of its relation to other things...Most measurements in physics are not directly concerned with the things which interest us but with some kind of projection, the word taken in the widest possible sense. Commenting on these findings Marcuse states that “objects continue to persist only as ‘convenient intermediaries’ as obsolescent ‘cultural posits.’”²² It could be argued that the notion of an object with an essence or determinate property is central for human thinking; it is an epistemological foundation for all thought itself. Without the notion of an object with an essence thinking would have nothing to think with. As Adorno notes “identity is inherent in thought itself... to think is to identify .”²³ This can be seen with the laws of classical logic such as the law of identity and non-contradiction which require an object with an essence to work with. Thus the metaphysical presupposition upon which logic is built is the notion that the object has an essence or identity. Nevertheless the above arguments of physics thus reject the metaphysical realist view of the object, who as Dummett argues believes “...that an object either determinately has or determinately lacks any property P which may be significantly be predicated of that object.”²⁴ In other words realism argues that an object has a determinate or essential property which characterises it and makes it what it is. On this point Putnam thus argues that if “the metaphysical picture that grew up with and

²¹ *ibid*, p.272.

²² *ibid*, p.149.

²³ T.Adorno, 1973, p5

²⁴ H.Putnam, 1985, p272.

conditioned classical logic is wrong, then some of the tautologies of classical logic may have to be given up.”²⁵ Now just as we get empirical support for the view that the laws of logic may have to be revised from relativity physics we also seem to get similar support from quantum mechanics via quantum logic.

There are a number of important issues around the notion of quantum logic. Gibbins points out some of these question are; Is quantum logic really logic? Is quantum logic a rival to classical logic? Can we speak of a logic of the world? If we can, is this logic to be decided empirically? Can quantum logic be used to resolve the paradoxes of quantum mechanics?²⁶ Gibbins notes that there are two main interpretations of quantum logic: the activist, and the quietist. The activist interpretation of quantum logic argues that we resolve the paradoxes of quantum mechanics by doing away with classical logic and replace it with quantum logic.²⁷ The quietists argue against the activists that quantum logic cannot resolve the paradoxes of quantum mechanics because the paradoxes cannot even be formulated in quantum logic.²⁸ Gibbins also notes that there are differing views regarding the scope of quantum logic. The revisionist argues that quantum logic is the logic of the real world and as such we should replace classical logic everywhere.²⁹ Finally there are the preservationists who argue that quantum logic is only applicable to the micro-world and not to the macro.³⁰

Gibbins notes that some philosophers of physics interpret quantum mechanics, thus quantum logic, realistically, ie that it describes the world as it is³¹ and others interpret it anti-realistically, ie it does not describe the world as it is.³² Others again see quantum logic

²⁵ *ibid*, p.273.

²⁶ P.Gibbins, 1987, p.x

²⁷ *ibid*, p.142.

²⁸ *ibid*, p.142.

²⁹ *ibid*, p.143.

³⁰ *ibid*, p.143.

³¹ *ibid*, p.1x

³² *ibid*,1x

instrumentally.³³ Some argue that quantum logic mirrors the logical structure of the world. Now it is extremely important for the claims of Quine and the notion of scepticism as to whether the realists or anti-realists are right. If the anti-realists are right then quantum logic says nothing about the structure of reality. Consequently the laws of classical logic dealing with the structure of reality or ‘matters of fact’ will not be called upon to be revised, because under an anti-realistic interpretation of quantum logic the revisions required in quantum logic have nothing to do with reality and therefore classical logic. In this regard Quine’s claims for the revision of classical logic at the macro level break down and scepticism becomes untenable. Now if the realist interpretation of quantum logic is correct we still have the revisionist and preservationist interpretations of quantum logic. If the preservationist interpretation is correct then quantum logic only applies to the micro-world. Consequently revisions in classical logic are only required when we deal with the micro-world but not when we deal with the macro-world. Thus once again Quine’s claims have no bearing upon the classical logic of the macro-world. Now the only alternative which gives support for Quine’s claims at the macro level is the revisionist interpretation. If this is the correct interpretation then quantum logic does require us to revise the laws of classical logic at the macro level and as a consequence inferences based upon the laws of classical logic will be uncertain in regard to their validity.

Now on the topic of quantum logic Putnam notes that the issues raised by the use of quantum logic in the interpretation of quantum mechanics are complex.³⁴ Putnam points out that the adoption of quantum logic has been proposed by both ‘realist’ and ‘verificationist’ construals.³⁵ According to Putnam the idea of adopting quantum logic plus a ‘realist’ semantics cannot take place until the notion of ‘realism’ itself is properly worked out.³⁶ Nevertheless Putnam himself argues that the laws of logic are revisable and that quantum mechanics is the right interpretation of the physical world.³⁷ On the validity of quantum logic

³³ H.Putnam, 1985 p.93.

³⁴ *ibid*, p.135.

³⁵ *ibid*, p.135.

³⁶ *ibid*, p.135.

³⁷ *ibid*, p.100.

