Ο ΑΠΕΙΟΣ ΠΩΤΟΣ ΤΗ ΨΗΦΟ ΒΑΛΕΤΩ. LEAVING NO PEBBLE UNTURNED IN SOPHISTICI ELENCHI, 1

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Traductions et Etudes

Le Langage. Lectures d'Aristote

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Abstract : Quelque nombreuses et quelque influentes qu'elles soient par ailleurs, les vues d'Aristote sur le langage se caractérisent à la fois par leur hétérogénéité et par leur marginalité. Sans faire nulle part du langage et de la signification l'objet d'une investigation autonome et méthodique, Aristote multiplie les remarques et les digressions à leur sujet, que ce soit dans ses écrits d'éthique et de politique ou dans ses traités d'histoire et de philosophie naturelle, ou encore dans ses manuels de dialectique, de poétique et de rhétorique.

Face à l'abondance de ces matériaux et aux difficultés qu'ils présentent du fait de s'offrir au lecteur en ordre quelque peu dispersé, « Le langage. Lectures d'Aristote » fait le choix d'indexer l'étude du langage chez Aristote sur des passages précis du corpus en ne posant aux textes aristotéliciens d'intérêt linguistique que les questions auxquelles ces mêmes textes – tantôt pris isolément, tantôt mis en relation les uns avec les autres – apportent une réponse.

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‘Ο ἄπειρος πρῶτος τὴν ψῆφον βαλέτω. Leaving No Pebble Unturned in *Sophistici elenchi*, 1 *

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A Claudio Majolino, con amicizia e ammirazione : siamo tutti, in certa misura, specialisti di qualcuno o di qualcosa, Magister M è specialista di tutto e di tutti.

« Was soll man nun dazu sagen, wenn jemand, statt diese Arbeit, wo sie noch nicht vollendet scheint, fortzusetzen, sie für nichts achtet, in die Kinderstube geht oder sich in ältesten erdenkbaren Entwickelungsstufen der Menschheit zurückversetzt, um dort wie J. St. Mill etwa eine Pfefferkuchen- oder Kieselsteinarithmetik zu entdecken ! » (G. Frege, *Die Grundlagen der Arithmetik*, VII).

CAVEAT. Even though Aristotle speaks often about language, his remarks do not fall within the province of any given discipline, let alone belonging to the same subject matter or amounting to a πραγματεία of their own [1]. Rather, they are somewhat scattered across the Aristotelian corpus and are to be gleaned from a vast array of texts, including ethical and political writings (where language plays a remarkable role in shaping human sociability), treatises on natural history (where Aristotle outlines the physiology of phonation in some animals such as birds and human beings), books on the soul (where Aristotle describes how language is intertwined with perception, imagination and thought) and works on dialectics, poetics and rhetoric (where linguistic expression is described as a powerful means of both persuasion and deception). Moreover, however relevant and to the point, what Aristotle has to say about language is, for the most part, accessory in nature and purpose : as a rule, Aristotle looks at language for the sake of something other than language itself.

SACRA PAGINA. The prologue to the *Sophistical Refutations* is no exception :

> [URTEXT] *Aristotelis Sophistici elenchi* 1, 164a 20 - 165a 17 : « περὶ δὲ τῶν σοφιστικῶν ἐλέγχων καὶ τῶν φαινομένων μὲν [21] ἐλέγχων, ὄντων δὲ παραλογισμῶν ἀλλ’ οὐκ ἐλέγχων, λέγωμεν [22] ἀρξάμενοι κατὰ φύσιν ἀπὸ τῶν πρώτων. [23] Ὅτι μὲν οὖν οἱ μὲν εἰσὶ συλλογισμοί, οἱ δ’ οὐκ ὄντες [24] δοκοῦσι, φανερόν. ὥσπερ γὰρ καὶ ἐπὶ τῶν ἄλλων τοῦτο [25] γίνεται διά τινος ὁμοιότητος, καὶ ἐπὶ τῶν λόγων ὡσαύτως [26] ἔχει. καὶ γὰρ τὴν ἕξιν οἱ μὲν ἔχουσιν εὖ, οἱ δὲ φαίνονται, [27] φυλετικῶς φυσήσαντες καὶ ἐπισκευάσαντες αὐτούς, καὶ [164b 20] καλοὶ οἱ μὲν διὰ κάλλος, οἱ δὲ φαίνονται, κομμώσαντες [21] αὐτούς. ἐπί τε τῶν ἀψύχων ὡσαύτως· καὶ γὰρ τούτων τὰ [22] μὲν ἄργυρος τὰ δὲ χρυσός ἐστιν ἀληθῶς, τὰ δ’ ἔστι μὲν οὔ, [23] φαίνεται δὲ κατὰ τὴν αἴσθησιν, οἷον τὰ μὲν λιθαργύρινα [24] καὶ καττιτέρινα ἀργυρᾶ, τὰ δὲ χολοβάφινα χρυσᾶ. [25] Τὸν αὐτὸν δὲ τρόπον καὶ συλλογισμὸς καὶ ἔλεγχος ὁ μὲν [26] ἔστιν, ὁ δ’ οὐκ ἔστι μέν, φαίνεται δὲ διὰ τὴν ἀπειρίαν· οἱ [27] γὰρ ἄπειροι ὥσπερ ἂν ἀπέχοντες πόρρωθεν θεωροῦσιν. ὁ μὲν [165a] γὰρ συλλογισμὸς ἐκ τινῶν ἐστι τεθέντων ὥστε λέγειν ἕτερον [2] ἐξ ἀνάγκης τι τῶν κειμένων διὰ τῶν κειμένων, ἔλεγχος δὲ [3] συλλογισμὸς μετ’ ἀντιφάσεως τοῦ συμπεράσματος. οἱ δὲ [4] τοῦτο ποιοῦσι μὲν οὔ, δοκοῦσι δὲ διὰ πολλὰς αἰτίας· ὧν εἷς [5] τόπος εὐφυέστατός ἐστι καὶ δημοσιώτατος, ὁ διὰ τῶν ὀνομάτων. [6] ἐπεὶ γὰρ οὐκ ἔστιν αὐτὰ τὰ πράγματα διαλέγεσθαι [7] φέροντας, ἀλλὰ τοῖς ὀνόμασιν ἀντὶ τῶν πραγμάτων [8] χρώμεθα συμβόλοις, τὸ συμβαῖνον ἐπὶ τῶν ὀνομάτων καὶ ἐπὶ τῶν [9] πραγμάτων ἡγούμεθα συμβαίνειν, καθάπερ ἐπὶ τῶν ψήφων [10] τοῖς λογιζομένοις. τὸ δ’ οὐκ ἔστιν ὅμοιον· τὰ μὲν γὰρ [11] ὀνόματα πεπέρανται καὶ τὸ τῶν λόγων πλῆθος, τὰ δὲ [12] πράγματα τὸν ἀριθμὸν ἄπειρά ἐστιν. ἀναγκαῖον οὖν πλείω [13] τὸν αὐτὸν λόγον καὶ τοὔνομα τὸ ἓν σημαίνειν. ὥσπερ οὖν [14] κἀκεῖ οἱ μὴ δεινοὶ τὰς ψήφους φέρειν ὑπὸ τῶν ἐπιστημόνων [15] παρακρούονται, τὸν αὐτὸν τρόπον καὶ ἐπὶ τῶν λόγων οἱ τῶν [16] ὀνομάτων τῆς δυνάμεως ἄπειροι παραλογίζονται καὶ αὐτοὶ [17] διαλεγόμενοι καὶ ἄλλων ἀκούοντες [Hasper 2013, 13-14 : now we must discuss sophistical refutations, that is, arguments that appear to be refutations, but are in fact fallacies rather than refutations. In accordance with the nature of things, however, we must start from the primary things. That some arguments do constitute deductions, while others seem to, but in fact do not, is clear. For just as in other cases this comes about because of a certain similarity, so too with arguments. For also with regard to their condition some people are really in good shape, whereas others only appear to be because they have decked themselves out as tribesmen and have equipped themselves ; and some people are beautiful because of their beauty, while others appear to be so because they have dressed up. It is like this also with lifeless things,

*. It is my pleasant duty to thank first and foremost my mentors, Sten Ebbesen and Jean Celeyrette, without whom I would be truly lost. I’d like to thank next Alain Lernould, Michael Lewis, Shahid Rahman, Tony Street and Walter Young for their constant advice and guidance. Last but not least, many thanks to the semi-anonymous referees who handled my case (« Aristotelica Linguistica : paper 7 ») : in the land of the double-blind, the one-eyed reviewer is king and it does not befit the vulgar scribbler that I am to take credit for their suggestions on how to inform and entertain at the same time.

1. Πραγματεία is a notoriously difficult expression to translate in scientific English (or to deal with in most modern languages, for that matter) – all the more so because Aristotle did not care to state what it meant exactly. On a first approximation, it encompassed specific, relatively self-contained – occasionally overlapping – inquiries that investigate or concern themselves with identifiable and arguably unified subjects. It so happens that Porphyry explained – in his conceited, self-promotional account of Plotinus’ life – that when his master entrusted him with the edition of his writings he imitated (μιμησάμενος) Andronicus of Rhodes’ thematic arrangement of Aristotle’s (and Theophrastus) works : « ὁ <*scilicet* Ἀνδρόνικος ὁ Περιπατητικός> δὲ τὰ Ἀριστοτέλους καὶ Θεοφράστου εἰς πραγματείας διεῖλε τὰς οἰκείας ὑποθέσεις εἰς ταὐτὸν συναγαγών ·οὕτω δὴ καὶ ἐγὼ κτλ. [Boys-Stones 2018, 36 : Andronicus the Peripatetic divided the works of Aristotle and Theophrastus into treatises, bringing related topics together. For my part, etc.] » (*Vita Plotini* 24, 9-11). Understandably enough, the notion of πραγματεία has come under close scrutiny by Aristotelian scholars discussing early stages of the Aristotelian corpus’ transmission : Moraux 1951 and 1973, 45-141 ; Gottschalk 1987 ; Barnes 1997 ; Drossaart Lulofs 1999 ; Lengen 2002 (in fact, a loose collection of linguistic-savvy, albeit unrelated, case studies) ; Primavesi 2007 ; Chiaradonna 2011 ; Hatzimichali 2013 ; Tutrone 2013 ; etc. On the Late Ancient commentators’ strictly disciplinarian (as in discipline-oriented) exegetical approach and its ancient (and modern) assets and liabilities, cf. Gazziero 2019.

> for some of them are really made of gold or silver, whereas others are not, but appear so to the senses : things made of litharge or of tin, for example, appear to be made of silver, and yellow-coloured things of gold. In the same way, one argument constitutes a real deduction or a real refutation, while another does not, even though it appears to due to our lack of experience. For those without experience are like people remaining at a distance and judging from far away. For a deduction is an argument based on certain granted points, such that it states, by way of necessity, something different from the points laid down because of them, while a refutation is a deduction together with the contradictory of its conclusion. But some arguments do not achieve this, even though they seem to on various grounds – of which one type of argumentation is very fertile and popular, the one based on words. For since it is impossible to have a discussion while adducing the things themselves, and we use words as symbols instead of the things, we assume that what follows for words, also follows for the things (just as with stones for those who do calculations). It is not the same, however, since the words are limited, just like the number of sentences, whereas the things themselves are unlimited in number. It is then inevitable that the same sentence or a single word signify several things. Just as in calculation, those who are not versed in moving stones around are tricked by the experts, so too those without experience of the possibilities of words are deceived by means of fallacies, both when themselves participating in a discussion and when listening to others] ».

[URTEXT]'s focus is clearly on argumentation : its whole point is to lay the groundwork for the study of fallacies, namely arguments which, despite looking good on the outside, turn out to be defective after all – treacherous, in fact : their appearance belies their reality, insofar as they actually fail to bring about the conclusion they force upon the incompetent and the untrained. There's no reason not to take [URTEXT] at face value and acknowledge that, if language is part of the picture in any way, it is factored in as a source of illusion and misdirection. What makes language interesting in this context is that it accounts for the numerous drawbacks that discursive reasoning and argumentation are prone to and more than a few predicaments they are lumbered with.

Aristotle might as easily have either elaborated upon the fact that we simply cannot dispense with language, or have expounded in greater detail how we rely on it each and every time a symbolic substitute is easier to handle than the real thing. Instead, he mentions both facts only in passing, while making another point altogether – the « ἐπεὶ γὰρ κτλ. » clause makes it pretty clear ([URTEXT], 165a 6-10). The point being : to the extent that we use linguistic signs as placeholders for the things and facts which we talk about, we are easily tricked into thinking that whatever is the case for words and word-compounds (sentences and the like), also goes for the things and facts they refer to. But if we believe that, then we are in for a big surprise – several, in fact. As the cruel tribesmen of old ([URTEXT], 164a 27) used to say – no doubt, while inflating and even stuffing their offerings with straw to make them look bigger and fatter than they actually were [2] – « trust in words is easily misplaced and, more often than not, it turns out to be a recipe for disaster : it welcomes deception, error, misjudgement – you name it ». To make a long story short, as far as [URTEXT] is concerned, language as such does not truly matter or, at least, it does not seem to matter for itself. What really counts is the fact that unscrupulous debaters and rogue dialecticians take advantage of some of its features to cheat their way in and out of arguments. If we come to understand how they manage to get away with it, we'll do a better job at stopping fallacy-mongers or, if we feel so inclined, we'll be able to turn the tables on those weasels. That being said, even though Aristotle spends more time explaining why linguistic expression derails the ordinary course of our arguments than trying to figure out what language is and how words and sentences actually work, since it is no accident that language puts arguments in harm's way [3], it is definitely worthwhile to try and extrapolate out of [URTEXT] as much of Aristotle's views on language as we possibly can [4].

WHERE DO WE START (AND WHERE DO WE GO FROM THERE) ? Making a virtue out of necessity – or a vice… in fact, a bit of both – seems to be the right thing to do, insofar as Aristotle's answer to the question « what do we need language for in the first place ? » is not so different from his answer to the question « what can possibly go wrong due to the way we talk to each other ? ». There are more things in heaven and earth than we can dream of ; a great many ghosts linger from the past and at least as many loom over the future ; wicked souls carry within them more wicked things than we care to count and the same goes for blessed people and blessed things, as well as for everyone and everything in between. Still, we have very little to show when we bring all of the above to someone else's attention. This is where words come in handy : you wish to trade granny's valuables for some quality time with your neighbour's daughters… fair enough, start a proper conversation, even if you'll probably have to meet them half-way, for – despite going by the same name – your idea of fun probably involves a different scenario than theirs ; besides, no one really knows what Grandma's earrings and necklace look like (she keeps telling everyone they made her look like the Queen on her wedding day, but – if they ever existed at all – only God knows where she locked them up after Grandpa passed away). We can get all cultivated and

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[2]. The *tribualiter inflantes* (φυλετικῶς φυσήσαντες) scam which Aristotle hints at in [URTEXT], 165a 27 definitely caught Latin commentators' imagination, for they indulged in all sorts of anatomical and surgical details calling on « Alexander »'s notoriously spurious authority (relevant texts in Ebbesen 1981, I, 351-357).

[3]. As usual, Paolo Fait hit the nail on the head : « language is easily misused and turned into a source of paralogisms. Such availability is not an accidental but a regular feature of language on account of its symbolic nature » (Fait 1996, 181).

[4]. All the more so – one might add – since the prologue of the *Sophistici elenchi* has not received as much scrutiny as other Aristotelian texts. At any rate, [URTEXT] has not been studied as much as it deserves – even by scholars who take stock of related matters as speech (Modrak 2001), homonymy (cf. e.g., Shields 1999) and meaning (Charles 2000).

sophisticated about it (and we will) but, bottom line, [URTEXT] conveys the kind of plain, down-to-earth message that anyone can easily grasp and hold on to. That is, words stand for more stuff than you can shake a stick at – which is fine, considering we can hardly put on display the countless things, facts and personal commotion we bring up for discussion. There's a flip side to it – there always is. You can hardly take a word's meaning for granted, quite the contrary. The same linguistic item can refer to different things – which is not so fine, considering there's not much we can do about it apart from running the appropriate tests to determine whether a given word or sentence has more than one meaning or not [5].

NOTULAE (MAIORES). Although we're not going to depart from the general idea that – as far as Aristotle is concerned – there's nothing mysterious or complicated about language, a few issues still deserve to be addressed in a more technical vein, starting with a handful of straightforward questions about Aristotle's choice of words.

Πράγματα ([URTEXT], 165a 6-7, 9 and 12). As interpreters have observed on a number of occasions [6], [URTEXT] leaves readers with a distinct sense of déjà-vu. Most likely, it is just another illusion [7] – still, we can't help feeling that what [URTEXT] rules out as impossible bears an uncanny resemblance to a literary episode of which so many of us have such fond memories : namely, the brazen linguistic expedient devised by the same Lagado's Projectors who went to great lengths to extract sunbeams out of cucumbers (good luck with that), restore weekly shitloads of poo back to its pristine undigested state (good luck with that too), erect buildings starting from the roof and working downwards (if bees can do it, why not men ?), use spiders instead of silk-worms (this one might actually work), etc. In this particular instance, Swift's Academics set their minds to achieve precisely what Aristotle says can't be done : for the sake of brevity and out of concern for speech fatigue and lung consumption, Lagado's best minds planned to give up words as substitutes for things and elected to stick to the things themselves instead. What things did Swift have in mind exactly ? Presumably, the kind that lead readers to cough up a hearty laugh [8]. If Lagado's professors believe that it is « more convenient for all Men to carry about them such things as were necessary to express a particular business they are to discourse on », then how much better to cast the whole lot in a buffoonish light than to grant them their wish and leave them doing the heavy-lifting which words freely offer to the ordinary folk [9] ? Unsurprisingly enough, we learn next that the « scheme for entirely abolishing all Words whatsoever » had the Wise look like pedlars struggling under the burden of the sum of things to say, which they – quite literally – packed on their shoulders. Whatever we are to think of the idea of letting things speak for themselves [10], there's little doubt that Swift was referring to very tangible things – solid stuff we can put under each other's nose or throw at each other's head if need be. Is it safe

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5. We have already touched upon language's unpredictable features in the « Introduction », so no particular reminder is needed here, apart from the trivial observation that the whole treatment of fallacies due to expression in the *Sophistical Refutations* (as well as a good deal of related materials in the *Topics* and elsewhere) rests on the assumption that linguistic diagnosis is both a reliable tool and a case-by-case matter. It is a reliable tool, insofar as no linguistic flaw is supposed to go undetected, as long as we stick to Aristotle's grid that is, which he deemed – and declared – to be inductively and deductively fool-proof (*Sophistici elenchi* 4, 165b 28-29 with Di Lascio 2013 who, for as long as her health permitted, really was the most brilliant Aristotelian scholar of the young generation). It is a case-by-case routine, insofar as those who do not know their way around words are said to be lacking in experience rather than, say, knowledge or intelligence – which means that there's nothing wrong with their understanding ; rather, their predicament has to do with their failure to look at all the facts (*De generatione et corruptione* I 2, 316a 5-11) and to look at them closely enough to discern what's what ([URTEXT], 164b 26-27).

6. Cf. e.g. Belardi 1975, 144 ; Chiesa 1991, 212-214 and 2013, 54 ; Whitaker 1996, 11 ; Levine Gera 2003, 134.

7. There's little chance that Jonathan Swift turned to Aristotle for inspiration. Language planning stood out prominently in his immediate background (cf. Knowlson 1975, Cohen 1977, Kelly 1978, Salmon 1983, Reed 1989 and Mulhall 2002) and provided him with all the elaborate schemes and enthusiastic schemers he could possibly need to poke fun at (amongst language reformers, John Wilkins and his characteristics have repeatedly been identified as Swift's most conspicuous targets, notably by Walker 1973 and Probyn 1974). At any rate, no Swift specialist has suggested an « Athenian » connection – neither Kelly 1988 who dealt with Swift's manifold linguistic interests in a plain and concise way, nor Baker Wyrick 1988, Francus 1994, Söderlind 1970, etc. In view of some of the suggestions, one wishes they had. For instance, it is difficult – for the layman at least – to figure out what to make of fabrications like Gierl 2008's, who – on an illustrious cyberneticist's whim and some fifty Google (not even Yahoo's, to add insult to injury) hits upon the clock to « support this notion » (p. 317) – has written, and published, an essay on Swift's Lagadian and Leibniz's Prussian Academy (« Lagadogs, do you want to live forever ? »).

8. To be sure, the fact that most references to abstract or semi-abstract items would be lost altogether is another serious shortcoming of Lagado's linguistic scheme : try to teach your children the Lord's Prayer and convey the exact meaning of « τὸν ἄρτον ἡμῶν τὸν ἐπιούσιον δὸς ἡμῖν σήμερον » by pointing at the sky and showing them a loaf of bread. It simply won't work. Whatever ὁ ἄρτος ὁ ἐπιούσιος means here, there's more to it than making sandwiches on a daily basis. But where's the fun in that ?

9. J. Swift, *Gulliver's Travels* III, 5 – no wonder women and common people (« such constant irreconcilable Enemies to Science ») saved the day : « this Invention would certainly have taken Place, to the great Ease as well as Health of the Subject, if the Women in Conjunction with the Vulgar and Illiterate, had not threatened to raise a Rebellion, etc. » (p. 271).

