Socrates: So now please do whichever of these you like: either ask questions or answer them. (*Gorgias*, 426b)

How did philosophy, from these interactive beginnings, develop into what Popper once described as a cult of great philosophers preaching Sermons on the Mount?

Johan van Benthem

- Castelnérac, B. & M. Marion, 2009, « Arguing for Inconsistency: Dialectical Games in the Academy », dans G. Primiero & S. Rahman (eds.), *Acts of Knowledge: History, Philosophy and Logic*, Londres , College Publication, 37-76.

- Marion, M. & H. Rückert, « Aristotle on Universal Quantification: A Study from the Perspective of Game Semantics ».

- Les autres : Rahman, S. & L. Keiff, « La dialectique, entre logique et rhétorique », *Revue de Métaphysique et Morale*, n. 66, 2010, & le « Built-in Opponent » de C. Dutilh-Novaes (Groningen).

- Étudier les joutes dialectiques, illustrées dans les dialogues de Platon et dont les *Topiques* (+*Réfutations sophistiques*) d'Aristote sont littéralement un manuel : elles constituent l'étape ultime avant la codification des règles d'inférence (syllogistique d'Aristote et « indémontrables » comme le *Modus Ponens* ou le syllogisme disjonctif des stoïciens).
- Malgré près de 2500 ans et l'intérêt jamais démenti en philosophie pour ses origines, ces joutes dialectiques sont très mal comprises, on présuppose à peu près tout le temps une compréhension qui est en bout de ligne défaillante, et on ne les étudie pas.
- L'attitude négative des logiciens du 20^{e} siècle (redoublés en historiens de la logique), comme Łukasiewicz, est aussi à mettre en cause.

Travail avec Alain Lecomte :

•Insuffisance de ces approches : elles permettent de donner des règles structurales pour les joutes dialectiques, mais en retrouvant un peu rapidement les règles pour les connecteurs, elles s'arrêtent en chemin, et ne peuvent pas rendre compte du niveau « prélogique » d'où elles émergent. D'où l'idée d'utiliser la ludique.

(Chez Lorenzen et dans l'école d'Erlangen la « protologik » est caractérisée en termes de du contexte « empratique » (Karl Bühler) ; par ex., la négation correspond à hocher la tête, etc. C'est clairement insuffisant.)

•Ce que la ludique permet de faire de façon « anachronique », nous pourrions le retrouver à cette époque où on a commencé à rendre explicite ces règles, pour mieux comprendre ce qui s'est passé.

- Ce qui suit : présentation à Groningen (*Dialectics and Aristotle's Logic*) modifiée, donc plus philosophique, mais dont le but est d'introduire le travail avec Alain, en donnant des éléments du contexte historique et philosophique.

Inquiring into dialectic, one faces two problems:

- First, the prejudice against it, expressed by Ross:

"We have neither the space nor the wish to follow Aristotle in his laborious exploration of the *topoi*, the pigeon-holes from which dialectical reasoning is to draw its arguments. The discussion belongs to *a by-gone mode of though*t; it is one of the last efforts of that movement of the Greek spirit towards a general culture, that attempts to discuss all manner of subjects without studying their appropriate first principles, which we know as the sophistic movement. What distinguishes Aristotle from the sophists, at any rate as they are depicted both by him and by Plato, is that his motive is to aid his hearers and readers not to win either gain or glory by a false appearance of wisdom, but to discuss questions as sensibly as they can be discussed without special knowledge. But *he has himself shown a better way, the way of science; it is his own* Analytics *that have made his* Topics *out of date*." (Ross 1949, 59).

- (Problems with the unity of the *Organon*.)

- Secondly, the fact that 20th century readers have tended to provide mathematical models, with varying degree of fit with the text, simply discarding what does not fit. (Łukasiewicz)
- Our approach is 'Collingwoodian'. We see Aristotle's text as an act, more precisely as analogous to a move in a game of, say, chess. To understand its point, over and above its conformity to the rules, one must reconstruct its context.
- Likewise, in order to understand Aristotle on dialectic, and to begin understanding the relation of dialectic to syllogistic, one must begin by an understanding of the context.
- It is, for example, very clear, reading *Topics*, that Aristotle presupposes from his reader knowledge of *dialectical games*. This is precisely the context we must try and reconstruct.