Putnam states that the quantum logic of quantum mechanics “is the only realistic interpretation of the *present* theory. If the present theory is true, or, subjunctively, if it *were* true, or if the true theory retains certain key features of the present theory, however much it may differ from the present quantum mechanics in other respects, then the interpretation I defend *is* an interpretation of the true theory, and no other realist interpretation *has ever been proposed*: only *wishes* for a different physical universe.”³⁸ With Putnam’s point of view I agree and argue, with Putnam, that if he is right “...then anyone who concedes that the present theory [quantum logic] *could* be true should concede that there is a strong ‘case’ for the possibility of a quantum logical universe.”³⁹ If this quantum logical universe is true then Quine’s claims that the laws of classical logic could be revised is substantiated. And the consequence of scepticism itself becomes tenable.

The source from which Quine derived his assertion in his 1951 article ‘Two Dogmas of Empiricism,’ that the law of the excluded middle could be denied by quantum mechanics was from Reichenbach’s use of three-valued logic in interpreting quantum mechanics.⁴⁰ Putnam points out that this interpretation of Reichenbach is technically inferior to one put forward by von Neumann.⁴¹ In 1936 J.Von Neumann and D.Birkhoff suggested that the logic of the physical world is non-classical.⁴² Putnam notes that since 1960 a great deal of work has been and is being done on this notion.⁴³ According to Putnam the question arises from this notion that if logic turns out to be empirical then the notion of ‘necessity’ may have to be scrapped.⁴⁴ The consequence of finding a quantum mechanical explanation to some phenomena leads to the result that, as Putnam notes, “...some of the laws of classical logic have been given up.”⁴⁵

³⁸ *ibid*, p.93.

³⁹ *ibid*, p.93.

⁴⁰ *ibid*, p.51.

⁴¹ *ibid*, p.51.

⁴² *ibid*, p.46.

⁴³ *ibid*, p.47.

⁴⁴ *ibid*, p.47.

⁴⁵ *ibid*, p.48.

In his 'Two Dogmas Revisited' Putnam points out some of the laws of classical logic which are rejected by quantum logic. According to Putnam the distributives laws of standard propositional calculus such as $p(q \vee r) = pq \vee pr$ are logically true. But in quantum mechanics this law is not regarded as being logically true.⁴⁶ Gibbins points out that, in quantum logic, for many P neither P nor $\neg P$ is true.⁴⁷ On the point of the logical connectives being the same for classical logic and quantum logic Gibbins expresses doubts. Gibbins argues that though "...quantum logic and classical logic share many features... unlike classical logic quantum logic cannot be truth functional. As a corollary, the quantum logical connectives cannot be defined by means of truth tables thus there arises the philosophical problem about the meaning of the quantum logical connectives."⁴⁸ Putnam argues that the meaning of logical connectives does not change. Putnam points out that the classical logical principles of:

" p implies $p \vee q$,

q implies $p \vee q$,

'if p implies r and q implies r , then $p \vee q$ implies r '

p, q together imply $p \cdot q$

$p \cdot q$ implies p

$p \cdot q$ implies q

all hold in quantum logic. And that

p and $\sim p$ never both hold

$(p \vee \sim p)$ holds and $\sim \sim p$ is equivalent to p "⁴⁹

Consequently Putnam argues that "...adopting quantum logic is *not* changing the meaning of the logical connectives but merely changing our minds about the laws."⁵⁰

Now some of the phenomena which seem to indicate that the laws of classical logic have to be revised are: the problems of interference; the uncertainty in the position of a particle with momentum; and the dual wave-particle nature of an object. If a single photon is directed at a plane containing two slits an interference pattern is detected if a photographic plate is in

⁴⁶ H.Putnam, op.cit, p.96.

⁴⁷ P.Giddens, op.cit, p.167.

⁴⁸ P.Giddens op.cit, p.93.

⁴⁹ H.Putnam, 1975, p.189-190..

⁵⁰ *ibid*, p.190

place behind the plate. If one of the slits is covered up no interference pattern is detected. This leads to the consequence that as Dirac noted “...each photon interferes only with itself. Interference between different photons never occurs.”⁵¹ Now as Putnam points out because of the uncertainty principle the photon can interact with both slits with the consequence that what “...one gets on the photographic plate is not a simple sum of the patterns that one would obtain by just performing the experiment with the left slit open and just performing the experiment with the right slit open. Rather it is as if half the photon went through the left hand slit and half the photon went through the right hand slit and the two halves then intermingled and interfered...”⁵² Now, according to Putnam, in von Neumann’s quantum logic the photon going through the left slit or the photon going through the right slit is symbolised in classical form thus $(p \vee r)$, but the classical forms $(p \ \& \ q)$, or pq and $(p \ \& \ r)$ or pr ie the statements ‘the photon went through right slit and hit R’ and ‘the photon went through the left slit and hit R’ respectively are impermissible.⁵³ The denying the permissibility of these classical logical forms is due to the fact that in von Neumann’s quantum logic he is not concerned with which slit the photon went through because quantum logic does not allow certain propositions ie the ‘incompatible’ propositions of quantum mechanics to be conjoined.⁵⁴ This has the consequence that the propositions p, r have no conjunction and the propositions q, q have no conjunction.⁵⁵ On this point Putnam notes that this is what “...certain philosophers of quantum mechanic think is going on.”⁵⁶ Similarly as Putnam notes, “ in fact the law of *conjunction introduction* (from any two propositions p, q infer their conjunction $(p \ \& \ q)$ has to be restricted to pairs of *compatible* propositions p, q and the distributive law has to be restricted to the case in which all three propositions p, q, r are totally compatible.”⁵⁷ Thus we see that in interpreting the phenomena of interference quantum mechanically, through quantum logic, some of the laws of classical logic are revised or given up.

