



Vasil'ev and Imaginary Logic

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This paper is about the 'Imaginary Logic' developed by the Russian logician Nicholas Vasil'ev between about 1910 and 1913, a logic that is often claimed to be a forerunner of different sorts of modern non-classical logics. The paper describes the content of that logic (not by trying to interpret it in modern logic, as some commentators have done, but by describing it in its own terms). It then looks at the philosophical underpinnings of the logic. Finally, in the light of the preceding, it discusses Vasil'ev's place in the history of logic.

1. Introduction: Nicholas Vasil'ev

Nicholas Vasil'ev (1880–1940) was a man of many parts: poet, logician, historian, medical doctor, to name but some. Of all these, it is perhaps as logician that he is now best known. Between 1910 and 1913 he published a handful of papers on logic which, for their time, were radical and ground-breaking. In particular, in his construction of what he called 'imaginary logic' he took on the orthodoxy of traditional logic.¹

Vasil'ev's work, though recognized at the time in Russia, had little effect on the development of the subject. (Why this is, I will return to towards the end of the paper.) It therefore lapsed into obscurity. Fortunately, it was rescued from this status by the work of a number of modern logicians, and particularly Vladimir Smirnov.² The Vasil'ev renaissance has concentrated largely on trying to interpret him in terms of modern logic. Interesting and important as this project is, the dangers of anachronism in it are obvious. I want in this paper to present and analyse Vasil'ev in his own terms.

This is a daunting prospect for someone who (like me) can speak no Russian. I am dependent on what has been translated into English; and so far, only one major paper has been translated, 'Logic and Metalogic' (1912–13).³ I can comment only, then, on the views expressed in this. Conclusions may have to be tempered in the light of views he expressed elsewhere.

Vasil'ev's project was to construct a logic in which, in some sense, the law of non-contradiction failed, though not at this world, but at some imaginary world. The exercise was no mere technical one, though. It came with an analysis of the possibility of this project. We will turn to this in the second part of this essay. In the first, I want to describe imaginary logic.

1 A short biography of Vasil'ev can be found in Smirnov (1989) and Poli (1993). The former also contains a bibliography of his work.

2 See Smirnov (1986) and (1989).

3 In what follows, all references to Vasil'ev are from the English translation of this. The only other thing published in English that I am aware of (1993) is a translation of an abstract of a talk that Vasil'ev gave at the Fifth International Congress of Philosophy at Naples in 1925. This adds nothing to the views of 'Logic and Metalogic'.

2. Vasil'ev's Logic

Traditional logic—a review

Though he rejected some aspects of it, Vasil'ev's work was very much in the problematic of traditional logic. So let me start with a brief summary of this.⁴ The propositions of this logic have one of two qualities (positive and negative) and one of two quantities (universal and particular). There are, hence, four basic sorts of propositions:

Universal positive	All S is P	$\forall S + P$
Universal negative	All S is not P	$\forall S - P$
Particular positive	Some S is P	$\exists S + P$
Particular negative	Some S is not P	$\exists S - P$

The notation of the last column is unorthodox, but its content is clear enough, and it will be convenient to use it.

Four sets of logical principles governed statements of this form. The first contains the principles of the syllogism. Syllogisms are inferences with two premises and a conclusion. For example:

$$\frac{\forall M + P \quad \forall S + M}{\forall S + P}$$

Valid syllogisms were broken up into four *figures*, according to the placing of the S , M and P in the premises. Specifically, we have:

1st Figure	2nd Figure	3rd Figure	4th Figure
$M P$	$P M$	$M P$	$P M$
$S M$	$S M$	$M S$	$M S$

In each figure there were a number of different *moods*, individuated by the kinds of the premises and conclusion. The syllogism above was a mood in the first figure traditionally called *Barbara*.

The second set of principles was encoded in the square of opposition:

$$\begin{array}{ccc} \forall S + P & \leftrightarrow & \forall S - P \\ \downarrow & & \downarrow \\ \exists S + P & \leftrightarrow & \exists S - P \end{array}$$

The pairs on the opposite ends of the diagonals are contradictories (exactly one is true); the pair on the top line are contraries (they cannot both be true); the pair on the bottom line are subcontraries (they cannot both be false); and the vertical relation is subalternation (entailment, top to bottom).

