A critique of Professor Acuña's Philosophical investigation of two-valued deductive logic

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Bilang kritik ng papel ni Acuña, ang aking papel ay isang pagtatanggol ng lohikang pormal laban sa mga batikos ni Prop. Acuña na isang lokal na manipetasyon ng lumalawak na impluwensiya ng lohikang impormal.

Pinapakita ko na ang pilosopiyang ginamit ni Prop. Acuña sa pagtuligsa sa lohikang pormal ay may kabalintunaan. Ang pinaniniwalaang kabalintunaan ng implikasyong materyal ay ginamit ni Prop. Acuña sa pagtuligsa sa lohikang pormal. Pinapakita rin na: (1) Hindi diretsong magagamit ang nasabing kabalintunaan laban sa konseptong ginagamit ng lohikang pormal sa pagsabing ang isang argumento ay tama (*valid*) o di-tama (*invalid*). At (2) Ang pinaniniwalaang kabalintunaan ng implikasyong materyal ay sa huli't huli hindi kabalintunaan. Sa Section VII pinakamatindi and hidwaan ng lohikang pormal at lohikang impormal. Dito pinapakita ko na ang mga halimbawa ni Prop. Acuña ng tama(valid) na argumento ay pawang totoong di-tama ayon sa lohikang pormal. Sa section VIII aking ipinakita na ang lohikang pormal ay may maitutulong sa pagsusuri ng mga argumentong tinaguriang *evaluative*.

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TO DATE THE STRONGEST LOGIC

Two-valued (alternatively called binary) deductive logic is unquestionably the strongest logic ever developed by logicians and philosophers. Even as we approach the 21st century it is the logic which exemplifies the power of symbolic formulation and definite formal techniques in understanding and appraising arguments, their constituent elements, and the linguistic expressions employed to convey them. It is presently the paradigm of logic.

Logic, as a matter of historical fact, has been one of the traditional branches of philosophy. One of the outstanding classical philosophers, Aristotle, was a logician. And it was Aristotelian logic which early in the history of philosophy featured some semblance of the use of symbolic formulations and definite formal techniques in appraising arguments and their constituent elements. In the medieval period the scholastic philosophers who were otherwise preoccupied with religious matters (such as God, soul, spirit, angels, etc.) and thus the branch of philosophy most closely associable with religion which was metaphysics devoted time and effort to logic. In a sense the scholastics were logical even as they were very religious and dogmatic.

Aristotelian logic, a logic which centered on the logic of syllogisms, of course has already had its heydays. Subsequent development of two-valued deductive logic remained to be and was indeed achieved by later philosophical greats and logicians like Boole, Frege, Whitehead and Russell, Wittgenstein (the Tractarian) and Quine, to cite but a few. The contribution of these later philosophers and logicians to the development of two-valued deductive logic is such that the power of twentieth century two-valued deductive logic far surpasses that of Aristotelian logic the latter now reduced to a mere historical curiosity. What Aristotelian logic can do twentieth century two-valued deductive logic surely can and much much more besides.

It has come however that despite all the power contemporary two-valued deductive logic has over traditional Aristotelian logic (the applicability of contemporary two-valued deductive logic extends to philosophy of mathematics), misgivings have been voiced in certain philosophical quarters as to its adequacy. Some philosophers, the inductivists, have sought to supplement deductive logic with some appropriate inductive (probability) logic which presumably would enable the appraisal of inductive arguments.

Some of them, e.g. Carnap, even contend that a formal inductive logic is possible[1] (though as with many philosophical projects it has subsequently run into immense difficulties). Some other philosophers have sought to advance over standard two-valued logic by venturing into formalized modal logic. Quine however has very strong objections to modal logic he proposes that the project of modal logic be abandoned altogether.[2] Still others have tried to advance formalized many-valued logic[3] in place of the standard two-valued logic, and still some others have tried to develop so-called logic of inquiry[4] (logic of questions/questioning beyond the usual logic of linguistic expressions expressive of somethings---statements, propositions--- capable of being either true or false). Here may I add that if interrogative logic is possible a logic of imperatives and policy decisions may also be possible. This may link logic with moral philosophy.

The proliferation of proposed logics may be taken healthfully as attempts to achieve the next big development in logic They may be taken healthfully as attempts to achieve progress in this branch of philosophy. And of course who is against progress?

But progress is not to be confused with the mere having of something new. The equating of progress with the having of something new is the characteristic feature of the fadist way of thinking. For not so explicable reasons, perhaps sheer exhaustion in the struggle to become excellent or just plain boredom, people resort to fads. And not even philosophers are exempt.

What would constitute genuine progress in logic? I believe genuine progress in logic is achieved when the present strongest logic, the present paradigm of logic which is standard two-valued deductive logic, is superseded by a logic capable of doing all of what the present paradigm can and much more besides. Anyone who proposes a candidate successor to the present paradigm of logic has the burden of argument to show that his proposed successor logic can do all of what the present paradigm can and much more besides.

The succession of traditional Aristotelian logic by modern twentieth century two-valued deductive logic was a matter of the latter being able to do all of what the earlier can and much more besides. The succession was progressive (as against degenerate) succession. If we get rid of the present paradigm of logic without putting in place something at least comparable then we have a clear case of degenerate succession.

The rise and dominance of analytic philosophy in the twentieth century is something that can be attributed to the precision and clarity of thought displayed by analytic philosophers against philosophers in the other traditions. The precision and clarity of thought in turn can be attributed to the widespread preoccupation of analytic philosophers with issues and matters of logic. Analytic philosophers, so to say, care to be logical.

If we examine the four main traditions in philosophy we find that it is in the analytic tradition where logic is most developed. What I take to be the four main traditions are: (1) The *Analytic* Tradition. Philosophy in this tradition features British empiricist philosophy in the tradition of Russell and Moore as infused by the philosophies of other major analytic thinkers like Frege and Wittgenstein. This is the philosophy dominant in Britain and other English-speaking countries. This is the tradition where much of technical philosophizing is taking place. (2) The *Continental* Tradition. Philosophy in this tradition is more or less rooted in German idealism. This is the tradition dominant in the European continent. This is the tradition where you encounter existentialism, phenomenology, structuralism and other so-called postmodern -isms. This is the tradition most closely allied with issues of ideology (like Capitalism versus Marxism). (3) The *Scholastic* Tradition. Philosophy in this tradition is the direct historical descendant of medieval scholastic philosophy. If there is a historical remnant of the philosophy closely allied with theology and religion which reigned supreme in the medieval period this is it! This is the dominant philosophy in Catholic dominated countries and is specifically the official philosophy of educational institutions run by the Catholic religious. Metaphysics related to God, soul, spirit, angels, and heaven is the main concern of this philosophy. If you want to be medieval philosophize in this tradition. (4) The *Pragmatic* Tradition. Philosophy in this tradition is closely allied though not to be identified with the philosophy in the analytic tradition. This is the tradition dominant in the mainland America. If I get it correctly this is the tradition where informal logic started to gain ground. Some great philosophers though are a mix of an analytic philosopher and a pragmatic philosopher. Quine is a good example, and Quine is against informal logic.

With respect to the development of logic as a branch of philosophy, it is the analytic tradition which stands out. Logic surely was not given much hearing and attention in the continental tradition. (Continental philosophers are typically accused of having muddled logical theory —recall Heidegger.)

On the other hand scholastic philosophers were logical in the manner of Aristotle but they seemingly have got stuck with Aristotle ever since (and so the logic taught in Catholic educational institutions is still basically Aristotelian and no more). Some philosophers in the pragmatic tradition like Pierce have surely done their part in the development of logic, but it remains a historical fact that the greatest contributions to logic came from analytic philosophers. There seems to be a symbiotic relation between logic and analytic philosophy. As analytic philosophers develop their logical tools these in turn enable the generation of more precise and pointed issues in analytic philosophy which further provide impetus to the development of still more powerful logical techniques, and so the process starts all over again in a higher cycle of the spiral. It is not an exaggeration to say, I think, that without its precise logic analytic philosophy would not have accomplished what it had accomplished to date.

But back we go to the challenges to the present paradigm of logic. Surely not all of the challenges to the present paradigm of logic issue from other analytic philosophers who are at least in accord with the symbolic/formal approach in logic. Advocacy of what is called by the term 'informal logic' is now an emerging trend in the philosophical scene and is fast gaining momentum. In short, much as there are challenges to two-valued deductive logic from within the camp of formal logicians there are challenges to two-valued deductive logic from outside the camp of formal logicians. It even seems that some attacks against two-valued deductive logic are mounted from an ambiguous and no so consistent mix of formal considerations and informal ones such as Stove's. Stove attacks standard two-valued deductive logic from a position which is a mix of modal logic and informal logic.[5]

I don't think the rise of informal logic and its threatened destruction of formal logic augurs well for analytic philosophy. Much as the development of twentieth century two-valued deductive logic augured well for analytic philosophy the decline of the present paradigm of logic may bring not further development of analytic philosophy but regression. I don't see informal logic someday being able to provide a paradigm of logic comparable to the present strongest logic which is two-valued deductive logic. Informal logic is described, not unfairly I think, as logic without a theory, and at least one defender of informal logic is not bothered at all, indeed gladly admits, that such is indeed the case.[6] I don't think a logic without a theory is very promising though perhaps having no theory has some pragmatic virtues. One may take the expediency of just rolling along whatever happens if one has no theory and thus no commitments.[7]

PRELIMINARY TO A POINT BY POINT REPLY

It seems to the tune of informal logic that Professor Acuña undertakes his attack against two-valued deductive logic in his paper entitled *Philosophical Analysis of Two-valued Deductive Logic*. Prof. Acuña prepares the ground for his main blows against two-valued deductive logic by making a number of quotes from Wittgenstein's *Philosophical Investigations*. I call the Wittgenstein of the *P.I.* fame Wittgenstein the Investigative as against Wittgenstein the Tractarian. The transition of Wittgenstein from being a Tractarian to being Investigative was a significant event in the history of analytic philosophy. It marked the move of Wittgenstein from the logical empiricist faction of analytic philosophy to the ordinary language faction of analytic philosophy. Indeed it can be said that next to Moore, Wittgenstein was a pioneer of the ordinary language faction of analytic philosophy. The subsequent dialectic between the two factions of analytic philosophy is best exemplified, I think, in the Ayer-Austin debate.

Between the logical empiricist and the ordinary language philosopher it is the former which is more likely to defend two-valued deductive logic or some other version, at least, of formal logic whereas it is the latter who is more likely to take the side of informal logic.

Prof. Acuña's paper is a confirmation of this. Starting with appeals to Wittgenstein's *P.I.* as background, Prof. Acuña thereafter delivers his own strikes against two-valued deductive logic. Taking the side of two-valued deductive logic, I will in due course in this paper deliver my point-by-point reply.

The reply will at some points be a bit technical. The reader hopefully has a good grasp of the fundamentals of symbolic logic. In any case the reply will be philosophical.

DEDUCTION IS NATURAL

Prof. Acuña starts his paper by citing Wittgenstein's question: In what sense is Logic sublime?

Something has to be noticed immediately about this question. The title of Prof. Acuña's paper features the term 'Two-valued deductive logic' not simply

'Logic' but it is this latter term only which we find in the question. Apparently, the term 'Logic' is to be taken to mean two-valued deductive logic.

But if we admit that indeed as said in a previous section two-valued deductive logic is the strongest logic to date, it is not surprising at all that by 'Logic' we mean two-valued deductive logic. Taking the term 'Logic' to mean two-valued deductive logic simply constitutes the strongest reading of the term 'Logic'.

And it is perhaps two-valued deductive logic's being the strongest logic which drove some philosophers (the Tractarian Wittgenstein included) to believe in its being sublime. To the question of in what sense is logic sublime, some ivory tower answer was given —that logic represents the a priori order of the world and thus to logic language must have to be isomorphic. And when no actual language seemed to satisfy this requirement an ideal language was to be constructed which language was to satisfy the requirement.

The requirement Wittgenstein finds to be in danger of becoming empty. Perhaps in a sense it has started to empty, but that it is now entirely empty is at least debatable. For are we to rule out in a priori fashion the possibility that someday in the future a semblance of an ideal language based on logic will be successfully deviced by human ingenuity?