1. Dialectical Games

2. Dialectic in Aristotle

3. Dialectic in Prior Analytics

1. Dialectical Games

Two initial problems:

- Scope: who played dialectical games? (Where should we look form them, which corpus)
  - Were they only invented by Socrates (Sidgwick)?
  - Were they abandoned by Plato after *Gorgias* (Vlastos)?, etc.
- Playing 'dialectical games' and writing about them.
  - Verbal practice (Socrates, Arcesilaus)
  - Handbooks, *Dissoi Logoi* and *Topics*
  - Plato's dialogues
  - A further problem: given that the original texts are lost, reports may hide the dialectical nature of the arguments (and there correct form. (For example, Zeno's millet seed in Aristotle and Simplicius.)

1. Dialectical Games

Our hypothesis is that dialectical games were common practice prior to Socrates:

- There are traces that dialectical games were played widely, not just in Athens, both before and after Socrates & Plato.
- Before: e.g., in Asia Minor (Hippocratic Corpus, *Dissoi Logoi* in Doric dialect). This includes the Sophists, in particular Gorgias (whose arguments in the treatise *On Non-Being* are of a dialectical nature) and Protagoras. (Socrates as a Sophist.)
- Zeno as inventor of Dialectics.

  (For Aristotle's description of Zeno as "the inventor of dialectics", see Sextus Empiricus, *Against Logicians*, I, 7; Diogenes Laertius, *Lives of Eminent Philosophers*, IX, 25.)

1. Dialectical Games

- At one point, Greeks decided to regiment public discussions. They began involving two participants, with an audience.
- Double discourse or questions & yes-no answers.
- This last pattern is clearly discernable in Plato's early, 'Socratic' dialogues. They involve the proponent P of a given thesis, say, A, who answers questions from an opponent O, usually (but not always) Socrates, and the dialogue begins with Socrates eliciting from P the initial assertion A, often as an answer to question of the form 'What is X?'. As O, Socrates then tries to show that A is inconsistent with other assertions that P also happens to believe. But dialectical games are not limited to Socratic dialogues and to definitions.

1. Dialectical Games

A few words on *Parmenides*, as an example:

- The dialogue is usually divided into two parts. ‘Part I’ opens with a brief introduction (126a-128e), and the dialogue begins in earnest with a speech at 128e-130a by a young Socrates, in his twenties, in which he outlines a theory of forms which is often compared with that of *Republic*. This is done as a sort of challenge to Zeno, who had apparently just finished reading from his book, while among those in attendance one finds Parmenides, now in his sixties, who had apparently accompanied Zeno in this visit to Athens.
- Parmenides then provides a series of arguments at 130a-134e, including a version of the ‘third man’, that leaves Socrates perplexed and unable to answer them.

1. Dialectical Games

- In a brief transitional section at 134e-137c, Parmenides points out that the 'power of dialectic' cannot be saved unless the theory of forms is saved. We are thus led to expect in Part II some form of repair for the latter. Parmenides then suggests to Socrates that the reason for his failure to defend his theory of forms was that his attempt at formulating it was simply premature and that if he wishes to repair it, he must first proceed as Zeno did.
- Asked to give an example of this method, Parmenides proceeds, in 'Part II' over a *series of 532 short questions with a yes/no answer* by another character called Aristotle, in an *unbroken sequence of roughly 180 arguments*, in eight (or nine) sections, usually called by modern commentators 'deductions', stretching over almost thirty Stephanus pages, 137c-166c.

1. Dialectical Games

- Two comments are in order. Before making them a quick review of the dialectical exchange is needed.

Here are some basic rules of the game:

1. Games always involve two players: a proponent *P* and an opponent *O*.
2. A play begins with *O* eliciting from *P* his commitment to an assertion or thesis *A*.
3. The play then proceeds through a series of alternate questions and answers. *O* asks questions such that *P* may give a 'short answer', ideally 'yes' or 'no' (*Topics*, Θ, 2, 158a 15).

1. Dialectical Games

4. Proceeding thus, O elicits further commitments from P, e.g., commitment to assertions B_1, B_2, …, B_n, which can be conceived as added to P's 'scoreboard'.
5. O may not introduce any thesis, P must commit himself to any thesis used by O. (Socratic Rule for Dialectical Games)
6. Having elicited from P commitment to, say, B_1, B_2, …, and B_n, O can then 'take together' or 'add up', and infer to absurdity from A, B_1, B_2, …, B_n. This is the *elenchus*:

$$A, B_1, B_2, \ldots, B_n \vdash \bot$$

7. If O has driven P into an elenchus, the play ends with O winning. P wins by avoiding being driven into an *elenchus*. (Winning rule)

Socratic Rule: 'say what you believe' and avowals of ignorance.