The third set of logical relations are termed conversion and obversion. The obverse of a proposition is a logically equivalent proposition with the same subject, but with the predicate non- P . Vasil'ev makes no use of compound predicates, so I will ignore

4 Full details can be found in, e.g., Kneale and Kneale (1975).

this.⁵ The converse of a proposition is a proposition entailed by it, that reverses the order of the subject and predicate. The converse of each kind of proposition is depicted in the following table:

<i>Proposition</i>	<i>Converse</i>
$\forall S + P$	$\exists P + S$
$\forall S - P$	$\forall P - S$
$\exists S + P$	$\exists P + S$
$\exists S - P$	None

The fourth, and final, set of logical relations are the mixed bag of propositions traditionally called the laws of thought, which are as follows.

Law of Non-Contradiction: Nothing can be both P and not P .

Law of Excluded Middle: Everything must be either P or not P .

Law of Identity: Every P is P .

Principle of Sufficient Reason: Nothing happens without a reason.

The law of non-contradiction is often put in a quite different, and non-equivalent, way, which Vasil'ev calls the law of absolute difference between the truth and falsehood (p. 338), and I will call simply:

The Law of Absolute Difference No proposition can be simultaneously true and false.

How this differs from the first formulation of the law of non-contradiction, we will see in due course.

Imaginary logic

With this background, we can now turn to Vasil'ev's imaginary logic. The two quantities of propositions are retained, but an extra propositional form is added, which may be read: S is both P and not P . I will write this as $S \pm P$. Vasil'ev terms the quality of this proposition 'indifferent', not a great name, but I will continue to use it. We hence have six basic forms of proposition.

It should be observed (p. 336f.) that $S + P$ and $S - P$ are now to be interpreted as 'what is S (and not also S) is P (and not also not P)' and 'what is S (and not also not S) is not P (and not also P)'. In particular, $S \pm P$ does not entail $S + P$ or $S - P$.

The square of the opposition is replaced by the rectangle:⁶

$$\begin{array}{ccc}
 \forall S + P \leftrightarrow \forall S - P \leftrightarrow \forall S \pm P & & \\
 \downarrow & \downarrow & \downarrow \\
 \exists S + P \leftrightarrow \exists S - P \leftrightarrow \exists S \pm P & &
 \end{array}$$

The vertical arrows represent subalternation. All propositions on the top line are

5 It is true that Vasil'ev sometimes writes things like 'non- P ' but the context normally seems to imply that this is just a variant of 'not P '. Thus, we have, e.g., 'Let us imagine hypothetically a world in which some things have one contradictory predicate (A), others have a predicate that contradicts the first one (non- A), other have both A and non- A simultaneously. Let some things be white, others not white, still others simultaneously white and not-white', p. 336. Vasil'ev seems, in fact, to show no awareness of traditional work on predicate negation. In the one place that he makes a clear reference to the subject (p. 348), it is in connection with the new 'mathematical logic'.

6 It would make more sense to represent the top and bottom lines as triangles, the three formulas being located symmetrically at the vertices. But I draw it this way for typesetting reasons.

contraries (no two can both be true), as is any formula on the top line and any formula on the bottom, except the one immediately below it. There are no other relations holding between the propositions. (For example the propositions on the bottom line are not subcontraries: any pair could both be false.)

Of the laws of thought, identity and sufficient reason still hold.⁷ The law of non-contradiction fails, and is replaced by its negation: some things can be both P and not P . The law of excluded middle also fails. This is replaced by the 'law of excluded fourth': everything is P , or not P , or P and not P . The law of absolute difference also still holds.

Conversion of positive propositions works as before. But conversion now fails for the universal negative. If every S is not P , it no longer follows that every P is not S , as can be seen by considering the following table:

	+P	-P	±P
+S	×		×
-S			
±S	*		

If every S is not P , the two slots marked with a cross are empty. But it does not follow that every P is not S . The slot marked with an asterisk could be occupied. Similarly, no indifferent proposition converts. For example, if every S is P and not P , nothing follows about those things that are P , as can be seen by considering the same table.⁸

This leaves the question of the valid syllogisms. Vasil'ev notes that in the first figure the four standard moods are still valid:

Affirmative Moods:

$$\frac{\forall M + P}{\forall [\exists] S + M} \quad \frac{\forall [\exists] S + M}{\forall [\exists] S + P}$$

Negative Moods:⁹

$$\frac{\forall M - P}{\forall [\exists] S + M} \quad \frac{\forall [\exists] S + M}{\forall [\exists] S - P}$$

He also notes two further valid moods:

Indifference Moods:

$$\frac{\forall M \pm P}{\forall [\exists] S + M} \quad \frac{\forall [\exists] S + M}{\forall [\exists] S \pm P}$$

A simple way to check the validity of these inferences is with a suitable form of Venn

⁷ See p. 338 for all the following.

⁸ Note also, that there is no way in this logic of expressing the claim that *no* S are P . In particular, 'all S are not P ' means something different, as consideration of the table soon shows. To express this would require predicate negation, 'all S is non- P '.

⁹ In the first premise, the text says 'Not all M are P ' (p. 340). To make sense, it seems to me, this should be 'All M are not P '. A similar comment applies to the conclusion.

diagram (which is not to be found in Vasil'ev). This takes the form of a $3 \times 3 \times 3$ cube, each plane of which represents one of the statuses of M . I depict the three planes separately, the top left entry of each plane shows the status of M :

+M	+P	-P	±P
+S	×1	×1	
-S	×1	×1	
±S	×1	×1	

-M	+P	-P	±P
+S	×2	×2	×2
-S			
±S			

±M	+P	-P	±P
+S	×2	×2	×2
-S			
±S			

For the \forall mood: If $\forall M \pm P$ then slots marked $\times 1$ are empty. If $\forall S + M$ then the slots marked $\times 2$ are empty. There is now no way that we can find a slot that is S and not $\pm P$. Similarly for the \exists mood.

Vasil'ev claims that there are no other valid moods in the first figure. I have not checked out all the other possibilities, but I take his word for it! He also claims that there are no valid moods in the second figure, nine in the third, and some more in the fourth (p. 340). The random checks that I have undertaken amongst the 216 possibilities in each figure are consistent with this! One thing that follows from all this (as Vasil'ev notes, p. 339) is that the possibility of valid syllogisms does not depend on the law of non-contradiction.¹⁰

So much for Vasil'ev's imaginary logic itself, we can now move on to its philosophical underpinnings.

3. Vasil'ev's Philosophy

Negation

Vasil'ev was moved to construct his imaginary logic, he tells us (p. 336), by analogy with non-Euclidean geometry. Euclidean geometry is the geometry of our world. (Remember that he is writing in 1912.) But there could be other, imaginary, worlds whose geometry is non-Euclidean. Similarly, Aristotelian logic is the logic of our world, but there could be imaginary worlds whose logic is imaginary logic. What might these be like? Let us approach this question via a consideration of the law of non-contradiction, which, according to Vasil'ev, holds in the real world, but may fail in imaginary worlds.

Vasil'ev argues that the law must hold in this world for the following reason. Given some property, say, *being red*, there are other properties that are incompatible with this, being green, being invisible, etc. Being not red is just the disjunction of all of these.

¹⁰ Aristotle, in fact, points this out himself (*Posterior Analytics*, 77^a10–21). He says, in effect, that if every S is M and not M , and every M is P , it still follows that every S is P . If S is M and not M it is still M . Note that this is not the case for Vasil'ev, for whom the syllogism $\forall M + P, \forall S \pm M; \forall S + P$ is invalid.

Hence to be red and not red, e.g., something would have to have incompatible properties, which is impossible.¹¹ Thus (p. 341):

If *A* is white, then a combination of everything that is incompatible with white (black, yellow, orange, *spiritual*, etc.) will be non-white. Dry is compatible with white, so we do not call dry a negation of white. The law of contradiction requires that affirmation should not coincide with negation. This requirement is met but in such a way that we call and consider to be negation only what is incompatible with affirmation. Thus, the only definition of negation implicitly contains the law of contradiction.

But, Vasil'ev argues, what is incompatible with what, is an empirical matter (p. 342):

The fact of existence of incompatible predicates, of uncombinable properties, like any fact, is an empirical element of our cognition. It is based on thousands of such minute facts as: white cannot be red, silence cannot be noisy, etc. These facts are *a posteriori* knowledge. Just as Hume's Adam on the first day of creation before any experience could not *a priori* perceive the causal relationship of phenomena, so he could not perceive before experience that red is incompatible with white, but is compatible with dry.