⁵¹ H. Zajac, 1979, p.452.

⁵² H.Putnam, op.cit, p.47-48.

⁵³ *ibid*, p.48.

⁵⁴ *ibid*, p.48.

⁵⁵ *ibid*, p.48.

⁵⁶ *ibid*, p.48.

⁵⁷ *ibid*, p.48.

As a second illustration that quantum logic leads to revisions in the classical laws of logic Putnam makes note of a computational experiment performed by Kochen and Speker which contradicts a theorem by Gleason based upon classical logic. Without going into detail the result indicated that the formule which are tautologically false in classical logic become possible in quantum logic.⁵⁸ The consequence of this result according to Putnam "...is that things which are *literally impossible according to classical propositional calculus* can happen and do happen..."⁵⁹ Thus we have the result that the laws of classical logic in some cases doesnot account for the appearance of certain phenomena; thus they are to be revised or rejected. This result is seen in regard to the violation of the law of the excluded middle by a particle with momentum.

Ayer points out that "in microscopic physics [quantum mechanics] the proposition that a particle with an ascertained momentum either is or is not at a particular position at a particular time is not taken to be true..."⁶⁰ As a consequence of this particle violating the law of the excluded middle, due to the uncertainty principle Ayer argued that "...a new system of logic ...would be better suited to quantum mechanics."⁶¹ A.J.Ayer noted that the world has to be such that we can apply our system of logic.⁶² Ayer claimed that it is possible that our system of classical logic may not be applicable to the world. As he states, "...it is conceivable that the world should not be accommodated, or at least not be so well accommodated to the system of logic that we have developed."⁶³ In this regard because the world does not accommodate the law of the excluded middle this law is thus rejected.

In 1881 Louis Victor, Prince de Broglie proposed that every particle should have an associated wave nature.⁶⁴ In subsequent years this proposal of de Broglie has been validated by numerous experiments. The wave nature of a particle is demonstrated in interference and

⁵⁸ *ibid*, p.50.

⁵⁹ *ibid*, p.50.

⁶⁰ A.J.Ayer, 1991, p.202.

⁶¹ *ibid*, 202.

⁶² *ibid*, p.202..

⁶³ *ibid*, p.202.

diffraction experiments.⁶⁵ Similarly light exhibits a dual nature of being a wave and being a particle. The particle nature of light is demonstrated in the photo-electric effect due to Einstein.⁶⁶ The wave aspect is demonstrated again in interference and diffraction experiments.⁶⁷ Thus we have a situation in which an object is simultaneously a particle and a wave. This result Putnam argues suggests that the principle of non-contradiction i.e. $\sim (p \ \& \ \sim p)$ might be revised.⁶⁸ As Putnam argues “...it might be suggested that the principle holds only for ordinary statements about ordinary macro-observable properties of ordinary macro-observable objects, such as ‘the cat is on the mat’, and it might be suggested that there is a class of *recherche* statements about waves and particles or whatever for which the principle fails. Perhaps ‘the electron is a particle’ is both true and false or ‘the electron is a wave’ is both true and false.”⁶⁹

Now on the point of an object being both a particle and a wave Zajak notes that “we are limited by our language to lists of words much as our worldly experiences limit the concepts those words bring to mind.”⁷⁰ With this in mind Zajak points out that we naively apply to the micro world concepts which only have applicability in the macro world. Electrons don’t behave like mini billiard balls and light does not behave like scaled down sea waves. As Zajak notes “*particles and waves are macroscopic concepts which gradually lose their relevance as we approach the submicroscopic domain.*”⁷¹ Thus with regard to the ontological nature of the world the situation seems to be as O’Hear notes “ontology here would be seen as determined by the demands of an area of discourse, rather than by any feeling that human recognitional powers and abilities should determine the limits of our language.”⁷² In this regard the logic which is generated by the use of the logical constants of a natural language such as ‘or’, ‘if’, ‘not’, ‘and’ , etc may not be adequate enough for the natural language to interpret or understand the ontological nature of the physical world. Thus

⁶⁴ H.Zajac, op.cit, p.448.

⁶⁵ ibid, p.449.

⁶⁶ ibid, p.444-445.

⁶⁷ ibid, pp448-457.

⁶⁸ H.Putnam op.cit, p.100.

⁶⁹ ibid, p.100

⁷⁰ H.Zajak, op.cit, p.449.