10. In small doses, the notion is as respectable as it gets and, in the right hands, more than a little effective. Here's an instructive anecdote Aristotle told in his books on politics « φασὶ γὰρ τὸν Περίανδρον εἰπεῖν μὲν οὐδὲν πρὸς τὸν πεμφθέντα κήρυκα περὶ τῆς συμβουλίας, ἀφαιροῦντα δὲ τοὺς ὑπερέχοντας τῶν σταχύων ὁμαλῦναι τὴν ἄρουραν· ὅθεν ἀγνοοῦντος μὲν τοῦ κήρυκος τοῦ γιγνομένου τὴν αἰτίαν, ἀπαγγείλαντος δὲ τὸ συμπεσόν, συννοῆσαι τὸν Θρασύβουλον ὅτι δεῖ τοὺς ὑπερέχοντας ἄνδρας ἀναιρεῖν [Reeve 1998, 90 : Periander said nothing to the messenger who had been sent to him for advice, but levelled a cornfield by cutting off the outstandingly tall ears. When the messenger, who did not know why Periander did this, reported what had happened, Thrasybulus understood that he was to get rid of the outstanding men] » (*Politica* III 13, 1284a 28-33). Herodotus (*Historiae* V, 92) and Diogenes Laertius (*Vitae philosophorum* I, 100) tell more or less the same tale, except that – according to their version – Thrasybulus did the gardening whereas Periander did the house cleaning rather than the other way around. On how the two different versions of the story might be related, see Forsdyke 1999.

to assume that Aristotle's πράγματα carry the same ontological weight in [URTEXT] ? It is tempting to read into Aristotle's text a similarly strong commitment to the cumbersome realities of everyday life [11], if only to do justice to its deliberate accumulation of concrete details and situations : bodily vigour both genuine and counterfeit, legitimate beauty and cosmetic charm, true and fool's gold, authentic silver as opposed to tin and litharge, botched abacus calculations and personal gain through fraudulent moneymaking. Sure enough, in most cases, there's no need to seek any further than the actual objects which discussions and calculations are about – especially ordinary talks and honest-to-God tabs. That being said, Aristotle makes no noticeable effort to either include or, for that matter, exclude any particular sort of things. More to the point, there's no clear indication that the text calls for a restriction of the notoriously wide range of realities πρᾶγμα can refer to [12] : robust particulars as well as not-so robust universals (*De interpretatione* 7, 17a 39 - 17b 1), all kind of actions and deeds as well as their representation as events occurring in a literary plot (*Ethica nicomachea* II 3, 1105b 5 and *Poetica* 14, 1453b 1-6 respectively), what we think about when we use a word (*Topica* I 18, 108a 18-26) or the image associated with it (*Rhetorica*, III, 2, 1405b 11), the formal content of productive and theoretical sciences (*Metaphysica*, Λ, 9, 1075a 1-3), hard facts as opposed to idle speculations (*De generatione et corruptione* I 8, 325a 17-19), states of affairs that either occur as often as not or, on the contrary, never obtain (*Metaphysica* Δ 29, 1024b 17-21), etc. Accordingly, the educated guess is that, in [URTEXT], πράγματα cover pretty much everything we can think of and convey through words : actual things first and foremost, of course, but also anything else we can set our mind to and put into words, whether it exists or not, and – if it exists – whether it is abstract, concrete or all shades of grey in between [13].

As it happens, we don't have to look far for confirmation :

> [T1] *Aristotelis Sophistici elenchi* 7, 169a 37 - 169b 1 : « μᾶλλον ἡ ἀπάτη γίνεται μετ' ἄλλων σκοπουμένοις ἢ καθ' αὑτούς (ἡ μὲν γὰρ μετ' ἄλλου σκέψις διὰ λόγων, ἡ δὲ καθ' αὑτὸν οὐχ ἧττον δι' αὐτοῦ τοῦ πράγματος)· εἶτα καὶ καθ' αὑτὸν ἀπατᾶσθαι συμβαίνει, [169b] ὅταν ἐπὶ τοῦ λόγου ποιῆται τὴν σκέψιν [Hasper 2013, 22 : deception occurs more often for those investigating with others than for those doing so by themselves (for the investigation with others is through sentences, whereas that by oneself is just as much through the object itself). Next, even by oneself, one ends up being deceived when one conducts the investigation at the level of a sentence] ».

Whatever one deems to be language's involvement in private musings and ruminations – and, as far as mental argumentation and its presentation are concerned, thought and speech get along famously [14] – the fact remains that he who thinks things over for himself does not get any smarter with his hands or, for that matter, with his wits. He may well be better off on his own, at least insofar as he is less liable to linguistic deception than those who, being in a sharing mood and all, depend more on oral or written communication ; yet, he does not get

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[11]. Tweedale 1987, 421, Whitaker 1996, 10-11, Wheeler 1999, 211, Lo Piparo 2003 and Crivelli 2004, 88 as well as 2015, 193 are not explicitly committed to the view (Whitaker came pretty close though), nonetheless their vocabulary – « external objects » (Whitaker), « real things » (Tweedale, Wheeler), « things in the world » (Wheeler), « non-mental objects », « worldly entities » (Crivelli) and « sheep-pragma » (Lo Piparo) – definitely suggests something along those lines.

[12]. Useful surveys of the different meanings of πρᾶγμα may be found in De Rijk 1987, 36-39 (≈ de Rijk 2002, 111-114) and Pritzl 1998, 183-186.

[13]. That πράγματα stand here for all kinds of things we can speak of – those we've got on our mind no less than those we perceive through our senses – has been suggested more than once. To start with, the idea fits, nicely, ancient narratives about how things got their names in the first place : mostly because people gave them one irrespective of their being related to reasoning or perception – cf. e.g. Boethius' account (which stands out as the least imaginative if not outright whimsical… think of the assembly of the wise, the χορὸς σοφῶν ἀνδρῶν who – according to Olympiodorus' *Prolegomena*, 21.32-38 – gathered on several occasions to name things, first, and to name names next) : « prima igitur illa fuit nominum positio, per quam vel intellectui subiecta vel sensibus designaret [such was the first imposition of names through which things pertaining either to reasoning or perception were referred to] » (*In Categorias commentaria*, 159b). As demonstrated time and again over the last thirty years, on the Porphyrian ancestry of names' institution(s) and its late ancient and mediaeval aftermath, along with Hoffmann 1987 which is definitely in the same league, Sten Ebbesen is the most prolific and reliable guide : Ebbesen 1990, 2003, 2005, 2007 and 2019. In more recent times, Hadot 1980, 310-311 has become the standard reference. Courtine 2004, 1076 is the most convincing advocate of the view that « the expression "the things themselves" does not refer primarily to an extra-mental and a-semantic reality – a stone, an ox, or an ass (which in fact it would often be difficult to bring into the discussion) – but to the affair at issue » – cf. already Wieland 1962, 159-160 (discussing the « πρᾶγμα vs ὄνομα » issue in *Sophistici elenchi* 16, 175a 5 et sq.) and Nuchelmans 1973, 33-36 ; as well as Berti 1994, 120 ; De Rijk 1996, 118-119 (developed further in de Rijk 2002, 104-111) and Di Mattei 2006, 14-15.

[14]. I see no compelling reason to open that particular can of worms – only a fool would be in a rush to quote on « mental language » in a footnote, where the wise are reluctant to even recommend themselves. A few bare texts will suffice to drive home the point that public and private argumentation follow pretty much the same compositional pattern which starts with uncombined thoughts and uncombined linguistic expressions (*De interpretatione* 1, 16a 10-15), builds up to form mental as well as spoken statements – be they affirmative or negative compounds – (*De interpretatione* 1, 16a 10-15 again, along with 14, 23a 33-36 and 24b 2-6), and leads to full-fledged deductions and demonstrations which occur either inwardly or outwardly (*Analytica posteriora* I 10, 76b 24-27). Moreover, as far as discursive content and process go, inner and outer speech share the same basic semantic requirements – most notably, a strict univocity or, to be more accurate, a strictly regulated polysemy (*Metaphysica* Γ 4, 1006b 7-11). But then again, who am I to deny serious readers their pound of chosen books and selected papers ? Here they are, down to the last ounce : Nuchelmans 1973, 36-39 ; Mignucci 1975, 203-206 ; Polansky and Kuczewski 1990 ; Chiesa 1992 ; Matelli 1992, 52-55 ; Panaccio 1999, 36-52 ; Di Mattei 2006 ; Duncombe 2016 ; Chriti 2018 ; McCready-Flora 2019. If one were to single out the most influential ancient interpreter on the issue of mental and oral discursivity, Boethius' name – in one of his many pages of Porphyrian observance (cf. *In De interpretatione commentarium. Editio secunda*, 30.3 and sq.) – would be the first to spring to mind. Magee 1989, 64-141 and Suto 2011, 77-113 – in some of their pages of Ebbesenian observance (cf. Ebbesen 1981, I, 133-170) – will provide readers, even the voracious type, with as much food for thought as they can possibly bite off and chew over in one or more sittings.

to manipulate things – whether in the flesh or not – any more than those who debate on the same subject. All things being equal, he who processes problems all by himself does not so much have a better understanding of whatever he is after as he simply does not have to worry about dialogical etiquette, especially the confusions it begets when, out of the blue, « strangers » become « odd people », dogs stop barking and start shining bright, and a « good » death, which is its own reward, turns out to be a « well-deserved » one too just because all of the above happen to share the same names : ξένοι, κύνες and ἀξία respectively [15]. More to the point, assuming the solitary thinker is ahead of the pack, this has little to do with him getting any closer to actual things – or abstract ones for that matter. A few Aristotelian digressions may be construed to imply that language blurs precisely the distinction between the two, making it hard for us to cope with the ontological variety beneath the even surface of words, especially when we expect hard things to be what we cogitate and discuss and are deceived by such expectation :

> [T2] *Aristotelis Sophistici elenchi* 33, 182b 13-16 and 22-25 : « ἐν τοῖς παρὰ τὴν ὁμωνυμίαν, ὅσπερ δοκεῖ τρόπος εὐηθέστατος εἶναι τῶν παραλογισμῶν, τὰ μὲν καὶ τοῖς τυχοῦσίν ἐστι δῆλα (καὶ γὰρ οἱ λόγοι σχεδὸν οἱ γελοῖοι πάντες εἰσὶ παρὰ τὴν λέξιν, οἷον κτλ. […]). τὰ δὲ καὶ τοὺς ἐμπειροτάτους φαίνεται λανθάνειν (σημεῖον δὲ τούτου ὅτι μάχονται πολλάκις περὶ τῶν ὀνομάτων, οἷον πότερον ταὐτὸ σημαίνει κατὰ πάντων τὸ ὂν καὶ τὸ ἕν, ἢ ἕτερον· τοῖς μὲν γὰρ δοκεῖ ταὐτὸ σημαίνειν τὸ ὂν καὶ τὸ ἕν, οἱ δὲ τὸν Ζήνωνος λόγον καὶ Παρμενίδου λύουσι διὰ τὸ πολλαχῶς φάναι τὸ ἓν λέγεσθαι καὶ τὸ ὄν) [Hasper 2013, 50 slightly modified : with those dependent on homonymy – which seems to be the most simple-minded mode of fallacy – some arguments are clear even to any chance person (for jokes too are almost all dependent on the expression, for example etc.) ; while others appear to go unnoticed even by the most experienced people. (A sign of this is that these people often quarrel about words, for example, whether “being” and “one” signify the same thing in all cases or something different. For some hold that “being” and “one” signify the same thing, while others solve the argument of Zeno and Parmenides by claiming that “one” and “being” are said in many ways)] ».
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> [T3] *Aristotelis Sophistici elenchi* 7, 169a 22-25 : « ἡ δ’ ἀπάτη γίνεται τῶν μὲν παρὰ τὴν ὁμωνυμίαν καὶ τὸν λόγον τῷ μὴ δύνασθαι διαιρεῖν τὸ πολλαχῶς λεγόμενον (ἔνια γὰρ οὐκ εὔπορον διελεῖν, οἷον τὸ ἓν καὶ τὸ ὂν καὶ τὸ ταὐτόν) [Hasper 2013, 22 : the deception in refutations depending on homonymy and amphiboly comes about through not being able to draw distinctions in the case of what is said in many ways. For with some terms, it is not easy to draw distinctions, for example, with “one”, “being” and “the same”] ».
>
> [T4] *Aristotelis Sophistici elenchi* 6, 168a 23-26 : « τῶν μὲν γὰρ ἐν τῇ λέξει οἱ μέν εἰσι παρὰ τὸ διττόν, οἷον ἥ τε ὁμωνυμία καὶ ὁ λόγος καὶ ἡ ὁμοιοσχημοσύνη (σύνηθες γὰρ τὸ πάντα ὡς τόδε τι σημαίνειν), κτλ. [Hasper 2013, 20 : among the apparent deductions and refutations due to the expression, some depend on equivocation, such as homonymy, amphiboly and similarity in form of expression (for customarily one signifies everything as something individual), etc.] ».
>
> [T5] *Aristotelis de sophisticis elenchis* 7, 169a 30-36 : « χαλεπὸν γὰρ διελεῖν ποῖα ὡσαύτως καὶ ποῖα ὡς ἑτέρως λέγεται (σχεδὸν γὰρ ὁ τοῦτο δυνάμενος ποιεῖν ἐγγύς ἐστι τοῦ θεωρεῖν τἀληθές, μάλιστα δ’ ἐπίσταται συνεπινεύειν), ὅτι πᾶν τὸ κατηγορούμενόν τινος ὑπολαμβάνομεν τόδε τι, καὶ ὡς ἓν ὑπακούομεν· τῷ γὰρ ἑνὶ καὶ τῇ οὐσίᾳ μάλιστα δοκεῖ παρέπεσθαι τὸ τόδε τι καὶ τὸ ὄν [Hasper 2013, 22 : it is difficult to distinguish which things are said in the same way and which are said differently. For someone who can do that is practically on the verge of knowing the truth. However, what especially lures us into assenting is that we assume that everything predicated of something is an individual and understand it as one thing. (For individuality and being seem most of all to go together with substance and what is one thing)] ».

At this juncture, it is immaterial to decide whether or not [T2] is a – presumably early – instance of the ἀπορῆσαι ἀρχαϊκῶς sleight of hand Aristotle pulled elsewhere on Parmenides and the Platonists who thought they could outsmart Parmenides at his own game [16]. It is also of little consequence whether we emphasize differences or similarities between homonymy, amphiboly and figure of speech in the other texts [17]. Rather, what deserves here to be underscored is the fact that – despite what our linguistic habits would have us believe – the things which actually come in all shapes and sizes are neither the only ones nor the most intriguing we can occupy our mind with or bring up for debate.

Λόγοι ([URTEXT], 164a 25, 165a 11, 13, 15). Even though later Aristotelian scholars either scorned the issue or ignored it altogether [18], in their ancient and mediaeval heyday, commentators took very seriously Aristotle’s

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[15]. Of course, there’s more to what I dubbed « dialogical etiquette » than meets the eye. Aristotle covers its many niceties when he portrays how dialecticians are supposed to handle specific lines of argument on their own and around people (cf. e.g. *Topica*, VIII, 1, 157b 34 - 158a 2) or when he describes how demonstrations – and argumentation at large – fare when you go through the moves in your head and when you vent them out (cf. e.g. again *Analytica posteriora* I 10, 76b 24-27). Even though no additional bibliography is required at this stage, let’s recall the most influential assessment of the specificity of dialectical argumentation, namely Moraux 1968 – through the usual bibliographical threads follow up routine, interested readers should be able to trace forward the most representative works (Brunschwig 1986 ; Dorion 1990 ; Wolff 1995 ; etc.).

[16]. Parmenides’ old-fashioned views are criticized in *Physica* I 2, 186a 23 et sq. (cf. Berti 1990, Castelli 2018). Fellow Academics are blamed for setting problems in an obsolete way in *Metaphysica*, N 2 1088b 35 et sq. (cf. Merlan 1967, Leszl 1973, Dorion 2011).

[17]. It is easy enough to do both in the footsteps of Ancient and Mediaeval sources on « actual » and « imaginary » equivocity – homonymy being tantamount to using one word with multiple meanings and form of expression having to do with words whose similar morphology tricks us into believing they refer to the same things or kind of things (cf. Gazziero 2016, 252-255).

[18]. Agostino Nifo – for one – only saw the potential for fun, since he settled for a good laugh rather than a convoluted explanation (cf. *Expositiones in libros De sophisticis elenchis*, 5vb). As a matter of fact, he dismissed a legitimate issue (why πράγματα are supposed to be infinite and what λόγοι – and ὀνόματα – are supposed to be limited in number ?) with a joke (for no one ever went to the trouble of counting them, no one really knows whether there are more things than linguistic expressions or the other way around, for that matter). Giulio Pace – for another – hardly gave the problem any thought either, since he did not even touch upon it, however briefly, in his influential *Commentarius analyticus* on Aristotle’s *Organon*.

claim that there are only so many linguistic expressions we can rely on in order to refer to the countless things out there (« and in here », says me pointing to little Nahida's forehead). One could hardly blame them for doing so : after all, for Aristotle himself, the fact that πράγματα and ὀνόματα along with λόγοι do not always add up is the main reason why we end up on the losing side of a number of phony arguments. As may be expected from experts whose relentless questioning was only matched by their eagerness to tear each other's views apart, all possible readings have been expounded at some point or another. Besides stating the obvious (namely, that there actually are fewer linguistic expressions than things and states of affairs, period), interpreters have come up with several other, more imaginative, solutions. According to some, neither things nor linguistic expressions are really infinite ; according to others, they both are ; according to others still (sometimes the same, endorsing different solutions) the former are more infinite than the latter or vice versa [19]. Despite their differences and nuances, commentators of old were in general agreement that – whether in short supply or not – what Aristotle referred to as λόγοι are ordinary sentences or statements. Had the traditional consensus not been breached in recent times, we might leave it at that and willingly move on. As it happened though, a few translators and Aristotelian scholars – philosophers and linguists alike – have interpreted [URTEXT] as if λόγοι meant definitions or accounts instead of ordinary pieces of verbal communication and argumentation [20], at least in 165a 11 and 13 – which, by the way, never augurs anything good : cherry picking where, just a few lines apart, a given word occurs with the same meaning and where it doesn't looks pretty suspicious, to say the least. Here's one more reason why, in this particular instance, we should dismiss novelty as a serious step back rather than a bold step forward : to start with, the whole point of [URTEXT] 165a 10-13's clause (« τὰ μὲν γὰρ [11] ὀνόματα πεπέρανται καὶ τὸ τῶν λόγων πλῆθος … σημαίνειν ») is that the numerical imbalance between the countless things we can bring up for discussion and the limited linguistic means at our disposal leads to confusion and deception. As soon as we acknowledge that we're dealing with ambiguity as a distinctive linguistic liability [21], we can confidently rule out the possibility that the multiple reference involved in [Urtext] has anything to do with the rather innocuous – in fact, very useful – feature of Aristotelian definitional accounts, which are supposed to apply to more than one individual thing without becoming equivocal in the process [22]. Should they turn out to be ambiguous after all, then equivocation would be the norm rather than the exception… nothing wrong with that either, of course ; but it certainly does not have an Aristotelian ring to it, not even a tinkle. Let's stick to our guns then and trust our elders on this one.

NOTULAE (MINORES). On the rare occasions Aristotle gives it to them straight, interpreters – pros and amateurs alike – should count their blessings and be content with the plain sense of what they read. Before we turn to [URTEXT]'s most peculiar feature, namely its analogy between those who are involved in pebble reckoning, on the one hand, and those who are involved in argument-driven discussions, on the other hand, let's briefly engage in one last round of lexical probing, which will help us lay further the groundwork for our reconstruction of Aristotle's main line of argument in [URTEXT].

Σύμβολα ([URTEXT], 165a 8). As with about everything else in Aristotle, Aristotelian σύμβολα come with a few strings attached [23]. [URTEXT] is the welcome exception, insofar as there is not much insight to be gained by

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19. Interested readers will find an edition of relevant texts and a critical survey of who's who in Gazziero 2021.

20. A few otherwise dependable translators have λόγοι stand here for definitional formulas. Pickard-Cambridge 1928, 536 : « names are finite and so is the sum-total of formulae, while things are infinite in number. Inevitably, then, the same formulae, and a single name, have a number of meanings » (revised, for the worse, by Barnes 1984, 278 : « names are finite and so is the sum-total of accounts, while things are infinite in number. Inevitably, then, the same account and a single name signify several things ») and Tricot 1939, 3 « les noms sont en nombre limité, ainsi que la pluralité des définitions, tandis que les choses sont infinies en nombre. Il est, par suite, inévitable que plusieurs choses soient signifiées et par une même définition et par un seul et même nom ». While sensible interpreters have resisted the temptation to explore the new path (cf. e.g. Robinson 1941, 144-145 or McKeon 1947, 29-31), more than a few eminent philosophers have followed the translators' lead and explained the text along the same lines : Hintikka 1959, 146 and Aubenque 1962, 107-108 and 118-120, whose Aristotelian credentials were impeccable, are – unquestionably – the most influential. A number of philosophically inclined linguists or linguistically inclined philosophers – many of them Italians – have gone down the same road, most notably Pagliaro 1962, 44 and 47-48 ; Belardi 1975, 138-139 and 1976, 81-82 ; Coseriu 1979, 432-436 ; Lo Piparo 2003, 183 ; and Gusmani 1986, 535 note 2, 1993, 111 and 2004, 155 note 12.

21. Pace Aubenque 1962, 119 ; Coseriu 1979, 434 ; Bellemare 1982, 273 ; Chiesa 1991, 230-232 ; Gusmani 1993, 111 ; Berti 1994, 123-124 ; etc. this is precisely what πλείω σημαίνειν means here. As vigorously pointed out by Leszl 1970, 32 and Dorion 1995, 207-208, πλείω σημαίνειν in [Urtext], 165a 12-13 is synonymous with πολλαχῶς λέγεσθαι (*Sophistici elenchi* 19, 177a 9-11) or πολλὰ σημαίνειν (10, 170b 20-22) and it means equivocity. Let's not forget either that, as often as not, syntactical ambiguity or amphiboly is simply dubbed λόγος by Aristotle (cf. 4, 165b 29 ; 6, 168a 25 and 7, 169a 22-23 with Garcia Yebra 1981, 44 and Fait 1996, 183 note 3).

22. Whether or not Aristotelian definitions are said in many ways (and there are more pros and cons to either position than any Aristotelian scholar who hasn't taken leave of her senses would care to admit in a footnote – cf. e.g. Charles 2010 and Deslauriers 2007 for a book-length defence of each side of the debate), it is still true that a formula's plural reference never puts its univocity at risk, even when we struggle to define peculiar individuals – namely, those who are both eternal and one of a kind (ἀίδια καὶ μοναχά), like the sun or the moon : God forbid, should two suns rise tomorrow instead of one, the same – unambiguous – definition would be common to both, as Aristotle claims in *Metaphysica* Z 15, 1040a 28 - 1040b 2.