1. Dialectical Games

•To my first comment. Plato provides important information in the opening pages of *Parmenides*:

> “Is this the point of your arguments - simply to maintain, in opposition to everything that is commonly said, that things are not many? And do you suppose that each of your arguments is proof for this position, so that you think you give as many proofs that things are not many as your book has arguments? Is that what you’re saying - or do I misunderstand? No, Zeno replied. On the contrary, you grasp the general point of the book splendidly.” (127e-128a)

•One might infer from this that Zeno is providing *reductio* of the thesis ‘things are many’, thus proving that ‘things are not many’.

1. Dialectical Games

- But Plato adds:

"Still, you haven't completely discerned the truth about my book [...] The truth is that the book comes to the defence of Parmenides's argument against those who try to make fun of it by claiming that, if it is one, many absurdities and self-contradictions result from that argument. Accordingly my book speaks against those who assert the many and pays them back in kind with something for good measure. Since *it aims to make clear that their hypothesis,* if it is many, *would*, if someone examined the matter thoroughly, *suffer consequences even more absurd than those suffered by the hypothesis if its being one*." (128b-d)

1. Dialectical Games

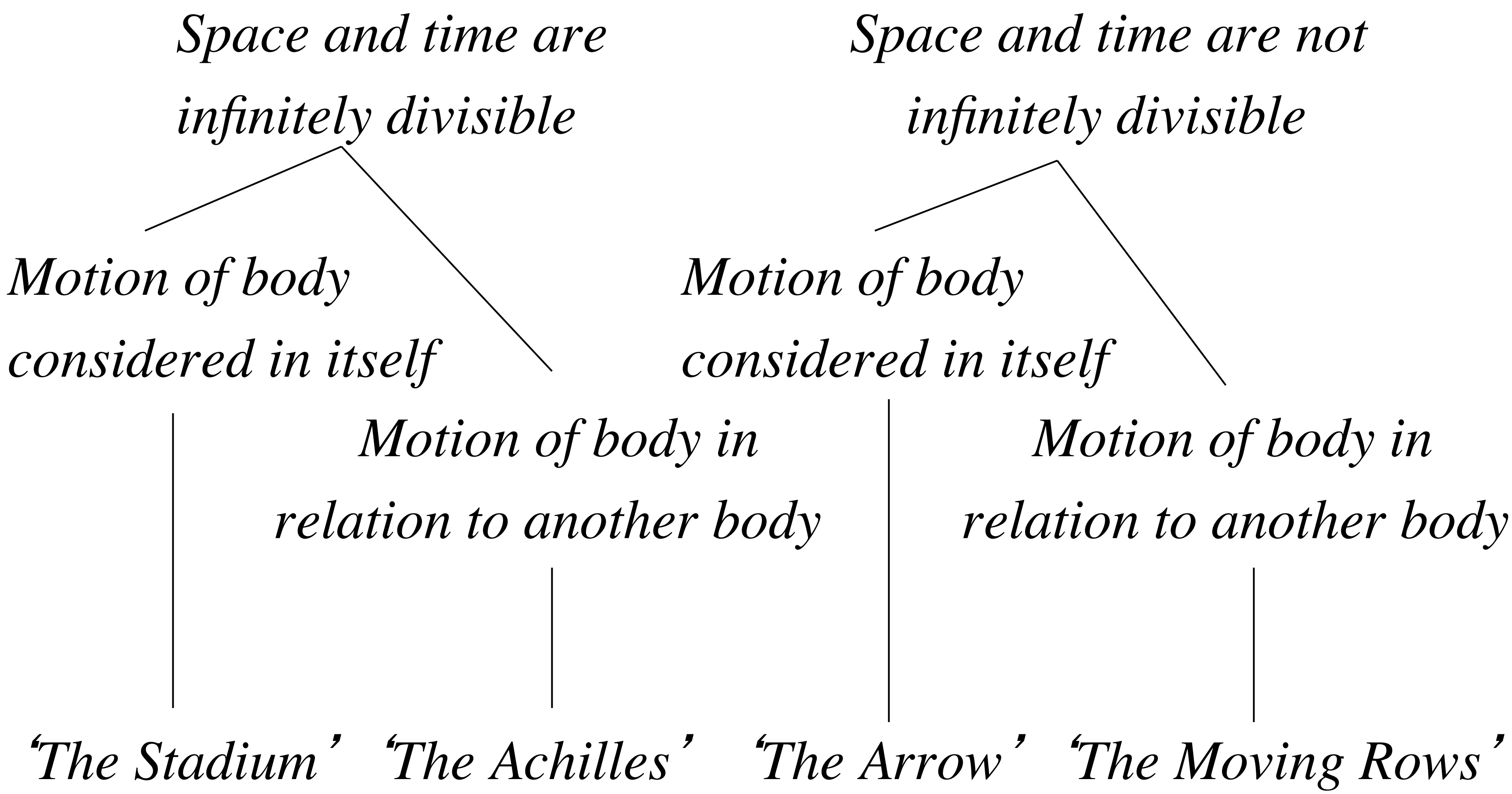
$$A, B_1, B_2, \ldots, B_n \vdash \bot$$