⁷¹ ibid, p.450.

concepts which are contradictions in terms such as an object being a ‘wave-particle’ or such mathematical ideas as ‘completed infinities’ reach the limits of our logic because they start violating our logical laws. In other words the nature of the world may transcend the limits and ability of language thus logic to characterise. In this regard the nature of the world seems to force us to adopt quantum logic and as a consequence to cause us to revise the laws of classical logic.

Thus we see that the revision of the laws of classical logic in quantum logic does not involve just changing the meaning of the logical connectives. Changing the laws of classical logic may mean not changing the meanings of the connectives at all. In some cases the laws are revised even though the meaning of the logical connectives stays the same in both classical logic and quantum logic. As we saw in some cases what is a logical truth or logical necessity in classical logic turns out to be not so when the logical expression is taken over in to quantum logic. This to my mind says that the idea that the whole idea of necessity should be scrapped is perhaps a bit extreme. What the examples from quantum logic indicate is that there is always some doubt in regard to whether a logical law is, or will remain ‘necessary’. Also the fact that some laws of classical logic remain logically true when brought over into quantum logic indicates that though some laws of logic are empirical not all of them are. Some at least appear to be *apriori*. In summation then we see that though there are some who would disagree there are arguments from relativity physics and quantum mechanics which support the view that science brings about revisions in the laws of classical logic. In this regard these findings lend some support to Quine’s claims. In regard to quantum mechanics there are differing interpretations over the scope and interpretation of quantum logic. We saw that the anti-realists argue that quantum logic does not refer to the logical structure of reality but only gives meaning to the results of measurements. In this regard anti-realist interpretations of quantum mechanics do not give support for Quine’s arguments in regard to the revision of classical logic for the macro-world and thus make scepticism untenable. Conversely we saw that the realists do argue that quantum logic does mirror the

⁷² A.O’Hear, 1991, p.51.

structure of reality. Now it is this interpretation which gives support for Quine's views and makes scepticism tenable. Nevertheless it is only the revisionist interpretation of the scope of quantum logic which gives this support. If the preservationist interpretation of the scope of quantum logic is correct, and quantum logic only applies to the micro world then Quine's views and scepticism only then apply to the micro- world and not the macro. Thus if the realist- revisionist interpretation is correct then any classical inference to do with 'matters of fact' will be open to revision and thus not certain in regard to its truth claim. In this regard we are led to scepticism. If we accept that we live in a macro-world which is explained by a minimal classical logic and quantum logic, or in other words logic which has a common part of Boolean logic and a part which is non-Boolean, namely quantum logic, then we must accept Quine's claims for the revision of classical logic and thus we are led to scepticism. Now chapter three will address the issues raised if the realist-revisionist interpretation of quantum logic and Quine's epistemological holism are correct. In chapter three I will outline how this interpretation leads to scepticism and what scepticism entails for epistemological holism.

CHAPTER THREE

EPISTEMOLOGICAL HOLISM

“... reevaluation of some statements entails reevaluation of others, because of their logical interconnections - the logical laws being in turn simply certain further statements of the system, certain further elements of the field. Having reevaluated one statement we must reevaluate some others which may be statements logically connected with the first or may be the statements of logical connections themselves...”¹

“ [if we alter logical truths]... it may well then be that we end up with a rather different set of ‘guaranteed’ truths and inferences for those sentences. For there would be no assurance that our new understanding of the compounding operations involved and the constituents they had to work on, would indicate the same sentence forms to be unimpeachable representers of reality.”²

¹ W.V.O.Quine, 1953, pp.42-43.

² D. Papimeau, 1979, p.176.

According to Quine even though we are reluctant to revise our core statements of say logic and mathematics these statements are nevertheless not immune from revision. Now it is argued that though Quine did not advocate scepticism I maintain that under certain conditions Quine's views lead to scepticism. These conditions are that if his epistemological holism is tenable and that a realist-revisionist interpretation of quantum logic is likewise tenable, then we can have no certainty in regard to the validity of any inference. Once our core beliefs of logic become revisable we have the inevitable consequence, for epistemological holism, of scepticism ie we cannot be certain of any of our inferences. On the point that the revising of the laws of classical logic have the consequence for epistemological holism of scepticism Papineau and O'Hear in a broad way agree.

Before I outline Papineau's and O'Hear's arguments I will recap on what Quine's holism means. As we saw Quine argues that "our statements about the external world face the tribunal of sense experience not individually but only as a corporate body."³ This has the consequence that if we revise one statement in the system other statements will have to be revised as well. As Quine states "...reevaluation of some statements entails reevaluation of others, because of their logical interconnections - the logical laws being in turn simply certain further statements of the system, certain further elements of the field. Having reevaluated one statement we must reevaluate some others which may be statements logically connected with the first or may be the statements of logical connections themselves...."⁴

Dummett has certain criticisms of holistic theories which seem to point out the untenability of holism. Dummett argues that holistic theories seem to preclude any account of the way statements are accepted or rejected.⁵ According to Papineau Dummett argues "if the meaning of the expressions in a language depended in turn on the totality of sentences

³ *ibid*, p.41.

⁴ *ibid*, pp.42-43.