Though, I will not pursue the issue here further, not for now at least. Instead I will present a simple logic lesson to remind some people about a basic character of deductive reasoning. This basic character of deductive reasoning seems to me to be too conveniently being set aside by the opponents of the paradigm of logic. After all Wittgenstein holds that the task of the philosopher is to provide reminders for a particular purpose.

Logic lesson: Deduction is Natural

A professor utters the ordinary language English sentence: *Both Hiroshima and Nagasaki were atomic bombed.*

Did the professor make a true statement in uttering the sentence? How does one answer this question as a matter of course?

Recalling one's knowledge of history, one thinks: *Hiroshima was atomic bombed. Nagasaki was (also) atomic bombed.*

And so concludes: *Both Hiroshima and Nagasaki were atomic bombed.*

Or one may think in a way more emphatic of truth value judgments: It is true that Hiroshima was atomic bombed. It is (also) true that Nagasaki was atomic bombed.

And so concludes: It is true that both Hiroshima and Nagasaki were atomic bombed.

Inference has taken place. Is the inference correct? This now is the specific concern of the logician.

The symbolic logician in accounting for the correctness of the inference will first present the inference in the form of an ordinary language argument, to wit:

(1) Hiroshima was atomic bombed.
(2) Nagasaki was atomic bombed.
(3) Therefore, both Hiroshima and Nagasaki were atomic bombed.

Or its equivalent emphatic of truth value judgments:

(1) It is true that Hiroshima was atomic bombed.
(2) It is true that Nagasaki was atomic bombed.
(3) Therefore, it is true that both Hiroshima and Nagasaki were atomic bombed.

The symbolic logician next resorts to symbolic representation of the argument, thus:

1. H
2. N

3. $\therefore$ H•N

where H: Hiroshima was atomic bombed
N: Nagasaki was atomic bombed

Is the argument valid? Answer: Yes. It is an instantiation of the elementary rule of inference known as *conjunction*. The truth of the conclusion necessarily (logically) follows from the truth of the premises.

The inference naturally happens. *Conjunction* is one of the elementary rules of inference in the *Natural Deduction System*. Indeed the symbolic logician may further go explicitly formal at this point by saying: All cases of conjunction, all arguments of the above logical form, are valid.

If in a sense being natural is being sublime[8], there is sense here of logic being sublime. The cogito deduces naturally. It is human nature to go deductive. . . Deduction, deductive inference, is natural.

A TASTE OF PREDICATE LOGIC

The lesson above is a lesson in propositional logic. Let me now present another lesson to illustrate the usefulness of symbolic logic. This time it is a lesson in what is called predicate logic.

The professor utters the ordinary language English sentence: All plants and animals are living things.

Did the professor express a true proposition in uttering the ordinary language English sentence? How does one answer this question as a matter of course?

Recalling of course sense of the words 'plant', 'animal', and 'living things' as used in classificatory biology, one thinks: It is true that all plants are living things. It is (also) true that all animals are living things.

And so concludes: *It is true that all plants and animals are living things.*

Inference has again taken place. Is the inference correct? Account for the correctness of the inference. This now again is the specific concern of the logician.

The symbolic logician will first present the inference in the form of an ordinary language English argument thus:

(1) It is true that all plants are living things.

(2) It is true that all animals are living things.

(3) Therefore, it is true that all plants and animals are living things.

Then the symbolic logician renders the above ordinary language English argument into the usual symbolic representations of predicate logic thus:

1. $(x)\ (Px \supset Lx)$
2. $(x)\ (Ax \supset Lx)$
3. $\therefore\ (x)\ [(Px \vee Ax) \supset Lx]$

where Px: x is a plant

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Ax: x is an animal
Lx: x is a living thing

Is the argument valid? *It is* valid. The formal proof is as follows:

1.	$(x)\ (Px \supset Lx)$	
2.	$(x)\ (Ax \supset Lx)\ /\ \therefore (x)\ [(Px \vee Ax) \supset Lx]$	
3.	$[(x)\ (Px \supset Lx)]\ .\ [(x)\ (Ax \supset Lx)]$	1,2,Conjunction
4.	$(x)\ [(Px \supset Lx)\ .\ (Ax \supset Lx)]$	3, Quantifier Distribution
5.	$(x)\ [(\sim Px \vee Lx)\ .\ (Ax \supset Lx)]$	4, Implication
6.	$(x)\ [(\sim Px \vee Lx)\ .\ (\sim Ax \vee Lx)]$	5, Implication
7.	$(x)\ [(Lx \vee \sim Px)\ .\ (\sim Ax \vee Lx)]$	6, Commutation
8.	$(x)\ [(Lx \vee \sim Px)\ .\ (Lx \vee \sim Ax)]$	7, Commutation
9.	$(x)\ [Lx \vee (\sim Px\ .\ \sim Ax)]$	8, Distribution
10.	$(x)\ [(\sim Px\ .\ \sim Ax) \vee Lx]$	9, Commutation
11.	$(x)\ [\sim(Px \vee Ax) \vee Lx]$	10, De Morgan's Theorem
12.	$(x)\ [(Px \vee Ax) \supset Lx]$	11, Implication

The truth of the conclusion necessarily (logically) follows from the truth of the premises. Indeed at this point the symbolic logician may go explicitly formal by asserting: All arguments of the above logical form are valid.

The inference to which the above argument is the public expression naturally happens. I again say: Deduction is natural.

But there is now a further realization. Predicate logic shows that the naturalness of deduction extends to the domain of propositions and arguments involving what is called *quantification* of propositional functions. According to one philosopher, Frege's discovery of quantification is the deepest single technical advance in logic".

Let us now have appreciation of the extent and importance of predicate logic. Consider the next arguments which are obviously with contemporary relevance and where all the propositions involve quantified propositional functions. Suppose an antiVFA protester presents the following argument:

1. All senators who are proVFA are lapdogs.
2. Some senators are proVFA.
3. Therefore, some senators are lapdogs.

Is the argument valid or not? Does the conclusion necessarily follow from the premises?

And suppose a proVFA presents the following argument:

1. All senators who are pròVFA believe that the Philippines is militarily unable to defend itself and that China is likely to undertake military adventurism in the near future.
2. Some senators are proVFA.
3. Therefore, some senators believe that China is likely to undertake military adventurism in the near future.

Is the argument valid or not? Does the conclusion necessarily follow from the premises?

Here a Wittgensteinian in the manner of Prof. Acuña may consider that validity or invalidity of an argument is language game specific. Which, in the instant case, is to say proVFAs have their own notions of validity and invalidity as against antiVFAs who have their own respective notions of validity and invalidity. What a proVFA will consider valid an antiVFA may consider invalid and what an antiVFA will consider valid a proVFA may consider invalid. Each in his own language game is right. Being correct is language game specific. Being Wittgensteinian in this sense is quite alright, if it were not for the inevitable resulting anarchy! (I have much to say about this in the next section).

Formal logicians do not believe validity and invalidity are language game specific. Formal logic believes in *universal* standards of validity and invalidity. If an argument has a valid logical form, it is valid no matter who made the argument. And if an argument has an invalid logical form it is invalid no matter who made the argument.

The antiVFA's argument is valid. The formal proof is as follows:

1.	$(x)\,[(Sx \cdot Px) \supset Lx]$	
2.	$(\exists x)\,(Sx \times Px)\ /\therefore\ (\exists x)\,(Sx \times Lx)$	
3.	$Sa \cdot Pa$	2, Existential Instantiation
4.	$(Sa \cdot Pa) \supset La$	1, Universal Instantiation
5.	La	4,3, Modus Ponens
6.	Sa	3, Simplification

7.	Sa . La	6, 5, Conjunction
8.	(∃x) (Sx × Lx)	7 Existential Generalization

where Sx: x is a senator
Px: x is proVFA
Lx: x is a lapdog

The proVFA's argument is also valid. (Surprised?) The formal proof is as follows:

1.	(x) [(Sx . Px) ⊃ (Ux × Cx)]	
2.	(∃x) (Sx . Px) / ∴ (∃x) (Sx × Cx)	
3.	Sb . Pb	2, Existential Instantiation
4.	(Sb . Pb) ⊃ (Ub . Cb)	1, Universal Instantiation
5.	Ub . Cb	4, 3, Modus Ponens
6.	Cb . Ub	5, Commutation
7.	Cb	6, Simplification
8.	Sb	3, Simplification
9.	Sb . Cb	8, 7, Conjunction
10.	(∃x) (Sx . Cx)	9, Existential Generalization

where Sx: x is a senator
Px: x is proVFA

Ux: x believes that the Philippines is militarily unable to defend itself

Cx: x believes that China is likely to undertake military adventurism in the near future

So it turns out that the antiVFA's argument and the proVFA's argument are both valid by formal logic. Thus if both believe in formal logic, there is one less quarrel, the quarrel about the validity or invalidity of each other's argument.

But then noting some people's penchant for quarrel, the disputation may shift to another matter. As I see it, with the question of validity settled by formal logic, the proVFA and the antiVFA would proceed to challenge the truth of each other's premises. They have a common second premise that some senators are proVFA I don't think they would quarrel about this. The potential conflict would be about the truth of their first premises.

The antiVFA asserts as his first premise 'All senators who are proVFA are lapdogs'. This obviously may be offensive to the ears of a proVFA and thus the proVFA may vehemently deny it. The proVFA may question the antiVFA what the latter's reasons are for asserting his first premise. I don't think the antiVFA will have difficulty supporting his first premise: Being a lapdog is the only reason he can think of for a senator to be proVFA. Hence, for the antiVFA the assertion of his first premise.

On the other hand the proVFA asserts as his first premise 'All senators who are proVFA believe that the Philippines is militarily unable to defend itself and that China is likely to undertake military adventurism in the future'. The antiVFA may question the truth of this premise because it seems to justify being proVFA. The antiVFA may question what the proVFA's reasons are for asserting his first premise. I don't think the proVFA will have difficulty supporting his first premise either: Believing that the Philippines is unable to defend itself militarily and that China is likely to undertake military adventurism in the near future is the only reason he can think of for a senator to be proVFA.

Obviously each has his point. The two sides may continue to quarrel. For my part I will accept both first premises as true. Afterall their conjunction will not give rise to a logical contradiction.

Suppose that combining the respective first premises of the proVFA and antiVFA I come up with an inference which can be presented as the following argument:

1. All senators who are proVFA believe that the Philippines is unable to defend itself militarily and that China is likely to undertake military adventurism in the near future.

2. All senators who are proVFA are lapdogs.

3. Therefore, all who believe that the Philippines is unable to defend itself militarily and that China is likely to undertake military adventurism in the near future are lapdogs.

The above ordinary language English argument can be rendered in the usual symbolic representations of predicate logic as follows:

1. $(x)\ [(Sx \cdot Px) \supset (Ux \times Cx)]$
2. $(x)\ [(Sx \cdot Px) \supset Lx]$
3. $\therefore\ (x)\ [(Ux \cdot Cx) \supset Lx]$

This argument is formally invalid. The technique of proving it invalid can be had in a good 3-unit college course in symbolic/formal logic. Being formally invalid, it is not acceptable as a good deductive argument. It is as an *inductive* argument that it can qualify as a plausible argument. It is as an inductive argument that I am accepting it as a good argument. In inductivist philosophy of science it is believed that scientific hypotheses are generated by inductive inference from empirical data. That is the essential role of inductive inference: it is a means of generating hypotheses.

Inductive inference, properly understood, is never truth transmitting —the truth of the premises merely confer a degree of probability of being true on the conclusion. It is the business of inductive logic to provide techniques of appraising how probably true an inductive conclusion is based on the truth of the premises. Whereas in a valid deductive argument granting all premises are true the truth of the conclusion necessarily follows Which is to say a valid deductive argument is truth transmitting (on the condition of course that all premises are true). (Once at least once premise is false, even if an argument is valid it is no longer truth transmitting.) In inductive inference even as all premises are true, the conclusion remains merely probable.

If one would like to get from truth to some other truth the reasoning to perform is (valid) deduction. If one would like to generate hypotheses from truth the reasoning to perform is induction.