$$\dfrac{B \qquad \begin{array}{c}[A]\\ \vdots \\ \text{not } B\end{array}}{\text{not } A} \qquad\qquad \dfrac{A \qquad \begin{array}{c}B\\ \vdots \\ \text{not } A\end{array}}{\bot}$$

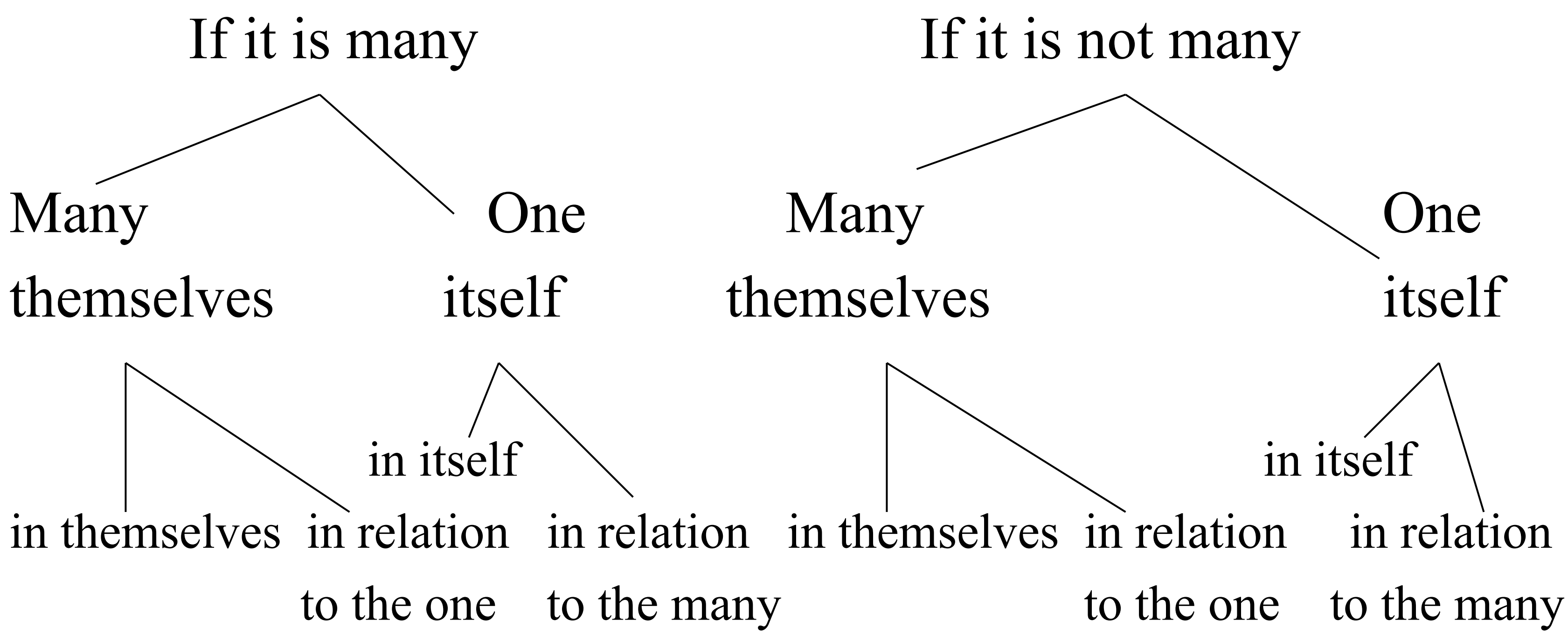
(Vlastos)