⁵ M. Dummett, 1973, pp.623-7

accepted by the users of the language, then we would never be able to understand any decision to accept any sentence as being guided by a prior grasp of what the sentence meant.”⁶ Nevertheless Dummett, according to Papineau, moves towards holism in that he adopts a molecular view of language in that Dummett maintains that some sentences do fix the meaning of other sentences in a law like manner.⁷ Papineau points out that from Dummett’s molecular view these fixing sentences have a special place in that their acceptability cannot be at issue.⁸ On this point Papineau notes that in science law like generalisations do come into question. Nevertheless Papineau argues that this talk of law like generalisations is really bringing back the old analytic-synthetic distinction; a distinction which holism was an attempt to eradicate.⁹ To circumvent Dummett’s cogent criticism of holism, and in fact defend holism, Papineau tries to account for the fact that there has to be fixing sentences but also these fixing sentences are themselves not immune from revision. To do this Papineau accounts for the fixing nature of generalisations in semantic terms. In consequence of this semantics Papineau, in Theory and Meaning, points out that if we accept the validity of epistemological holism, which he does, then once we are forced to revise our logical truths then the inevitable consequence is scepticism

Papineau argues along the line of Dummett that “..the logical truths are forced upon us by the semantics of the logical constants...”¹⁰ The decision to accept or reject a scientific generalisation¹¹ is according to Papineau dependent upon the logical form. As Papineau states “ so our understanding of the way the meanings of generalisations depend on the meanings of their constituents, our understanding of their logical form, does inform our decision as to whether to accept or reject them.”¹² Now Papineau argues that a decision to accept or reject a generalisation is determined by the generalisation’s relationship to reality

⁶ D. Papineau, 1979, p.169.

⁷ *ibid*, p.170.

⁸ *ibid*, p.170.

⁹ *ibid*, pp.119-121

¹⁰ *ibid*. p.173.

¹¹ Papineau uses the term ‘generalization’ where some one like Quine would use the term ‘core belief’. In this regard what Papineau calls a ‘generalisation’ is to my understanding synonymous with core belief.

[it is because of this that the restriction of the realist-revisionist thesis must be tenable]. Papineau argues that “ the holist approach to scientific theories has already, in earlier chapters, been shown to be consistent with the notion that our theories are attempts to represent reality, and that we can have good reason for thinking one such representation better than another.”¹³ Similarly Papineau argues that “...it is of course perfectly possible for evidence to compel revision of a scientific theory...”¹⁴ Now according to Papineau scientific generalisations are part of an holistic system such that all the generalisations not just certain ones, contribute to fixing the content of scientific terms. As Papineau states “ all scientific generalisations contribute to the fixing of the content of scientific terms. So there is never any question of evidence for or against a single generalisation in isolation.”¹⁵ Now it is in this regard that scepticism becomes the consequence of epistemological holism on Papineau’s account.

According to Papineau’s account semantics fixes the meanings of scientific generalisations via it fixing of the meanings the logical constants and thus logical form of the generalisations. As Papineau argues these generalisations and thus logical form may not correspond to reality and as such could be revised.¹⁶ In other words Papineau argues that once we are faced with the fact that our sentences do not relate to aspects of reality we are then forced to find alternative ways of understanding these sentences based upon their relationship to reality. In this regard Papineau is outlining the verificationist position of the realist. Now based upon this line of argument Papineau then goes on to argue that we may end up with a different set of guaranteed truths and inferences for those sentences with the sceptical consequence that we would have no assurance that these new sentence forms represented an unimpeachable representation of reality.¹⁷ On these points Papineau

¹² D. Papineau op.cit, p.185.

¹³ *ibid*, p.186.

¹⁴ *ibid*, p.119.

¹⁵ *ibid*, p.186.

¹⁶ *ibid*, p.178, 180.

¹⁷ This is really a realist position in the sense as outlined in chapter one, ie that our sentences must correspond and be verified by reality. This is different from the anti-realist position that argues that our sentences don’t make an ontological claim about reality but is only valid in regard to the way we say they are to be verified; as B.Taylor notes (1996, p.5) “...anti-realism uses non-classical truth conditions or warrants ie certifications which could actually be obtained by a sufficiently systematic enquirer.”

states “suppose we concluded on the basis of arguments from the philosophy of language that the way we had up to now understood certain complex sentences required the constituent expressions to relate to aspects of reality in a way in fact failed. We would then no longer feel that we could maintain our previous understanding of those sentences. Of course we could and in most cases would seek some alternative way of understanding how their constituents related to reality. But it may well then be that we end up with a rather different set of ‘guaranteed’ truths and inferences for those sentences. For there would be no assurance that our new understanding of the compounding operations involved and the constituents they had to work on, would indicate the same sentence forms to be unimpeachable representers of reality.”¹⁸ In this regard once the logical forms had to be revised by their non correspondence with reality the validity of the other sentences in the holistic system become uncertain; thus scepticism.