I believe in symbolic/formal logic. I believe in standard two-valued deductive logic. But I don't believe that valid deductive arguments are the only acceptable arguments. In short, I don't believe in the philosophy called ***deductivism*** which asserts that only valid deductive arguments are acceptable. I believe in the philosophy called ***inductivism*** which says that both (valid) deductive arguments on the one hand and inductive arguments on the other are acceptable. So long as one is clear as to what one wants to accomplish, e.g. establish something as true on the basis of other truths or generate speculation and hypotheses from truths one can keep deduction to its proper domain and induction to its proper domain. Each in its own proper domain can be very beneficial to humanity.

So back we go to the example of inductive argument. Has the inductive argument generated a good scientific hypothesis? Consider the conclusion 'All who believe that the Philippines is unable to defend itself militarily and that China is likely to undertake military adventurism in the near future are lapdogs'. Does this constitute a good scientific hypothesis? Applied specifically to Filipinos. I definitely answer yes. Remember that the proVFA and antiVFA dialectic is in the Philippine context.

Allow me to elaborate the standing of the statement 'All who believe that the Philippines is militarily unable to defend itself and that China is likely to undertake military adventurism in the future are lapdogs' as a good scientific hypothesis of course generated inductively. Let me start by pointing out that the above inductive argument is of the same logical form as the argument.

1. All patients included in the survey are chainsmokers who avoid using appropriate nicotine filters on their cigarettes.
2. All patients included in the survey are sick of lung cancer.
3. Therefore, all chainsmokers who avoid using appropriate nicotine filters on their cigarettes are sick of lung cancer.

This argument can be rendered in the usual symbolic representations of predicate logic as follows

1. $(x)\ [(Ax \cdot Ix) \supset (Hx \times Vx)]$
2. $(x)\ [(Ax \cdot Ix) \supset Ox]$
3. $\therefore\ (x)\ [(Hx \cdot Vx) \supset Ox]$

where Ax: x is a patient
Ix : x is included in the survey
Hx: x is a chainsmoker
Vx: x avoids using appropriate nicotine filters on his cigarettes
Ox: x is sick of lung cancer

Comparing the above symbolic representation to that of the previous argument the thing to notice is that the two arguments are of the same logical form (though obviously they have different empirical contents).

Hence, much as the previous argument is (formally) invalid the above argument is also (formally) invalid. Both clearly are not acceptable as good deductive arguments, but both can be accepted by an inductivist as plausible inductive arguments.

The last argument is obviously a good scientific argument since the conclusion constitutes a good scientific hypothesis. It is a good scientific hypothesis insofar as it can be interpreted as saying 'Chainsmoking in conjunction with avoidance of appropriate nicotine filters causes lung cancer'. This can be considered a good hypothesis in medical pathology.

Similarly the conclusion in the former inductive argument can also be considered a good scientific hypothesis insofar as it can be interpreted as saying 'Belief that the Philippines is militarily unable to defend itself in conjunction with belief that China is likely to undertake military adventurism in the near future causes lapdog behavior'. This very obviously is a good *social science* hypothesis. I think it can be considered a good hypothesis in specifically political psychology. In any case let it be my contribution to Philippine social science.[10]

As shown in this section predicate logic is useful.

ON PROFESSOR ACUÑA'S OBJECTION TO PIAGET

Prof. Acuña objects to Piaget's offering of two-valued deductive logic as the highest level of cognitive development. However, I agree with Piaget.

If Prof. Acuña is an epistemological anarchist a la Feyerabend he would object to Piaget. Prof. Acuña objects to Piaget Therefore, (perhaps) Prof. Acuña is an anarchist a la Feyerabend.

The above, of course, is an argument which is (deductively) invalid as any competent two-valued deductive logician knows It is inductive —even as all the premises are true the conclusion is not established as true but remains a conjecture or speculation. Appraising such an argument is actually the care of inductive logic but inductive logic has still many problems. Of course unless it is shown by other means that my speculative (inductive) conclusion is false I have all the right to hold on to my speculation. After all Prof. Acuña agrees with inductive inference and so do I.

Why would an epistemological anarchist like Feyerabend object to Piaget? Because Piaget offers a certain cognitive field, two-valued deductive logic, as the highest and hence above all the rest. Feyerabend holds that the different cognitive fields be all held on equal footing. The different cognitive fields like science, religion, the humanities, witchcraft, magic, etc. all must be considered epistemologically at par. No cognitive field is to be above any of the rest. This follows from a deeper philosophical position: Behind any cognitive field is an ideology, and for Feyerabend no single ideology must dominate. Science is just an ideology among the rest, it is not to be above any of the rest.[11]

But just as science is not to be above any of the rest, consistency demands that religion is also not to be above any of the rest, witchcraft is also not to be above any of the rest, and yes, two-valued deductive logic is not to be above any of the rest. Whereas Piaget holds that two-valued deductive logic is the highest level of cognitive development and hence in this sense the highest cognitive field. But what does 'highest' mean if not higher than any of the rest?

But what is the rationale behind the epistemological egalitarianism? For Feyerabend the different cognitive fields must be on equal footing so that they can freely compete in a free market of ideas. The free competition, the free for all, the anarchy is supposed to bring the best out of everyone. And with everyone producing the best it can, there will be tremendous production all will progress together without anyone getting above any of the rest. No one is left behind.

The epistemological egalitarianism somehow reminds us of the social egalitarianism of naive communism. In a hypothesized communist state all citizens are equal. Every citizen is provided the same opportunities and the same resources as any other. All being equal, all citizens can freely compete. The free competition, the free for all, the anarchy brings the best out of everyone. (Do we have sense here of the anarchist communism of Mikhail Bakunin?) Everyone produces the best he can. With everyone producing his best, there is tremendous production, there is plenty for everyone. There is no discontent. All citizens progress together without anyone being left behind. Progress is for everyone. This is the communist utopia.

The sense of epistemological communism in the epistemological egalitarianism of Feyerabend is perhaps the reason why Feyerabend is considered a philosopher of the New Left. Of course the social communists, the orthodox communists, comprise the Old Left. Feyerabend even goes to the extent of accusing the Old Left of having made a religion out of Marxism.

The problem which is distinctly philosophical about Feyerabend's epistemological anarchism is that epistemological anarchism itself is an ideology. Hence, on its own account epistemological anarchism must be equal to any other ideology. But much as that all ideologies must be equal is an ideology that not all ideologies must be equal is also an ideology. And so the ideology which says all ideologies must be equal must be equal to the ideology which says not all ideologies must be equal. But how can an ideology which says all ideologies must be equal be equal to an ideology which says not all ideologies must be equal? This is a manifest paradox. If Professor Acuña is an epistemological anarchist he has this paradox to grapple with.

But there is an alternative and much simpler account why Prof. Acuña objects to Piaget. Prof. Acuña must be faulting Piaget's holding two-valued deductive logic as the highest level of cognitive development because this cognitive field is *not* by Prof. Acuña's lights the highest level of cognitive development. Then, the question becomes: What for Prof. Acuña is the highest level of cognitive development?

Quantum logic perhaps? Prof. Acuña, at the least, should have hinted at what he considers the highest level of cognitive development. Then we would be able to evaluate the merits of Prof. Acuña's candidate for the position of the highest level of cognitive development versus Piaget's.

As things stand we are left speculating. So as not to waste time and effort idly speculating, let us ask the question which logically comes at this point: Why did Prof. Acuña fail to propose a candidate?

Taking notice that Prof. Acuña might be working from a Wittgensteinian position as indicated by his numerous quotes from Wittgenstein, the answer I offer is this: Prof. Acuña did not care to propose a candidate because for a Wittgensteinian the typical answer to the question of what is the highest level of cognitive developmen , the typical answer to the question of what is the highest cognitive field is that the highest level of cognitive development, the highest cognitive field is language game specific.

I don't think this is a satisfactory answer at all. Saying that the answer to the question of what is the highest cognitive field is language game specific is a gratifyingly expedient philosophical position to forever avoid committing oneself to a definite answer

Accordingly there is forever no definite answer to the question of what is the highest cognitive field. In Piaget's language game, two-valued deductive logic; in that of some quantum scientist-philosophers, quantum logic; in Prof. Acuña's, (perhaps) informal logic; in a witch's, witchcraft; in a drug addict's, drug tripping; in a Catholic religious, beatific vision; and so forth and so on. To the end, there is an anarchy of answers. Each is true in its own language game. Each is relatively true. Forever. We seem to be back to Feyerabend's epistemological anarchism.

The anarchy may be such that one is reduced to merely looking and seeing.

Piaget was not merely looking and seeing when he offered two-valued deductive logic as the highest level of cognitive development. And I think there is enough justification for his offering. Piaget may yet be considered in step with developments in science and philosophy of science.

In philosophy of science, the question of what logic to use in making sense of physical phenomena has become an urgent issue. In the early years of the twentieth century researches and experiments undertaken to test classical physical theory (classical mechanics) about the nature of light, atoms, and radiation yielded puzzling results. Somehow the experimental data were anomalous —they were not the results to be expected if classical physical theory was true. The anomalous experimental results induced physicists to formulate and device what is now called quantum theory (quantum mechanics). Quantum theory was met with immediate success, it was capable of explaining and predicting experimental results heretofore puzzling in classical physical theory.

Yet the success of quantum theory brought about conceptual and hence philosophical difficulties about the nature of reality. Giving a realist interpretation of quantum theory seems to demand so drastic a revision of our conceptual picture of microphysical reality it becomes *not* visualizable at all (whereas ordinary macrophysical reality is easily visualizable). Accordingly the philosopher of science Reichenbach describes macrophysical reality as a normal system whereas microphysical reality is described as *not* a normal system.[12] An explanation offered by advocates of quantum theory why quantum reality is not visualizable is that our minds work in terms of standard two-valued deductive logic whereas quantum reality works in terms of what is called quantum logic. In any case, while ordinary macrophysical phenomena can be adequately accounted for by using standard two-valued deductive logic microphysical phenomena can not so easily be accounted for by the same logic, but by quantum logic. An example of experiment yielding results difficult to account for by standard two-valued logic is the so-called two slit experiment.

Standard two-valued logic and quantum logic have so fundamental differences they seem to be simply incompatible. Some physicists (e.g. Neils Bohr) favor standard two-valued logic while some other physicists favor quantum logic. The issue of choice of logic is actually very complex. The dilemma seems to be: Either one retains standard two-valued deductive logic or one adopts quantum logic. If one chooses the former then one has a natural logic but has to give up the idea of objective reality (i.e. that things are in a definite state whether or not observed) but if one chooses the latter then one has a *weird* logic but may retain the idea of objective reality. Clearly, either horn is problematic. The issue is philosophical even as it is very complex and technical. It has made philosophers out of physicists, e.g. Bohr of the Copenhagen school of microphysics. The development of quantum theory has generated issues for philosophizing. Philosophy is alive[13].

So in philosophy of science where the question of what is the very logic of physical reality is considered and answers disputed, standard two-valued deductive logic is one side whereas quantum logic is the opposing side. One thing though, quantum logic is much more complicated and technical than standard two-valued deductive logic. And if as claimed by Prof. Acuña standard two-valued logic has some counterintuitive features, the more quantum logic has some counterintuitive features. Quantum logic is even weirder.

There are thus two important reasons in support of Piaget's having offered standard two-valued deductive logic as the highest stage of cognitive development: (1)Standard two-valued deductive logic is the strongest logic since it is ever so natural; and (2)Standard two-valued deductive logic figures in one side of a raging dispute in the philosophy of unquestionably the most developed empirical science today which is physics.

Notice that informal logic which Prof Acuña advocates is not at all in the dispute. This should not be surprising, for after all how can a logic without a theory stand up to physics? So perhaps to continue spiting Piaget Prof. Acuña may opt for quantum logic.

To wind up this section allow me to bring to attention the historical fact that some of the best philosophers in the analytic tradition were logicians in the manner of standard two-valued deductive logic. Consider Frege and

Russell, or in the more contemporary times, Quine and Putnam. How is one to appreciate, understand, and perhaps even criticize the works of these philosophers if one does not have a good measure of standard two-valued deductive logic?