23. A bibliographical due diligence process might start by looking into three monuments of Swiss (and Franco-Swiss) philology : Müri 1931, Meier-Oeser 1998, 712-713 and De Libera & Rosier Catach 2004, 1159-1164. It will consider next the Greco-Roman « tessarae hospitales » (cf. Knippschild 2002, 152-157) whose affinity with linguistic symbols has not gone unnoticed by attentive Aristotelian readers (cf., e.g., Bellemare 1982, 268-271 ; Magee 1989, 39-40 ; Gusmani 2004, 156-157 and Baghdassarian 2014, 55-56). Overviews worth

asking, say, to what precise extent linguistic symbols are either by nature or by convention, or whether there's good reason to set spoken symbols and written ones apart, or again how straightforward or how layered a relation symbol's signification actually is, etc. [24] Rather, what Aristotle made sure we don't miss in [URTEXT] is that symbols serve in a subsidiary capacity. We use them as a makeshift solution – as it happens, a permanent fix, but a fix nonetheless, with a few flaws of its own to boot. Accordingly, granted that we simply can't do without language as a much-needed substitute for whatever we aren't able to bring directly to each other's consideration, we should not put too much stock in linguistic expression either. At the very least, we are advised to keep tabs on it, lest it end up creating more problems than it actually helps us solve. More to the point – and this is the peculiar feature of linguistic symbols which [URTEXT] brings to the fore – despite being a rare commodity, words are ten a penny ; they are as cheap as the pebbles Aristotle compares them to and, as it turns out, every bit as tricky !

Τῶν ὀνομάτων δύναμις ([URTEXT], 165a 16). The very concept of δύναμις – along with its manifold relations to other Aristotelian notions (actuality, substance, movement, generation and change to name a few) – has a scholarly record second to none [25]. Yet, its association with ὀνόματα in the prologue of the *Sophistici elenchi* is hardly mentioned at all in recent literature [26]. This though should come as no surprise – for, as it occurs in [URTEXT], the compound is self-explanatory, to a certain extent. In addition, it has very little to do with exciting – and excitingly fashionable – topics such as the hazardous chemistry involved in many linguistic interactions [27].

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mentioning should include at least a few more items, that is Belardi 1999, 12-14 ; De Angelis 2002, 18-22 : Viltanioti 2015, 34-41 and Suto 2012, 45-51. It is hard to tell what to do exactly with Lo Piparo 2003 highly unconventional take on Aristotle and linguistic symbolism, besides saying, first, that – as Franco Lo Piparo himself, in not so many words, warns his readers right off the bat (Lo Piparo 2003, 2) – his translations are so unorthodox (« non-canonical » he calls them) one wonders eventually whether we're reading the same texts and, second (and more to the point), that his whole notion of a non-conventional non-substitutional symbol (cf. Lo Piparo 2003, 43, 62, 184 emphasis on « non-substitutional ») – especially when applied to the prologue of the *Sophistici elenchi* – is simply too far off the mark to warrant discussion.

[24]. Those are, of course, perfectly legitimate questions and have been debated forever – they simply do not have much bearing on [URTEXT]. In recent times, they have been conflated with another issue, namely the alleged nuance to be made between linguistic symbols (σύμβολα) and linguistic signs (σημεία) – « alleged » insofar as ancient commentators made no difference between the two : most notably Ammonius who stated that the Philosopher used them interchangeably (*In De interpretatione commentarius*, 20.6-7 with Brunschwig 2008, 61-66) and Boethius who translated both σύμβολα and σημεία as *notae* (*De interpretatione. Translatio Boethii*, 5.6 and 8 with Magee 1989, 49-63 and Suto 2012, 43-76). Since Kretzmann 1974 forcefully argued that they are not synonyms, the issue has become a powerful catalyst and has received a huge amount of scholarly attention. With very few exceptions (Sedley 1996, 89 note 8 declined to battle his way through the rival interpretations ; Wheeler 1999, 198 declared himself neutral ; Tselemanis 1985, 194-198 was both critical and supportive of Kretzmann's views but – as far as I know – has not made good yet on his promise to provide a more positive and constructive account), Aristotelian specialists have felt compelled to take sides and either rallied round Kretzmann's standard (Pépin 1985 ; Chiesa 1986 and 1991, 285-309 ; De Angelis 2002 ; Walz 2006 ; etc.), or fought against the rising tide of Kretzmann's supporters (Weidemann 1982 ; Arens 1984, 27 ; Magee 1989, 36-49 ; Polansky & Kuczewski 1990 ; Wolanin 1995 ; Modrak 2001, 19-20 ; Di Mattei 2006 ; Noriega-Olmos 2013, 55-59 ; Raspa 2018 ; etc.).

[25]. To begin with, its bibliography speaks for itself. Crubellier, Jaulin, Lefebvre & Morel 2008 and Lefebvre 2018, by and large, deserve to be mentioned as the top contenders in their respective categories (team and solo effort). As it happens, Cleary 1998, 32's most promising reference to the « power of speech (De Juv. 469a 3) » turns out to be a *lapsus calami* in an otherwise flawless essay – as a matter of fact, speech plays no special role in Aristotle's treatise on the cycle of life and no role at all in the cardiocentric account of animal sustenance and development : « φανερὸν τοίνυν ὅτι μίαν μέν τινα ἐργασίαν ἡ τοῦ στόματος λειτουργεῖ δύναμις, ἑτέραν δ' ἡ τῆς κοιλίας, περὶ τὴν τροφήν [it is clear that, as far as nutrition is concerned, the mouth has the faculty of performing one function, whereas the stomach has the faculty of performing a different function] » (*De iuventute et senectute* 3, 469a 2-4 ; King 2001, 71-73 distinctive « life process » focused approach studies nutrition as a case in point).

[26]. Considering the results, one wonders whether scholars ought to have left it alone altogether. For instance, Belardi 1975, 171 allusion is entangled in a dubious operation of Saussurian revamp. Gusmani 1992, 20 (≈ Gusmani & Quadrio 2018, 58) comments boil down to one problematic claim : δύναμις in [URTEXT], 165a 16 pertains to « referential polyvalence », i.e. the trivial fact that words refer to more than one thing belonging to the same class (sharing the same account, that is) – which, for reasons pointed out above, is plainly wrong.

[27]. Should one wonder whether « chemistry » is the right word here, let him be reminded that, as a matter of course, the power of speech had long been compared to the property of remedies and poisons (φάρμακα). Gorgias, for one, had drawn a parallel between the effects – both good and bad – of speech on the soul, on the one hand, and the actions of drugs – whether healing or noxious – on the body, on the other : « τὸν αὐτὸν δὲ λόγον ἔχει ἥ τε τοῦ λόγου δύναμις πρὸς τὴν τῆς ψυχῆς τάξιν ἥ τε τῶν φαρμάκων τάξις πρὸς τὴν τῶν σωμάτων φύσιν. ὥσπερ γὰρ τῶν φαρμάκων ἄλλους ἄλλα χυμοὺς ἐκ τοῦ σώματος ἐξάγει, καὶ τὰ μὲν νόσου τὰ δὲ βίου παύει, οὕτω καὶ τῶν λόγων οἱ μὲν ἐλύπησαν, οἱ δὲ ἔτερψαν, οἱ δὲ ἐφόβησαν, οἱ δὲ εἰς θάρσος κατέστησαν τοὺς ἀκούοντας, οἱ δὲ πειθοῖ τινι κακῇ τὴν ψυχὴν ἐφαρμάκευσαν καὶ ἐξεγοήτευσαν [Laks & Most 2016, 179-181 : the power of speech has the same relation with the arrangement of the soul as the arrangement of drugs has with the nature of bodies. For just as some drugs draw some fluids out of the body, and others other ones, and some stop an illness and others stop life, in the same way some speeches cause pain, others pleasure, others fear, others dispose listeners to courage, others drug and bewitch the soul by some evil persuasion] » (*Encomium Helenae* 14). Relevant literature includes Segal 1962, Verdenius 1981, Leszl 1985, Mourelatos 1987, Porter 1993, Noël 1994 and 2008, Valiavitcharska 2006, Pratt 2015 and Bourgeois 2017. Let it be noted that the pharmaceutical metaphor occurs in Plato's *Cratylus* as well, where δύναμις however has less to do with the emotional response linguistic expressions may trigger than with their discriminatory power – which, interesting though it is (cf. already Bury 1894 and Souihé 1919, 82-84), is hardly relevant here : « ποικίλλειν δὲ ἔξεστι ταῖς συλλαβαῖς, ὥστε δόξαι ἂν τῷ ἰδιωτικῶς ἔχοντι ἕτερα εἶναι ἀλλήλων τὰ αὐτὰ ὄντα· ὥσπερ ἡμῖν τὰ τῶν ἰατρῶν φάρμακα χρώμασιν καὶ ὀσμαῖς πεποικιλμένα ἄλλα φαίνεται τὰ αὐτὰ ὄντα, τῷ δέ γε [394b] ἰατρῷ, ἅτε τὴν δύναμιν τῶν φαρμάκων σκοπουμένῳ, τὰ αὐτὰ φαίνεται, καὶ οὐκ ἐκπλήττεται ὑπὸ τῶν προσόντων. οὕτω δὲ ἴσως καὶ ὁ ἐπιστάμενος περὶ ὀνομάτων τὴν δύναμιν αὐτῶν σκοπεῖ, καὶ οὐκ ἐκπλήττεται εἴ τι πρόσκειται γράμμα ἢ μετάκειται ἢ ἀφῄρηται, ἢ καὶ ἐν ἄλλοις παντάπασιν γράμμασίν ἐστιν ἡ τοῦ ὀνόματος δύναμις [Reeve 1997, 112-113 : because of variation in their syllables, names that are really the same seem different to the uninitiated. Similarly, a doctor's medicines, which have different colours and perfumes added to them, appear different to us, although they are really the same and appear the same to a doctor, who looks only to their power to cure and isn't disconcerted by the additives. Similarly, someone who knows about names looks to their force or power and isn't disconcerted if a letter is added, transposed, or

To be sure, the spell words and speeches cast – especially on audiences [28] – was a concept Aristotle and his contemporaries were perfectly familiar with. In particular, they all knew too well that some words are not to be trifled with, lest they mess with your head the way « dishonour » (τὸ αἰσχρὸν καλούμενον – a powerful catchword indeed) played tricks on the mind of Melian leaders – at least according to Thucydides' account of the negotiation which paved the way for the islanders' swift demise :

> [T6] *Thucydidis Historiae* V, 111 : « οὐ γὰρ δὴ ἐπί γε τὴν ἐν τοῖς αἰσχροῖς καὶ προύπτοις κινδύνοις πλεῖστα διαφθείρουσαν ἀνθρώπους αἰσχύνην τρέψεσθε. πολλοῖς γὰρ προορωμένοις ἔτι ἐς οἷα φέρονται τὸ αἰσχρὸν καλούμενον ὀνόματος ἐπαγωγοῦ δυνάμει ἐπεσπάσατο ἡσσηθεῖσι τοῦ ῥήματος ἔργῳ ξυμφοραῖς ἀνηκέστοις ἑκόντας περιπεσεῖν καὶ αἰσχύνην [4] αἰσχίω μετὰ ἀνοίας ἢ τύχῃ προσλαβεῖν. ὃ ὑμεῖς, ἢν εὖ βουλεύησθε, φυλάξεσθε, καὶ οὐκ ἀπρεπὲς νομιεῖτε πόλεώς τε τῆς μεγίστης ἡσσᾶσθαι μέτρια προκαλουμένης, ξυμμάχους γενέσθαι ἔχοντας τὴν ὑμετέραν αὐτῶν ὑποτελεῖς, καὶ δοθείσης αἱρέσεως πολέμου πέρι καὶ ἀσφαλείας μὴ τὰ χείρω φιλονικῆσαι [Mynott 2013, 384 : surely you will not be drawn into that sense of shame which is quite fatal when it is danger and dishonour that are staring you in the face. For many people, even though they can see the dangers they are being led into, are still overcome by the power of a name – this thing we call "dishonour" – and, victims of a word, in fact fall of their own accord into irreversible disaster and so bring on themselves a dishonour all the more shameful because it comes more from their folly than their misfortune. That is the outcome you will be well advised to avoid and you should realise that there is no loss of face in submitting to a great power which is offering reasonable terms – namely, for you to become allies, retaining your own territory on payment of tribute – and that when you have a choice between war and safety you should not be so contrary as to insist on the worse option] ».

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subtracted, or even if the force a name possesses is embodied in different letters altogether] » (*Platonis Cratylus* 394a 5 - 394b 6 with Barney 2001, 85-86 ; Sedley 2003, 81-86 ; Ademollo 2011, 167-178 ; Smith 2014).

[28]. The vagaries of mass communication as opposed to the more controlled environment of cross-examination – or questions and answers driven exchange – were not lost to ancient theorists and practitioners. Let's stay close to our main example ([T6]) and take full advantage of it. Blurring the boundaries between fiction and reality in subtle enough ways to have us wonder to this day whether we should take his word for it and to what extent [a], Thucydides had the Athenian envoys' set the tone of the so-called Melian dialogue along these lines precisely [b]. In particular, holding all the cards of the negotiation, Athenian representatives had no qualms about the Melian dignitaries stopping the uninterrupted – or rather unchecked – flow of their eloquence in front of the Melian people : « ἐπειδὴ οὐ πρὸς τὸ πλῆθος οἱ λόγοι γίγνονται, ὅπως δὴ μὴ ξυνεχεῖ ῥήσει οἱ πολλοὶ ἐπαγωγὰ καὶ ἀνέλεγκτα ἐσάπαξ ἀκούσαντες ἡμῶν ἀπατηθῶσιν (γιγνώσκομεν γὰρ ὅτι τοῦτο φρονεῖ ἡμῶν ἡ ἐς τοὺς ὀλίγους ἀγωγή), ὑμεῖς οἱ καθήμενοι ἔτι ἀσφαλέστερον ποιήσατε. καθ' ἕκαστον γὰρ καὶ μηδ' ὑμεῖς ἑνὶ λόγῳ, ἀλλὰ πρὸς τὸ μὴ δοκοῦν ἐπιτηδείως λέγεσθαι εὐθὺς ὑπολαμβάνοντες κρίνετε. καὶ πρῶτον εἰ ἀρέσκει ὡς λέγομεν [86] εἴπατε [Mynott 2013, 379 : we see that our discussions are not to take place before the popular assembly – no doubt to prevent us from deceiving the people at large with one continuous presentation of persuasive arguments that would go unchallenged (for we do realise that this is the point of your bringing us before this smaller body). Why then don't you who sit before us adopt yet one further safeguard ? Why don't you too deal with the issues point by point rather than in just one speech and take up straightaway anything you object to in what we say ? And you can begin by saying if this proposal is acceptable to you] » (*Thucydidis Historiae* V, 85-86 with Frazier 1997 and Tsakmakis 2006 but, *pace in terra agli uomini di buona volontà*, without Spina 2019). [a] « THUCYDIDES ON THINGS SAID ». The nature of Thucydides' reports of words traded on different memorable – and not so memorable – occasions has been debated forever. West 1973a provides a handy description and listing of Thucydides speeches (a detailed synopsis is also to be found in Mynott 2013, 624-628) ; Rood 2015 offers an all-purpose survey of – and rich bibliography about – the reception of the so called « archaeological » section (most notably I, 22) where Thucydides is quite forthcoming about how much invention he resorted to in order to supplement available evidence. In fact, Thucydides is so candid about the approximation issue that – as Pelling 2000, 115 aptly put it – « the only feature which most interpreters share is their confidence in their interpretation, and their utter bemusement that others should not see it the same way ». Wilson 1982 – arguably one of the most lucid assessments of Thucydides' authenticity claim – will serve here as a convenient *terminus a quo* for a few bibliographical bearings : Loriaux 1982 ; Dover 1983 ; Plant 1988 and 1999 ; Orwin 1989 ; Bicknell 1990 ; Develin 1990 ; Porter 1990 ; Badian 1992 ; Rengakos 1996 ; Garrity 1998 ; Nicolai 1998 and 2011 ; Tsakmakis 1998 ; Porciani 1999 and 2007 ; Winton 1999 ; Farber & Fauber 2001 ; Greenwood 2006, 57-82 ; Scardino 2007, 399-416 ; Moles 2010 ; Schutrumpf 2011 ; Dorion 2013 ; Feddern 2016 and 2018 ; Liberman 2017, 49-64. Despite not making the chronological cut, we should also mention, at the very least, a bibliography that covers one hundred years of previous Thucydidean scholarship on speeches, West 1973b, a note on the most problematic aspect of the debate, namely the meaning of τὰ δέοντα μάλιστ' εἰπεῖν in I, 22.4, Winnington-Ingram 1965, plus Huart 1973 and Cogan 1981. For some reason, Thucydides' portrayal of Nicias – the superstitious old fart whose weak leadership and inferior military skills have been held largely responsible for the Syracusan disaster – has enjoyed a considerable amount of scholarly attention and interest. His speeches, letters and battlefield addresses have been studied as a case in point for assessing Thucydides' fairness as a more or less informed observer by Westlake 1941, Murray 1961, Adkins 1975, Del Corno 1975, Marinatos 1980, Lateiner 1985, Zadorojnyi 1998, Morrison 2006, Niedzielski 2017, Tompkins 2017 and Titchener & Damen 2018. [b] « THE MELIAN AFFAIR ». If one does not dismiss the whole episode as a later interpolation – a neat trick if you ask me, albeit a bit controversial : in recent times, Hemmerdinger 1948 actually came up with this rather elegant solution to the Melian conundrum, but few have followed in his footsteps, apart Canfora 1970, 1971 and 1992 (as well as one of Canfora's pupils, namely Cagnazzi 1983) – then he or she's in for the bibliographical ride of a lifetime… « there is no keeping up with the bibliography » dispiritingly declared Andrewes 1970, 182, taking his cue from Wassermann 1947, 18 note 1 (« there is hardly any book or article on Thucydides which does not mention the Melian Dialogue, etc. »). Skipping over international relations, political and security studies whose dubious or inexistent philology and the occasional lack of concern for getting at least the facts straight should deter even the most compulsive reader (e.g., Lunstroth 2006, 99 : « the "Melian Dialogue", a debate between two Athenian generals and members of the Melian "magistrates and the few", etc. » where does Thucydides say that "two generals" – presumably Cleomedes and Teisias – spoke for the Athenian expeditionary corps ? this is not what is suggested in V, 84 : « λόγους πρῶτον ποιησομένους ἔπεμψαν πρέσβεις κτλ. » Alas, Lunstroth did not care to share where this particular insight came from – is it just possible that this precious piece of information [sic] lingered in one of the several Wikipedia entries Lunstroth took the trouble to look up ? … there, I said it. A pedant might offer Dionysius of Halicarnassus στρατηγοί at *De Thucydide*, VII, 40 as a tentative source, but to what avail ? there's nothing to be salvaged anyway), also leaving aside anachronistic perspectives (cf., e.g., Alker 1988's « neoclassical polymetrics » or Mara 2008's, 46-54 « psychocultural » and « game-theoretic » gimmicks), we'll narrow it down to the body of studies devoted to the literary aspects of the alleged exchange between Athenian envoys and Melian oligarchs : De Sanctis 1930 ; Méautis 1935 ; Deininger 1939 ; Hudson-William 1950 ; Andrewes 1960 ; Stahl 1966, 158-171 ; Amit 1968 ; Liebeschuetz 1968 ; Volk 1971 ; MacLeod 1974 ; Radt 1976 ; Rengakos 1984 ; Gomez-Lobos 1989 ; Seaman 1997 ; Vickers 1999 ; Morrison 2000 ; Roman 2007 ; Greenwood 2008 ; Vimercati 2008 ; Boyarin 2012 ; Von Reden 2013 ; Kurpios 2015 ; Fragoulaki 2016 ; Ponchon 2017, 286-314.

Artful a fabrication though it is likely to be – and the whole speech definitely smacks of invention supplementing evidence (emphasis on invention) [29] – the unmitigated brutality and verbose callousness of the Athenian spokesmen in the so-called Melian dialogue present us with an interesting linguistic pattern nonetheless. As Thucydides had it, Athenians pursued a conscious strategy consisting, primarily, in downplaying the emotional response morally loaded words like « justice », « injustice », « courage », « piety », « honour », « shame », « uprightness », « bravery », etc. were supposed to elicit from any self-respecting Greek leader. Accordingly, from the very start, they strove to neutralize the power of such « alluring expressions », claiming – for instance – that they would neither rely on them (V, 89 « ἡμεῖς τοίνυν οὔτε αὐτοὶ μετ' ὀνομάτων καλῶν, κτλ. [as far as we're concerned, we won't resort to fine words, etc.] »), nor allow their Melian counterparts to use them in order to talk their way out of their current predicament (V, 89 : « οὔθ' ὑμᾶς ἀξιοῦμεν ὡς ἡμᾶς οὐδὲν οἴεσθαι πείσειν κτλ. [we don't expect you to think that you can convince us either, etc.] »). [T6] achieves this process of linguistic demystification : since the Melians, being the pompous asses that they were, proved utterly impervious to the recommendation to steer clear of all idle talk about justice and honour as irrelevant and beside the point (V, 89 : « ἐπισταμένους πρὸς εἰδότας ὅτι δίκαια μὲν ἐν τῷ ἀνθρωπείῳ λόγῳ ἀπὸ τῆς ἴσης ἀνάγκης κρίνεται, κτλ. [Hornblower 2008, 233 : we both know that in the discussion of human affairs, justice enters only when there is a corresponding power to enforce it, etc.] »), the Athenians urged them to resist the power of seduction of such deceptive words (ὀνόματος ἐπαγωγοῦ δύναμις), lest they succumb to their charm (ἡσσηθεῖσι τοῦ ῥήματος ἔργῳ) and, hell-bent on living up to their own pious incantations, they end up losing everything. Truth be told – but we enter here into uncharted territory without much reason to do so – as [T6]'s subtle wordplay (αἰσχρὸν, αἰσχύνη, αἰσχίω) suggests, Athenians went further still : not only did they strip all the καλὰ ὀνόματα the Melians could muster of the sentimental value and emotional associations they ordinarily conveyed, but they also reassessed them in the light of the situation at hand by shifting the traditional standards of praise and blame from slavish submission (V, 86 : δουλεία ; V, 92 : δουλεῦσαι ; V, 100 : δουλεύοντες) to doing whatever it takes to avoid enslavement (V, 100 : πᾶν πρὸ τοῦ δουλεῦσαι ἐπεξελθεῖν), namely taking up arms in order to preserve one's own freedom. If the Melians were to listen to the Athenians, then doing the honourable thing – that is, holding their ground in the face of impossible odds instead of giving in to fear and despair – would have been a shame more shameful (αἰσχύνη αἰσχίων) than demeaning themselves by surrendering and living on in shame. For the Athenians' insinuation to pay off, the word « αἰσχρὸν » had to retain its power and convey the moral stigma it carried before, so that people might still be goaded into avoiding whatever the word came to be attached to. Accordingly, what changed was not so much the meaning of the word, but its reference through the self-serving reappraisal of the way it applied to deeds. Of course, Athenians were neither the first nor the only ones to wreak such abuse upon language. What happened to αἰσχρὸν in Melos was not so different from what happened in Corcyra (and elsewhere) to ἀνδρεία and other fine words caught in the linguistic turmoil which, according to Thucydides, matched the upheaval and excesses of the conflict turning to ubiquitous civil strife : « τὴν εἰωθυῖαν ἀξίωσιν τῶν ὀνομάτων ἐς τὰ ἔργα ἀντήλλαξαν τῇ δικαιώσει. τόλμα μὲν γὰρ ἀλόγιστος ἀνδρεία φιλέταιρος ἐνομίσθη, κτλ. [Mynott 2013, 212 : men assumed the right to reverse the usual values in the application of words to actions. Reckless audacity came to be thought of as comradely courage, etc.] » (III, 82) [30].