O’Hear, in What Philosophy Is, gives a quite picturesque description of what the consequence is if we start revising the laws of classical logic for an holistic system. He states “changing a logical law in this way is not to be considered lightly. Precisely because it governs inference within the system as a whole, the effect of such a change will be very wide-ranging indeed...playing fast¹⁹ with the logic and definitional apparatus of the system may be regarded as tantamount to demolishing the very notion of system which makes holism initially plausible and attractive. Without our terms and our logic being firm and clear at the outset, it will be unclear just what is meant by any statement at all...[if there is no distinction between logical and empirical statements, as Quine notes, then the system would] collapse into an incoherent and featureless pile of statements, the sense of any one of which is indeterminate and perpetually shifting because of changes he may decide to make in other beliefs.”²⁰ Thus with the system breaking down into chaos the certainty of any statement is thrown into doubt, because it could be revised, due to another revision of logic. Consequently we end up with scepticism, perpetual uncertainty - the end of foundationalistic philosophy.

¹⁸ D. Papimeau, 1979, p.176.

¹⁹ We must note that Quine doesn’t advocate playing fast with the laws of logic. As we saw in chapter one Quine argues that we give up our core beliefs ie the laws of logic reluctantly

O’Hear nevertheless does argue that this collapse into conceptual chaos is not a necessary consequence of the revision of the laws of logic within an holistic system. O’Hear argues that “so long as the changes that are made are clearly signalled beforehand, there is no reason why this system of knowledge [holistic] should collapse into an incoherent and featureless pile of statements...”²¹ This argument of O’Hear’s I feel is incorrect. For as will be shown below we can signal beforehand that the law of non-contradiction is to be revised

and the result is that we cannot then decide between logical statements which were inconsistent with our original logical principles. O’Hear himself notes that with the revision of the law of non-contradiction “just what effect experience is to have on any belief of ours will always be left in doubt [ie uncertainty- scepticism] and this is hardly different from having no belief at all.”²² Papineau, in my reading, argues that what fixes the meaning of generalisations is the semantics of their logical form. Now this fixing nature of logical form is not to be seen as introducing again the notion of analytic statements for these fixing generalisation are themselves susceptible to revision if they do not relate to reality. Now as we saw Papineau argues that “...a given generalisation will always presuppose other generalisations, in such a way that it is the whole set of generalisations involved.”²³ Thus the alteration of a law of logic will have the effect, under Papineau’s formulation of holism, of refracting through and altering the other generalisations; as these generalisations realign themselves with each other. This will have the effect, as Papineau noted above, of resulting in the fact that sentences in the system which previously related to reality may end up having a different set of truths associated with them resulting with the consequence that different inferences are now drawn from them. And as Papineau noted we will have now no assurance or certainty whether these sentences represented reality in an unalterable manner. Thus we are left with scepticism in regard to the validity of inferences.

²⁰ A, O’Hear, 1991, pp.109-110.

²¹ i bid, p.110.

²² ibid, p.109.

The laws of logic enable us to make inferences from one statement to another, ie to be able to see that some statements are incompatible with other statements. In other words the laws of logic allow us to conclude that some statements imply other statements and to see that other statements are ruled out. Thus we see that the laws of logic are the interconnecting links in our system of statements. Now if the laws of logic are revisable then some statements which imply others, under the unrevised logic, may be not be allowed under the revised logic. Thus we have no certainty as to whether an inference is valid or not. If our laws of logic are revisable the end result is that nothing is ever certain. This results, as O'Hear points out, from the fact that we can not make sense of our system of statements because these statements are always changing due to the fact that one statement following from another is, under the unrevised logic, not necessarily so under the revised logic. Some of these consequences can be seen in regard to the revisions of the law of identity, the law of contradiction and the law of the excluded middle.

We saw that relativity physics argues that there are no determinate properties of objects, ie, no essences. In other words the properties of objects are floating in the sense that what is an object's property is dependent upon how its is perceived. In this regard without determinate fixed properties we can never be certain of just what an object's property may be. Consequently we cannot fix and identify an object as the same across time because its identity itself is not fixed. Hookway notes that in regard to identity "...it is often claimed that we understand the nature of objects of a particular kind, and we can talk about them intelligibly, only when we can understand identity statements involving terms referring to the object."²⁴ Thus when the law of identity is revised we are left the problem that we are uncertain as to how an identity statement is to be understood in regard to its object. This thus generates an incoherence in our concept of the object via the concept of identity and a complete revision in our conceptual scheme is thus generated. Thus then any inference drawn, prior to observation, which is dependent upon its properties will be uncertain. Thus with the revision of the law of identity we have no way of knowing just what the properties of an object may be. Without fixed determinate properties the properties of an

²³ D.Papineau, op.cit, p.186.

²⁴ C.Hookway, 1988, p.14.

object thus float and as such there is always a measure of uncertainty in regard to any inference about the object. Take any concept such as that of a horse. If a horse has no fixed determinate properties which fix it and identify it across time then there will be a measure of uncertainty about just what I am talking about whenever the word 'horse' appears in a statement.