1. Dialectical Games

- The second point concerns another aspect of the second part of *Parmenides*. So far, the dialectical games as presented correspond to Socrates' practice : having elicited a thesis *A* from the proponent, he drives him into a contradiction, and the dialogue usually ends up immediately after. This leads to the suspicion that Socrates believed 'not *A*'.
- Not so in *Parmenides*, but also in Zeno (and Gorgias). Here, contradictions are derived on both sides.
- Zeno's 4 arguments about motion have been preserved. They can easily be framed in dialectical terms and show this structure, once you assume the one as divisible and the existence of motion, i.e., once Zeno's adversary has granted him these premises:


Space and time are infinitely divisible
Space and time are not infinitely divisible
Motion of body considered in itself
Motion of body in relation to another body
Motion of body considered in itself
Motion of body in relation to another body
'The Stadium'
'The Achilles'
'The Arrow'
'The Moving Rows'

- One will have noticed the role of the qualifications ‘in itself’ and ‘in relation to others’ (*pros heauto* and *pro ta alla*). The same occur in Part II of Plato’s *Parmenides*.



1. Dialectical Games

- Again:

  "[…] if you want to be trained more thoroughly, you must not only hypothesize, if each thing is, and examine the consequences of that hypothesis; you must also hypothesize, if that same thing is not." (135e-136b)

- One might ask: what is the point of this 'exercise'? Simply that for numerous questions no obvious answer is forthcoming, e.g., 'Is the world eternal or not?'. What other method would there be to try and answer such questions?
- This practice of deriving contradictions on both sides, the 'method of the dialectical games', allows one to see which of the answers 'The world is eternal' and 'The universe is not eternal' is the more plausible. The ideal, limit case would be where one could derive contradiction only on one side.

2. Aristotle

- To come to Aristotle, what I just called the method of dialectical games is what he called ‘going through the difficulties on either side’ (*aporia*: ‘difficulties’, ‘puzzles’).
- He defines *aporia* in terms of ‘equality between contrary reasonings’:

> Likewise also an equality between contrary reasonings would seem to be a cause of perplexity; for it is when we reflect on both sides of a question and find everything alike to be in keeping with either course that we are [puzzled] about which one we are to do. (*Topics*, Z, 6, 145^b17-20; translation slightly modified.)

- Aristotle may have distinguished for the purpose of argument between the dialectician and the philosopher, but, like Plato nowhere does he claim that the philosopher could do without dialectic, or at least its results.

2. Aristotle

[…] when it comes to knowledge and the wisdom that comes from philosophy, *being able to discern – or having already discerned – the consequences of either assumption is no small instrument*: for it remains to choose one or the other of these rightly. In order to do that, one must be naturally gifted with respect to truth: to be properly able to choose the true and avoid the false. This is just what the naturally good are able to do, for it is by loving and hating in the right way whatever is presented to them that they judge well what is best. (*Topics*, Θ, 14, $163^{b}9$-16)

We must, as in all other cases, set out the phenomena before us and, after first [going through all the] difficulties, go on to prove, if possible, the truth of all the reputable opinions about these affections or, failing this, of the greater number and the most authoritative; for *if we both resolve the difficulties and leave the reputable opinions undisturbed, we shall have proved the case sufficiently*. (*Nicomachean Ethics*, H, $1145^{b}2$-7)

2. Aristotle

- Then there is a controversial passage in *Topics* that goes a long way towards explaining the structure of his treatises:

[This treatise on dialectic] is useful in relation to the philosophical science, because if we have the ability to go through the difficulties on either side we shall more readily discern the true as well as the false in any subject.

Furthermore, it is useful in connection with the first of the starting-points about any individual sciences. For if we reason from the starting-points appropriate to the science in question, it is impossible to make any statement about these (since these starting-points are the first of them all), and it is by means of what is acceptable about each that it is necessary to discuss them. But this is unique, or at any rate most appropriate, to dialectic: for since its ability to examine applies to the starting-points of all studies, it has a way to proceed. (*Topics*, A, 2, 101^a34-101^b4)

2. *Aristotle*

- Problem: if he discarded his dialectics in favour of syllogistic, why are there virtually no apodeictic syllogisms, or ‘demonstrations’ in Aristotle’s treatises?
- On the other hand, Examples of *aporia* of the form ‘Is it A or $\neg A$?’ abound in Aristotle’s treatises, e.g., the dialectical discussion in *De Caelo*, I, 10, 297^b4*f.*, where the question is ‘Is the world eternal or not?’.
- Even more significantly, *Metaphysics* Book B contains a discussion of 14 *aporia*, all of the same form, that are left unresolved, in accordance with the definition of *aporia* as “equality between contrary reasonings”. (Not to mention discussion of the principle of non contradiction in Book Γ!)