CONFUSION OF MATERIAL IMPLICATION WITH LOGICAL IMPLICATION CLEARED: PARADOX OF MATERIAL IMPLICATION DEBUNKED

Prof. Acuña attacks the notion of validity by playing the so-called paradox of material implication against what he takes to be formal logic's notion of validity. The attack is not without sophistication. And given Prof. Acuña's style, not without rhetorical appeal. The point is that if material implication is paradoxical as commonly claimed and formal logic rests many of its other notions and techniques on the notion of material implication then the paradox permeates these other notions and techniques of formal logic. The point is well taken, and I think any symbolic/formal logician worth his salt must at least offer something to parry this attack against formal logic. I'll offer one: The realization that in a sense material implication, after all is said and done, is *not* paradoxical.

But in the meantime I'll defer presenting this realization. It will be, so to speak, the main event of this section. First things first.

My diagnosis of Prof. Acuña's attack against what he takes to be formal logic's notion of validity is this: There is a confusion of material implication with logical implication. Prof. Acuña thinks formal logic's notion of validity rests exclusively on material implication. Note that he does not have a single instance of use nor mention of the term 'logical implication' all throughout his paper even as obviously the issue is logical validity.

But formal logic's notion of validity does not rest so much on material implication as on logical implication. Formal logic's criterion of validity can be presented thus: To an argument corresponds a conditional statement whose antecedent is the conjunction of all the premises of the argument (hence the premise set) and whose consequent is the conclusion of the argument. An argument is valid if and only if its corresponding conditional is tautologous, i.e. a logical truth.

Thus the technique of settling questions of validity and invalidity in formal logic specifically involves determining what is the corresponding conditional of a given argument and then subsequently determining whether this conditional is a tautology or not. If it is a tautology, i.e. a logically true statement, then the argument is valid but if it is not a tautology, i.e. either a self-contradictory or a contingent statement, then the argument is invalid. Let us have actual examples of application of this technique.

Suppose the argument is: If the light was on last night then the switch was on last night. The switch was not on last night. Therefore, the light was not on last night.

First, symbolize the argument thus:

1. L ⊃ S
2. ~ S
3. ∴ ~ L

where L: The light was on last night
S: The switch was on last night

Next, present the conditional corresponding to the argument:

[(L ⊃ S) × ~ S] ⊃ ~ L

Proceed to determine whether this conditional is a tautology or not. Construct its truth table.

[(L ⊃ S)	× ~ S]	⊃ ~ L
T T T	F F T	T F T
T F F	F T F	T F T
F T T	F F T	T T F
F T F	T T F	T T F

The conditional is a tautology. In any line of the truth table the truth value of the conditional is 'true'. The conditional is logically true. The conditional is a *logical implication*. The argument is valid.

Suppose now the argument is: Either Pia or Ana will come to class. Pia will come to class. Therefore, Ana will not come to class.

Symbolize the argument:

1. P ∨ A
2. P
3. ∴ ~ A

where P: Pia will come to class
A: Ana will come to class

Next present the argument's corresponding conditional: $[(P \vee A) \cdot P] \supset \sim A$

Proceed to construct the truth table of this conditional. Determine whether the conditional is a tautology or not.

[(P	∨	A)	.	P]	⊃	~	A
T	T	T	T	T	F	F	T
T	T	F	T	T	T	T	F
F	T	T	F	F	T	F	T
F	F	F	F	F	T	T	F

The conditional is not a tautology. There is one line in the truth table where the truth value of the conditional is 'false.' The conditional is not logically true. The conditional is not a logical implication. The argument is invalid.

The point in the above exercise is simple. Logical implication from premise set to conclusion is what is required for an argument to be valid.

Suppose we are now confronted with the argument: Prof. Vera Cruz is a Pilipino. Therefore, Prof. Zerwek is a Pilipino (too).

We know that the premise here is true and the conclusion false. If we now consult Prof. Acuña's table of validity, this argument is supposed to be invalid. It is case II. And indeed formal logical would agree with Prof. Acuña that it is invalid. For if we symbolize the argument and determine whether its corresponding conditional is tautologous, it is found to be not tautologous. Thus:

1. V
2. ∴ Z

where V: Prof. Vera Cruz is a Pilipino
Z: Prof. Zerwek is a Pilipino

V	⊃	Z
T	T	T
T	F	F
F	T	T
F	T	F

Swell! Prof. Acuña's table of validity seems to be correct.
Then suppose we are now confronted with the argument:

Prof. Zerwek is a Pilipino.
Therefore, Prof. Vera Cruz is a Pilipino.

We know that the premise here is false and the conclusion true. If we now consult Prof. Acuña's table of validity this argument is supposed to be valid. It is case III. Would formal logic agree with Prof. Acuña here? Answer: *No.*

For if we symbolize the argument and determine whether its corresponding conditional is tautologous it is found that it is not tautologous. Thus:

1. Z

2. ∴ V

Z ⊃ V

T T T

T F F

F T T

F T F

So we now have an argument which Prof. Acuña by his understanding of formal logic holds valid but which formal logic actually holds invalid. What is going on?

The truth is that Prof. Acuña has based his notion of validity on the notion of material implication whereas formal logic's notion of validity is based on logical implication. Note that if we compare the truth table of material implication with Prof. Acuña's table of validity, a parallel is obvious: where material implication is false (i.e. case II) an argument is invalid and where material implication is true (cases I, III, and IV) an argument is valid. Insofar as material implication is to be distinguished from logical implication the conflict is not unexpected at all, indeed, it is inevitable.

The trouble of course is that Prof. Acuña imputes his table of validity on formal logic. (Or would he say the validity table is purely an Acuña original?) Thus apparently the conflict exposed here is a conflict within formal logic.

However there is no such internal conflict within formal logic. The conflict is just the unfortunate result of Prof. Acuña's having misrepresented the notion of validity of formal logic.

So the present situation is this: Prof. Acuña imputes a notion of validity on formal logic which notion of validity is actually not formal logic's. Then Prof. Acuña makes a heroic effort to expose the alleged counterintuitive features of the notion of validity he imputes on formal logic. Then Prof. Acuña triumphantly believes that thereby, together with his other strikes against formal logic, he has refuted formal logic. The victory, if victory it is, is partly a victory over a strawman of Prof. Acuña's own making.

There is no other way one may come to a misrepresentation of the concept of validity of formal logic as Prof. Acuña's outside of the failure to distinguish between material implication and logical implication. Accordingly it is people who somehow confuse material implication with logical implication who are exceptionally vulnerable to being convinced and carried away by Prof. Acuña's attack against formal logic's notion of validity.

Let me then do my part in clearing the present instance, and perhaps preventing future occurrences, of confusion of material implication with logical implication. Understandably what is due is a clear sharp distinction between these two different sorts of implication.

There are actually many sorts of implication. These are material implication, decisional implication, causal implication, definitional implication, and finally logical implication. I will not present an exhaustive discussion of all these types here.[14] The focus is on material implication, said to be the weakest sort of the different types of implication, on the one hand, and logical implication, said to be the strongest sort of implication on the other. Actually, material implication is part of all the sorts of implication it can with due caution be described as the common denominator of the different sorts of implication.

One may start distinguishing between material implication and logical implication by considering that any logical implication constitutes a material implication, but not any material implication constitutes a logical implication.

Let us consider any two statements which we will conveniently tag respectively by the letter 'A' and the letter 'B'. What is the criterion for saying there is material implication from A to B? Or equivalently, what is the criterion for saying A materially implies B? The criterion is: A materially implies B if and only if either A is false or B is true.

This criterion is actually what is conveyed by the truth table of material implication:

A	⊃	B
T	T	T
T	F	F
F	T	T
F	T	F

In the first line A is true and B is true. Therefore in this line either A is false or B is true. Hence in this line A materially implies B. In the second line A is true and B is false. Therefore in this line it is false that either A is false or B is true. Hence in this line A does not materially imply B. In the third line A is false and B is true. Therefore in this line either A is false or B is true. Hence in this line A materially implies B. Finally in the last line A is false and B is also false. Therefore in this line either A is false or B is true. Hence in this line A materially implies B.

Each line of a truth table is to be interpreted as standing for a possible universe or a type of possible universes. Thus in the truth table above the first line stands for the possible universe or type of possible universes where A is true and B is also true. The second line stands for the possible universe or type of possible universes where A is true and B is false. The third line stands for the possible universe or type of possible universes where A is false and B is true. The last line stands for the possible universe or type of possible universes where A is false and B is also false.

On the other hand, what is the criterion for saying A logically implies B? The criterion for saying A logically implies B can be variously but equivalently expressed as:

(1) A logically implies B if and only if there is no possible universe where A is true and B is false.

(2) A logically implies B if and only if a universe where A is true and B is false is impossible.

(3) A logically implies B if and only if A materially implies B in each and every possible universe.

(4) A logically implies B if and only if 'A ⊃ B', equivalently 'A materially implies B', is tautologous.

The four equivalent expressions of the criterion of logical implication have different appeals. (1), (2), and (3) perhaps appeal more to the ontologically minded student of logic, whereas (4)perhaps appeals more to the logically minded student of logic. It is easy to see why. (1), (2), and (3) involve possible universe(s) talk whereas (4)does not involve possible universe(s) talk but only expressions we are familiar with in fundamental symbolic/formal logic.

And (4) is the most precise and useful. It provides us immediately with a technique of settling the question of whether a given statement A logically implies another given statement B.

Let us have exercise in applying this technique. Suppose the question is, Does the statement 'Pia is pretty' logically imply the statement 'Either Pia is pretty or Pia is intelligent'? Here our A is the statement 'Pia is pretty' and our B is the statement 'Either Pia is pretty or Pia is intelligent'. Symbolizing 'Pia is pretty' by 'P' and 'Pia is intelligent' by 'I', our technique yields:

A ⊃ B
P ⊃ (P ∨ I)
T T T T T
T T T T F
F T F T T
F T F F F

We find that all the truth values under the horseshoe symbol are *true*. 'P ⊃ (P ∨ I)' is tautologous. P logically implies (P ∨ I)

Recalling that in a truth table each line stands for a universe or type of universes, we realize that in the first line above P materially implies (P ∨ I). In the second line also P materially implies (P ∨ I). In the third line also P materially implies (P ∨ I). In the fourth line also P materially implies (P ∨ I). Hence it may be said finally: In any possible universe P materially implies (P ∨ I). P logically implies (P ∨ I).

The truth table above is the truth table of the logical implication 'P ⊃ (P ∨ I)'. There is no one single truth table of logical implication. There are truth tables of different logical implications. Whereas there is only one truth table of material implication.

But suppose the question is, Does the statement 'Either Pia is pretty or Pia is intelligent' logically imply the statement 'Pia is both pretty and intelligent'? Here now our A is 'Either Pia is pretty or Pia is intelligent' and our B is 'Pia is both pretty and intelligent'. Our technique yields:

A ⊃ B
(P ∨ I) ⊃ (P . I
T T T T T T T
T T F F T F F
F T T F F F T
F F F T F F F

We find that the values under the horseshoe are not all *true's*. '(P ∨ I) ⊃ (P × I)' is not tautologous. (P ∨ I) does not logically imply (P × I).

Recalling that in a truth table each line stands for a universe or a type of universes, we realize that in the first line above (P ∨ I) materially implies (P × I). In the second line (P ∨ I) does not materially imply (P × I). In the third line (P ∨ I) does not materially imply (P × I). In the fourth line, (P ∨ I) materially implies (P × I). Hence it may be said finally: It is not the case that in any possible universe (P ∨ I) materially implies (P × I). (P ∨ I) does not logically imply (P × I). '(P ∨ I) ⊃ (P × I)' is not a logical truth.

The above discussions hopefully have accomplished what they are supposed to accomplish namely to make sharp the distinction between material implication and logical implication such that any actual confusion is cleared and any potential confusion is prevented. Further elaboration of the distinction can be had presumably in a good three-unit course in symbolic/formal logic.