It follows, then, that the law of contradiction may fail if the world is different. In such a world, something may be both red and yellow, i.e., not red.

But both Vasil'ev's defence of the law of non-contradiction and his argument for its variability are dubious. For a start, the analysis of negation is difficult to maintain. When Russell was giving his lectures on logical atomism, a similar account of negation was put up by one of his listeners, Demos (1917). In the published version of his lectures, Russell gives two objections to the analysis, which are difficult to gainsay.¹²

The first is to point out that it is not only atomic sentences, such as '*a* is red', that can be negated, but complex sentences such as 'something is red', '*a* is red or *a* is blue', 'John believes that *a* is red', etc. The analysis cannot apply to these. Secondly, the analysis of negation appeals to the notion of incompatibility. But what is it for one predicate to be incompatible with another? Simply for it to be the case that an object can *not* have both of them. The analysis is therefore circular.

So much for the analysis itself. But even if it were correct, the variability of the law of non-contradiction would still not follow. This is because the extension of 'not *P*' does not have to be the same across all worlds. Its extension at world *w* might be taken, not as the disjunction of all properties that are incompatible with *P* at *this* world, but as the disjunction of all those incompatible with *P* at *w* itself. And if this is the case, '*a* is *P* and is not *P*' holds at no world.

Perception

Whether for this reason, or for some other, when Vasil'ev comes to give an account of a world in which imaginary logic holds, he does not simply say that there are worlds in which, e.g., something might be red and yellow. Rather, he employs another strategy. First, according to Vasil'ev, we never have perceptions of negative states of affairs. Whenever we are justified in claiming that something *is not* the case, it is

11 To make the law of excluded middle hold, on this account of negation, the set of properties in question would have to be exhaustive of all the possibilities as well. Vasil'ev does not discuss this issue.

12 Pears (1972), pp. 67ff.

because we see that something else *is* the case, and *infer* that something incompatible is not the case. Thus (p. 344):

If I say 'There is no this thing [sic] in the room', I mean first of all that I do not see it, that it is absent from my visual perception of the room. However, for this reason, I cannot state objectively the absence of the thing from the room. The thing can be in the room while I cannot see it. Only when I have ascertained that everywhere in the room there are other things which exclude the possibility that the thing I am looking for is in the room, only then can I conclude 'The thing is objectively absent from the room'.

Now, though he does not elaborate on this claim at great length in the paper, it is possible, according to Vasil'ev, that in an imaginary world, a person should be able to *see* negative states of affairs. And in such a case, they could see that something is, e.g., both red and not red (p. 342, fn. 11):

[here] it will suffice to say that imaginary logic without the law of contradiction is based on the introduction of direct negation, 'perception of absence'. The imaginary logic would be real in a world with negative sensation, in the world with contradictory kinds of beings.

The point does not answer the question of what an imaginary world is like, so much as what the experience of cognitive agents (if there are any in that world) might be like.¹³ Still, the idea at least gives us a start in seeing what a world in which contradictions may be true is like.

I think, though, that Vasil'ev's account of perception is faulty: we can, in fact, perceive negative states of affairs. For example, given a physical object, we see that it is transparent or that it is opaque; but to be transparent is to be not opaque and vice versa. I do not know which one of these is really the negative state;¹⁴ but whichever it is, one can see it. Moreover, I think that one can even see contradictory states in this world. There are, for example, certain visual illusions, such as the waterfall illusion, where one can see something moving and stationary at the same time.¹⁵ Of course, this is an illusion: the perception is not veridical. But none the less the contents of our visual perceptions in such cases are contradictory. We can, therefore, see contradictory states.

This raises the question of how we know such states to be illusory, but I shall not go into this here.¹⁶ The above suffices to undercut Vasil'ev's distinction between this world and an imaginary world. This fact cuts both ways, though. Since there may be no difference between the real world and an imaginary world of the kind Vasil'ev envisages, one might simply infer that there is no world appropriate for imaginary logic; but one might, on the other hand, infer that *this* world is a world appropriate for imaginary logic! After all, for a logic to be appropriate, it is not necessary that instances of every kind of proposition expressible in the logic (and, *a fortiori*, indefinite statements) actually be *true*.