In the case of the law of non-contradiction an example of the inferential uncertainty resulting from the revision of the laws of logic can be seen with regard to the law of modus ponens. If we revise the law of non-contradiction such that an object is both A and $\sim A$ then we can not be certain of the implication of the modus ponens. Modus ponens argues that "If P , then A . P . Therefore A ' Now if P can be both A and $\sim A$ then the modus ponens 'If P then A . P . Therefore A ' could equally become 'If P then A . P Therefore $\sim A$ '. So in this regard with the law of non-contradiction being revised we can have no certainty in regard to the conclusion of a modus ponens. Thus we have no certainty as to which inference is valid or not. This consequence refracts through the conceptual system with the result that we could regard any theory based upon one of these inferences and equally valid even though based upon our original logical principles they are incompatible. On this point O'Hear notes that with the revising of the law of non-contradiction "...we could hold onto any theory and any combination of other theories and counter-evidence, even if, on our original logical principles, the two were patently inconsistent."²⁵

With the revision of the law of the excluded middle we are left with an uncertainty in regard to just what an object is thus any inference drawn in regard to the object is again left uncertain. The law of the excluded middle argues that an object has to be either one thing or another ie either A or not A . With the violation of the law of the excluded middle an object could be neither both A nor not A . We saw that the first possibility characterises the photon which is both a particle and a wave. In this regard we have as well as a

²⁵ *ibid*, p.109.

violation of the law of the excluded middle a violation of the law of non-contradiction and as a consequence the problems as mentioned above.

Thus we see that in revising the laws of logic for an holistic system we end up with the consequence of scepticism in regard to the validity of any inference. Now the results of quantum logic indicate that O'Hear's characterisation of conceptual chaos due to the idea that statements of logic are really empirical statements, and thus open to revision, is perhaps too extreme. What appears to be the case is that with some laws of logic appearing to be necessary there thus remains some stability in the statements of a system because the logical form of some statements is fixed. Nevertheless there still remains the possibility that because 'necessity' is always open to doubt conceptual chaos remains a possibility. Even though this extreme consequence may only be a possibility, the results of quantum logic lend support for scepticism. For with some of the laws of logic being revised and the possibility of conceptual chaos, due to doubts in regard to the notion of 'necessity', we are left with uncertainty in regard to the validity of any inference; since this inference may be altered due to an alteration in a law of logic.

CONCLUSION

...if epistemological holism is tenable and the laws of logic are not necessary, because the realist/revisionist interpretation of quantum logic is correct, then all the principles of logic, and the inferences drawn from them, have no certainty as an epistemic condition for truth. Consequently philosophy as a discipline of reasoned argument becomes untenable because there can be no certainty as to the necessity of any of its inferences.

This thesis has argued that with certain restrictions Quine's claim that the laws of classical logic could be revised undermines the whole validity of philosophical argument. This undermining is due to the consequence that if the laws of classical logic are revisable and Quine's epistemological holism is correct then, with certain restrictions imposed, there can be no certainty in regard to the truth of any inference drawn from classical logic. In other words the consequence is that with certain restrictions, if the laws of logic are revisable and epistemological holism is tenable then the result is scepticism. This thesis has argued that if we make three assumptions then Quine's views lead to scepticism. These three assumptions or restrictions are: 1) quantum logic mirrors the structure of reality; and its corollary 2) metaphysical realism is the correct interpretation of quantum mechanics; 3) the logic of the macro-world is the same as the quantum logic of the micro-world. Now this thesis has shown that these restrictions can be seen as characterising the realist/revisionist interpretation of quantum mechanics. If the realist/revisionist interpretation is correct then a consequence of this, as this thesis has argued, is scepticism.

What this scepticism means, this thesis has argued, is that there can be no certainty in regard to the validity of any philosophical inference. This scepticism has the consequence for philosophy that foundationalist philosophy and foundationalist philosophical argument, or in other words philosophy which seeks for certainty becomes untenable.

In chapter one I argued that Quine based his claims for the revisability of the laws of logic upon three points: his epistemological holism; inductions from the history of science; the denial of analyticity. From his epistemological holism Quine a priori argues that the laws of logic could be revised. Quine looks to science to find support for his thesis of the revisability of logic. It is in quantum mechanics that Quine feels that his arguments are validated. Quine, it was argued, believes the findings in science indicate that the laws of logic could be revised because the world could be described by other forms of logic. In other words Quine's claim for the rejection of the laws come from the

idea that the findings in science indicate that the world could cause us to abandon some or all of our beliefs in the laws of logic. Thus it was argued that Quine's claim for the revision of the laws of logic is built upon a coherence theory of truth, or what is called by Dancy Quine's epistemological holism. From this epistemological holism and inductions from findings in science Quine formulates his arguments for the revision of the laws of logic. It will be shown that Quine argued that revisions in logic entailed the rejection or revision of: the law of contradiction; the law of the excluded middle; and the law of identity. Quine does not give reasoned arguments for these claims but only speculative inferences from the current state of theoretical orientations in quantum mechanics.