Prof. Acuña undeniably employed the paradox of material implication in trying to refute formal logic's concept of validity. The attack is to be adjudged as not successful at all since in the first place Prof. Acuña misrepresented formal logic's concept of validity which actually turns on the concept of logical implication whereas Prof Acuña thought it is based solely on the concept of material implication. The clear evidence of this is that all throughout Prof. Acuña's paper, there is no use nor mention of the term 'logical implication'. The closest Prof. Acuña got to the notion of logical implication is perhaps in his use of the term 'logical relation'. But the term 'logical relation' is fearfully ambiguous compared to the term 'logical implication'. When Hume demanded 'necessary connexion' between the premises and conclusion of cause and effect reasoning (and found none) he was not demanding merely logical relation but I think the relation of logical implication from premises to conclusion.

Since there is a difference between material implication and logical implication the so-called paradox of material implication cannot be brought to bear directly upon formal logic's notion of validity. At best the so-called paradox of material implication can be brought to bear against formal logic's notion of validity only indirectly or remotely. The so-called paradox of material implication can be brought to bear against formal logic only insofar as formal logic makes use of the concept of material implication at all. And unquestionably formal logic does make use of the notion of material implication.

In his attack against formal logic Prof. Acuña employed the so-called paradox of material implication. Being an avid defender of formal logic I will now try to prevent further use of this alleged paradox against formal logic. I would like the opponents of formal logic have one less weapon in their arsenal to unleash against formal logic.

The so-called paradox of material implication is based on two essential realizations: (1) If a statement is true any other statement whether true or false materially implies the statement--- This truth is what is conveyed by the logical implication '$p \supset (q \supset p)$'; and (2) If a statement is false, the statement materially implies any statement whatever whether true or false. this truth is what is conveyed by the logical implication '$\sim p \supset (p \supset q)$'.

What is paradoxical in these realizations? Obviously, if there be a paradox the paradox at most is not a *hard* paradox, i.e. paradox in the sense of logical antinomy, but only a *soft* paradox, i.e. a paradox consisting in something's being counterintuitive. What is counterintuitive in the first realization? If there be anything that can be considered counterintuitive in the first realization I think it is the notion of any statement whatever whether true or false, in other words all statements, each and every statement, all (materially) implying a statement on account solely of the latter's being true.

On the other hand, what is counterintuitive in the second realization? If there be anything that can be considered counterintuitive in the second realization I think it is the notion of a statement on account solely of its falsity (materially) implying any statement whatever, in other words all statements, each and every statement whether true or false.

In the respective linguistic formulations of the two realizations let us cautiously replace the expression 'materially implies' by the expression 'materially leads to'. Accordingly the two realizations will respectively read: (1) If a statement is true any other statement whether true or false materially leads to the (true) statement; and (2)If a statement is false, the (false) statement materially leads to any statement whatever whether true or false.

I have accordingly reflected on the above two realizations, and have come to a sense that they are not paradoxical at all! Consider the first realization. Is it paradoxical at all that any statement whatever whether true or false materially leads to a true statement? Why, if anything that is symbolic/formal logic's consolation to the honest man — a honest man's statement being true, all other statements whether true or false materially leads to it. Is there ever anything paradoxical for symbolic/formal logic to provide sense that all statements whether true or false materially converge in a true statement? Note that objectivist and realist philosophers of science have the faith that in the historical march of science there will ultimately be a convergence of all theories into the one true description of the universe.

Consider now the second realization. Is it paradoxical at all that a false statement materially leads to any statement whatever whether true or false? Indeed it can be shown by symbolic/formal logic that a false statement materially leads to a contradiction. This can be proved by a simple exercise in propositional logic

1. $\sim P \supset (P \supset Q)$
2. $\sim P \supset (P \supset \sim Q)$
3. $\therefore \sim P \supset [P \supset (Q \times \sim Q)]$

The formal proof of the validity of the above argument goes as follows:

1.	$\sim P \supset (P \supset Q)$	
2.	$\sim P \supset (P \supset \sim Q) / \therefore \sim P \supset [P \supset (Q \times \sim Q)]$	
3.	$(\sim P \,.\, P) \supset Q$	1, Exportation
4.	$(\sim P.\ P) \supset \sim Q$	2, Exportation
5.	$[(\sim P.P) \supset Q] \times [(\sim P \times P) \supset \sim Q]$	3,4. Conjunction
6.	$[\sim(\sim P.P) \vee Q] \times [(\sim P \times P) \supset \sim Q)$	5, Implication
7.	$[\sim(\sim P.P) \vee Q] \times [\sim(\sim P \times P) \vee \sim Q$	6. Implication
8.	$\sim(\sim P.P) \vee (Q \times \sim Q)$	7, Distribution
9.	$(\sim P.P) \supset (Q \times \sim Q)$	8. Implication
10.	$\sim P \supset [P \supset (Q \times \sim Q)]$	9, Exportation

Both the premises here are each a logical implication, a logical truth. The premises both being logical truths the conclusion proven to logically follow from them is also a logical truth The conclusion may be read: If a statement is false the statement materially implies a contradiction.

That a false statement materially leads to a contradiction is, if anything, again a consolation to the honest man. For is it not a consolation to the honest man that a liar's lie materially leads to a contradiction?

So there you have it. Take it or leave it. If you are an honest man I don't see why you would leave it. I think I have discovered a sense that the so-called paradox of material implication is afterall not a paradox[15]. I offer this discovery as a specific contribution of Philippine analytic philosophy.

And if the paradox of material implication is not a paradox, then there is one less weapon in the arsenal of opponents of symbolic/formal logic. Prof. Acuña would not have employed the paradox against symbolic/formal logic had he been made to realize earlier that the so-called paradox is not a paradox at all.

REFUTATION OF COUNTER EXAMPLES TO FORMAL LOGIC

In his discussion of logical fallacy Prof. Acuña seems to argue that formal logic's fundamental doctrine that validity and invalidity are a matter of logical form solely is false. Prof. Acuña focuses specifically on formal logic's notion of logical fallacy and tries to show that this notion is mistaken.

Insofar as logical fallacy[16] is a matter of invalidity and insofar as formal logic holds that invalidity is a matter of logical form, formal logic must accordingly hold that logical fallacy is a matter of logical form. And indeed for formal logic, logical fallacy is a matter of logical form. Formal logic even has neat name tags for the different formal fallacies.

In defiance of formal logic, Prof. Acuña tries to show that logical fallacy is not a matter of logical form alone. He tries to show specifically that some arguments though by form invalid (formally invalid by formal logic) are actually valid! Thus, as we ourselves may conclude in defiance of formal logic and in agreement with Prof. Acuña, invalidity is not a matter of logical form.

Two logical forms which formal logic holds invalid are called respectively *affirming the consequent* and *undistributed middle.* Hence there are in formal logic what are called fallacy of affirming the consequent and fallacy of undistributed middle. The former is a fallacy in propositional logic whereas the latter is a fallacy in predicate logic.

Formal logic's classic example of fallacy of affirming the consequent is the following argument.

1. If it rained then the ground is wet.
2. The ground is wet.
3. Therefore, it rained.

This argument can be represented as follows:

1. $R \supset W$

2. W

3. $\therefore$ R

where R: It rained

W: The ground is wet

Formal logic holds that any argument of the same form as the above is invalid. For any argument of such form would be such that even if all the premises are true the truth of the conclusion does not necessarily follow.

Prof. Acuña does not voice objection that the above paradigm of fallacy of affirming the consequent is indeed invalid, even as he says such example is self-serving on the part of formal logic. (Why self-serving? Because the paradigm example is so obviously invalid? But that is what a paradigm example is supposed to be.) In any case I don't think any opponent of formal logic would object to formal logic that the above argument is indeed invalid.

But one thing before we proceed. In the paradigm example of fallacy of affirming the consequent the converse of the first premise, i.e. $W \supset R$, is as a matter of background knowledge not true even as the first premise $R \supset W$ is true. This realization will serve us in good stead later. If the opponents of formal logic are convinced that the paradigm example is indeed invalid it is because $W \supset R$ is not true as a matter of background knowledge. If it happened that as a matter of background knowledge $W \supset R$ is true (not false) they wouldn't have agreed with formal logic's paradigm of fallacy of affirming the consequent. My explanation why this is so will come later.

Prof. Acuña affirms, even while grumbling that it is self-serving, that formal logic's paradigm example of fallacy of affirming the consequent is indeed invalid. But in direct defiance of formal logic, Prof. Acuña insists that not all instances of affirming the consequent are fallacious. To substantiate his claim Prof. Acuña presents a totality of four examples which Prof. Acuña claims are valid even as by their explicit logical form they are instances of affirming the consequent and therefore according to formal logic invalid. The four are as follows:

Argument 1

1. If the figure is a triangle then it is a geometric figure with three sides and three angles.
2. The figure is a geometric figure with three sides and three angles.
3. Therefore, the figure is a triangle.

Argument 2

1. If that man is a bachelor then that man is an unmarried male.
2. That man is an unmarried male.
3. Therefore, that man is a bachelor.

Argument 3

1. If that boy is a brother then that boy is a male sibling.
2. That boy is a male sibling.
3. Therefore, that boy is a brother.

Argument 4

1. If it rained, La Mesa Dam is full.
2. La Mesa Dam is full.
3. Therefore, it rained.

The respective symbolic representations are:

Argument 1

1. $T \supset G$
2. G
3. $\therefore T$

where T : The figure is a triangle

G: The figure is a geometric figure with three sides and three angles

<u>Argument 2</u>

1. M ⊃ U

2. U

3. ∴ M

where M: That man is a bachelor

U: That man is an unmarried male

<u>Argument 3</u>

1. B ⊃ S

2. S

3. ∴ B

where B: That boy is a brother

S: That boy is a male sibling

<u>Argument 4</u>

1. R ⊃ L
2. L
3. ∴ R

where R: It rained

L: La Mesa Dam is full

It is by considering the respective symbolic representations of the four arguments that it becomes utterly obvious that each is a case of affirming the consequent. By their explicit logical form formal logic would have to judge them invalid. But Prof. Acuña insists that they are valid, and indeed I would not be surprised if some readers are carried by Prof. Acuña's insistence.

I stand by formal logic. All of Prof. Acuña's examples are invalid by their explicit logical form. And I think I can explain why despite their being invalid by explicit logical form they nevertheless may look valid.

The above examples are such that the respective converses of the first premises, to wit, G ⊃ T, U ⊃ M, S ⊃ B, and L ⊃ R are each as matter of background knowledge true. In fact the respective truths of G ⊃ T, U ⊃

M, S ⊃ B, and L ⊃ R follow by valid deduction from greater truths of background knowledge, to wit, G ≡ T, U ≡ M, S ≡ B, and L ≡ R.

To fully realize what have just been said, consider the proper correspondences:

G ⊃ T : The figure is a geometric figure with three sides and three angles only if it is a triangle.

U ⊃ M : That man is an unmarried male only if that man is a bachelor.

S ⊃ B : That boy is a male sibling only if that boy is a brother.

L ⊃ R : La Mesa Dam is full only if it rained.

G ≡ T : The figure is a geometric figure with three sides and three angles if and only if it is a triangle. (Follows from the definition of the term 'triangle'. Background knowledge of definition of terms.)

U ≡ M : That man is an unmarried male if and only if that man is a bachelor. (Follows from the definition of the term 'bachelor'. Background knowledge of definition of terms.)

S ≡ B : That boy is a male sibling if and only if that boy is a brother. (Follows from the definition of the term 'brother'. Background knowledge of definition of terms.)

L ≡ R : La Mesa Dam is full if and only if it rained. (Follows from the empirical belief that the one and only cause of La Mesa Dam being full is rain. We know of nothing else besides rain which causes La Mesa Dam to be full. The empirical belief is part of background knowledge.)

When one is presented arguments like those of Prof. Acuña presented here one brings in the relevant parts of one's background knowledge. A formal logician knows that each of the examples is invalid. Nevertheless the formal logician, just like any ordinary person presented the arguments, would like to give the arguments sympathetic reading by the principle of charity. The formal logician would for example think that even as the T ⊃ G, G ∴ T is what is explicitly presented (and which is of course invalid) what the reasoner ought to be presenting is the valid argument G ≡ T, G ∴ T since this is the *stronger* argument that can be constructed from available background knowledge to prove true the same conclusion T.