13 As we will see in a moment, Vasil'ev subscribes to psychologism of a Kantish kind. Hence, it is not clear that the question makes any sense for him as to what a world that has no cognitive agents would be like. For the same reason, it is a little misleading to talk about the logic of a world at all. A world might have two different types of cognitive agent: one that can perceive negative states directly, and one that cannot.

14 Or even if this question makes much sense at all. But if it doesn't the objection to Vasil'ev are obvious.

15 Accounts of the waterfall illusion can be found in most books on the psychology of perception, e.g., Robinson (1972).

16 This and all the above matters concerning perception are discussed at length in Priest (2000).

Metalogic

So much for some of the things that could change from logic to logic, from world to world. Could everything about logic change from world to world, though? Vasil'ev explicitly tell us: no. There are certain things that must be features of any logic (p. 331):

Changing logical thinking cannot cease to be logical, it can change only within the limits assumed by the definition of the logical. For thinking to be logical, it must meet certain requirements which follow from the essence of the logical, and these requirements will be unchangeable for any logical thinking. What does not meet these requirements cannot be considered logical.

The invariant part of logic, Vasil'ev dubs 'metalogic'.¹⁷ So what parts of logic belong to metalogic, and why?

The first question is easier to answer. Vasil'ev tells us explicitly (p. 347):

This divine logic, the logic of perfect cognition, logic without negative propositions, is metalogic. It is the simplest, most abstract of all possible logical systems and lies at their base.¹⁸

Metalogic, thus, is just positive logic, that is, anything that does not involve negation. As such, metalogic will contain the syllogisms that employ only positive propositions, the subalternation relation between the two positive forms in the square of opposition, conversion of these two forms, the laws of identity and sufficient reason, and the law of absolute difference.¹⁹ All these are common to traditional logic and imaginary logic.

It should be noted that nearly all of these things may fail in some modern logics, though. Some positive syllogisms are not valid in standard modern logic. Take *Darapti*, for example, a valid mood of the third figure: $\forall M + P, \forall M + S; \exists S + P$. In first order logic $\forall x(Mx \rightarrow Px)$, $\forall x(Mx \rightarrow Sx) \not\vdash \exists x(Px \wedge Sx)$. Similarly, in modern logic subalternation fails: $\forall x(Sx \rightarrow Px)$, $\not\vdash \exists x(Sx \wedge Px)$. The law of identity is harder, but there are certain relevance logics in which it fails.²⁰ The principle of sufficient reason is not a part of modern logic at all, and in any case has been cast into doubt by quantum mechanics. And the law of absolute difference fails in the semantics of, say, first degree entailment where sentences may have more than one truth value.²¹

Why, then, does Vasil'ev think that these principles must hold in any logic worth that name? The answers he gives are rather sketchy. He often suggests (p. 331f.) that the invariant part of logic is what is true by definition (or follows analytically from such). But it is hard to see any of the above parts of metalogic as true by definition, simply because there are logical systems in which they fail. And Vasil'ev attempts no proof of this fact, not even telling us what the basic definitions are.²²

17 This has nothing to do with the word as it is used in modern logic. Vasil'ev uses the word, he tells us (p. 345), by analogy with 'metaphysics', to indicate that it is a logic beyond empirical considerations.

18 It is the logic of perfect cognition because, Vasil'ev thinks, there would be no need for negative propositions if we never made mistakes: all facts are positive.

19 It is not clear that Vasil'ev is entirely consistent in the last, since it requires negation to express the law of absolute difference. Another passage also gives rise to some worries about consistency. Vasil'ev thinks that his readers might be sceptical that there could be such a thing as purely positive logic. To undercut this scepticism he argues (p. 347f.) that all negative propositions are reducible to affirmative ones—which tends to undercut the distinction between metalogic and the rest.