[29]. If we are to believe Thucydides and get along with the idea that Melians were actually offered terms and that those terms were not so harsh that no amount of pedagogy would have convinced them to comply (« μέτρια προκαλουμένη » at [T6] 111.4 might suggest just that ; on the other hand, V, 91-92 puts Melian submission in a far bleaker light, as does V, 97 : καταστραφῆναι sounds pretty ominous to me), then we have to admit that envoys on both sides got off to a bad start and basically had it all backwards. What follows is merely a cautionary tale about the dangers of reading too much into the dialogue (as did, among others, Price 2001, 195-204 and Viansino 2007 who construed it as a communication breakdown of tragic proportion between irreconcilable worldviews ; and Coleman 2010, 82 who went so far as to make of Melos' talks the paradigm of « incommensurable conceptual schemes » clashing together, which is outright extravagance). On the one hand, Athenians should have known better than to take seriously the last simpletons of a kind that had long become a laughing stock all over Greece (III, 83 : « οὕτω πᾶσα ἰδέα κατέστη κακοτροπίας διὰ τὰς στάσεις τῷ Ἑλληνικῷ, καὶ τὸ εὔηθες, οὗ τὸ γενναῖον πλεῖστον μετέχει, καταγελασθὲν ἠφανίσθη [Mynott 2013 : simplicity of spirit, which is such an important part of true nobility, was laughed to scorn and vanished] » with Crane 1998 and Williams 1998). How do you expect to reason with people eager to gamble their very survival on a bunch of poor assumptions about the righteousness of their cause, the goodwill of the Gods (or the Spartans' for that matter) and the amenability of their foes to sail back home empty handed but fully enlightened about the wickedness of their ways – as if anybody mounted educational expeditions and dispatched ships by the dozens just to teach their neighbours a lesson in political realism ? On the other hand, what is there to say about the Melians, apart from the fact that they could not have botched it any worse had they done it on purpose ? What were they thinking ? You simply don't get in the way of a charging bull – this only pits your weakness against its strength. What do you do instead ? Nothing. As long as rebellion or resistance get you nowhere, you bide your time in shame, the same exact way Athens' other allies were biding theirs (as foreshadowed in V, 91), bearing in mind that if you leave bullies to their own devices, they will self-destruct sooner than later, screw up big time and butcher their lives – just like Aussie legend Steve-o-Bradbury did back in 2002 (https://youtu.be/5fFnSRKUBFU). Then – and only then – you are welcome to join the lynch mob and have all sorts of fun, starting with the kind of atrocities Athenians fretted over after the Sicilian failure (VIII, 1) and, even more so in the wake of the Aegospotami defeat (Xenophon, *Hellenica* II, 1.30-32, 2.3 and 6-10), when such atrocities were allegedly (Ehrhart 1970 ; Bommelaer 1981, 103-115 ; Wylie 1986 ; etc.) – but most likely (Strauss 1983 ; Robinson 2014 ; Kapellos 2019) – visited upon them, to some extent at least (Spartans can be such killjoys sometimes).

[30]. Language as a collateral victim of the violent disruption brought about by civil war is yet another favourite topic in Thucydidean studies (« the most celebrated aspect of Thucydides' presentation of stasis is his discussion of the debasement of language », as Orwin 1988

Working a linguistic angle on opponents and audience, especially by telling them what they wanted to hear, was not outside the dialectical compass of well-trained practitioners, by any stretch of the imagination [31]. That being said, the power of words expert dialecticians were expected to harness in [URTEXT] – if they hoped to avoid running into all sorts of discursive hazards – carries little or no emotional weight. The δύναμις of a word or its worth is but its meaning, that is the thing or things it can stand for, irrespective of whatever the word itself makes people feel like when they either utter or hear it. Our claim rests both on contextual and internal evidence, which – as we briefly pass it in review – will lead us to [URTEXT]'s main thread, namely the pebble analogy we'll discuss next.

To start with, the equivalence between what a word means and what a word is worth is well attested both in Aristotle and contemporaries sources :

> [T7] *Lysiae In Theomnestum* 7, 90.24 - 91.5 : « ἐγὼ δὲ οἶμαι ἡμᾶς, ὦ ἄνδρες δικασταί, οὐ περὶ τῶν ὀνομάτων διαφέρεσθαι ἀλλὰ τῆς τούτων [91] διανοίας, καὶ πάντας εἰδέναι ὅτι, ὅσοι <ἀπεκτόνασί τινας, καὶ ἀνδροφόνοι εἰσί, καὶ ὅσοι> ἀνδροφόνοι εἰσί, καὶ ἀπεκτόνασί τινας. πολὺ γὰρ <ἂν> ἔργον ἦν τῷ νομοθέτῃ ἅπαντα τὰ ὀνόματα γράφειν ὅσα τὴν αὐτὴν δύναμιν ἔχει· ἀλλὰ περὶ ἑνὸς εἰπὼν περὶ πάντων ἐδήλωσεν [Todd 2000, 105 : but in my view, gentlemen of the jury, you must decide on the basis not of the words but of their meaning (διάνοια) : you all recognize that those who kill people are also man-slayers, and those who are man-slayers have also killed people. It would have been a considerable task for the lawgiver to write all the words that have the same meaning (δύναμις), but by talking about one of them, he made clear his views about them all] ».
>
> [T8] *Aristotelis Rhetorica* III 2, 1405b 4-7 and 15-17 : « κάλλος δὲ ὀνόματος τὸ μὲν ὥσπερ Λικύμνιος λέγει, ἐν τοῖς ψόφοις ἢ τῷ σημαινομένῳ, καὶ αἶσχος δὲ ὡσαύτως. […]. τὰς δὲ μεταφορὰς ἐντεῦθεν οἰστέον, ἀπὸ καλῶν ἢ τῇ φωνῇ ἢ τῇ δυνάμει κτλ. [the beauty of a word lies, as Licymnius says, either in its sound or in the thing the word stands for, and the same goes for its ugliness. (…). Therefore, metaphors should be drawn from words whose beauty lies either in the vocal sound or in their meaning, etc.] ».
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> [T9] *Aristotelis Analytica priora* I 39, 49b 3-9 : « δεῖ δὲ καὶ μεταλαμβάνειν ἃ τὸ αὐτὸ δύναται, ὀνόματα ἀντ' ὀνομάτων καὶ λόγους ἀντὶ λόγων καὶ ὄνομα καὶ λόγον, καὶ ἀεὶ ἀντὶ τοῦ λόγου τοὔνομα λαμβάνειν· ῥᾴων γὰρ ἡ τῶν ὅρων ἔκθεσις. οἷον εἰ μηδὲν διαφέρει εἰπεῖν τὸ ὑπολῃπτὸν τοῦ δοξαστοῦ μὴ εἶναι γένος ἢ μὴ εἶναι ὅπερ ὑπολῃπτόν τι τὸ δοξαστόν (ταὐτὸν γὰρ τὸ σημαινόμενον), ἀντὶ τοῦ λόγου τοῦ λεχθέντος τὸ ὑπολῃπτὸν καὶ τὸ δοξαστὸν ὅρους θετέον [Smith 1989, 56 : one ought also to substitute things which have the same value for one another (words in place of words, phrases in place of phrases), whether a word or a phrase, and always to take the word instead of the phrase : for the setting out of terms will be easier. For example, if there is no difference between saying that the believable is not the genus of the opinable and that what is opinable is not just a certain kind of believable (for what is signified is the same), then "believable" and "opinable" should be put as terms in place of the phrase stated] ».

As Lysias states in [T7] – and will illustrate through a remarkably aggressive exemplification [32] – different words have the same δύναμις as long as they have the same meaning. Accordingly, in the eyes of the law, blaming someone for beating his mother or accusing him of battering the woman who gave him birth should not be treated differently ; in the same vein, the accusation of throwing away one's shield should carry the same exact weight as the reproach of abandoning or relinquishing it – why ? because, even though the actual wording differs, what is referred to boils down to the same thing [33]. That is to say – with Aristotle's [T9] [34] – whenever

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put it). Amongst those who have insisted on the axiomatic import of the ἀξίωσις τῶν ὀνομάτων ἐς τὰ ἔργα in III, 82, we should mention : Müri 1969 (whose early suggestion that there is more to III, 82 than simple μετονομασία was remarkably on the mark as was his comparison between Greek during the iron age of στάσις and German under Nazi rule ; at any rate, it is far more convincing than the alleged analogies with Orwell's Newspeak and Spanish propaganda drawn by Edmunds 1975, 834-835 and Thompson 2013, 273-274 and 286-288 respectively) ; Hogan 1980 (whose interest in the partisan « judgment of worth or estimation » perverting the « customary use of words to assess worth, to praise and blame » was also much to the point) ; Wilson 1982b (whose idea that post-stasis rhetoric cashed in on the usual meaning of words, which did not change, is germane to the point we've just made) ; Loraux 1986 (developing Hogan's and Wilson's views and introducing an interesting parallel with *Rhetorica* I 9, 1367a 33 - 1367b 4). A few more references to complete the picture : Solmsen 1971 ; Macleod 1979 ; Worthington 1982 ; Swain 1993 ; Piovan 2017 (in fact, an English translation of an essay in Italian published the same year or the other way around) ; Spielberg 2017.

[31]. Whether he asked questions or answered them, it was in the dialectician's best interest to cultivate an unthreatening demeanour (on Aristotelian « irony » cf. e.g. *Sophistici elenchi* 12, 172b 21-24 as well as *Topica*, VIII, 1, 156b 4-9 and 18-20), lest he got both the competition and the assistance all riled up, which would only make it harder to get the right answers out of his respondent and to get a sympathetic ear from the very people who were going to assess his performance. In particular, whenever they might have raised the suspicion of flying in the face of well-accepted views, dialecticians were well advised not only to reassure their public on the spot (cf. *Topica* VIII 1, 156b 20-23), but also to sound as little exotic as they possibly could (on Aristotle's linguistic « conservatism » cf., e.g., *Metaphysica* α 3, 994b 32 - 995a 3 and *Rhetorica* III 2, 1404b as well as 13, 1414b 15-18).

[32]. Lysias' accumulation of misdeeds and misnames has a characteristic comical effect, as interpreters have pointed out time and again (most recently : Todd 2007, 671-674 ; Colla 2012 ; Kastle 2012 ; Larran 2014 ; etc.).

[33]. The linguistic tenets of Lysias' distinction between the letter and the substance of the law are all the more interesting since – in [T7] – δύναμις is roughly synonymous with διάνοια or, at any rate, it serves the very same purpose, insofar as they are both set against ὄνομα and refer to what ὄνομα stands for in the mind of the speakers. A similar opposition between διάνοια and ὄνομα is to be found in Aristotle as well, who – notoriously – rejected a competing classification of fallacies according to which these are to be arranged in two main families which alternatively aim at the thought (διάνοια) or at its verbal expression (ὄνομα) : « οὐκ ἔστι δὲ διαφορὰ τῶν λόγων ἣν λέγουσί τινες, τὸ εἶναι τοὺς μὲν πρὸς τοὔνομα λόγους, ἑτέρους δὲ πρὸς τὴν διάνοιαν· ἄτοπον γὰρ τὸ ὑπολαμβάνειν ἄλλους μὲν εἶναι πρὸς τοὔνομα λόγους, ἑτέρους δὲ πρὸς τὴν διάνοιαν, ἀλλ' οὐ τοὺς αὐτούς [Hasper 2013, 25 : the distinction that some postulate between arguments does not exist : that there are arguments related to the word and arguments related to the thought. It is absurd to suppose that some arguments are related to the word, while others are related to the thought, without these being the same arguments] » (*Sophistici elenchi* 10, 170b 12-16 with Hecquet 1993).

the σημαινόμενον of two linguistic expressions – however different they are – is the same (ταὐτὸν), they have the same meaning or signify the same thing (ταὐτὸ δύναται). For all practical purposes, δύναμις and σημαινόμενον – as opposed to vocal sound – may thus be treated as synonyms, as Aristotle does in [T8] [35].

[URTEXT] warrants a similar conclusion. We use linguistic expressions – ὀνόματα for short [36] – instead of things as their symbols. For there are only so many linguistic items available at any given time, it is inevitable that some expressions have more than one meaning. Those who ignore it, are likely to be preyed upon by those who are familiar with the power names have not so much to hurt, elate or demean as to refer indiscriminately to different things.

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PROLEGOMENA DE ABACO. Not entirely convinced ? Aristotle himself must have thought that the point deserved further clarification, for he came up with a compelling analogy between the way we do a sum and the way we conduct an argument, which he used first – in [URTEXT], 165a 6-10 – to explain why we labour under the delusion that, if our findings sound convincingly argued for or look good on the pebble-board, then we must be right and then – in [URTEXT], 165a 13-15 – to illustrate why we are likely to be taken advantage of when we lack the proper dialectical and computational training. How to best make sense of Aristotle's comparison between the way we mishandle counters, on the one hand, and the way we lose our way with words, on the other ? If the question is worth asking at all, it should come as no surprise that getting to the bottom of it will involve challenging a few entrenched ideas. It will also require that we either add new pieces of information or highlight previously neglected ones. As usual, a combination of both is what we need in order to explain the abacus facts behind Aristotle's simile. Hence, after we bulldoze our way through a few false assumptions about ancient reckoning boards' arrays and inscriptions, we'll focus on two of its most distinctive features. Whilst one (i.e. the abacus being a positional system through and through) holds little mystery for the educated crowd, the other (i.e. the abacus' place value system being hybrid in more than one sense, as opposed to it being abstract and homogeneous) has not yet received the attention it deserves. For obvious reasons, the latter deeply affects our understanding of the former : by and large, the nature of the abacus' scale and arrangement determines what its positionality is all about. Therefore, taking it into account is likely to result in a new way of looking at an old problem.

RAIDERS OF THE LOST ABACUS. A great deal of guesswork and no small amount of amateurism have gone into the reconstruction of ancient counting boards. Another partisan review of the past and current status of abacus studies would only add confusion to an already confused field. More to the point, it would neither achieve much by itself nor shed much light on Aristotle's pebble analogy. For one thing, we can hardly fall back on the all-too-perfunctory surveys provided in past years by non-specialists like J.P. Pullan (who, apparently, never divulged his first name) or Parry Moon [37]. For another, we would not be better off were we to put our stock in recent endeavours which display more courage than wisdom and turn out to be highly speculative at best and very much mistaken at worst. Since it has a reputation as the « most comprehensive », « valuable », « timely », etc. treatment of Greek counting boards and is especially praised for « presenting an astonishingly extensive record of everything one can find in Ancient Greek literature on the subject » [38], Schärlig 2001 (Prix F. Zappa 2003) is definitely a force to be reckoned with [39]. And – no doubt – when it comes to pushing the philological envelope as well as going against the grain, Schärlig 2001 truly is in a league of its own. Its conspicuous inaccuracies and

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34. For the most recent – and most detailed – survey of what analytical ἔκθεσις is about, cf. Crubellier, Marion, McConaughey & Rahman 2019 ; one will welcome the great novelty of the novelty part and, for the benefit of the binge reader, add to the already rich bibliography a couple of antiquarian curiosities (Rescher & Parks 1971 and Hintikka 1978) and at least as many landmark studies (Mignucci 1991 and Ierodiakonou 2002).

35. As far as [T8] is concerned, Zanker 2016, 67 note 106 has already made the point abundantly clear.

36. Characteristically, Aristotle does not burden [URTEXT] with subtleties he displays elsewhere. In this particular instance, the distinction he makes in *De interpretatione* 3, 16b 6-7 between ὀνόματα (names) and ῥήματα (verbs or predicates) – which is all the more understandable since, to an extent, it is a distinction in name only : « αὐτὰ μὲν οὖν καθ' ἑαυτὰ λεγόμενα τὰ ῥήματα ὀνόματά ἐστι καὶ σημαίνει τι [by themselves and said for themselves, verbs are names and signify something] » (3, 16b 20-21). See Graffi 2020, 80-88 for a recent survey of relevant issues in Aristotle and Ademollo 2015 for a similar overview as far as Ancient Philosophy at large is concerned.

37. Pullan 1968, 16-29 ; Moon 1971, 21-28. For all their good will and conciseness, there's not much to go on here and, more to the point, very little we can actually use to explain Aristotle's analogy. If we were to go all the way back and begin at the beginning, we would be rewarded with some fine pieces of early abacus scholarship : Saglio 1877 ; Hultsch 1893 ; Nagl 1899, 1903, 1914 and 1918. Time travellers are advised to expect some turbulence though, especially while going through the Pritchett-Lang controversy back in the sixties and the fifties : Lang 1968 (cf. already Lang 1956), 1965, 1964 and 1957 ; Pritchett 1968 and 1965 ; Wyatt 1964.

38. Cf. e.g. Cuomo 2004, Ribémont 2001, Ineichen 2002 and Fromentin 2003.

39. It would be remiss of me if I singled out Alain Schärlig for criticism and, doing so, I missed the wood for the tree. The truth is that, for all its exuberance, the forest that has outgrown Schärlig's milestone study is of much superior quality – certainly – but, more often than not, it concerns itself with local (or tangential) issues : Knoepfler 2001, 78-81 ; Mathé 2009 ; Marcellesi 2013, Rousset 2013 ; Doyen 2014 ; Schärlig 2014 (which is as much about ancient accounting as it is about, say, ancient horse breeding or ancient swordsmanship).

preposterous suggestions should give even the layman reader pause [40]. They certainly go a long way towards explaining why it has never been so tempting to refine the whole abacus-thing out of existence. Amongst those who think we should dispense with it altogether, Reviel Netz is arguably the most extreme, according to whom « ultimately, the very notion of the abacus as a clearly defined artefact is misleading » or, at any rate, « designated abaci are less important than the skills that make them so easy to construct and use on an ad hoc basis » [41]. Yet another case of a remedy worse than the disease ? One thing is for sure : if the abacus is not so much a material device as a « state of mind », then we are simply left with nothing to be right or wrong about Aristotle's analogy. In fact, for it to work, there must be more to manipulating the pebbles on a reckoning board than Netz' mere arithmetic skills at play [42].

So, where does this leave us ? The long answer would be somewhere between a rock and a hard place, for nobody in their right mind would either abide by Netz' suggestion and throw the baby out with the bathwater or follow in Schärlig's footsteps and throw good money after bad. Luckily for us, the short answer skirts the problem altogether. In fact, strange though it may sound, Netz' easy way out of the predicament of piecing together how the ancient abacus actually worked and Schärlig's headlong rush into it have more than meets the eye in common. To start with, they share two related, albeit mutually exclusive, misconceptions. The first is the odd idea that – for all practical purposes – the abacus' arrangement mirrored the decimal system, its columns and rows conveniently matching units, tens, hundreds, thousands, etc. The second is the even odder idea that the inscriptions on several of the surviving abaci were a nuisance to the extent that, being inconsistent to a fault with the decimal system itself, they made actual calculations harder than they already were (as opposed to making them easier, as one would expect). The first assumption – the « decimal bias » (hereafter referred to as [BASE-10 BIAS]) – is simply mistaken and betrays little or no awareness of the epigraphic and literary evidence. The second assumption – the « booby-trapped abacus bias » (henceforth noted [COMPLICATION BIAS]) – simply defeats the purpose of resorting to the abacus in the first place and betrays a poor understanding of the abacus' practical vocation which, most assuredly, was not to add to the very problem it was meant to solve.

PARS DESTRUENS (MALLEUS ABACISTARUM). Before we discard both misgivings, let's dwell a little longer and in modest detail on each :

[BASE-10 BIAS]. As it will become clear through a cursory survey of the literary and epigraphic evidence, relevant sources and surviving abaci – at least those which still bear inscriptions – typically refer to non-decimal monetary or weight values (as in « so and so much worth of etc. »). As a matter of fact, with so few exceptions as to make no difference, no known document alludes to numeric values as such in connexion with the abacus, let alone abstract units, their multiples or fractions. Although most of the available evidence points in the opposite direction, Alain Schärlig and Reviel Netz take it for granted that the ancient abacus was the practical implement of an abstract, homogeneous calculation system. « Abstract » insofar as lines and spaces between – columns, for short – stood for abstract numeric digits. Or so the story goes. « Homogeneous » insofar as the abacus layout was a plain arithmetic scale, each column standing in the same relationship to the next and its value consistently increasing – or decreasing – by the same factor : times 10 no doubt. Or so the story goes again.