Doing sympathetic reading of such arguments is of course not a monopoly of formal logicians. Even ordinary persons are capable of such sympathetic readings. And it is when the ordinary person giving sympathetic reading is carried away by the rhetorical techniques of skillful opponents of formal logic like Prof. Acuña that he may be deluded to believe that an argument which is formally invalid is nonetheless valid. The formal logician even as he is sympathetic is not easily carried away by the rhetorics.

In defense of formal logic, I wish to present a psychological hypothesis why arguments like those of Prof. Acuña may have the look of being valid despite their explicitly being invalid by formal logic. Any person who honestly believes that Prof. Acuña's examples are valid may be enlightened by this hypothesis and be convinced to agree with formal logic instead of Prof. Acuña.

The hypothesis is: It is actually the valid argument form 'p ≡ q, q ∴ p' which is behind the delusion that arguments of the invalid argument form 'p ⊃ q, q ∴ p' are valid.

How did I arrive at this hypothesis? I arrived at this hypothesis by the usual inductive route of affirming the consequent:

1. If it is actually the valid argument form 'p≡ q, q ∴ p' which is behind the delusion that arguments of the invalid argument form 'p ⊃ q, q ∴ p' are valid then all examples of seemingly valid arguments of the invalid argument form 'p ⊃ q, q ∴ p' will be such that in each of them the relevant statement of the form 'p≡ q' is a truth of background knowledge.

2. All examples so far of seemingly valid arguments of the invalid argument form 'p ⊃ q, q ∴ p' are such that in each of them the relevant statement of the form 'p≡q' is a truth of background knowledge

3. Therefore (probably) it is actually the valid argument form 'p≡ q, q \p' which is behind the delusion that arguments of the invalid argument form 'p ⊃ q, q ∴ p' are valid.

Is the hypothesis a good hypothesis or an idle hypothesis? I don't think it is an idle hypothesis. It is a good one. It is a good one because by it a prediction can be made: All future cases of arguments of the invalid argument form 'p ⊃ q, q ∴ p' argued as valid by opponents of formal logic will be such that in each the relevant statement of the form 'q ⊃ p' is true as a matter of background knowledge.

I accordingly challenge Prof. Acuña and company to provide examples of seemingly valid arguments of the invalid argument form 'p ⊃ q, q ∴ p' which are such that the relevant statement of the form 'q ⊃ p' is *NOT* true by background knowledge. (Because if Q ⊃ P is not true by background knowledge then P≡Q is also not true by background knowledge.) Recall the grumble of Prof. Acuña against formal logic's paradigm of fallacy of affirming the consequent —Rain is not the only possible cause of a waterlogged ground. Which is to point out that in the paradigm example the converse of the first premise, to wit 'If the ground is wet then it rained' is *NOT* true! Prof. Acuña's grumble itself suggests what an informal logician takes as the cue to say an argument of the invalid argument form 'p ⊃ q, q ∴ p' is valid: the relevant statement of the form 'q ⊃ p' is true by background knowledge.

But if Q ⊃ P is true, and P ⊃ Q (the provided premise) is also true, then P≡Q is true. Prof. Acuña's grumble accordingly confirms my hypothesis.

My hypothesis is a good scientific hypothesis. It is falsifiable it seems to come up to Popper's standard of what counts as scientific. I myself have pointed out what would constitute falsification or refutation of my hypothesis. If such falsifying or refuting examples will be forthcoming, I may have second thoughts about formal logic.

The logical form of affirming the consequent in propositional logic has some affinity with the logical form called undistributed middle in predicate logic. This some affinity is perhaps what leads informal logicians attacking the fallacy of affirming the consequent to similarly attack the fallacy of undistributed middle The supposed vulnerability of formal logic to attack on the fallacy of affirming the consequent encourages the informal logicians to perceive a similar vulnerability of formal logic to attack on the fallacy of undistributed middle. And so Prof. Acuña, representing informal logic, indeed attacks the fallacy of undistributed middle. The attack is not unexpected at all.

Formal logic as usual true to form holds that any instance of undistributed middle is invalid and hence fallacious. Informal logic in contrast holds that some instances at least of undistributed middle are valid. Prof. Acuña's examples are as follows:

Argument 5
1. All triangles are geometric figures with three sides and three angles.
2. X is a geometric figure with three sides and three angles.
3. Therefore, X is a triangle.

Argument 6
1. All bachelors are unmarried males.
2. Peter is an unmarried male.
3. Therefore, Peter is a bachelor.

Argument 7
1. All brothers are male siblings.
2. Jose is a male sibling.
3. Therefore, Jose is a brother.

The corresponding symbolic representations of the above arguments are as follows:

Argument 5
1. (x) (Tx ⊃ Gx)
2. GX
3. ∴ TX
where
Tx: x is a triangle
Gx: x is a geometric figure with three sides and three angles
GX: X is a geometric figure with three sides and three angles.
TX: X is a triangle

Argument 6
1. (x) (Bx ⊃ Ux)
2. Up
3. ∴ Bp
where
Bx: x is a bachelor
Ux: x is an unmarried male

Argument 7
1. (x) (Rx ⊃ Mx)
2. MJ
3. ∴ RJ
where
Rx: x is a brother
Mx: x is a male sibling

The thing to notice regarding arguments 5 6, and 7 is that the respective converses of their first premises are true as a matter of background knowledge. The first premise of argument 5 is true. But so is its converse, 'All geometric figures with three sides and three angles are triangles', or in symbols, '(x) (Gx ⊃ Tx)'. The first premise of argument 6 is true. But so its converse, 'All unmarried males are bachelors', or in symbols, '(x) (Ux ⊃ Bx)'. The first premise of argument 7 is true. But so is its converse, 'All male siblings are brothers', or in symbols '(x) (Mx ⊃ Rx)'. These realizations will serve us in good stead later.

Formal logic would simply have to judge arguments 5, 6, and 7 as by their explicit logical form invalid. Part of course in giving these arguments sympathetic reading is the assumption that the arguer knows the definitions and thereafter the meanings of the terms employed in the arguments. In fact, on this assumption, these arguments can be pointed out as, to say the least, strange. Why would an arguer present such arguments when by appeal to proper definitions he could have presented more natural, much stronger, and henceforth more convincing arguments to prove the truth of the very same conclusions. These more natural, much stronger, and henceforth more convincing arguments standing respectively to the matching strange arguments are as follows:

Arguments 8
1. Anything is a triangle if and only if it is a geometric figure with three sides and three angles.
2. X is a geometric figure with three sides and three angles.
3. Therefore, X is a triangle.

Argument 9
1. Anyone is a bachelor if and only if he is an unmarried male.
2. Peter is an unmarried male.
3. Therefore, Peter is a bachelor.

Argument 10
1. Anyone is a brother if and only if he is a male sibling.
2. Jose is a male sibling.
3. Therefore, Jose is a brother.

The respective symbolic representations of the above arguments are as follows:

Argument 8
1. (x) (Tx≡ Gx)
2. GX
3. ∴ TX

Argument 9
1. (x) (Bx≡Ux)
2. Up
3. ∴ Bp

Argument 10
1. (x) (Rx ≡Mx)
2. MJ
3. ∴ RJ

Arguments 8, 9, and 10 are all formally valid. Nobody in his right mind, I think, can even claim that arguments 5, 6, and 7 presented by the informal logician to spite formal logic are even just equally as natural, as strong, and henceforth as convincing in proving the truth of the same conclusions as do arguments 8, 9 and 10. Arguments 5, 6, and 7 are doing the task of proving the truth of their respective conclusions in a rather difficult way. The difficulty is perhaps something the informal logician would willingly put up with just to spite formal logic.

Ultimately of course, arguments 5, 6, and 7 fail to establish the truth of their respective conclusions because they are invalid. The informal logician's insistence that they are valid is simply the result of a delusion. In defense of formal logic I again offer a psychological hypothesis specifying the nature of this delusion. The hypothesis is: It is actually the valid argument form '$(x)\ (\phi x \equiv \psi x),\ \psi x\ \therefore \phi x$' which is behind the delusion that arguments of the invalid argument form '$(x)\ (\phi x \supset \psi x),\ \psi x\ \therefore \phi x$' are valid.

How did I arrive at this hypothesis? I arrived at this hypothesis in a manner similar to that of the previous hypothesis, a manner admittedly inductive:

1. If it is actually the valid argument form '$(x)\ (\phi x \equiv \psi x)$, $yx \backslash fx$' which is behind the delusion that arguments of the invalid argument form '$(x)\ (\phi x \supset \psi x)$, $\psi x \backslash \phi x$' are valid then all examples of seemingly valid arguments of the invalid argument form '$(x)\ (\phi x \supset \psi x)$, $\psi x \backslash \phi x$' will be such that in each of them the relevant statement of the form '$(x)\ (\phi x \equiv \psi x)$' is a truth of background knowledge.

2. All examples thus far of seemingly valid arguments of the invalid argument form '$(x)\ (\phi x \supset \psi x)$, $\psi x \backslash \phi x$' are such that in each of them the relevant statement of the form '$(x)\ (fx \equiv Ux)$' is a truth of background knowledge.

3. Therefore, (probably) it is actually the valid argument form '$(x)\ (\phi x \equiv \psi x)$, $\psi x\ \therefore \phi x$' which is behind the delusion that arguments of the invalid form '$(x)\ (\phi x \supset \psi x)$, $\psi x \backslash \phi x$' are valid.

The hypothesis is unquestionably a good scientific hypothesis. A prediction can be made from it: All future cases, as are all present cases, of seemingly valid arguments of the invalid argument form '$(x)\ (\phi x \supset \psi x)$, $\psi x\ \therefore \phi x$' will be such that in each of them the relevant statement of the form '$(x)\ (\phi x \equiv \psi x)$' is a truth of background knowledge.

The hypothesis is accordingly falsifiable. Examples of seemingly valid arguments of the invalid argument form '$(x)\ (\phi x \supset \psi x)$, $\psi x \backslash \phi x$' where the relevant statements of the form '$(x)\ (\psi x \supset \phi x)$' are NOT true as a matter of background knowledge would refute the hypothesis (because if $(x)\ (\psi x \supset \phi x)$ is not true by background knowledge then $(x)\ (\phi x \equiv \psi x)$ is also not true by background knowledge). There is thus clear sense that the hypothesis meets strict Popperian standards of what count as scientific conjecture. It now remains for opponents of formal logic like Prof. Acuna to come up with the described appropriate refuting instances.

There is no denying that the two psychological hypotheses presented are psychological hypotheses. But at the same time there is also no denying that the nature of both hypotheses is such that only a person with good enough grasp of and devotion to formal logic can form them. Accordingly, let these hypotheses be now in the arsenal of formal logic as therapeutic devices. When an informal logician or a person in the sway of an informal logician raises the issue of allegedly valid arguments of the form affirming the consequent or the form undistributed middle these psychological hypotheses come in handy for the formal logician to convince the informal logician or the fan of the informal logician that they are merely in a state of delusion. For as long these hypotheses stand unfalsified they have the important function of serving as cure to appropriate logical pathology.

It is to be pointed out and even emphasized that the form of reasoning called affirming the consequent is a logical mainstay in the physical as well as in the social sciences. As formal deductive logic holds such reasoning fallacious Prof. Acuña accuses formal deductive logic of giving scientists, social scientists particularly, guilt feelings in using this form of reasoning.

I don't think this charge of Prof. Acuña against formal deductive logic is proper. The allegation is uncalled for. If anything the allegation is for propaganda purposes. I myself have applied the form of reasoning called affirming the consequent several times already in this paper with what I think to be good results and have no guilt feelings at all. The point is if one is cognizant of the essential difference between deduction and induction and that one is doing induction instead of deduction in applying the form of reasoning called affirming the consequent why should one have guilt feelings because formal deductive logic holds such reasoning fallacious? If anything formal deductive logic's holding affirming the consequent fallacious can be healthfully considered as formal deductive logic's reminder for us not to forget that such reasoning is inductive (and hence deductively invalid). On the other hand to suggest in the manner of Prof. Acuña that deductive standards be observed in the inductive domain is to suggest that the essential distinction between deduction and induction be obliterated. Is Prof. Acuña proposing that the distinction between (valid) deduction and (scientific) induction be obliterated? Is Prof. Acuña saying that scientists do not know the distinction between deduction and induction?