3. Prior Analytics

- Łukasiewicz construed Aristotle's syllogistic as an *axiomatic system*, in which syllogistic figures are not meant to be inference rules, but *logical truths* of the '*if*…, *then*…' form, with a conjunction of the two premises as the antecedent and the conclusion as the consequent.

  Exegesis: in essence, Łukasiewicz claims that they are not deductions because of the absence of the Greek word for 'therefore'. This has been challenged (Austin 1952, 397-398), whose assessment was shared by (Prior 1955, 116) and (Rose 1968, 24-26). On Łukasiewicz's side, (Patzig 1968, 3-4), etc.

- Łukasiewicz has four axioms: the syllogistic 'principles' corresponding to the syllogisms *Barbara* and *Datisi*, and the 'laws of identity', as he calls them, *Aaa* and *Iaa*. These last two do *not* occur in Aristotle.

  For the full system, (Łukasiewicz 1957, 88-90).

3. Prior Analytics

- Syllogisms are made of Aristotle's 4 basic forms of proposition. (The fifth form '*a* is *b*' does not occur in Aristotle's inference rules, we leave it aside.):

Universal affirmative:	'*a* belongs to all *b*',
Universal negative:	'*a* belongs to no *b*',
Particular affirmative:	'*a* belongs to some *b*',
Particular negative:	'*a* not-belongs to some *b*'

- Thus *Barbara* reads like this

  If *a* belongs to all *b*

  and *b* belongs to all *c*,

  then *a* belongs to all *c*

3. Prior Analytics

- The basic forms of propositions, above, were construed by Łukasiewicz as containing *non-logical constants* that represent *relations* between universal *terms*: 'to belong to all', 'to belong to none', 'to belong to some', and 'to not-belong to some'.

  (Aristotle had yet another form of expression: 'to be predicated of all', 'to be predicated of none', and so forth.)

- Denoting these constants with the traditional letters, i.e., respectively, *A*, *E*, *O*, and *I*, we have:

'*a* belongs to all *b*':	*Aab*
'*a* belongs to no *b*':	*Eab*
'*a* belongs to some *b*':	*Oab*
'*a* not-belongs to some *b*':	*Iab*

3. Prior Analytics

- So Łukasiewicz's *Barbara* can be rendered as:

  $$(Aab \,\&\, Abc) \rightarrow Aac$$

- *A*, *E*, *O*, and *I*, are relations between terms, not propositions, so, according to Łukasiewicz – who follows here 19th-century British logicians such as Venn or Jevons – Aristotle's contribution was limited to the development of a 'logic of terms', where *A* would express class inclusion: inclusion, *E* disjointness, *O* partial disjointness, and *I* partial inclusion.
- The above formula uses the connectives '&' and '→' linking the propositions, so Aristotle's presumed axiomatic system *presupposes a propositional logic* as 'underlying logic', and Aristotle was thus faulted by Łukasiewicz for having ignored this (1957, 14-15 & 48-49).

3. Prior Analytics

- Quantifiers? Łukasiewicz believed that Aristotle connected instead quantifiers with 'syllogistic necessity' and with the notion of proof by instantiation (*ecthesis* or 'setting out').
- By 'syllogistic necessity', Łukasiewicz referred to Aristotle's claim that the conclusion of a syllogism must follow from the premises, e.g., at Prior Analytics, A, 3, 26a: "if A is predicated of every B and B of every C, it is necessary for A to be predicated of every C."
- Łukasiewicz's conditionals, such as the one above, are thus generalized with respect to their schematic letters, and would look like:

$$\forall a \forall b \forall c\ ((Aab\ \&\ Abc) \rightarrow Aac)$$

(Again, these are part of the presupposed propositional logic.)

3. Prior Analytics

- Corcoran (1972, 1973, 1974a, b, 1994) and Smiley (1973, 1994) interpreted Aristotle's syllogistic not as an axiomatic system requiring an underlying propositional logic, but as an underlying logic which is best modelled (in the ordinary sense of the word 'model') as a Gentzen-style system.
- A new notation:

  Universal affirmative '*a* belongs to all *b*': $\Pi^{+}(A, B)$

  Universal negative '*a* belongs to no *b*': $\Pi^{-}(A, B)$

  Particular affirmative '*a* belongs to some *b*': $\Sigma^{+}(A, B)$

  Particular negative '*a* not-belongs to some *b*': $\Sigma^{-}(A, B)$
- Aristotle's universal quantifier Π^{+}(A, B) is bounded to a domain of quantification that varies from one quantifier occurrence to another.