Truth be told, the idea of a « decimal abacus » (Schärlig 2001, 182) is not so new. On the contrary, it is as tough as old boots, more's the pity it hasn't got a leg to stand on then. Some thirty-five years before the discovery of the first abacus in Salamis, Delambre 1811, 205 (a loose English adaptation of a French mémoire of 1807) already suggested that its columns stood for units, tens, hundreds and thousands. Nagl 1914, 5 and 1918, 5 took the notion for gospel ; as did Heath 1921, 46 ; Smith 1921, 7-8 and 1925, 158 ; Cajori 1928, 22 ; and

[40]. In the historians' business, it is the details that sell the story and, as often as not, Alain Schärlig gets them wrong. Even if one leaves out the occasional misattribution (Schärlig 2001, 181 : Aristotle is quoted, almost chapter and verse, from a work, the *Sand Reckoner* or Ψαμμίτης (*Arenarius*), whose authorship is commonly ascribed to Archimedes) as well as the trivial embroidery (Schärlig 2001, 28 : where does the discussion about tides, in Alexis' fragment 15, come from anyway ?), literary forgery is where old fashioned readers usually draw the line : what are we to make of Schärlig's most egregious blunder (Schärlig 2001, 25), namely the longish and tedious (no kidding : « longue et fastidieuse ») description of how we use fingers for numbers in the « Esperanto of sorts » Aristotle must have learned buying vegetables or whatever he was purchasing at the Athenian marketplace where people notoriously did business all day despite the fact they did not speak the same language ? If you can't recall where exactly Aristotle dealt with finger-numbering and would like to find out, you'll have to ask Schärlig himself, for he's probably the only one who knows for sure. (Hunain ibn Ishaq, whose Arabic paraphrasis of the peripatetic physical problems Schärlig, ever the erudite, did not care to mention, would certainly have had a few interesting things to contribute ; unfortunately, he's not been around for a long time and – God rest his soul – did not divulge where the whole fingers stretching and bending digression – *Problemata physica arabica* XVI 2, 648.56 et sq. – came from). Admittedly, philological sloppiness – a venial sin, if a sin at all – is no indication as to whether Schärlig's account of the ancient abacus is flawed too. We have at least a couple of reasons to believe it is and we'll get there in a moment.

[41]. Netz 2002a, 327, minus a « perhaps » at the beginning of the sentence.

[42]. It might seem a bit unfair to turn tables on Reviel Netz and nit-pick him apart while relying – heavily at that – on his brilliant characterisation of Ancient Greek numeracy. Guilty as charged, Your Honour ! we're all in Netz' debt and he's most likely forgotten more about these matters than your average scholar is likely to ever learn. More to the point, even if he's not the first (already in the late Eighties, Høyrup 1989's notion of « sub-scientific mathematics » covered pretty much the same ground), he's certainly taken « Greek practical mathematics » (another convenient label for roughly the same field by Asper 2003 and 2009, 108-114) to an all different level, starting with the « counter culture » pun, which – in the words of Giordano Bruno – « se non è vero è molto ben trovato ».

Thomas 1939, 35. The idea still lingers here (Sugden 1981 ; Vilenchik 1985 ; Swiderek 1998) and there (Teeuwen 2003, 353 ; Molland 2013, 517 ; Woods 2017, 419-420), and it will for the foreseeable future – if only because Reviel Netz lent it considerable credit :

> « the ancient Mediterranean abacus – the normal instrument for any calculation in Archimedes' world – simply was a decimal, positional system. [...]. In other words, the instrument consists of a series of scratches dividing rows to which the calculator assigns, for the given calculation, values such as "units", "fives", "tens" and onwards » (Netz 2003, 260 ; cf. Netz 2002a, 326-327 and Netz 2002b, 275-276).

[COMPLICATION BIAS]. If the facts don't fit the theory, change the facts or, failing that, explain them away. Unlike other – more result-driven – scientists, historians usually deem tampering with the evidence beneath them. On occasion, however, all they have to offer as an explanation is so far-fetched that one can't help but wonder whether they're really any better off for it. This must be one of those occasions. As a matter of fact, it defies reason to suggest that rational people – and certainly Ancient Greeks were as reasonable as you and me – would knowingly mess up their abacus for no other reason than to make their computational routine more exciting. Incongruous though this is, it is precisely what a number of specialists fall back on when they realize that, first, it is not possible – by any stretch of the imagination – to match the surviving abacus' monetary (and ponderal) inscriptions with a decimal scale and, second, for that very reason, [BASE-10 BIAS] simply cannot be defended on factual ground. Clutching at straws, they came up with the not so brilliant notion that, for all their smartness, Ancient Greeks built a flaw into their abacus design. Worse yet, in spite of the obvious and most unfortunate drawbacks (we're talking about counting money and goods, for crying out loud), they never cared to fix the issue – which is, by the way, as strong an indication as any that there never was anything wrong with it in the first place.

Lest I give the impression that I'm swinging at a strawman of my own construction, let him speak for himself. In the words of the greatest abacist of recent times :

> « to begin with, let it be known that one talent was worth six thousand drachmas. As a result, Ancient Greeks did not pass from thousands to tens of thousands ; on the contrary, they went from thousands to sixains of thousands. This was a breach of the base-10 routine and a pitfall on the abacus. […]. More departures from the base-10 norm (and, consequently, more traps on the abacus !), below the drachma this time : one drachma was worth six obols and one obol was worth eight coppers » (Schärlig 2001, 47).

With friends like that, who needs enemies ? If we were to follow Schärlig's reconstruction, we would end up with more misleading symbols on the abacus' edges than dependable ones – which is downright absurd or « it is not a bug, it is a feature » kind of hilarious (truly, some things never change !). Why on earth – if you don't mind my asking – would anyone have suffered to be misled more often than not when he laid eyes on the abacus ? Because this is precisely what would happen if a good half of the abacus' inscriptions turned out to be at odds with its alleged computational standard.

Truth be told again, the idea of a counting board riddled with « complications » (Schärlig 2001, 182, 208) is not that new either. Quite the opposite, its pedigree is as old as the first recorded archaeological discovery, for Alexandros Rizos Rangavis – who described the Salamis abacus as early as 1846 – was well aware that the inscriptions it bears are acrophonic symbols of sorts, yet he could not make out how they were supposed to make it easier to work with numbers : « we don't know much about such boards. That being said, if we are to believe that their arrangement was meant to help with arithmetical operations, then our slab does not seem to have served such purpose in the least » (Rangabé 1846, 297) [43]. And rightly so, one might add, at least as long as our focus is on « arithmetical operations » as such rather than on the more specialized calculations we'll bring into the picture later on [44]. Unsurprisingly, classicists and historians of mathematics did not think much of the

[43]. Rizos Rangavis made the exact same point a few years later (cf. Rangabé 1855, 590), as though Jean Antoine Letronne's answer (Letronne 1846) and Alexandre Joseph Hidulphe Vincent's comments (Vincent 1846) in the meanwhile had been to little or no avail and had left him as unconvinced as he was to start with. Unless we break the mould, history is going to repeat itself, eventually. Abacus studies are no exception and the Laurion specimen (Laurion Museum, 90) presents us with a later – and slightly more complicated – example of the same conundrum. Although West 1992b made short work of Themelis 1989 allegation that the abacus inscription was a musical notation of sorts, he could not make out why the abacus' numerical symbols did not follow a tidy numerical pattern. « They do not continue the mathematical series correctly », he complained, « 1/2 = 0.5, but then we ought to have 1/20 = 0.05, and in the second line 1 ought to be followed by 1/10 and 1/100. However, they do seem to represent an attempt to continue the series with successively smaller fractions. The sage has simply used symbols current for subdivisions of the drachma and obol, going down to the minimal chalkous (X), instead of being fastidious in his arithmetic and having to find notations for unfamiliar fractions » (West 1992b, 27-28). Either I am much mistaken or this whole talk about discontinued or incorrect numerical series is completely off-target. If the Laurion abacus – as well as several others – is inscribed with the subsequence « 1 drachma, 3 obols (= a half-drachma), 1 obol, 4 coppers (= a half-obol), 1 copper », this was no coincidence – it was no mistake either, nor the whim of a poorly trained individual : it simply speaks volumes in favour of the commercial and financial nature of the abacus assisted operations, in fact transactions (I definitely side with Spuridês 1993, 66-72 on this one).

[44]. Chiesa 1991, 226-236 paved the way for this line of approach with his translation (p. 226 : « nous supposons que ce qui se passe dans les mots se passe aussi dans les choses comme il arrive à ceux qui comptent les suffrages en utilisant des cailloux ») and focus on « vote counting » rather than calculation at large (p. 228 : « there is an analogy between the sophistical understanding of language and the process of vote casting, where pebbles allow voters to make their electoral choices known »). We'll show that this cannot possibly be the kind of specialized reckoning Aristotle – who, by the way, was perfectly familiar with the role counters and court abaci played in juridical and

Salamis abacus. They occasionally dismissed it as a crude approximation of what a proper reckoning board should look like (Nagl 1918, 6), and – for lack of a better one (which, of course, no one is going to dig up any time soon) – they came to the rather disheartening conclusion that « the Greeks, in fact, had little need of the abacus for calculations » (Heath 1921, 51), thank you very much !

Despite Schärlig's brave effort, the whole concept might have been conveniently left to wither on the vine, had Reviel Netz not revived it, in rather a bold fashion at that :

> « for the abacus, one should note a complication – actually a rather minor one. As was already seen for obols and drachmas (and as is largely true for the higher denominations, minas and talants), the units involved do not fall into a simple decimal pattern, etc. » (Netz 2002a, 332).

Reviel Netz should have left it at that and let people trust him implicitly – as did Schärlig, who never bothered to ask why deviant inscriptions are the rule and regular ones are the exception (odd, isn't it ?). But the more brilliant a scholar, the more likely he is to forget that it is not an honest mistake that gets him into trouble – nay, it is the fancy footwork to fix it or to cover it up that does the damage. I'll have to call Mr Netz on this one, albeit reluctantly, and use his poor excuse for an explanation as a case in point. Let's go through his steps and see what happens :

> « the reason for this complicated pattern lies outside Greek history : coin denominations are parasitic upon earlier weight systems which go back to the Ancient Near East. For obvious reasons, such metrological systems are extraordinarily conservative, and even today it takes enormous efforts by governments to effect conversions into decimal systems. Thus, all Ancient Mediterranean metrological systems ultimately derived from Mesopotamian temples, whose arithmetical culture was perhaps the most sophisticated the world has ever known. The peoples of the Mediterranean had to cope somehow with a numerical system designed by highly trained scribes, masters of sexagesimal operations » (Netz 2002a, 332).

So far so good, even if the Babylonian connection strikes me as a trifle too straightforward to be taken at face value. That being said, since the ultimate origin of the non-decimal abacus' layout has no immediate bearing on the issue at hand, there's no harm in taking Netz' word for it. Which leaves us with the real question – namely how did all this come to affect the ancient abacus ? And therein, as the Bard would have it, lies the rub :

> « [a] this of course would make calculations somewhat difficult, but coin and weight calculations were effected by exactly the same [333] methods as purely arithmetical calculations. [b] Perhaps, in fact, this is why the abacus tended to be unmarked. An unmarked series of lines could serve equally well to represent "fives", "tens", "fifties", etc., or, say, "obols", "drachmas", "ten-drachmas", "minas", etc. [c] Several literary references to the abacus envisage just that, while some of the numerical markings on the edges of abaci belong to this family of symbols. [d] All one needed to do was to adjust, mentally, to the correct equivalences between neighbouring lines – and one had enormous experience with such equivalences, in daily economic life » (Netz 2002a, 332-333).

First things first, no literary reference – known to me – suggests, let alone implies, that unmarked abaci were more fashionable than marked ones ([b] : « the abacus tended to be unmarked »). In fact, there might be more of these (inscribed abaci) than a conservative estimate allows. Inscriptions were either engraved, and therefore permanent, or painted. A few traces of such temporary inscriptions still survive as in the case of the painted columns of a Corinthian abacus (SEG XI 188) used for public accounting during the Hellenistic period (cf. Donati 2010, 10a and 21a). Of course, we cannot make much out of it, but it stands to reason to assume that ephemeral inscriptions bore more of the same and that they too were pecuniary in nature and purpose [45]. Again, no literary reference – known to me – suggests, let alone implies, that one had to shift – however easily – between decimal and non-decimal systems ([c] referring back to [b] : « "fives", "tens", "fifties", etc., or, say, "obols", "drachmas", "ten-drachmas", "minas", etc. »). In fact – with one possible exception [46] – ancient Greek sources consistently stuck to the monetary standard and to the monetary standard alone.

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political voting procedures – had in mind. Nevertheless, even if Chiesa 2013, 53-59 will give up on it later on, his original effort to pin down the precise notion of computation involved in Aristotle's simile is instrumental in getting its meaning right.

[45]. The argument's circularity notwithstanding, the fact remains that there are a few more surviving abaci with monetary markings without columns than the other way around – and this should be telling. That being said, I'm afraid I'll have to concede a stalemate here.

[46]. *Euripidis (quod fertur) Rhesus*, 309-313 : « στρατοῦ δὲ πλῆθος οὐδ' ἂν ἐν ψήφου λόγῳ θέσθαι δύναι' ἄν, ὡς ἅπλατον ἦν ἰδεῖν, πολλοὶ μὲν ἱππῆς, πολλὰ πελταστῶν τέλη, πολλοὶ δ' ἀτράκτων τοξόται, πολὺς δ' ὄχλος γυμνὴς ἁμαρτῇ, Θρηκίαν ἔχων στολήν [Kovacs 2002, 387 : you could not count his host even by reckoning with pebbles, so ungraspable was it. Many were the cavalry, many the companies of shield bearers, many the shooters of arrows, and many the light troops in Thracian gear] ». The wording ἐν ψήφου λόγῳ θέσθαι is unusual (even a bit awkward as suggested by Fraenkel 1965, 238 and, more recently, by Liapis 2012, 147 and Fries 2014, 233), but the reference to the counters « positioned » on the abacus is transparent enough. Still, the Messenger's allusion to accurate calculation by means of pebbles does not give us the first clue as to how the ancient abacus worked. For all we know, the hyperbole might just as well be understood as a reminder of the large amounts of currency abacus assisted calculations could easily handle (contrary to what some seem to believe – most notably Fait 1996, 186 quoted below – there's no reason to assume that ancient Greeks expected their reckoning boards to compute infinite sums and products). Just the same, it is only reasonable to think that pebbles did stand here for soldiers and units of soldiers. As a result, an unmarked abacus or a decimal engraved one – if it ever existed – would have done the job nicely – as one can gather from Porter 1916, 60-61. Since it is immaterial for my purpose and I have very little to contribute anyway, I will not bring up the topic of the work's authorship, which – as early as Ritchie 1964 and without interruption ever since – has been debated to quite a remarkable extent (see Manousakis & Stamatatos 2018 for a recent *status quaestionis* and an interesting combination of traditional and non-traditional authorship analysis).

Be that as it may, it is the whole notion that the abacus' numerical markings made calculations somewhat more difficult ([a]) and required of the user constant mental adjustment ([d]) that is asinine and should be dismissed, full stop. To begin with, it makes no practical sense whatsoever : what's the point of using an abacus in the first place if you end up taking your calculations mentally off the board ? Money and weight calculations follow the exact same rules as purely arithmetical ones – fair enough. Now, try to preach the virtues of cognitive recalibration to a busy bunch of fishmongers, slave-traders and moneylenders working out monthly rates of interest or haggling over the price of anchovies and Phrygian beauties. More to the point, try to convince them that they are supposed to « adjust, mentally, to the correct equivalences between neighbouring lines » at the exact moment they're taking care of their main priority, namely getting paid. Chances are that all you're going to get is a colourful suggestion about where your mental gymnastics with recalcitrant notations belongs. Serious people doing serious business have a lot on their minds as it is ; the last thing they need is another aggravation, as if disloyal competitors and stingey customers did not make their life miserable enough. Why in the world should they let constant mental catching-up get in the way when all they need to do is to look at the markings on the edges of the abacus ? You do not mentally adjust when what you see is what you get (or what your customer thinks he gets) and, to be sure, honest businessmen (and dishonest ones too, especially the fishmongers) would not have it any other way.

All in all, it makes a lot more sense to think of the abacus' monetary inscriptions the other way around. It is not so much that they demanded mental adjustment each time calculators had to pretend that counters in a given column stood for some other value or arithmetical ratio than those spelled out in capital letters under their eyes. In fact, it is just the opposite : abacus' monetary inscriptions saved people the trouble of compensating for decimal discrepancies between neighbouring (and not so neighbouring) columns. Instead of calling for extra-attention at every turn – which is a sheer waste of time and energy to no particular avail – the inscriptions were put there for exactly the opposite reason : that is, to spare people the hassle of wrapping their heads around the most common operations involving different ratios (times eight, six, five, twelve, sixty, and of course times ten – in whatever order the reckoning at hand called for). After all, it is easy enough to count numbers, even big numbers, as long as they stand in the same relationship (say, a neat decimal one). It is a whole different story to make out figures, even small ones, as soon as they run across scales (say, coppers, half-obols, obols, drachmas, staters, minas or talents). Reason enough, methinks, to drop the idea of a flawed abacus altogether. Ancient Greeks knew better than to play havoc with their everyday tools. All things considered, it is past time we acknowledge that abacus' inscriptions are not so much part of the problem as they are part of the solution. If nothing else, we'll stop embarrassing ourselves trying to play them down. More to the point, as soon as we do away with the silly notion that abacus' inscriptions were a liability, we may start using them as the asset they were in order to figure out how the ancient abacus operated and what purpose did it actually serve. But before we turn to the literary and epigraphic evidence which has only been hinted at so far, there's at least one question we should not leave unanswered – two in fact : what do all these biases have in common and, more important still, how do they hinder our understanding of why, exactly, Aristotle brought words and counters together in the prologue of the *Sophistici elenchi* ?

HOW DID IT COME TO THIS (AND WHY DOES IT MATTER) ? For all their differences and nuances, contemporary views on ancient counting boards labour under the same basic assumption and, as a consequence, they share the same shortcomings :

- on the one hand, once pebble-boards are equated with a « state of mind » and the abacus functions as a catchword for the maths rather than the reckoning skills required to operate it ;
- on the other hand, when the admittedly meagre epigraphic and literary evidence is either simply ignored or summarily laid aside ;

☐ in both cases, it becomes all too easy to lose sight of the abacus' hybrid nature and to conceive it in a rather abstract way, namely as if it were the material transcription of a plain arithmetic system (further on abbreviated as [ARITHMETICAL BIAS]).

Despite being almost universally accepted – most notably, among Aristotelian scholars who adopted it wholesale – such a view is misleading. At the very least, it calls for qualification – or so we claim. This will be provided shortly, along the lines of a more specialized notion of abacus computation, involving first and foremost monetary calculations (ordinary currency conversions, routine accounting, everyday merchant transactions and the like) – which only makes sense, considering that, in ancient sources, the abacus is most commonly associated with counting money. (A fact that has been completely overlooked by Aristotelian commentators so far).

How is it then that [ARITHMETICAL BIAS] is so popular and comes so naturally to us that we take it for granted instead of asking ourselves whether it isn't, after all, just another way of looking at the facts of the matter ? As with every issue worth discussing, the question brings its own answer along with it : there's nothing more compelling in the traditional picture than our need to deal with things on familiar terms. More to the point, we

don't realize that there's more to Aristotle's analogy than the arithmetical routine of adding, dividing, multiplying and subtracting (in whatever order and combination) simply because we've always looked at it that way. As a matter of fact, Aristotle's comparison between linguistic expressions and pebbles has largely been understood – or, rather, misunderstood – as if being skilled at moving the counters around boiled down to having a knack for arithmetical calculation as such. A page from Agostino Nifo's book – an impressive piece of Aristotelian scholarship in its own right, especially when it comes to familiarity with both Eastern and Western Aristotelian commentators [47] – is as good a landmark as any and better than most. As a matter of fact, it epitomizes the view that had long become the standard story in the Latin and the Byzantine traditions alike, and convincingly passed it down to generations to come [48] :

> [T10] *Augustini Niphi expositiones in libros De sophisticis elenchis*, 6ra : « "QUEMADMODUM IGITUR ET ILLIC, QUI NON SUNT IDONEI CALCULOS SUBSTINERE, A SCIENTIBUS DECIPIUNTUR ET IPSI DISPUTANTES ET ALIOS AUDIENTES". Epilogat ea quae dixit et dicit : "QUEMADMODUM IGITUR ET ILLIC", scilicet in supputationibus "QUI NON SUNT IDONEI CALCULOS SUBSTINERE" ut sunt numerandi scientiae imperiti, "A SCIENTIBUS" artem numerandi "DECIPIUNTUR" scilicet in supputationibus et subaudi ita etiam "IPSI DISPUTANTES" qui opponunt "ET ALIOS AUDIENTES" qui scilicet respondent, subaudi decipiuntur cum ignoraverint virtutes nominum ab iis qui eas sciunt ["JUST LIKE THOSE WHO ARE NOT GOOD AT CALCULATIONS, THOSE <who have little knowledge of the power of words> ARE DECEIVED BY THE EXPERTS BOTH WHEN THEY PARTAKE IN A DISCUSSION AND WHEN THEY LISTEN <to one>". Aristotle recapitulates what he has previously stated and says : "JUST AS IN THE CASE OF", namely just like with computations, "THOSE WHO ARE NOT GOOD AT MAKING CALCULATIONS", insofar as they are ignorant of the science of reckoning, "ARE DECEIVED" namely <are deceived> when they calculate, "BY THOSE WHO MASTER" the science of reckoning, the same happens – understand – to those "PARTAKING IN A DISCUSSION" – engaged, that is, in opposing <an argument> ; as well as to those who are "LISTENING" or play the role of those who answer <to the former's questions>, for – understand – they are deceived because they know little about the power of words and, for that reason, are deceived by those who know how this power works] ».

The fact that modern commentators have reached divergent – in fact, opposite – conclusions about the nature and purpose of Aristotle's pebble analogy should not prevent us from looking at their differences as variables bound to the same constant. As a matter of fact, [ARITHMETICAL BIAS] is so embedded in the fabric of contemporary understandings of Aristotle's simile that one simply has to tug at the thread to see their alleged variety unravel to reveal a common pattern. Admittedly, analysis grids – even broad and compelling ones – are a dime a dozen. This particular one, however, delivers more than the usual bang for your buck. If nothing else, because it comes with a routine check – provided by the text itself [49] – which allows to set different readings at

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47. While interest in Agostino Nifo as an Aristotelian commentator has steadily grown in recent years (though a trifle grandiloquent, Pattin 1991's title has a ring of truth to it ; more eloquently, De Bellis 2005 welcomed Nifo amongst Aristotelian interpreters who have achieved book-length bibliography status) – apart from a few exceptions (e.g. Ashworth 1976 and De Bellis 1997) – stakes in his logical production have not paid many dividends, yet.