The fallibility of science is traceable to its use of inductive reasoning. In inductive reasoning properly understood even as all premises are known to be true the conclusion is never known to be true but remains merely probable or conjectural. Which is to say inductive reasoning is by deductive standards always invalid. Thus scientific results being fallible they are open to correction, modification, or revision in the future. The realization that some reasonings in science are merely inductive and thus violate strict deductive standards constitutes the antithesis to dogmatism and claims to final absolute truth which were the hallmark features of medieval philosophy. Descartes was still very much in the medieval tradition when he undertook the Cartesian project of finding first premises which cannot be doubted at all and from which the rest of all knowledge would follow by one brilliant glorious exercise of deductive logic.

Prof. Acuña in tune with informal logic would like to hold that some instances at least of affirming the consequent are valid. His very examples feature true premises. In saying these examples are valid is he saying that the truth of the conclusions necessarily follows from the truth of the premises? And if he then holds that instances of affirming the consequent done by scientists valid so as not to give them guilt feelings is he not then saying that the conclusions of these instances of affirming the consequent are established to be true? So are these instances of affirming the consequent being valid still inductive? Prof. Acuña seems to be suggesting something here —a scientific reasoning in order to be considered good must be at par with valid deductive reasoning. This is a return to deductivism! Prof. Acuña afterall perhaps has secret yearnings for deductivism.

On the other hand, obliterating the distinction between deductive reasoning and inductive reasoning makes for anarchy.

In some a bit muddled discussion regarding definition and extension and intension of terms, Prof. Acuña voices objection to the accepted practice of representing definitions by the biconditional. He alleges that representing definitions by the biconditional has counterintuitive results. His example of a biconditional featuring a definition which biconditional is supposedly counterintuitive is the biconditional, 'X is a Zenogill if and only if X is an animal with five legs'. Here both components of the biconditional are false. Therefore, as per Prof. Acuña the definiendum and the definiens are both false. How then can it be maintained that the definition is true?

Some technical clarifications are in order here. First, a definition is not represented by a biconditional in propositional logic but by a universalized biconditional in predicate logic. Thus, the definition of the term 'zenogill' by the term 'animal with five legs' is to be represented as: (x) [Zx≡(Ax × Fx)] where Zx: x is a zenogill, Ax: x is an animal, and Fx: x has five legs.

In the above universalized biconditional the terms 'zenogill' and 'animal with five legs' are, so to say, co-equals. Where the term 'zenogill' is the definiendum, the term 'animal with five legs' can be properly offered as definiens. Where the term 'animal with five legs' is the definiendum, the term 'zenogill' can be properly offered as definiens.

As Prof. Acuña presents the biconditional 'X is a zenogill if and only if X has five legs' he is presenting what is called a *substitution instance* of the universalized biconditional. Note that the term 'X' in Prof. Acuña biconditional is supposed to be understood as a proper name.

Prof. Acuña then proceeds to point out that 'X is a zenogill' is false and 'X is an animal with five legs' is also false. (Here I suppose 'X is a zenogill' is false because there are no zenogills. 'X is an animal with five legs' is (also) false because there are no animals with five legs.) Then Prof. Acuña says that the reasoning 'The definiendum is false. The definiens is also false. Therefore the definition is (still) true' as absurd —apparently an absurd consequence of representing definitions by the biconditional.

Franky, I don't see anything absurd in what Prof. Acuña points out to be (by his lights) absurd. A biconditional is true even if the components flanking the biconditional sign are both false. A universalized biconditional may be held true as for example it is held true in a definition even if all substitution instances of the propositional functions flanking the biconditional sign are false. All these are just the normal course of things in formal logic.

Finally let me drive home the point by my own example mimicking Prof. Acuña's. Suppose we consider the biconditional: Prof. Acuña is a bachelor if and only if Prof. Acuña is an unmarried male.

Here, 'Prof. Acuña is a bachelor' is false. And 'Prof. Acuña is an unmarried male' is also false. The definition, 'Anyone is a bachelor if and only if he is an unmarried male' is true. Anything absurd in all these?

TYING SOME LOOSE ENDS

In the section entitled *The Concept of Argument* of his paper, Prof. Acuña castigates several well known logicians for their concept of argument. Prof. Acuña presents the respective definitions of argument of these logicians and claims to show counterintuitive consequences of these definitions of argument.

Prof. Acuña's first target is the logician Hocutt. The latter's concept of argument is, as I may summarily put it, proving something as true on the basis of some other things taken as or accepted to be true.

I don't see anything immediately offensive in Hocutt's concept of argument. For surely one of the most important activities of human concern is that of getting to truth from previously accepted truths or generating truth from previously accepted truths. From truths already known we human beings undoubtedly do not particularly wish to get to falsehoods but rather to further truths. Only a damned liar specifically wishes to generate and propagate falsehoods in the hope that gullible as some people are he may achieve his purposes via the falsehoods. It is to the truth-seeking human activity that deductive logic theory devotedly caters. As I may put it, deductive logicians as deductive logicians would like to ensure that arguments are always truth transmitting. For as long as human beings still care about having/knowing truths from truths there is surely still a place for deductive logic in the scheme of things.

A deductive argument ultimately aims to be truth transmitting. But there are two distinct requirements in the production of a sound deductive argument. An argument is truth transmitting if and only if it is a sound deductive argument. So it follows that the requirements for a sound deductive argument are at the same time the requirements for a truth transmitting argument.

What are these requirements? They are: (1) the argument must be valid, and (2) the argument must have all its premises true.

The second requirement that all the premises of an argument be true is not exclusive to deductive argumentation It is also a requirement even in inductive argumentation. And this requirement has its appropriate watered-down version in moral argumentation —all the premises in a moral argument capable of truth value must be true. Thus it is not only in deductive argumentation that a false premise is damning. A false premise is destructive to an inductive or a moral argument as it is to a deductive argument.

It is the first requirement which is exclusive to deductive argumentation and which requirement distinguishes deductive arguments from other sorts of arguments, e.g. inductive or moral. The requirement of validity is what makes an argument distinctively deductive.

Insofar as some deductive logicians, and apparently Hocutt and Copi (the second target of Prof. Acuña's attack) are in the company, confound argumentation with deductive argumentation they are narrow minded. Arguments are not all deductive. On this point I certainly agree with Prof. Acuña.[17]

Some appropriate definition of the term 'argument' is desirable which definition would not commit the error of confounding deductive argument with argument in general. Though, the confounding of deductive argumentation with argumentation in general may be understood as symptomatic of the philosophical position most forcefully articulated in the twentieth century by the philosopher Popper: *deductivism*.

As I see it, there are even different brands of deductivism.[18] Deductivism of whatever brand is so problematic I don't subscribe to it. I believe though in two-valued deductive logic appropriately limited to its proper domain, the domain of human concern where truths are what are sought from truths. I suppose that there is a universal human consensus that this domain of human concern is important.

So back we go to the concept of deductive argument. It has already been said that the requirement of validity is exclusive to deductive argumentation. It is the distinctively deductive requirement. There is thus no wonder that deductive logicians devote so much attention and effort to the concept of validity.

What is a deductive argument? I offer the following criterion: An argument is deductive if and only if it is either one wherein the conclusion necessarily follows from the premises or one intended to support its conclusion as following necessarily from its premises.

The concept of 'necessarily follows' of twentieth century two-valued deductive logic is not merely loose or vague or based on intuitive gut feel, as some ordinary language philosophers and informal logicians, it seems, would have it. It is precise and technical: there is a definite method to determine whether the relation of 'necessarily follows' obtains between the premises and the conclusion of an argument.

As the concept of 'necessarily follows' is what is precisely defined by the concept of validity my criterion essentially ties the concept of deductive argument with validity. It follows from my criterion that all valid arguments are deductive, but not all deductive arguments are valid. An invalid deductive argument is one which intends to be valid but actually fails to achieve what is intended. (Pursuant to my criterion an inductive reasoner may claim that inductive argument in the first place never has any intention of being valid, it is thus not deductive and accordingly the requirement of validity is given up.)

The deductive concept of validity is intimately tied to the concept of logical implication. However, I believe I have already made an adequate exposition of the concept of logical implication as differentiated from material implication in Section VI of this paper I see no point discussing it again here. Suffice to say that some of Prof. Acuña's critical comments (and there are many) like '... (to) an argument where the premise is false, the requirement of invalidity cannot possibly obtain'[19] and '... if the aim of an argument were validity, and nothing else, then the best course would be to start with a false premise'[20] are simply reflective of the confusion I have pointed out in Sec. VI of this paper of material implication with logical implication. For surely, if material implication solely already defines validity then any argument with a false premise is valid. And further it is by expressedly and purposively asserting a false premise, a move which of course amounts to lying, that one expediently ensures one's argument is valid. But these are paradoxical results which have bearing only to the strawman.

Prof. Acuña's most precise discussion about two-valued deductive logic's criterion of validity and invalidity consists in the following passage:

> What logicians are silent about is that the criterion for valid as well as invalid argument is simply the random manipulation of the truth values of the premises and conclusion. And if in all possible arbitrary assignment of truth values of the premises and conclusion one does not come up with a combination where the premise set is true and the conclusion false, then the argument is valid. If one does then the argument is invalid. But the truth being manipulated here is analytic. It is empty — it has no empirical content..[21]

Evidently even Prof. Acuña's most precise discussion of two-valued deductive logic's criterion of validity and invalidity fails, so to say, to hit the nail on the head; even as obviously too Prof. Acuña is easily and pleasurably smalling something. This something is purportedly two-valued deductive logic's criterion of validity and invalidity. Prof. Acuña talks of an alleged random manipulation of truth values of the premises and conclusion. If Prof. Acuña cared to be more precise and thus closer to a correct account he should have said.

> What logicians are silent about is that the criterion for valid as well as invalid argument is simply the presentation of all possible truth value combinations of the simple component statements of the conditional corresponding to the argument. And if in all possible truth value combinations of the simple component statements of the conditional corresponding to an argument one does not come up with a combination where the premise set is true and the conclusion false then the argument is valid. If one does then the argument is invalid. But the truth being demanded here is analytic. It is empty — it has no empirical content.

Allow me now to proceed with my criticism of Prof. Acuña's passage in the light of my own upgraded version. First, I don't think logicians are silent in any way about two-valued deductive logic's criterion of validity and invalidity. If anything they are loud about it. I surely am not silent about it. And that makes doubly puzzling Prof. Acuña's having misrepresented two-valued deductive logic's criterion of validity and invalidity. In deference to Prof. Acuña, I am close to thinking this misrepresentation is just a simulated one to make for expediency in attacking two-valued deductive logic. Where Prof. Acuña uses the expression 'random manipulation of truth values of premises and conclusion' he should have used the expression 'presentation of all possible truth value combinations of the simple component statements of the conditional corresponding to the argument'. The difference is crucial! The former expression can be taken to allude only to material implication between the premise set and the conclusion whereas the latter expression definitely alludes to what is actually required —logical implication from the premise set to the conclusion.

Second, the truth demanded of the conditional corresponding to an argument is undeniably analytic since any logical implication is analytically (logically) true. But the analytic truth of the conditional corresponding to an argument does not count out in any way the individual premises and the conclusion being on their own empirical! To best realize this consider the argument: Pia is both pretty and intelligent. Therefore, either Pia is pretty or she is virtuous.

The conditional corresponding to this argument is analytically true, a logical implication. And so the argument is valid. But a simple look at the premise 'Pia is both pretty and intelligent' and the conclusion 'Either Pia is pretty or she is virtuous' discloses that the premise as well as the conclusion are on their own empirical. They are not by any normal construal analytic.

Whereas Prof. Acuña seems to argue that since what is required of the conditional corresponding to an argument is analytic truth its individual premises and conclusion are thereby also required to be analytically true. And thus in this sense empty.

The second requirement of a sound deductive argument is that all the premises be true. No specification is made in this requirement that all premises be analytically true. They may all be empirical or some may be empirical while some are analytic. To be sure there is a distinction between empirical truth and analytic truth. Empirical truth is contingent whereas analytic truth is necessary truth. Both sorts of truth are of human concern, and sound deductive arguments may convey empirical truth or analytic truth from premises to conclusion via the analytic truth of the logical implication from premises to conclusion. *The conveyance is analytic but what is conveyed may be empirical.*

Finally let me make some comments about so-called quasi-arguments. Suppose we are presented the argument: If you want to be medieval philosophize in the scholastic tradition. You do want to be medieval. Therefore, philosophize in the scholastic tradition.