20 See Meyer and Martin (2000a).

21 See, e.g., Priest (2000a), section 4.6.

22 There is an irony here, in that Vasil'ev berates Husserl, who takes all logic to be absolute, for not showing that it is so deducible (p. 331): 'In logic there are undoubtedly eternal and unchanging truths, but they are only those which analytically follow from their definition, whereas Husserl insists on the

A second reason given is that the metalogical principles must hold because they are the genuine laws of thought (p. 345):

Only metalogic is the formal science of logic, since any metalogic abstracts from any content of thought, from everything factual, empirical. Hence, metalogic is logic valid for every world, no matter how peculiarly its objects have been constructed, for it contains only laws of pure thought, of judgment and inference in general, it reflects only the nature of the cognizing subject.²³

Vasil'ev's psychologism is evident here. As such, the argument now needs little comment: logical laws are not the laws of the way that people actually think. But worse, no argument is given as to *why* people must think in the way that metalogic requires. And given that all the laws of metalogic may be taken to fail, one way or another, it is clear that people may not. For example, it is now obvious that one can judge that all *S* are *P* without judging that some *S* are *P*.

A final, and more sustained, argument is given for the necessity of the law of absolute difference (p. 338):

This law forbids self-contradiction, enjoins self-consistency, conformity of statements to the cognizing subject. That is why this law could be called the law of non-self-contradiction. Without this law no logic is possible, hence, no imaginary one either. He who would cease to distinguish between truth and falsehood would cease to think logically.

Though this is an argument, it is a poor one. Logics where some things may be both true and false are just as possible—and coherent—as logics where some things may be neither.²⁴ Certainly, if one violates this law, one may end up endorsing contradictions. But so what? If one asserts isolated contradictions, such as that the liar sentence is and is not true, this does not seem to be problematic. In particular, someone who asserts a contradiction does not cease to distinguish between truth and falsehood. *Perhaps*, if they asserted *all* contradictions, they might be held to do so. But just because some propositions are both true and false, it hardly follows that all are. Vasil'ev's argument is a simple slide from 'some' to 'all'—the standard Aristotelian trick in defending the law.²⁵

4. Vasil'ev's place in the history of logic

Now that we have looked at Vasil'ev's ideas, both logical and philosophical, it is time to assess his significance in the history of logic. I think that this can hardly reside in the content of his work. The logic itself is now little more than a curiosity, and the philosophical ideas, I have argued, do not stand up to inspection. Wherein, then, lies

unchangeability of all basic logical postulates. This is absolutely unjustified. To insist on it, Husserl should analytically infer all basic logical postulates from the definition, from the essence of the logical, and from the supreme logical principle, but he does not do so ...'

23 And again (p. 335): '... fruitless, unreasonable and perilous would be thought about refuting the laws of thinking, of the mind's rational elements. Cognizing subjects can think other objects and other laws of objects, but they cannot think other cognizing subjects and other laws of thinking. This would be self-negation... Thus, for example, the eternally cognizing subject is bound by the form of judgment. Deny it, replace it with something else, he cannot.'

24 See, e.g., Priest (1987).

25 See Priest (1998). For good measure, Vasil'ev argues that syllogisms, though they do not depend on the law of non-contradiction, do depend on the law of absolute difference (p. 339). This is false. Many syllogistic inferences may be valid in a logic in which some sentences are both true and false. Again, see Priest (1987).

his significance? I think it is in the fact that Vasil'ev's work lies at a crucial juncture in the history of logic, and displays a Janus-headed status with respect to its two sides. Vasil'ev was a logician who was at once both very radical and very conservative. His conservatism is clear. For a start, his psychologism is of a kind that is now no longer thinkable after the onslaught of Frege and Husserl. Logic is not, in any sense, about the way that people think. More importantly, his logic is essentially traditional: his theory of logical form, of the syllogism, though not exactly Aristotle's, appear minor variations in comparison with those that were occurring elsewhere in the world at that time, and have continued since. Indeed, the radical changes to logic brought about by Frege, Russell, and others, ensured that Vasil'ev's work would soon appear archaic. This is one reason, I think, why his work did not have any influence at the time: it was too late.