48. THE TRUTH AND NOTHING BUT THE TRUTH – YET NOT THE WHOLE TRUTH. Whoever happens to be interested in the full story – including the edition of all the relevant sections in the Latin commentary tradition as well as a tribute to its unsung heroes (most notably, the Anonymus Bavaricus and William of Ockham, who got the analogy just about right, pebbles and all !) – will have to wait for the mediaeval instalment of the saga (Gazziero forthcoming).

49. There are, of course, exceptions to every rule, and [« τὸ δ' οὐκ ἔστιν ὅμοιον » TEST] has a few of its own. These are hard to come by, however, and they are best accounted for as people taking liberties with the text or relying on gross mistranslations. As for the former (exegetical liberties), cf. e.g. Rescher 2006, 108 : « The Inexhaustibility of Fact. The point is that there is every reason to think that language cannot keep up with reality's realm of actual existence. And this important point is not all that new. For the unbridgeable gulf between language and reality was already noted by Aristotle : "It is impossible in a discussion to bring in the actual things discussed : we use their names as symbol instead, and we suppose that what obtains in the names obtains in the things as well… But the two cases are not alike. For names are finite and so are their combinations, while things are infinite in number. Inevitably, then, the same words, and a single name, have a number of meanings" (Aristotle, *Sophistici elenchi*, 165a 5-13). The crux is that facts need not be exhausted by truths, etc. »… so much for the analogy between names and counters. That being said, it is pretty clear how Nicolas Rescher tested as far as [« τὸ δ' οὐκ ἔστιν ὅμοιον » TEST] is concerned. Truth be told, he wasn't the first to go down that road – Lugarini 1963, 332 had already deconstructed the text in similar fashion. He won't be the last either – Wey 2014, 324 cut Rolfes 1925's translation of Aristotle's text along the very same lines and read it accordingly : « man kann beim Disputieren nicht die Dinge selbst hernehmen, sondern gebraucht statt ihrer, als ihre Zeichen, die Worte. […]. Aber hier fehlt die Gleichheit usw. » ; as does Cosci 2014, 349 with Zanatta 1995's : « poiché non è possibile discutere adducendo le cose stesse, ma ci serviamo dei nomi come di simboli in luogo delle cose, riteniamo che quel che accade per i nomi accada anche per le cose, […]. Ma la somiglianza non sussiste etc. »). As for the latter (i.e., mistranslations), cf. e.g. Walz 2006, 244 : « an analogy that Aristotle makes in *Sophistical Refutations* may be helpful for grasping the significance of this latter point. He says : "For one cannot discuss by bringing in the things themselves, but we use names as symbols instead of the things, and we suppose that what follows about the names follows also about the things, just as those who calculate suppose about their pebbles. But it is not alike. For names and the quantity of calculations are limited, whereas things are unlimited in number. It is necessary, then, that the same calculation and one name signify for many" ». Even if one disregards the rather infelicitous rendering of « πλείω σημαίνειν » (« signify for many », as opposed to the more sensible « have a number of meanings » or « signify several things »), whatever λόγος means in [URTEXT], 165a 11-13 – and we haven't heard the last of the feud between those who understand it as « account » or « definition », on the one hand, and those who understand it as « sentence » or « utterances », on the other hand – it surely does not stand for « calculation ». If, this late in the game, one still feels like asking why, I'm not sure he or she would understand the answer anyway. Even if it is hardly part of their job description any more, a few modern translators have gone beyond and, in a few cases, above the call of duty and have made it plain where their sympathies lay. Forster 1955, 13, for one, sided with the most traditional view. His translation of [URTEXT] reads : « for, since it is impossible to argue by introducing the actual things under discussion, but we use names as symbols in the place of the things, we think that what happens in the case of the names happens also in the case of the things, just as people who are counting think in the case of their counters. But the cases are not really similar ; for names and a quantity of terms are finite, whereas things are infinite in number ; and so the same expression and the single name must necessarily signify a number of things. As, therefore, in the above illustration, those who are not clever at managing the counters are deceived by the experts, in the same way in arguments also those who are unacquainted with the power of names are the victims of false reasoning, both when they are

variance (insofar as their conclusions are actually at odds) while laying bare their fundamental agreement (insofar as they are, in reality, committed to the same underlying assumption).

[« Τὸ δ' οὐκ ἔστιν ὅμοιον » TEST]. Whoever skims – however cursorily – through [URTEXT] and the relevant literature, will acknowledge that there is no way around the puzzling « τὸ δ' οὐκ ἔστιν ὅμοιον [but this is not the same] » (165a 10) Aristotle squeezed between the first mention of those who manipulate the counters for reckoning purposes and the main reason why those who use words for the sake of arguments should not trust them at every turn. As usual, – barring the occasional reader too clever for his own good (and anyone else's) – everybody agrees that Aristotle's reasoning ties up nicely. How it is so, however, is a matter of some controversy. In a nutshell : how much stock did Aristotle put in his own simile ? Are we to take him at his word – « καθάπερ ἐπὶ τῶν ψήφων » (165a 9-10), « τὸν αὐτὸν τρόπον καὶ ἐπὶ τῶν λόγων » (165a 15) – and understand the analogy literally (linguistic expressions are to argumentation as counters are to abacus calculation, hence the way we mishandle the latter sheds some light on how we misuse the former) ? Or, should we assume that computational and linguistic symbols work at cross purposes and the analogy is to be understood as if it meant the opposite (linguistic expressions and counters simply don't get along, hence how we put the latter to good use when we work figures out may cast some light on how the former let us down when we argue) ?

[DISANALOGY VIEW] : TOO MANY CHIPS, NOT ENOUGH WORDS. Despite being counterintuitive, the idea that Aristotle mentioned abacus' tokens in order to explain how linguistic items do not work, rather than the other way around, has been remarkably successful. As a matter of fact, it has held sway amongst Aristotelian pundits since forever. It has also resonated with historians of linguistic theories and linguists alike, most notably through the corollary that calculations, as opposed to arguments, enjoy a direct, indeed a one-to-one relationship with what they are calculations about.

Norman Kretzmann expounded [DISANALOGY VIEW] very concisely – and very effectively – in his mainstream « History of Semantics » [50] :

> « ambiguity, Aristotle maintained, is theoretically unavoidable, [363] for since "names and the sum-total of formulas [λόγοι] are finite while things are infinite in number… the same formula and a single name must necessarily signify a number of things". This will, however, give us no trouble unless "we think that what happens in the case of the names happens also in the case of the things, as people who are counting think of their counters", which are in a one-to-one correspondence with the things counted (*Sophistical Refutations* 165a 5) » (Kretzmann 1967, 362-363).

In so many words, he claims that people who reckon have good reason to think that the result of their calculations obtains out there, whereas those who use words instead of pebbles have little reason to be that confident. And – before you ask – pebble-pushers are usually right and word-spinners aren't because pebbles stand in a one-to-one relationship with the things they count, whereas words do not stand in so straightforward a relationship with the things they mean. Explanations in the same vein have achieved, on occasion, comparable accuracy and terseness [51]. They may even exhibit a higher degree of technicality, but the outcome is pretty much

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themselves arguing and when they are listening to others ». Forster's choice of words (« in the case of things », « in the case of counters », « but the cases are not really similar ») strongly suggests that he understood the « τὸ δ' οὐκ ἔστιν ὅμοιον » clause as if Aristotle were opposing how we use words, on the one hand, and how we use counters, on the other hand ; that is to say, along the lines of a fundamental lack of similarity between the two. Pickard-Cambridge 1928, 535-536, for another, provided extra clarity by spelling out what is what in « τὸ δ' οὐκ ἔστιν ὅμοιον », that is « names » and « things » : « it is impossible in a discussion to bring in the actual things discussed : we use their names as symbols instead of them ; and therefore we suppose that what follows in the names, follows in the things as well, just as people who calculate suppose in regard to their counters. But the two cases (names and things) are not alike. For names are finite and so is the sum-total of formulae, while things are infinite in number. Inevitably, then, the same formulae, and a single name, have a number of meanings. Accordingly, just as, in counting, those who are not clever in manipulating their counters are taken in by the experts, in the same way in arguments too those who are not well acquainted with the force of names misreason both in their own discussions and when they listen to others » (Barnes 1984 will undo Pickard-Cambridge's efforts, for the revised translation reads : « but the two cases are not alike. For names are finite etc. » – one step forward, two steps back). For all that Jules Tricot's French translation usually does not look its best when compared to more recent endeavours, it is only fair to acknowledge that, in this particular instance, it definitely stands comparison : « or, entre noms et choses, il n'y a pas de ressemblance complète : les noms sont en nombre limité, ainsi que la pluralité des définitions, tandis que les choses sont infinies en nombre etc. » (Tricot 1939, 3).

[50]. Since we have already dealt with the minutiae of the text, there's no point in taking up again for discussion the curious claim that Aristotle's homonymy results from the fact that the same name and the same definition applies to a number of things, a rather straightforward consequence of translating λόγος in [URTEXT], 165a 13 as if it meant « formula » or « account » rather than « sentence » or « statement ». Only one thing worth noting here. Even though Norman Kretzmann was not, by far, the only one to operate under this particular delusion, he should have known better, given his impeccable credentials as a mediaevalist. As a matter of fact, neither Michael of Ephesus nor Latin commentators thought for one second that Aristotle could possibly be referring to ordinary names and definitions here. Robert of Hautecombe, for instance, made it pretty clear that : « et si dicatur quod illae nominantur nomine communi, non propter hoc sequitur nomen esse aequivocum quamvis unum nomen commune plures res comprehendat [and if one were to say that those things are named by means of a common name, it does not follow that, because of that, the name is equivocal, even if each common name refers to a plurality of things] » (*Commentarium in Sophisticos Elenchos*, 136ra / 2va). Mediaeval Aristotelians knowing their business and all, no one ever bothered to make the same point about formulae or accounts.

[51]. No doubt, Michel Foucault and Louis-André Dorion achieved both, which – Foucault being Foucault and Dorion being Dorion – is hardly surprising : « <the difference between names and things> consists in the fact that there is a finite number of names and an infinite number of things, that there is a relative scarcity of words ; that we cannot establish a bi-univocal relation between words and things. In short, the relation between words and what they designate is not isomorphic to the relation that enables one to count » (Foucault 1971, 44) – « (*ad* 165a 3) the case of the names we use instead of things is not exactly similar or even analogue to the case of the pebbles we use when

the same : what sets counters apart from words is that they are mere embodiments of abstract computational operands (units, tens, hundreds, thousands, etc.) which are dealt with in accordance with abstract computational rules (basic operations and ratios).

Italian scholars have been particularly fond of this narrative, which they have perfected over the years [52].

Antonino Pagliaro – one of the very first to see the merits of the « τὸ δ' οὐκ ἔστιν ὅμοιον » proviso [53] – set the tone in the early Sixties. He drove home a peculiar but telling point : that is, « Aristotle sets forth a clear-cut distinction between the language of numbers and the language of spoken words » (Pagliaro 1962, 45) [54]. He argued – on a general principle – that numbers and their symbolic counterparts match things, no matter how many there are out there. Words, on the contrary, as made perfectly clear by Aristotle, are always in short supply. In addition, he resorted to an enthralling example to back up such claim :

> « clearly, the difference between those who speak and those who count or reckon with pebbles (the affinity between the two does not extend any further than the fact that neither deal directly with the things themselves) consists in the fact that, as far as numbering is concerned, symbols and things are in a straightforward relationship with one another – one pebble stands for one book, two pebbles for two books. On the contrary, language makes use of signs, which – as such – have a remarkable latitude when it comes to meaning something. As a matter of fact, linguistic signs refer to concrete objects which they determine both through connotation and extension : e.g., not only the word "book" can be used for books whose shape and content may differ, but it can also refer to one, two, three books or all of them (for we say: "the book contributes to the dissemination of culture"). Fallacies arise from within the scope of such meaning, understood as a concept » (Pagliaro 1962, 46).

Sure enough, Antonino Pagliaro's take on Aristotle's homonymy and its origin was way off the mark : whether conceptual or not, the unity of meaning of the word « book » has nothing to fear from the fact that it stands not only for all kinds of books but also for all quantities thereof – one, two, three or the whole lot of them for that matter, needless to say : in whatever shape, size and content they come. That being said, what Pagliaro lacked in Aristotelian orthodoxy and, arguably, in semantic insight tout court, he made up for in critical acumen, for his appreciation of the exegetical options available, as well as his preference for the idea that pebbles and words have next to nothing in common, were to shape later readers' views starting with the decision about what side of the [« τὸ δ' οὐκ ἔστιν ὅμοιον »] fence it is better to be sitting on.

Walter Belardi took up where Antonino Pagliaro left off without adding much new, except for the fancy « onomata : pragmata = psêphoi : pragmata » proportion – a flawed one at that, as it turns out :

> « while "psêphoi : pragmata" may be interpreted as a one-to-one (1:1) relationship, insofar as there are as many pebbles or calculi as there are things they stand for (it is a numerical representation, that is to say a reckoning), "onomata : pragmata" is a different kind of relationship altogether, insofar as it is a one-to-many relationship (1:n, where n stands for a whole number whatsoever). From a "linguistic" point of view, a single sign, for instance the word "man", stands for infinite men (it is a symbolic representation, that is to say a word). Accordingly, "psêphoi : pragmata" is a relationship where quantity is identical ; on the other hand, "onomata : pragmata" is a relationship where quantity differs and is indeterminate, indeed undeterminable because of the infinite latitude of things the name applies to, insofar as it can refer to whichever of the infinite (or, more accurately, the infinite number of possible) homogeneous individuals it stands for by virtue of the abstract generic notion these individuals amount to » (Belardi 1975, 141-142 = Belardi 1976, 83).

It appears that Walter Belardi too took a wrong turn somewhere, for there's no way a word can get us in trouble for just referring to multiple individuals of the same kind (this is precisely what « homogeneous » means

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we reckon. Because, for a reason Aristotle will introduce immediately afterwards, between words and things there's not the one-to-one relationship there is between counters and the unities constitutive of numbers » (Dorion 1995, 206). Others achieved a poetic concision of sorts, most notably Larkin 1971, 10 : « the reason for using names is that we cannot calculate with the things themselves »… whatever that means.

52. Precursors (and outsiders) rather than epigones will be our main concern here (with one exception : Pagliaro's clone mentioned below, note 54). Accordingly, we'll not touch upon more recent avatars of [DISANALOGY]. Amongst others, Gusmani 1993, 111 and 2004, 155 ; Lo Piparo 2003, 183-186 (the section's heading says it all though : « Le parole non sono sassolini ») ; Sorio 2009, 301 ; Gusmani & Quadrio 2018, 58.

53. Picking a quarrel with McKeon 1947's translation : « the two cases (of names and things), however, are not alike, for names are finite as is the sum-total of assertions, while things are infinite in number » – which in our book is as good a translation as it gets and counts as two strikes (« names and things », strike one, and « sum-total of assertions » strike two) – Pagliaro 1962, 45 note 11 sensed that much was at stake here : « according to this reading the dissimilarity implied by the τὸ δ' οὐκ ἔστιν ὅμοιον refers to an opposition between words and things, whereas we understand it as a dismissal of our belief (ἡγούμεθα συμβαίνειν) that what goes for words also goes for things, just like it happens with numbers, and the pebbles which stand for them, for they both refer directly to things ».

54. Di Cesare 1981a made the same exact point some twenty years later : « most notably, Aristotle sets verbal language and numeric language apart » – all the more reason to put them in the same bag, considering that her main arguments are the same (Pagliaro 1962 is suitably mentioned twice p. 23 note 6 and, more to the point, p. 24 note 8), almost to the letter (Pagliaro 1962, 45-46 : « differenza netta tra il linguaggio dei numeri e il linguaggio fonico », « l'uno e l'altro non operano direttamente con gli oggetti particolari », « nel rapporto tra il numero e le cose vi è un rapporto fisso, nel senso che il numero, applicandosi esclusivamente all'aspetto puramente quantitativo del reale, opera secondo determinazioni ben stabilite », « nella numerazione concreta il rapporto del simbolo con la cosa è diretto, nel senso che il legame sul piano dell'estensione è univoco », « nel caso del linguaggio si opera con segni, che per sé hanno una grande latitudine connotativa e all'oggetto concreto si applicano, attraverso una duplice determinazione, connotativa e estensiva », etc. ; Di Cesare 1981a, 22-24 : « distinzione tra linguaggio verbale e linguaggio numerico », « entrambi usano simboli al posto di degli oggetti particolari », « il numero ha un rapporto univoco con l'oggetto, dato che tale rapporto è determinato quantitativamente e perciò è fisso », « il nome che possiede una grande latitudine connotativa, si riferisce all'oggetto concreto attraverso una determinazione connotativa e denotativa », etc.) – more of the same in Di Cesare 1981b, 16-20.

here, if we are to take his cue). On the other hand, his account of why (and how) counters and words do not add up is a nice variation on an old favourite : one-on-one and one-too-many are formulas whose appeal is seldom lost and arithmetic gadgets cut a nice figure and all, but we definitely are on familiar ground here, even if it is a slippery slope.

Even though Eugenio Coseriu did not fix the alleged polysemy bug that had plagued his two predecessors (if anything, he made things worse with a highly unorthodox translation), he nevertheless pushed the commitment to [ARITHMETICAL BIAS] a step further – which, so it appears, he upheld in its purest form [55] – the decimal friendly sort (« ein einziger Rechenstein auch bestimmte Gruppen von Sachen – z. B. 10, 100, 1000 davon – vertreten kann, usw. ») :

> « there's no analogy between the relationship "names-things" and the relationship "counters-things". Counters and things stand in a one-to-one relationship (regardless of whether a counter can stand for a given set of things as well, e.g. ten, one hundred, one thousand). It is a direct relationship : counters simply stand for things. They have no "meaning". Their only function is to represent things or to refer to them directly. Not so with names. A name does not stand directly for this or that thing. What it stands for is a unity, a single meaning. Accordingly, through such meaning, it can refer to multiple things (basically, it can refer to everything that matches its meaning, that is to say everything that is what the name means or possess the feature the name refers to). For precisely this reason, "those who are not familiar with the power of words" run into all kinds of problems » (Coseriu 1979, 436).

Interestingly enough, Eugenio Coseriu allowed counters to stand for more than one thing. Even so, he did not let it affect the margin of error for counter-assisted calculations, which hardly increased at all. As a matter of fact, it makes no difference how much a pebble is worth (be it one, ten, one hundred or one thousand, as Eugenio Coseriu revealingly put it). « Why ? » would be an interesting question to ask – considering that, as it will be argued later on, first and foremost Aristotle's analogy is about failure : failure to handle counters no less than failure at juggling with words. For the time being, however, we'd like to point out instead that Coseriu's concession only makes sense as long as computational symbols work as mere placeholders in the strictly controlled environment of numbering as such or purely arithmetical calculation. Stripped of all meaning, counters become perfectly safe to work with. Virtually indistinguishable from numbers themselves, they are in fact expected to operate at the same level of transparency and compliance to smooth arithmetical routines.

TENGO NA ANALOGIA TANTA. Is saddling Aristotle with a « mistaken analogy » the best we can do [56] ? The standard story has been told for so very long that the question may appear, prima facie, more provocative than it actually is. Truth be told, not only has the issue been raised before, but we already have the answer or, at the very least, a good half of it. On the face of it (but feel free to scrape the surface and dig all you like), [DISANALOGY VIEW] bears two tell-tale signs. On the one hand, there is [DISANALOGY], or the idea that Aristotle's pebble analogy is an analogy in name only. On the other hand, there is [ARITHMETICAL BIAS], namely the idea that pebbles are of no interest by themselves and carry no particular significance – other than, of course, reminding us that people who toss them around are more or less proficient with numbers and calculations. If one does not particularly like this picture and wishes to replace it with a new one, he basically has two options. He can either reject the [DISANALOGY] part of [DISANALOGY VIEW], while going along with the overall [ARITHMETICAL] narrative itself, or he can get rid of the whole gazinkus and discard not only [DISANALOGY], but also – and especially – the [ARITHMETICAL BIAS] it is embedded with.

The first option has been brilliantly argued for by Fait 1996 – hands down the finest piece of scholarship ever written on the subject [57]. While making quick work of [DISANALOGY]'s flaws, Paolo Fait must have felt there was no need to tear down its conceptual framework in the process. As a result, instead of turning the page of the old narrative once and for all, his criticism of [DISANALOGY] lead to a more refined version of the same old story. In Fait's view, the « computational analogy » – as he calls it (which itself speaks volumes) – suffers no restrictions. On the contrary, it provides a powerful way of illustrating how calculation as such and language can shed light on each other. To begin with, it is supposed to clarify Aristotle's premiss and help us understand why we can't have actual things speak for themselves :

> « the factual claim that it is impossible to display the things themselves when we talk about them gains greatly in clarity if we take into consideration its arithmetical counterpart : as long as small numbers are concerned, we can add things up directly, without resorting to counters. On the other hand, once we reach amounts that transcend the human ability for numerical representation, a positional system's usefulness becomes obvious on account of its symbolic spareness » (Fait 1996, 185).

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55. Anecdotal evidence suggests that, since at least July 1977, Eugenio Coseriu believed numbers' univocity to be a literal quotation from the prologue of Aristotle's *Sophistici elenchi* – cf. Garcia Yebra 1981, 33-34.

56. Albeit misguided and a tad naive, Schreiber 2003, 12 « mistaken analogy » label – his most noteworthy contribution on this issue – rings ominously true. If naming is nothing like counting, then – maybe – we'd better just let them go their separate ways instead of forcing one on the other while doing violence to both.

57. Though we'll end up disagreeing (*amicus Paulus, etc.*), it is only fair to acknowledge Paolo Fait's breakthrough : in hindsight, he deserves all the credit for having almost singlehandedly brought down [DISANALOGY] bias, the main stumbling block on the way of an adequate understanding of Aristotle' counters comparison.