The above argument may shock the sensibilities of logicians like Hocutt or Copi. In fact their branding such arguments quasi-arguments may be taken as their knee-jerk response to simply ignore such arguments so that they may remain focused on less problematic arguments. Common deductive arguments are problematic enough they need not as of the meantime delve in even more problematic arguments. Perhaps they would rather leave the task of working with what they call quasi-arguments to thinkers and philosophers less devoted to deductive logic like Prof. Acuña.

The above argument is understandably problematic on account that some components in it are not capable of truth value. The first premise has the look of a normal conditional except that the consequent is an imperative sentence 'Philosophize in the scholastic tradition' and thus is not expressive of something either true or false. The antecedent 'You want to be medieval' is plainly an empirical statement and thus is either true or false. This antecedent later assumes the place of the second premise whereas the consequent later assumes the place of the conclusion The conclusion is thus something which is not capable of truth value.

Is the above argument a cognitively significant argument? Usual deductive arguments are for sure cognitively significant arguments---desirably in each from premises known to be true one seeks to know further truth, and all the premises and the conclusion and all simple components are truth-value capable and thus cognitively meaningful. A deductive argument as a whole is thus cognitively significant.

Sound deductive arguments are paradigmatic of cognitively significant arguments. This, I think, is incontestable. This being incontestable the preoccupation of some philosophers and logicians with deductive logic theory is understandable. The preoccupation is just an indication of interest and concern about the cognitive activity of humankind. And cognitive activity is surely one of the most important of human activities.

Good inductive arguments, particularly paradigm scientific ones, are next in line after sound deductive arguments as cognitively significant arguments. Their in a sense being merely second rate is due to the fact that the conclusions in them are merely rendered probably true and not surely true even as all premises are assured to be true. In inductive argumentation we talk merely of probable knowledge in the conclusion. The probable truths of the conclusions of good inductive arguments have the primary role of being useful guides to action The conclusions in inductive arguments being guides to action are what make inductive arguments humanly necessary, for the human condition is such that by the time something is established as certainly true it may already be too late for action. By the time something is established as certainly true the harm and destruction may be equally certain. Only a hypothetical being like God who cannot be harmed can be straight deductive. Human beings being vulnerable to harm have to go inductive. This realization comprises the existentiality of induction. The second rate status of inductive argument as cognitively significant argument compared to sound deductive argument is more than made up by its instrumental value.

We have already considered deductive argumentation and inductive argumentation in turn as to their cognitive merits. Let me now return to the question, How about quasi-arguments? It seems that moral and evaluative arguments all would fall under the category of quasi-argumentation that Prof. Acuña so vehemently objects to the deductive logicians' calling them by the pejorative term 'quasi-'. In any case, clearly, quasi-arguments are problematic even as they are perhaps common place and real. Their cognitive significance is suspect since some components at best are incapable of truth value. The usual technical categories of 'valid', 'invalid', and 'probable' do not easily apply to quasi-arguments.

Allow me now to focus on my own example of quasi-argument. It has some semblance to one of the valid argument forms in deductive logic, to wit, *modus ponens*. The first premise may be cautiously called a quasi-conditional. The second premise affirms the antecedent of the quasi-conditional and the consequent of the quasi-conditional is the conclusion. If it be said that the quasi-argument has at least a sense of being valid, that is, that there is a sense of the conclusion necessarily following from the premises, it is because the quasi-argument mimicks the usual case of modus ponens in deductive logic. (It may be called a case of quasi modus ponens.) Note that the mere semblance of the quasi-argument to the valid argument form modus ponens confers upon it a sense of being valid. This fact attests further to the validity of modus ponens in standard two-valued deductive logic.

Can the usual tautologous transformations of standard two-valued deductive logic be applied to a quasi-conditional like 'If you want to be medieval then philosophize in the scholastic tradition'? Is there sense in saying for example, 'Either you do not want to be medieval or philosophize in the scholastic tradition'? I think yes, in this particular case at least.

Can *transposition* be applied to a quasi-conditional like the above? I don't think so, since transposition involves denying the consequent of the original quasi-conditional and the consequent is an imperative. Can there be a quasi-conditional wherein the antecedent is an imperative? Such conditional,.I think, would be plain nonsense. (Consider 'If don't philosophize in the scholastic tradition then you do not want to be medieval'.)

Suppose we are now confronted with two cases of seemingly quasi-conjunctions: (1) Fail to train hard and be clobbered, and (2) Enroll in the course and study well.

In each of the above cases the conjuncts by surface grammar seem each to be an imperative and thus the conjunctions are quasi-conjunctions.

But on closer examination it is foolish to take the seemingly imperative sentence 'Fail to train hard' as imperative and it is also foolish to take the seemingly imperative sentence 'Be clobbered' as imperative. No one normally issues and no one normally accepts such imperatives. Accordingly I think what is meant by 'Fail to train hard and be clobbered' is something akin to what is meant by 'If you fail to train hard then your failing to train hard will be conjoined with your being clobbered' which is logically equivalent by *absorption* to 'If you fail to train hard then you will get clobbered'. So in understanding even a seemingly quasi-conjunction as the instant case knowledge of standard two-valued deductive logic comes in handy.

But a quasi-argument can now be easily constructed on the basis of the normal conditional 'If you fail to train hard then you will get clobbered' like: If you fail to train hard then you will get clobbered. You do not want to get clobbered. So, do not fail to train hard.

This sounds like a perfectly good argument despite its being a quasi-argument. What makes it a quasi-argument? The first premise is a normal conditional it is cognitively significant. The second premise is something either true or false so it is also cognitively significant. But the conclusion is an imperative. So it is not capable of truth value and in this sense is not cognitively significant. The conclusion alone makes the argument a quasi-argument.

But even as it is undoubtedly a quasi-argument it surely has sense of being a good or valid argument —in some loose sense the conclusion seems to necessarily follow from the premises. And this, I think, can be accounted for by its being a semblance of *modus tollens,* another of the established rules of inference in standard two-valued deductive logic. What passes for a semblance of denial of the consequent 'You will get clobbered' is the second premise 'You do not want to get clobbered' and what passes for a semblance of denial of the antecedent 'You fail to train hard' of the normal conditional first premise is the conclusion 'Do not fail to train hard' even as this is undeniably an imperative. The point is that in understanding and evaluating even quasi-arguments knowledge of standard two-valued deductive logic may be very helpful.

The second seemingly quasi-conjunction 'Enroll in the course and study well' is, I think, really a quasi-conjunction. Why? Because its component conjuncts, unlike in the first seemingly quasi-conjunction, can be really construed normally as imperatives. Being imperatives they are incapable of truth value, so the conjunction wherein they occur as the component conjuncts is also incapable of truth value

Now suppose we are confronted with the argument: Enroll in the course and study well. Therefore, enroll in the course.

The argument is indisputably a quasi-argument even as it does seem to have semblance of being valid. And this fact is not difficult to account for. For the quasi-argument mimicks a valid argument form in standard two-valued deductive logic —*simplification*.

So in closing this paper, my advice to anyone aiming to venture into analyses of quasi-arguments is this: Don't set aside standard two-valued deductive logic.

NOTES

[1]See Rudolf Carnap, *"Probability and Inductive Logic"* in D. Shapere, *Philosophical problems of Natural Science* (The MacMillan Company, New York, 1965), pp.62-74.

[2]For an account of the conflict between Quine and the modal logicians see Milton K. Munitz, *Contemporary Analytic Philosophy* (The MacMillan Publishing Co., New York, 1981) pp.380-399, Chap. VIII *Ontological Commitments.*

[3]Idea of a continuous value (probability) logic is already introduced by Carnap in his *Probability and Inductive Logic*. The issue I would like to point out in relation to this is whether probability values are truth values or just epistemic guides as to what to expect —something is true or something is false.

[4]See specifically the preface of Jaakko Hintikka and Vandamme, F. *Logic of Discovery and Logic of Discourse* (Plenum Press, New York, 1985).

[5]See D.C. Stove, *The Rationality of Induction* (Clarendon Press, Oxford, 1986), specifically pp.117-127. I have defended formal logic against Stove's attack in a previous paper entitled *In Defense of Formal Logic.* The paper is unfortunately still unpublished.

[6]See Don S. Levi, *"In Defense of Informal Logic,"* in *Philosophy and Rhetoric,* Vol. 20 No. 4 1987

[7]Note that Wittgenstein asks philosophers not to think nor construct theories. They are simply to look and see. So afterall, informal logic's

lack of theory is very Wittgensteinian. But apparently Wittgenstein looked and saw that two-valued deductive logic had claims of being sublime. And he was not content simply looking and seeing this so he did all of what he did to change the situation. Wittgenstein was a philosopher. Was Wittgenstein consistent?

[8]I don't specifically wish to be a mystic, but I do understand that some mystics consider moments of feeling being one with nature sublime, a state of ecstacy.

[9]Micheal Dummett as quoted in Irving M. Copi, *Introduction to Logic*, (9th Ed.) (MacMillan Publishing Co., New York, 1994), p. 412.

[10]Considering that the hypothesis is to be understood in the Philippine context, it can be reworded as 'Belief that the Philippines is militarily unable to defend itself and that China is likely to undertake military adventurism in the near future causes lapdog behavior in Filipinos'. This is now clearly a hypothesis in Philippine social science. I plan to continue writing about this hypothesis in a future paper.

[11]Paul K. Feyerabend, *"How To Defend Society Against Science,"* in Ian Hacking (Ed.), *Scientific Revolution*(Oxford University Press, New York, 1985), pp.156-167.

[12]See Hans Reichenbach, *"The Verifiability Theory of Meaning,"* in Herbert Feigl (Ed.), *Reading in the Philosophy of Science* (Appleton-Century-Crofts, New York, 1953), specifically pp.100-101.

[13]See Hillary Putnam, *Realism and Reason Philosophical Papers* ,Vol. 3, (Cambridge University Press, Cambridge, 1983), specifically pp.46-53.

[14]Copi discusses the different sorts of implication in his *Introduction to Logic* (9th Ed.) (MacMillan Publishing Co., New York, 1994), pp.337-345

[15]I further believe that the heretofore paradoxical image of material implication is due to a confusion of material implication with logical implication. Which confusion is also behind Prof. Acuña's false image of formal logic's notion of validity.

[16]Not all fallacies are logical fallacies insofar as not all fallacies are a matter of invalidity. These other fallacies may better be called *purely rhetorical* fallacies. Some fallacies are more a question of just what argument is being made such as some instances of fallacy of ambiguity. Where an ambiguous formulation figures in an argument it may be that more than one argument is involved. The contrasting arguments may each be valid. So there is no logical fallacy even as there may be a purely rhetorical one. Some fallacies are a matter of soundness of an argument even as the argument itself may be valid —note strawman fallacy. A strawman

argument may be able to validly establish its conclusion. But what makes it strawman is that the conclusion is false owing to a false premise, the strawman premise. A strawman premise is a premise rendered false by the arguer's false image of the position he is attacking. The strawman conclusion is of course a statement amounting to assertion of victory over the position being attacked by the arguer.

[17]I doubt though whether Copi can be justly accused of confounding argument with deductive argument, for Part III of his book *Introduction to Logic* is entitled *Induction*. This part comprises about a third of the said book. The proper charge against Copi is more his apparent failure to recognize arguments which are both nondeductive and noninductive, e.g. moral or evaluative arguments.

[18]I distinguished Popperian deductivism against conclusive verificationist deductivism in my paper entitled *Conclusive Verificationist Deductivism Unrecognized* published in the May 1994 issue of the *Philosophy Research Bulletin* (PRB which used to be the U.P. Philosophy Department's regular publication is now defunct.)

[19]This is quoted from p.132 of Prof. Acuña's article *Philosophical Analysis of Two-valued Deductive Logic* which appears in this issue.

[20]Also from p.15 of said draft copy of Prof. Acuña's paper.

[21]From p.14 of the draft copy of Prof. Acuña's paper.