In chapter two I outlined arguments which give support for Quine's claim that the laws of classical logic could be revised. In this chapter I presented arguments from two areas of science: from relativity physics and quantum mechanics. It was shown in this chapter that relativity physics denies the notion of the object. This it was argued, is in agreement with Quine. When it comes to quantum mechanics I outlined Putnam's arguments that quantum logic may cause revisions in classical logic. It was shown that quantum logic calls for rejection of the law of the excluded middle, and in some cases the revision of the law of non-contradiction. It was shown in this chapter that the area of quantum logic is complex. There are a number of differing positions in regard to how quantum logic is to be understood. There are the revisionists who argue that quantum logic applies to both the macro world and the micro world. On the other hand the preservationists argue oppositely that quantum logic only applies to the micro world. There are the realists who see quantum logic realistically, ie as referring to the logical structure of the world. Conversely, there are the anti-realists who argue that quantum logic doesn't apply to the world but is only referring to our measurements. It was argued in this chapter that it is only the realist/revisionist interpretation of quantum logic which leads support for Quine's claims that the laws of logic could be revised at the macro level. Consequently it was argued that if the realist/revisionist interpretation is correct then scepticism becomes the consequence of the revisions of the laws of classical logic. In other words

from the findings of relativity physics and quantum logic it was argued that a realist/revisionist interpretation will lend support to Quine's thesis with the inevitable sceptical conclusions in regard to the validity of inferential argument.

In chapter two it was shown that the revision of the laws of classical logic in quantum logic does not involve just changing the meaning of the logical connectives. It was shown that in some cases the laws are revised even though the meaning of the logical connectives stays the same in both classical logic and quantum logic. Also it was pointed out that in some cases what is a logical truth or logical necessity in classical logic turns out to be not so when the logical expression is taken over into quantum logic. It was argued in this chapter that it is only the realist interpretation of quantum logic, ie logic mirrors the structure of the world that gives support for Quine's views and makes scepticism tenable. It was argued that anti-realist interpretations of quantum mechanics do not give support for Quine's arguments in regard to the revision of classical logic for the macro-world and thus make scepticism untenable. The conclusions then of chapter two were that if the realist- revisionist interpretation is correct then any classical inference to do with 'matters of fact' will be open to revision and thus not certain in regard to its truth claim; thus we are left with scepticism.

In chapter three I outlined how the realist/revisionist interpretation of quantum logic leads to scepticism and what scepticism entails for epistemological holism if the realist-revisionist interpretation of quantum logic and Quine's epistemological holism are correct. In this chapter I outlined arguments from Papineau and O'Hear to the view that if we assume epistemological holism then once the laws of logic are revised we end up with uncertainty in regard to any inference which is drawn. After outlining these arguments I showed how this uncertainty manifests itself. It was argued that if we revise the law of non-contradiction, the law of identity and the law of the excluded middle, then any inference drawn from within an holistic system will collapse into uncertainty

It was argued that if the law of identity is revised then we are left with the consequence that we are uncertain as to how an identity statement is to be understood in regard to its object. This uncertainty it was argued generates an incoherence in our concept of the object via the concept of identity and a complete revision in our conceptual scheme is thus generated. With this uncertainty it was shown that any inference drawn, prior to observation, which is dependent upon its properties will be uncertain. Consequently with the revision of the law of identity and the accompanying uncertainty we have no way of knowing just what the properties of an object may be. It was argued that without fixed determinate properties the properties of an object thus float and that there is always a measure of uncertainty in regard to any inference about the object

In this chapter it was shown the uncertainty that is generated when the law of non-contradiction is revised. It was argued, if we revise the law of non-contradiction such that an object is both A and $\sim A$ then we can not be certain of the implication of the modus ponens. It was pointed out that if P can be both A and $\sim A$ then the modus ponens 'If P then A . P . Therefore A ' could equally become 'If P then A . P . Therefore $\sim A$ '. So in this regard with the law of non-contradiction being revised we can have no certainty in regard to the conclusion of a modus ponens. In this regard it was argued that we can have no certainty as to which inference is valid or not. The consequence of this it was maintained refracts through the conceptual system with the result that we could regard any theory based upon one of these inferences equally valid even though based upon our original logical principles they are incompatible.

Finally chapter three outlined the consequences if the law of the excluded middle was to be revised. It was argued that if the law of the excluded middle is violated then we have an uncertainty in regard to just what an object is; thus any inference drawn in regard to the object is again left uncertain.

It was argued in this chapter that these revisions in the laws of logic result in scepticism in regard to the validity of any inference. With this scepticism it was maintained we end up with the possibility of what O'Hear characterised as conceptual chaos. It was pointed out that in some cases it appeared that some laws of logic are necessary with the consequence that there remained some stability in the statements of a system because the logical form of some statements is fixed. Nevertheless it was argued that there still remains the possibility that because 'necessity' is always open to doubt conceptual chaos remains a possibility. This conclusion was derived from the argument that with some of the laws of logic being revised and doubts in regard to the notion of 'necessity', we are left with uncertainty in regard to the validity of any inference; since this inference may be altered due to an alteration in a law of logic. Consequently the possibility of conceptual chaos.

Thus the conclusion of this thesis is that if epistemological holism is tenable and the laws of logic are not necessary, because the realist/revisionist interpretation of quantum logic is correct, then all the principles of logic, and the inferences drawn from them, have no certainty as an epistemic condition for truth. Consequently philosophy as a discipline of reasoned argument becomes untenable because there can be no certainty as to the necessity of any of its inferences.

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