More to the point, the simile accounts for the success language and calculation achieve in dealing with an infinite number of different items by virtue of a finite number of tools, words and counters respectively [58]. And this is precisely, according to Paolo Fait, what makes the analogy worthwhile :

> « the analogy between words and counters also explains better the opposition between language, which is finite, and reality, which is infinite. As a matter of fact, the numerical notation systems ancient Greeks were familiar with had to resort to ever new symbols as the numbering went on. On the contrary, nine counters are, in principle, all you need to display any number on the abacus. In the precise and concise words of Hermann the Cripple (Hermann von Reichenau), author of a well-known treatise on the abacus : column by column, "usque in infinitum progreditur" multiplying by ten over and over again. Since this feature of the abacus undoubtedly goes hand in hand with the counters' "ambiguity" – on which the *Elenchi*'s comparison rests entirely – it is not hard to grasp the remarkable analogy between the fact that a few pebbles is all it takes to represent the infinite series of numbers and the idea that a limited number of linguistic items suffice to refer to an infinity of meanings » (Fait 1996, 186-187).

No wonder Paolo Fait conveys the kind of lame stereotypes we have already challenged – most notably, the myth of a « decimal abacus » [59] and the belief that ancient counting boards were used for calculations making little allowance for concerns other than purely arithmetical [60]. Nor does it come as a surprise that the meagre evidence he presents may be either dismissed as irrelevant or construed as implying the contrary [61].

PARS CONSTRUENS (ABACUS ANTIQUORUM). We can now turn to the literary and epigraphic evidence that will provide the much-needed background [ARITHMETICAL BIAS] – for reasons that should be obvious by now – has no interest in taking into account. Since our aim here is to spell out the reasons why Aristotle resorted to the pebble analogy in the first place and to assess, accordingly, the implications for his views on how language occasionally fails us, we won't indulge in a full-fledged reconstruction of the ancient abacus – specialists have long run out of educated guesses and ours, semi-educated at best, are no great shakes – nor will we go into too many details – which we are in any case lacking – as to why, for all its strengths and sophistication, the abacus was an accident waiting to happen (to the unwary and the untrained, that is). A minimalist account of what reckoning boards must have looked like, interspersed with a summary survey of the literary and epigraphic evidence, will do for the purpose of illustrating the abacus' features which Aristotle's simile presupposed and relied upon.

As far as we can tell, ancient abaci were crude but effective reckoning devices. Even if we do not go so far as to claim that any ruled board – or flat surface for that matter – along with a handful of tallies might have easily qualified as such, it is safe to assume that abaci came in all shapes and sizes, ranging from bulky, stationary items to light, portable ones. At almost five feet long, two and a half feet wide and as many inches thick, the Salamis abacus, with its 400 pounds of Pentelic marble, is firmly on the heavy side – as are, understandably enough, most of the thirty-odd other surviving stone specimens [62]. No small-scale counting board of old has survived [63], so we have precious little to go on, besides the fact that they were easily summoned and put to use on the spot, as a comedic argument over the price of a dinner amongst friends is to suggest :

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[58]. It is a bit of a pity that emphasis on success – rather than on failure, as one would expect – is the lesson readers have drawn from Fait's authoritative contribution (cf. e.g. Laspia 2004, 112).

[59]. In addition to the passages just quoted, cf. Fait 1996, 182-183 : « it is likely that the type of abacus ancient Greeks used had a number of columns which stood for different orders of magnitude (to keep it simple, think of these as units, tens, hundreds, etc.) ».

[60]. Since there is no conclusive evidence, I won't tackle here the issue of whether the ancient abaci were actually built to handle open-ended calculations. That being said, all the circumstantial evidence I'm aware of (and which will be provided shortly) is not consistent with Paolo Fait's suggestion.

[61]. Predictably enough, Salamis' abacus is the only counting board Paolo Fait shows any interest in (Fait 1996, 182). We have already cast some doubts on the literature he relies on (in particular, Cantor 1863, Heath 1921 and Smith 1921), so we will leave it at that. Predictably enough as well, an all too known passage from the Aristotelian *Problemata* is the only literary source Paolo Fait mentions at this juncture – Fait 1996, 187 : « as a confirmation of the fact that Aristotle was fully aware of the properties of a positional system we may adduce a passage from the Aristotelian *Problemata* <XV 3, 910b 38 - 911a 1> where Aristotle offers as a possible explanation of the success the decimal system has with all people, Greek and barbarian alike : "or is it because all people were born with ten fingers ? So having as it were their own number of counters, they count other things with this quantity as well ?" ». As of this moment, it is our word against Paolo's. In a page or two, we hope to show that this very text tells quite a different story and is better understood as an explanation of the reason why decimal abaci weren't built, despite the fact ancient calculators were perfectly familiar with the decimal system itself.

[62]. As Rousset 2013, 290 note 8 pointed out not so long ago, an accurate (and complete) description (as well as inventory) of ancient Greek abaci is still a desideratum. For the time being, we'll have to implement and cross-check lists, additions and the occasional rectification from different sources ; most notably : Lang 1957 and 1968 ; Pritchett 1968 ; De Grazia & Kaufman Williams 1977 ; Buchholz 1984, 562-563 ; Immerwahr 1986, 198 note 7 ; Schärlig 2001, 61-95 (the most complete catalogue to date) ; Knoepfler 2001, 78-81 ; Chaniotis, Corsten, Stroud & Tybout 2001 ; Mathé 2009, 173 ; Marcellesi 2013, 413-414. As far as the Salamis board is concerned (IG II^2, 2777), the best preserved and first discovered, it was described for the first time by Rangabé 1846. Pritchett 1968, 194 note 10 pointed out an error in previous drawings (Rangabé 1846, 296 ; Nagl 1899, 357 ; Heath 1921, 50 ; as well as Lang 1964, in fact the only one he cared to catch out) – all three sets of numerals (« money units » of course, as acknowledged by W.K. Pritchett himself) should be facing outwards rather than inwards – it figures.

[63]. The converted roof tiles and potsherds described in Lang 1956, 19 and Lang 1976, 22 must have come pretty close to the real thing. The counting table painted on the so-called Darius volute-crater comes in a distant second. It certainly is about the right size and is often referred to as a reckoning board (cf. Sugden 1981, 7 ; Cuomo 2001, 11-13 ; Chankowski 2014). That being said, even if the pro abacus party has grown stronger of late, doubts linger whether it was a reckoning board to begin with rather than just a convenient desk for counting actual coins (cf. already Smith 1909, 193-195 and 1925, 161).

[T11] *Athenaei Naucratitae Deipnosophistae* III, 117e 3-7 : « ἐν δὲ Ἀπεγλαυκωμένῳ συμβολάς τις ἀπαιτούμενός φησι· <A> Παρ' ἐμοῦ δ', ἐὰν μὴ καθ' ἓν ἕκαστον πάντα † δ' ὡς †, χαλκοῦ μέρος δωδέκατον οὐκ ἂν ἀπολάβοις. <B> δίκαιος ὁ λόγος. <A> ἀβάκιον, ψῆφον. λέγε [Douglas Olson 2006, 57-59 : in *The Man Who Had a Cataract* <Alexis, fr. 15>, someone being asked to pay his share of the expenses for a dinner party says : <A> unless † … † every item individually, you wouldn't get a penny out of me. <B> fair enough. <A> bring an abacus and some counting pebbles ! Go ahead !] ».

There's been a bit of controversy over who said what at the beginning of Alexis' fragment, as reported by Athenaeus [64]. However, it makes no difference who took the initiative of fetching the abacus in order to settle accounts, be it the guest arguing the toss (A) or his associate intent on setting the record straight (B). Whichever character called for the reckoning board, he certainly expected a slave or a servant to hand it to him as easily as the handful of counters that went with it [65], rather than lead him to one. That being said, it might just as well have come down to the same thing : whatever the actual shape and size of the abacus (wooden frame or table, stone slab, even the occasional dust or sand tray [66]), counters would have been added to the corresponding column and moved around as (B) talked (A) through the bill. As a matter of fact, even without pressing the point too hard, it is worth noticing that designs and inscriptions on diminutive or vestigial abaci matched those on larger, official ones, being in every case monetary symbols [67] (more about that shortly).

« INDULGE ME ». For there's wisdom in asking to see a negative before providing a positive, let's start with the abacus' opposite number and work our way from there. Despite the fact that they bore the same name, the pebble board (ἄβαξ) – as well as the pebbles (ψῆφοι) – used in everyday calculations were quite different from those used, say, in Athenian courts of justice and assemblies :

[T12] *Aristotelis Atheniensium respublica* 69, 1 : « πάντες δ' ἐπειδὰν ὦσι διεψηφισμένοι, λαβόντες οἱ ὑπηρέται τὸν ἀμφορέα τὸν κύριον, ἐξερῶσιν ἐπὶ ἄβακα τρυπήματα ἔχοντα ὅσαιπερ εἰσὶν αἱ ψῆφοι, καὶ ταῦτα ὅπως αἱ κυριαι προκείμεναι εὐαρίθμητοι ὦσιν, καὶ τὰ τρυπητὰ καὶ τὰ πλήρη. οἱ δὲ ἐπὶ τὰς ψήφους εἰληχότες διαριθμοῦσιν αὐτὰς ἐπὶ τοῦ ἄβακος, χωρὶς μὲν τὰς πλήρεις, χωρὶς δὲ τὰς τετρυπημένας. καὶ ἀναγορεύει ὁ κῆρυξ τὸν ἀριθμὸν τῶν ψήφων τοῦ μὲν διώκοντος τὰς τετρυπημένας τοῦ δὲ φεύγοντος τὰς πλήρεις· ὁποτέρῳ δ' ἂν πλείων γένωνται, οὗτος νικᾷ, ἂν δὲ ἴσαι, ὁ φεύγων [Rhodes 2017, 171-173 : when all the jurors have voted, the attendants take the jar that is to count, and empty it on to a board which has as many holes as there are ballots, so that the votes that matter may be laid out for easy counting, both the hollow and the solid. The men in charge of the ballots count them on the board, the solid and the hollow separately ; and the herald proclaims the numbers of the votes, the hollow for the plaintiff and the solid for the defendant. Whoever has the greater number wins ; if they are equal the defendant wins] ».

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64. Modern editions, as the one we adopted here for the editor's candour, usually follow Schweighaeuser 1802, 323, and have (A) ask for the abacus. On the other hand, Kaibel 1887 and Desrousseaux 1942, 53 have (B) – rather than (A) – speak the words : « δίκαιος ὁ λόγος. ἀβάκιον, ψῆφον » (117e 7). Arnott 1996, 88 discusses the issue, very briefly, and takes (B) solution's side, which indeed seems slightly more plausible : (B), who has just acknowledged that (A) has every right to ask where the money has gone, makes it clear that the calculation will be run strictly by the book.

65. As noted by Schweighaeuser 1802, 323, followed by Desrousseaux 1942, 53-54, we don't need, strictly speaking, a plural here, since the singular ψῆφον may as well have a collective connotation.

66. While ideal for tracing geometric figures, dust abaci would have been a hindrance more than a help when it comes to reckoning, unless impressions in the sand were erased as one went along (a cumbersome process all the same). Pushing pebbles would only make it worse : as Pullan 1968, 18 shrewdly observed : « it is not so easy to imagine counters being moved easily from place to place on a sandy surface, and grooves would only add to the difficulty of moving them ».

67. Cf. e.g. Lang 1976's E6 (= Lang 1956's n°79) : an « informal abacus, with the symbols serving as headings for the placement of pebbles : 5 (drachmas), 1 (drachma), 1 (obol), 1/2 (obol), 1/4 (obol) » (Lang 1976, 22). Since we have already mentioned it, it is worth noticing all over again that – though somewhat atypical (cf. Tybout 1978 for a discussion of the peculiar symbols involved, in particular the letter Ψ for 1000, usually noted X (χίλιοι)) – the eight letters inscription on the Darius vase is monetary through and through (I would be hard pressed to say what to do exactly with Massa Pairault 1996, 239-240 contention that the letters are in fact a cipher reminding Histiaeus' plot to start the Ionian upraising against the Persians) : T stands for τεταρτημόριον, that is a quarter obol ; O is the initial letter for ὀβολός, namely an obol ; chances are that the unusual « < »sign, placed as it is between T and O, is worth a ἡμιωβέλιον, i.e. an half-obol, etc. This might carry little weight though, for the painter – that's my two cents – had another agenda altogether : the whole scene is not so much a snapshot of an actual ongoing calculation. Rather, it simply states the price of the vase which the Darius painter spelled out in unconverted obols (1340 obols, by my math : that is 5 (O) + 1x5 (Π) + 3x10 (Δ) + 3x100 (H) + 1x1000 (Ψ *à la béotienne*)), which by the way is not unheard of (cf. e.g. similar amounts expressed in Delian inscriptions both as « δραχμάν, ὀδελοὺς δύο ἡμιωδέλιον » (FD, III, 15) and « ὀβολοὺς ὀκτὼ ἡμιωδέλιον » (FD, III, 16)). Since Pouzadoux 2009, 259 also worked out the figures, but they do not tally with mine [a], it is hard to say whether she made the same suggestion or not – for sure, she did not understand the epigraphic evidence along the same lines, namely as a standard whose unit is the obol rather than the drachma (which saves us the trouble of reading either too much or too little into the Π symbol and allows us to construe it as a most unexotic abbreviation for 5… 5 obols, that is – instead of the botched scratch it is usually thought to be). Anyway, whether I got her suggestion right or wrong [b] and for what it's worth – I first picked up the idea from her : « if the overall picture catches the gist of a tax collection scene and presents us with the last piece of the Persian royalty in Alexander's times, a closer look would have revealed the letters and their provenance. This might just be the piece of misdirection that allowed the painter to give away his origin and his work's worth » (Pouzadoux 2009, 259). [a] Pouzadoux 2009, 259 : « the outcome of the operation, as depicted in the scene, might be 1235 drachmas and 5 obols (1000x1+ 100x3+10x3+5x1+1x5) ». In fact, 1335 drachmas and 5 obols, for we counted them again over the phone. [b]. As it happened, more wrong than right, for what Claude Pouzadoux had in mind was more of a symbolic nature : the hyperbolic figures the accountant is working his way up to – and, for sure, he's nowhere near the final result, one hundred talents, as indicated in the diptych he holds in his left hand – epitomize the painter's high opinion of his own work and craftsmanship. Admittedly, the figures I come up with may still be a bit on the expensive side (for comparison purposes, Alexis' blow-out budget, as partially (?) recorded in [T15] below, was anything between fifty and sixty obols), but they should not shock even the harshest critics of the « fine pottery » lobby and their most conservative estimates (cf. notably Vickers 1990, 613 note 6, confirmed in Gill & Vickers 1995, 227).

As it happened, Athenian officials went to great lengths to prevent ambiguity : so many jurors, so many counters, so many votes. More to the point, [T12] makes it plain that forensic abaci were positional, albeit in a peculiar way. As there were exactly as many holes on the counting board as ballots to be counted (« ἄβακα τρυπήματα ἔχοντα ὅσαιπερ εἰσὶν αἱ ψῆφοι »), each pebble had its own unique (i.e. unequivocal) position and – until it was removed along with the others to be counted according to its kind, that is separately (οἱ δὲ ἐπὶ τὰς ψήφους εἰληχότες διαριθμοῦσιν αὐτὰς ἐπὶ τοῦ ἄβακος, χωρὶς μὲν …, χωρὶς δὲ …) – it was not supposed to leave its spot on the abacus, let alone trade places with any other. Moreover, by Aristotle's time, differences in value or meaning were conveyed upfront, by means of counters which had different shapes, either pierced or solid (καὶ τὰ τρυπητὰ καὶ τὰ πλήρη). In short [68], it would have taken an inordinate amount of ingenuity and a great deal of dexterity to doctor the figures involved in a vote. No doubt, had a sleight of hand for tricking people into either believing that a hole hosted no pebble when it did (or the other way around) or mistaking pierced tokens for solid ones (or vice-versa) ever been successful, we would have heard about it. Since we have not, it is only reasonable to think that everybody – including Aristotle – took the verdict of forensic pebble-reckoning at face value. Which is the exact opposite of what Aristotle's comparison in [URTEXT] is all about, for its whole point is to suggest that, contrary to what one would expect ([URTEXT], 165a 8-10 : τὸ συμβαῖνον κτλ.), when dealing with words and counters, what you see is not – always – what you get.

ABACI VESTIGIA. Different tools have different uses, and both archaeological and literary evidence suggest that everyday abaci operated on an entirely different principle than those used in tribunals :

> [T13] *Polybii Historiae* V 26, 12-13 : « βραχεῖς γὰρ δὴ πάνυ καιροὶ πάντας μὲν ἀνθρώπους ὡς ἐπίπαν ὑψοῦσι καὶ πάλιν ταπεινοῦσι, μάλιστα δὲ τοὺς ἐν ταῖς βασιλείαις. [13] ὄντως γάρ εἰσιν οὗτοι παραπλήσιοι ταῖς ἐπὶ τῶν ἀβακίων ψήφοις· ἐκεῖναί τε γὰρ κατὰ τὴν τοῦ ψηφίζοντος βούλησιν ἄρτι χαλκοῦν καὶ παραυτίκα τάλαντον ἰσχύουσιν, οἵ τε περὶ τὰς αὐλὰς κατὰ τὸ τοῦ βασιλέως νεῦμα μακάριοι καὶ παρὰ πόδας ἐλεεινοὶ γίνονται [Paton 1923, 73 : so brief a space of time suffices to exalt and abase men all over the world and especially those in the courts of kings, for those are in truth exactly like counters on a reckoning board. For these at the will of the reckoner are now worth a copper and now worth a talent, and courtiers at the nod of the king are at one moment universally envied and at the next universally pitied] ».
>
> [T14] *Diogenis Laertii Vitae philosophorum* I 59, 1-5 : « ἔλεγε δὲ τοὺς παρὰ τοῖς τυράννοις δυναμένους παραπλησίους εἶναι ταῖς ψήφοις ταῖς ἐπὶ τῶν λογισμῶν· καὶ γὰρ ἐκείνων ἑκάστην ποτὲ μὲν πλείω σημαίνειν, ποτὲ δὲ ἧττω· καὶ τούτων τοὺς τυράννους ποτὲ μὲν ἕκαστον μέγαν ἄγειν καὶ λαμπρόν, ὁτὲ δὲ ἄτιμον [<Solon> used to say that those who have influence with tyrants are like the pebbles used in calculations ; for just as each pebble some times is worth more some times is worth less, so the tyrant treats them some times as great and illustrious, some times as worthless] ».
>
> [T15] *Athenaei Naucratitae Deipnosophistae* III, 117e 7 - 118a 13 : « <A> ἀβάκιον, ψῆφον. λέγε. <B> ἔστ' ὠμοτάριχος πέντε χαλκῶν. <A> λέγ' ἕτερον. <B> μῦς ἑπτὰ χαλκῶν. <A> οὐδὲν ἀσεβεῖς οὐδέπω. λέγε. <B> τῶν ἐχίνων ὀβολός. <A> ἀγνεύεις ἔτι. <B> ἆρ' ἦν μετὰ ταῦθ' ἡ ῥάφανος, ἣν ἐβοᾶτε; <A> ναί· χρηστὴ γὰρ ἦν. <B> ἔδωκα ταύτης δύ' ὀβολούς. [118a] <A> τί γὰρ ἐβοῶμεν; <B> τὸ κύβιον τριωβόλου. <A> † ονεῖλκε χειρῶν γε † οὐκ ἐπράξατ' οὐδὲ ἕν. <B> οὐκ οἶσθας, ὦ μακάριε, τὴν ἀγοράν, ὅτι κατεδηδόκασιν τὰ λάχαν' <αἱ> τρωξαλλίδες. <A> διὰ τοῦτο <τὸ> τάριχος τέθεικας διπλασίου; <B> ὁ ταριχοπώλης ἐστίν· ἐλθὼν πυνθάνου. γόγγρος δέκ' ὀβολῶν. <A> οὐχὶ πολλοῦ. Λέγ' ἕτερον. <B> τὸν ὀπτὸν ἰχθὺν ἐπριάμην δραχμῆς. <A> παπαῖ, ὥσπερ πυρετὸς ἀνῆκεν, εἶτ' † ἐν ἐπιτέλει †. <B> πρόσθες τὸν οἶνον, <ὃν> μεθυόντων προσέλαβον ὑμῶν, χοᾶς τρεῖς, δέκ' ὀβολῶν ὁ χοῦς [Douglas Olson 2006, 59 : <A> bring an abacus and some counting pebbles ! Go ahead ! <B> there's raw-saltfish for five chalkoi. <A> next item ! <B> mussels for seven chalkoi. <A> you haven't committed any sacrilege so far. Next item ! <B> an obol for the sea-urchins. <A> you're still clean. <B> wasn't what came after that the cabbage you kept shouting for ? <A> yeah – it was good. <B> I paid two obols for it. <A> so why did we shout for it ? <B> the cube-saltfish cost three obols. <A> didn't he charge anything for [corrupt] ? <B> my dear sir, you don't know how matters are in the marketplace ; the locusts have consumed the vegetables. <A> is that why you've charged double for the saltfish ? <B> that's the saltfish-dealer ; go ask him about it. Conger eel for ten obols. <A> that's not much. Next item ! <B> I purchased the roast fish for a drachma. <A> Damn ! It dropped like a fever, then † corrupt †. <B> add the wine I bought when you were drunk : three choes, at ten obols per chous] ».

Each in its own way, [T15] as well as [T13] and [T14] [69] are a testament to the ancient abacus' versatility.

[T15] achieves its peculiar comic effect as the deadbeat character praises one moment the expenses his crony presents him with only to curse them the next. (A) does not mind the five coppers worth of one variety of saltfish nor the three obols worth of another, neither does he seem to begrudge the seven coppers for the mussels, the obol for the sea-urchins, or the ten obols for the eels. At two obols, he's not pleased with the cabbage, while the

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68. As a general rule, the best place to look for details is still Rhodes 1981, *ad loc.* (in this case, p. 733-734), who however did not pay much attention to the ψῆφοι (δημοσίαι) – possibly because Boegehold 1963, 367-372 had been thorough enough a few years back. The same Alan L. Boegehold, in Boegehold 1976, discusses a number of dikastic ballots found in and around Athens (according to *Atheniensium respublica*, 57, 3 Zea's court was where citizens accused of killing or wounding somebody defended themselves speaking to the judges from a boat). As did Lang 1995 and, more recently, Lopez-Rabatel 2019, 45-53.