3. Prior Analytics

- Aristotle's explanation of the universal affirmative in *Prior Analytics*, A, 2, 24b 28 is:

  > And we say that one term is predicated of all of another, whenever nothing can be found of which the other term cannot be asserted. (trad. Smith)
  >
  > We use the expression 'predicated of every' when none of the subject can be taken of which the other term cannot be said. (trad. Jenkinson)

- A natural reading here is that $\Pi^{+}(A, B)$ can be asserted *if no A can be found which is not B*, i.e., or in type-theoretical terminology, no c of type A or 'c : A' can be taken for which B(c) fails. In *Prior* Analytics, Aristotle continues the above passage pointing out $\Pi^{-}(A, B)$ can be treated in a similar fashion as $\Pi^{+}(A, B)$ and we can recover $\Sigma^{+}(A, B)$ and $\Sigma^{-}(A, B)$, by the square of oppositions, as their respective contradictories.

3. Prior Analytics

- We now have:

$\Pi^+(A, B)$: no $c : A$ can be taken for which it is not the case that $B(c)$,

$\Pi^-(A, B)$: no $c : A$ can be taken for which it is the case that $B(c)$,

$\Sigma^+(A, B)$: a $c : A$ can be taken for which it is the case that $B(c)$,

$\Sigma^-(A, B)$: a $c : A$ can be taken for which it is not the case that $B(c)$.

- This a *no-counterexample* interpretation. The idea that universality means a lack of counterexample could simply be understood in truth-conditional terms. Today one would say that a formula $\forall x\ B(x)$ is true in a domain D if there is no object in D for which $B(x)$ fails. It suffices that one replaces here D by the type A to recover the above-mentioned reconstruction of Aristotle's meaning explanation. This truth-conditional reading of the meaning explanation of $\Pi^+(A, B)$ *would not be entirely faithful.* A game-theoretical interpretation is more accurate.

3. Prior Analytics

Topics, Θ, 2, 157a 34:

> "If one has made an induction on the strength of several cases and yet the answerer refuses to grant the universal proposition, then it is fair to demand his objection. But until one has oneself stated in what cases it is so, it is not fair to demand that he shall say in what cases it is not so; for one should make the induction first, and then demand the objection."

3. Prior Analytics

Topics, Θ, 8, 160b 3:

"[…] against the universal one should try to bring some objection: for to bring the argument to a standstill without an objection, either real or apparent, shows ill-temper. If, then, a man refuses to grant the universal when supported by many instances, although he has no objection, he obviously shows ill-temper. If, moreover, he cannot even attempt [to provide a counterexample] that it is not true, far more likely is he to be thought to be ill-tempered."

Opponent	Proponent	
	a : A is a B	
	b : A is a B	
	c : A is a B	
	.	
	.	(Induction)
	.	
	$\Pi^{+}(A, B)$	
d : A is not a B		

3. Prior Analytics

- If *P* does not concede that *d* is a counterexample, then he must either argue that *d* is not of type *A* or argue that *d* is, contrary to *O*'s claim, a *B*.
  - *O* seems to be breaking here the Socratic Rule by introducing '*d* : *A* is not a *B*'. However, the play will not continue until *P* has conceded this to *O*, so that the Socratic Rule is actually not violated.
- Instances of the rule are found in Plato's dialogues, e.g., in *Lesser Hippias* 366c-369b.
  - (Aristotle was aware of these: he explicitly mentions this dialogue his *Metaphysics*, Δ, 29, 1025^{a}6-13)
- We thus have a case where a rule implicit in dialogical games has been made explicit in *Topics*. The claim is that the meaning explanation in *Prior Analytics* A, 2, 24b 28 is derived from this rule.

3. Prior Analytics

- It is worth pointing out two further passages. In the first one, at *Topics*, Γ, 6, 120a 8, the above contradictory pairs $\Sigma^{+}(A, B)$ and $\Pi^{-}(A, B)$, and $\Sigma^{-}(A, B)$ and $\Pi^{+}(A, B)$ are defined in terms of dialectic:

  "If the problem is indefinite, it is possible to overthrow it in only one way: e.g., if a man has asserted that some pleasure is good or is not good, without any further definition. For if he has asserted that some pleasure is good, you must prove universally that no pleasure is good, if the proposition in question is to be demolished. And likewise, also, if he has asserted that some pleasure is not good you must prove universally that all pleasure is good: it is impossible to demolish it in any other way. For if we prove that some pleasure is not good or is good, the proposition in question is not yet demolished."