Characterizing Vasil'ev's radicality is much harder. As a logician, it has been claimed, Vasil'ev was a forerunner of many-valued logic.²⁶ This is hardly the case. Imaginary logic is not a many-valued logic in anything close to the modern sense. It is not a modern logic at all. Sometimes, he is claimed to be a forerunner of paraconsistent logic. This is closer to the truth, but still incorrect. Paraconsistent logics challenge the claim that everything follows from a contradiction. Vasil'ev did not even have the logical machinery to formulate this claim.²⁷ Perhaps closer still, he is a forerunner of dialethic logic, which endorses some contradictions. But even this is not right, since, after all, he endorsed the law of non-contradiction. I think that the best way to think of Vasil'ev's logical work is as trailblazing the logic of possible worlds. Not the rather staid possible worlds of orthodox modal logic. But rather, the more radical impossible worlds that are now coming into vogue.²⁸ These are worlds where contradictions may hold, and even where logic itself may be different.

As a philosopher, it may be claimed, Vasil'ev's originality lay in realizing that logic was revisable. But at the time he was writing, logic was being revised in a much more radical and profound way by Frege, Russell and company. (Later generations may not always have seen this as a revision, merely as an extension, but only because they have forgotten what traditional logic was.²⁹) More plausibly, he can be seen as beating Quine to claim that logic is partly empirical—though this is not entirely accurate, since Quine's claim was the really more radical one that there is no cogent distinction to be drawn between the empirical and the non-empirical. Perhaps the best way to see Vasil'ev's philosophical originality is as anticipating modern logical pluralists,³⁰ who argue that different kinds of objects require different logics, depending, perhaps, on empirical features of the objects in question.

Still, however one locates Vasil'ev's originality—be it in anticipating paraconsistent logic, impossible worlds, revisability or pluralism—the developments that would have to happen to make it possible to appreciate this were some time into the future. In this sense, his work was too early.

26 See Poli (1993) for references to all the following claims.

27 In the only sense that one can pose the question, Aristotelian syllogistic is already paraconsistent. Consider, e.g., the invalid: all *As* are *Bs*; no *Bs* are *As*; hence some *As* are *As*. Aristotle himself pointed this out (*Prior Analytics*, 63^b40–64^a19): 'In the middle [i.e., second; the fourth figure came later] figure a deduction can be made both of opposites and of contraries. Let *A* stand for good, *B* and *C* stand for science. If one then assumes that every science is good, and that no science is good, *A* belongs to every *B* and to no *C*, so that *B* belongs to no *C*; no science, then, is a science... Consequently, it is possible that opposites may lead to a conclusion, though not always or in every mood...' Barnes (1982).

28 See, e.g. Priest (1997).

29 For more on this, see Priest (2000b).

30 Like da Costa (1997).

Vasil'ev was well aware of the fact that he was writing in times of logical change. He lists a number of those whose work he took to be making fundamental changes to logic, including De Morgan, Peano, Husserl, Meinong and Russell. The list also includes many more, whose names are hardly encountered at all nowadays, including Sigwart, whom he takes to be the greatest revolutionary. He continues (p. 351):

All these various new and original ideas have produced considerable turmoil in logic, with new ideas coming into conflict with the old ones. This accounts for the apparently chaotic and unstable state of modern logic so different from the ideal stability and completeness which reigned in it for two thousand years and which was so rightly pointed out by Kant.

Then, in what is, for me, the most striking paragraph of the whole essay, he says:

In logic we are present at the fall of the Great Chinese Wall: of 'ancient and medieval logic'. We are present at the continued creation of the 'logic of modern times' through the creative efforts of several generations. It is difficult to foretell the future. However, to all appearances, the new logic will be a new formal logic, broader than the ancient one; it will embrace induction and deduction, will be as universal as our time is universal in comparison with the closedness of Antiquity and the Middle Ages. We must introduce into logic the idea of infinity, the great idea of modern times with its infinitely large astronomical universe and its infinitely small mathematical analysis. Logic has always lacked infinity, small and closed as it was with its nineteen moods of the syllogism and four rules of deduction. One should widen its horizons, ascertain the infinity of possible logical systems. He who ascertains this will feel as Giordano Bruno did when for the first time in his imagination there appeared the infinity of the physical universe, when the crystal spheres broke into pieces.

Vasil'ev's words are prophetic in a way that he could not have imagined. He saw the future; but, like many transition figures, was too immured in the past to see any of its details. Perhaps, then, this was his real greatness. He was a remarkable visionary, a vision made even more remarkable by the fact that, unlike some of his more famous contemporaries, he had little notion of what was on the other side of the Great Wall.

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