- From this one can see that the meaning explanations for Aristotle's four basic forms $\Pi^{+}(A, B)$, $\Pi^{-}(A, B)$, $\Sigma^{+}(A, B)$, $\Sigma^{-}(A, B)$ have their roots in dialectic.

3. Prior Analytics

- The second passage, at *Topics*, Γ, 6, 119a 34, is a statement of the doctrine of the existential import of the quantifiers:

  "[…] in demolishing or establishing a thing universally we also prove it in the particular; for if it belongs to all, it belongs also to some, and if to none, not to some."

- It is interesting to note the link between this doctrine and the rule for $\Pi^{+}(A, B)$. The dialectical rule always requires that one establishes a universal proposition on the basis of a number of instances; universal propositions never come into play without instances being established first. This may be the reason behind existential import in Aristotle's syllogistic.

- Pour conclure, un mot sur les rapports à la syllogistique dans les *Analytiques,* en particulier sur les preuves par *reductio per impossibile.*
- (Cela ne concerne pas le travail avec Alain, mais ouvre une autre piste.)
- Il ne faut pas oublier ce qui vient d'être dit, puisque les, $\Pi^{+}(A, B)$, $\Sigma^{+}(A, B)$, $\Pi^{-}(A, B)$ et $\Sigma^{-}(A, B)$ sont les formules impliquées dans les règles de la syllogistique d'Aristote. On voit donc l'origine dialectique de leur signification.
- Les *elenchi* sont des *reductio per impossibile,* les syllogismes des preuves directes. On peut donc se demander si Aristote n'a pas généré ses règles à partir de ces *reductio*.

The study of proofs by r*eductio per impossibile* is unjustly neglected:

- Łukasiewicz dismisses such proofs as mistaken, and can't give an account of them
- Better readers such as Robin Smith insist a lot on this metatheorem: All deductions can be reduced to the two universal deductions in the first figure, Barbara and Celarent.
- Hardly anybody notices that Aristotle makes another metatheoretical claim:

  "Everything concluded probatively can be proved through an impossibility, and whatever is proved through an impossibility concluded probatively, through the same terms" (II, 14, 62b38-40)

- A similar claim occurs on two further occasions:

For whatever is proved probatively can also be deduced through an impossibility by means of the same terms, and whatever is proved through impossibility can also be deduced probatively (I, 29, 45a26-28).

It is evident, then, that it is also possible to prove each of the problems <which was proved through an impossibility> through the same terms probatively. But similarly, if the deductions <in question> are probative, it will also be possible to lead them away into an impossibility, using the terms which were taken, when the premise opposite to the conclusion is taken. For the same deductions come about as by means of conversion; consequently, we also know at once the figure by means of which each one will be possible. It is clear, then, that every problem can be proved in both ways, through an impossibility as well as probatively, and that it is not possible for one of the ways to be separated off (II, 14, 63b12-21).

- Tout ce qui est prouvé directement peut l’être par *reductio* et tout ce qui peut être prouvé par *reductio* peut l’être directement.
- Cette thèse mérite examen – ce qui n’a jamais été fait !
- Peut-être est-ce possible de montrer qu’Aristote avait une méthode pour transformer les preuves directes en preuves par *reductio* et vice-versa.
- Cette thèse n’aurait aucun mérite si elle ne contient pas de façon implicite une thèse sur la priorité conceptuelle d’un des deux membres de l’équivalence. On peut songer à la priorité des preuves par *reductio*, car elles forment le contexte des *Analytiques*. Aristote aurait alors une méthode pour extraire de celles-ci ses règles de syllogistique.

- Pour Aristote, dans un syllogisme conclusion découle « nécessairement » des prémisses, il semble qu'il pensait pouvoir montrer cela par *reductio*: le conclusion contraire mène à une contradiction.
- Un mot sur l'internalisation, et le passage du « dialogique » au « monologique » ('Built-in opponent') :

  "what we call thought is speech that occurs without the voice, inside the soul in conversation with itself." (*Sophist* 263e)

  "all syllogism, and therefore a fortiori demonstration, is addressed not to the spoken word, but to the discourse within the soul, and though we can always raise objections to the spoken word, to the inward discourse we cannot always object." (*Posterior Analytics*, I, 10, 76b 24-27)