69. Polybius metaphor in particular – alone or along with Solon's maxim to the same effect – has been quoted too many times to count, starting with Rangabé who had no sooner discovered the very first (and best preserved) abacus in Salamis than he mentioned already Polybius as a meaningful connexion between the archaeological finding he was the first to describe and ancient literary evidence (Rangabé 1846, 296-297) – in fact, [T13]'s relevance predates Rangavis' finding, for already Yates 1842, 2 pointed out : « that the spaces of the abacus actually denoted different values, may be inferred from the following comparison in Polybius (V 26) etc. ». Since it keeps showing up at every turn of the page, Polybius' text is more conspicuous for its absence than for its presence, as in the case of Adkins 1956, which provides a number of references to the abacus in Greek literature. Appendix IV, 307-308 gets Aristophanes, Diogenes Laertius, Theophrastus and even Plutarch right, but – inexplicably enough – says nothing about Polybius. On the misfortunes Apelles – the powerful schemer who inspired Polybius' disparaging comparison – brought upon himself, cf. Errington 1967, Herman 1997 and Miltsios 2013, 97-99.

whole drachma spent on the roast fish definitely gets him all worked up. For all we have is a fragment, we don't know what reaction the 30 obols for the wine to wash everything down – on top of the beverage that had already intoxicated him and his fellow-revellers – elicited from him. Be that as it may, we are to assume that the reckoning board allowed for such swift swings of mood and then some, for it made no difference in what order pebbles for coppers, obols and drachmas were added to the tally or how many times counters shifted back and forth between columns [70].

[T13] and [T14] make essentially the same point : pebbles had no value in themselves and one had to decide time and again how much each one of them was worth ([T13 : κατὰ τὴν τοῦ ψηφίζοντος βούλησιν). In addition, [T13] and [T14] emphasize the fact it was the very same tokens ([T13] : ἐκεῖναί, [T14] : ἐκείνων ἑκάστην) that varied in value ([T14] : ποτὲ μὲν πλείω σημαίνειν, ποτὲ δὲ ἧττω), the scope of such variations being – on occasion – remarkably wide ([T13] : ἄρτι χαλκοῦν καὶ παραυτίκα τάλαντον ἰσχύουσιν) [71]. Moreover, [T13] underscores that such changes happened all at once (βραχεῖς, παρὰ πόδας), which goes well with the idea that pebbles actually traded places on the counting board, as is also suggested by a few other turns of phrase which convey the idea that handling the counters involved moving them around rather than simply laying them down [72]. This is a possibility backed up by archaeological evidence as well. As a matter of fact, twelve or so surviving abaci – amongst them the one from Salamis (as first noted by Pritchett 1968, 189) – have raised rims built into their structure [73], a feature which is definitely consistent with the assumption that counters were moved around : the raised rims preventing them from being knocked off the table while switching position on the reckoning board.

If we now take [T13], [T14] and [T15] together and compare what they say with what survives today of the ancient abaci themselves, a couple of features (henceforth referred to as [POSITIONALITY] and [HYBRIDITY] respectively) stand out, which are of paramount importance for getting Aristotle's pebble simile straight.

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[70]. This is why we probably should not read too much into Herodotus comparison between the way Greeks and Egyptians wrote and reckoned (left-wise and right-wise respectively) : « γράμματα γράφουσι καὶ λογίζονται ψήφοισι Ἕλληνες μὲν ἀπὸ τῶν ἀριστερῶν ἐπὶ τὰ δεξιὰ φέροντες τὴν χεῖρα, Αἰγύπτιοι δὲ ἀπὸ τῶν δεξιῶν ἐπὶ τὰ ἀριστερά [Waterfield 1998, 110 : as Greeks write and do their sums they move their hands from left to right, but Egyptians move from right to left ; although this is their actual practice, they say that they are doing it right, while the Greeks are left-handed] » (*Herodoti historiae* II 36, 4). For one thing, there's always the possibility – and a strong one at that – that Herodotus was just referring to the way operations and their results were recorded rather than processed on the abacus (Griffiths 1955, 141-144 has built an interesting case in favour of the letter-letters and letter-numbers hypothesis ; in recent years, he's been followed by Lloyd 1989, 261 and 1994, 161). For another, it is irrelevant whether we proceed from left to right (or contrariwise) when working out figures on the abacus : the whole point of using one was to pick up the right column, whatever side it happened to be in relation to the preceding step or steps of an ongoing calculation.

[71]. A rough estimate – indexed on the Attic standard – would allow for a 1 : 288.000 odd ratio between the two denominations (that is to say, 1 talent is worth 288.000 coppers) : 1 (τάλαντον), times 60 (μναῖ), times 100 (δραχμαί), times 6 (ὀβολοί), times 8 (χαλκοί) – cf. Walbank 1957, 560 for the maths. For there's no such thing as coincidence, Cantor 1863, 141-142 noticed a long time ago that Polybius' chosen denominations matched the highest (T = τάλαντον) and the lowest (X = χαλκοῦς) end of the Salamis abacus' scale range : « I'd like to emphasize that the end-values mentioned here, that is copper and talent, correspond exactly to the inscriptions on the Salamis table ». Ten years later, Edmond Saglio observed to the same effect that « both the lowest and the highest monetary units – namely, the copper and the talent – are inscribed each at one end of the scale for everyone to see, etc. » (Saglio 1873, 2-3).

[72]. Should one feel that Aristotle's τὰς ψήφους φέρειν ([URTEXT], 165a 14) is too close to home for comfort, a little background might help him see that there's nothing to be suspicious about. Whilst Plato's parallel between questions and answers interplay, on the one hand, and checkers strategy, on the other hand, has little to contribute to the matter (this much is controversial, but it will have to wait), the association of ability (ὑπὸ τῶν πεττεύειν δεινῶν), tokens and arguments (οὐκ ἐν ψήφοις ἀλλ' ἐν λόγοις) with the verb φέρειν is relevant. Ψῆφοι were supposed to move on the board, even if – at some point – they had nowhere to go : « καὶ ὁ Ἀδείμαντος, Ὦ Σώκρατες, ἔφη, πρὸς μὲν ταῦτά σοι οὐδεὶς ἂν οἶός τ' εἴη ἀντειπεῖν. ἀλλὰ γὰρ τοιόνδε τι πάσχουσιν οἱ ἀκούοντες ἑκάστοτε ἃ νῦν λέγεις· ἡγοῦνται δι' ἀπειρίαν τοῦ ἐρωτᾶν καὶ ἀποκρίνεσθαι ὑπὸ τοῦ λόγου παρ' ἕκαστον τὸ ἐρώτημα σμικρὸν παραγόμενοι, ἀθροισθέντων τῶν σμικρῶν ἐπὶ τελευτῆς τῶν λόγων μέγα τὸ σφάλμα καὶ ἐναντίον τοῖς πρώτοις ἀναφαίνεσθαι, καὶ ὥσπερ ὑπὸ τῶν πεττεύειν δεινῶν, οἱ μή, τελευτῶντες ἀποκλείονται καὶ οὐκ ἔχουσιν ὅτι [487c] φέρωσιν, οὕτω καὶ σφεῖς τελευτῶντες ἀποκλείεσθαι καὶ οὐκ ἔχειν ὅτι λέγωσιν ὑπὸ πεττείας αὖ ταύτης τινὸς ἑτέρας, οὐκ ἐν ψήφοις ἀλλ' ἐν λόγοις [Reeve 2004, 180 : and Adeimantus replied : "no one, Socrates, would be able to contradict these claims of yours. But all the same, here is pretty much the experience people have on any occasion on which they hear the sorts of things you are now saying : they think that because they are inexperienced in asking and answering questions, they are led astray a little bit by the argument at every question, and that when these little bits are added together at the end of the discussion, a big false step appears that is the opposite of what they said at the outset. Like the unskilled, who are trapped by the clever checkers players in the end and cannot make a move, they too are trapped in the end, and have nothing to say in this different kind of checkers, which is played not with pieces, but with words"] » (*Platonis Respublica* VI, 487b 1 - 487c 3). In addition to the standard πεττεία references (e.g., Kurke 1999 and Guéniot 2000), it's definitely worth mentioning Conche 1986, 446-447 who – in his commentary on Heraclitus' fragment 130 (52) – provides a very interesting discussion of ancient checkers as opposed to other board games involving a random element, κυβεία most notably. That pebbles were moved around and not simply placed on the abacus is also suggested by other turns of phrase which may be construed as implying motion, e.g. « ἕλκειν τὰς ψήφους » used by Simonides (*Hibeh Papyri Simonidis sententiae*, 65.23-25 : « τὸ δὲ ἀναλωθὲν ὀλίγου μὲν εἴληπται, προσαναλίσκεται δὲ τὸ διπλάσιον· διὸ δεῖ ἕλκειν τὰς ψήφους [Grenfell & Hunt 1906, 65 : expenditure is reckoned of slight account, and twice as much is spent again ; so one should draw back the counters] » – as suggested by Gilbart Smyly 1908, 149-150, the expression ἕλκειν τὰς ψήφους is more likely to refer to moving counters from one area of the abacus to another, where assets and expenditures were calculated separately, rather than between columns) and Theocritus (*Theocriti epigrammata*, 14.1-5 : « ἀστοῖς καὶ ξείνοισιν ἴσον νέμει ἥδε τράπεζα· θεὶς ἀνελεῖ ψήφου πρὸς λόγον ἑλκομένης. ἄλλος τις πρόφασιν λεγέτω· τὰ δ' ὀθνεῖα Κάικος χρήματα καὶ νυκτὸς βουλομένοις ἀριθμεῖ [Gow 1952, 247 : this bank serves native and foreigner alike. Deposit, and then withdraw according to the reckoning when an account is made up. Others may make excuses, but Caicus, at need, transacts foreign business even after dark] »).

[73]. In fact more, if we are to add the Volos abaci (Bakhuizen 1972, 406 and 1992, 263-264) to Rousset 2013, 294's list.

[POSITIONALITY]. First things first, [T13] and [T14] make it very clear that the abacus' tokens had no intrinsic value of their own ; their worth had to be determined according to a place value system which was either left to the reckoner's discretion or indexed on the headings inscribed on either edge of the counting board itself (occasionally on more than one side of the abacus). Counters – usually pebbles of roughly the same shape and size – symbolized figures, be they units (e.g. coin or weight units : drachmas, for instance), subunits (to stick with the same monetary and ponderal standard, by far the best attested one – in fact, the only one we know of for sure : obols, half-obols and coppers) or superunits (staters, minas and talents) as determined by the column in which they were placed at one step or another of whatever sequence of operations was being processed. As the reckoning proceeded ([T15]), they were alternatively added to or removed from any column of the abacus. The very same pebbles could also be transferred from one column of the abacus to any other ([T13]). Each and every time their position on the abacus changed, counters were assigned a new value accordingly, which was therefore entirely contingent upon the place they held on the counting board at any given moment of an ongoing calculation.

[HYBRIDITY]. Whilst Aristotelian scholarship has eventually come to terms with the fact that a pebble's worth on the abacus was inherently positional and that – for the same reason – the abacus itself was a position-value system through and through [74], there has been little or no interest in – and therefore little or no effort put into – making out what the positions on the counting board actually stood for and, consequently, what the abacus' positionality was ultimately about. First of all, as far as evidence goes – and there's really no point in either ignoring available data or extrapolating anything except more of the same – we can definitely rule out that the abacus' layout and markings were designed to meet the needs of an abstract, arithmetical system. Needless to say, there's nothing wrong with the notion itself. There's nothing anachronistic either. Aristotle for one – or somebody so close to his school as to make guilt by association plausible enough [75] – knew everything there is to know about it or, at any rate, as much as it takes to ask why – barring a few half-wits of Thracian descent – everybody had fallen in love with the decimal number system :

> [T16] *Aristotelis quod fertur Problemata* XV 3, 910b 23-31 and 910b 38 - 911a 4 : « διὰ τί πάντες ἄνθρωποι, καὶ βάρβαροι καὶ Ἕλληνες, εἰς τὰ δέκα καταριθμοῦσι, καὶ οὐκ εἰς ἄλλον ἀριθμόν, οἷον β΄, γ΄, δ΄, ε΄, εἶτα πάλιν ἐπαναδιπλοῦσιν, ἓν πέντε, δύο πέντε, ὥσπερ ἕνδεκα, δώδεκα; οὐδ' αὖ ἐξωτέρω παυσάμενοι τῶν δέκα, εἶτα ἐκεῖθεν ἐπαναδιπλοῦσιν; ἔστι μὲν γὰρ ἕκαστος τῶν ἀριθμῶν ὁ ἔμπροσθεν καὶ ἓν ἢ δύο, καὶ οὗτος ἄλλος τις, ἀριθμοῦσι δ' ὅμως ὁρίσαντες ἄχρι τῶν δέκα. οὐ γὰρ δὴ ἀπὸ τύχης γε αὐτὸ ποιοῦντες φαίνονται καὶ ἀεί· τὸ δὲ ἀεὶ καὶ ἐπὶ πάντων οὐκ ἀπὸ τύχης, ἀλλὰ φυσικόν. […] ἢ ὅτι πάντες ὑπῆρξαν ἄνθρωποι ἔχοντες δέκα δακτύλους; οἷον οὖν ψήφους ἔχοντες τοῦ οἰκείου [911a] ἀριθμοῦ, τούτῳ τῷ πλήθει καὶ τἆλλα ἀριθμοῦσιν. μόνοι δὲ ἀριθμοῦσι τῶν Θρᾳκῶν γένος τι εἰς τέτταρα, διὰ τὸ ὥσπερ τὰ παιδία μὴ δύνασθαι μνημονεύειν ἐπὶ πολύ, μηδὲ χρῆσιν μηδενὸς εἶναι πολλοῦ αὐτοῖς [Mayhew 2011, 457-459 : why do all people, both barbarians and Greeks, count up to ten, and not to another number, such as 2, 3, 4, 5, and then repeat them again, one-five, two-five, just as (they count) eleven, twelve ? Or again, why do they not stop (at some number) beyond ten, and then repeat from there ? For each of the numbers is the preceding (number) plus one or two, and this is some other (number), but nevertheless they count by setting the limit up to the tens. For indeed, it is not from chance that all people plainly do in truth do this and always ; but what is always the case and for all people is not from chance, but natural. (…). Or is it because all people began (counting) with ten fingers ? So having as it were their own number of counters, they count other things with this quantity as well. But a certain race of Thracians alone count up to four, because just like children they cannot remember for long, nor do they use much of anything] ».

As [T16] implies, a decimal abacus was beyond neither the technological capabilities nor the intellectual grasp of anybody interested in building one. In a sense, the thing itself had been around forever, albeit not as an artefact. For longer than people cared to remember, fingers had always provided them with a natural abacus of sorts (a digital abacus, if you like). This might help explain, to some extent at least, why Ancient Greeks expected more of their abaci than simply to assist them with operations their hands could easily take care of, i.e. operations whose numeric values – even and especially when they changed – stood in one and the same relationship (say again, a neat decimal one). Be that as it may, the fact remains that the ancient abacus wasn't bound to any specific arithmetical basis (most certainly not a decimal one), exclusive of others. On the contrary, if the reckoning board's vestigial markings mean anything – and they have to, since they were put there for a

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74. Merit where merit is due – as we've already pointed out above, Fait 1996 deserves to be regarded – in this respect – as a watershed in Aristotelian studies, for it truly marked a turning point in our understanding of Aristotle's pebble analogy.

75. Preferably if someone else is to draw the inference, that is. Truth be told, what follows is a tad speculative and, strictly speaking (i.e., as per the requirements of the argument at hand), beyond – if not above – the call of duty. Accordingly, without claiming any credit for it (nor avoiding any blame – and there's always plenty to pass around), I'm content to go along with one of the most likely – and widely accepted – authorship scenarios. Specifically, I follow Zucker 2010, 35 note 38 : « as it stands, the *Problemata* collection cannot be ascribed to Aristotle, even if it is Aristotelian in both essence and methodology ». Concerning the plausibility of an Aristotelian Urcompilation (as alluded to by Aristotle himself on seven or eight occasions, most notably in *De generatione animalium* IV 4, 772a 37 - 772b 12 referring to *Problemata*, X, 14 and 41, as well as in *Meteorologica* II 6, 363a 24-25 referring to XXVI), cf. e.g. Louis 1991, XXIII-XXXV or Mayhew 2011, XVIII-XX (if you don't read French or are in a hurry – or both, as is generally the case). On our hands being man's « natural abacus », cf. Caveing 1997, 229. *Problemata*, book XV's title, program and general interpretation have elicited a keen interest : Acerbi 2011, Mayhew 2012 and Bowen 2015 will help you get off the starting blocks. Bodnar 2011, is an excellent general introduction to the collection of Aristotelian problems. For the history of the text (Greek tradition) : cf. Marenghi 1961, Mansfeld 1992 (translated and slightly revised in Mansfeld 2009) and Bertier 2003 ; and for its mediaeval legacy : De Leemans & Goyens 2006 and Brouillette & Giavatto 2010. More bibliography in Ulacco 2011.

purpose (other than being purely decorative, which they were not) – they consistently mirrored non-decimal monetary conventions rather than plain numerical arrays. (Mark the words « non-decimal » and « conventional », for they'll come in handy soon enough). As a matter of fact, without exception, ancient reckoning boards neither laid out numerical values as such nor did they arrange numbers according to a purely arithmetical order (whichever its basis happened to be, provided the abacus' inscribed figures consistently stuck to the same numerical sequence, which they did not). As it happened, counting tables were labelled with monetary symbols instead – or their weight equivalents (as in "so much worth of wine, olive oil, lupini beans or whatever your houseboy was buying on that fine day") [76]. When they were labelled at all, that is. Without claiming to be exhaustive, a fairly comprehensive list of monetary scaled abaci would include findings from Athens [77], Epidaurus [78], Eretria [79], Hosios Loukas [80], Imbros [81], Korinthos [82], Laurion [83], Minoa [84], Oropos [85], Rhamnous [86], Thyrrheum [87] and, of course, Salamis [88]. While markings and their exact patterns may be slightly different from one abacus to another [89], they all have in common one feature, namely they all are symbols for monetary denominations – which, as everyone is well aware, were both conventional and non-decimal (more about that in a moment). So, the question is not so much « what did abacus inscriptions mean precisely ? » – we know that all too well [90] – but, rather, « why ancient abacists inscribed their reckoning boards with monetary units and monetary signs instead of abstract numbers and scales ? ». Might it be that the abacus was used, first and foremost, for counting money and was labelled accordingly ? Simple as that. And rightly so : stating the

[76]. For obvious reasons (it being their proper function), the close association of monetary and ponderal standards is most evident in the case of σηκώματα (*mensae ponderariae*), which however we will have to disregard here. The best-studied measuring table was discovered in Naxos in the 1870s (IG XII 5 99) : it displays a row of monetary signs for tallying purposes as recorded and described by Dumont 1873, 46 and discussed by Lang 1968, 242 and, more recently, by Cioffi 2014. Those in Delos have also attracted their fair share of scholarly attention – starting with Deonna 1938, 167-185 and down to Chankowski & Hasenohr 2014.

[77]. IG II² 2778, 2779, 2780 and 2781. Another alleged board, a Pentelic marble fragment found around 1933 in a previous excavation's dump, is mentioned by Lang 1968, 242-243.

[78]. IG IV, 984 and IG IV², 1 159. Cf. Pritchett 1968, 189-190.

[79]. IG XII 9 894. Petrakos 1981, 330 describes two more abaci whose inscriptions range – standardly enough – from the highest to the lowest monetary denomination – up to T (talents) and down to X (chalkous), that is.

[80]. Rousset 2013, 290-291. The Hosios Loukas' abacus shares a peculiar feature with the Thyrrheum boards (cf. below note 87), that is it includes the stater (Σ = στατήρ) in its standard. On the other hand, it seems to be the only abacus on record lacking a sign for the drachmas, as pointed out by Rousset 2013, 293 in his masterly reconstruction of the « Δ (δέκα μναῖ), Π (πέντε μναῖ), Π (μνᾶ), Δ (δέκα στατῆρες), Π (πέντε στατήρες), Σ (στατήρ), O (ὀβολός), H (ἡμιωβέλιον), T (τεταραμόριον), X (χαλκοοῦς) » inscribed sequence.

[81]. IG XII 8 61 and IG XII 8 62.

[82]. SEG XI 188 and SEG XXVI 401. Broneer 1933, 563-565 (discovery) ; De Grazia & Kaufman Williams 1977, 72-73 and 76 (description and discussion as item 28 and 29 of his catalogue of findings) ; Immerwahr 1986, 200-201 and Donati 2010, 10, 20-23 (further discussion).

[83]. Cf. note 43 above.

[84]. IG XII 7 282.

[85]. IG VII 762, 763 and 765. Cf. Leonardos 1926, 44-45 for the three of them (labelled each as λογιστικὸς ἄβαξ, items 156, 157 and 159 respectively).

[86]. Petrakos 1999, 121.

[87]. IG IX 1² 362, 363, 364. Cf. Woisin 1886, 4 ; Tod 1912, 112 ; Nagl 1914, 20 ; Rhomaios 1916, 48. *Contra* Schärlig 2001, 94-95 (« A bogus abacus : Acarnania II »), we follow Tod 1927, 144-145 and 1947, 26 epigrammatic interpretation (most notably, Σ is for στατήρ and T is for τριώβολον) of the inscription as a monetary scale rather than a given amount of money (16.666 drachmas) as previously believed by Cousin 1886, 179-180 and Dittenberger 1897, 121 (= IG IX 1 488).

[88]. IG II², 2777. The undisputed star in our list. Cf. note 62 above for its description, depiction and relevant bibliography.

[89]. E.g., usually « □ » was the symbol for drachmas, but Epidaurus (IG IV, 984) and Korinthos (SEG XXVI 401) abaci had « O » instead. Drachmas were most commonly followed by obols, yet Eretria abacus (IG XII 9 894) had an added 3 obols or half-drachma sign « ϟ» between « □ » and « – » (which is also a relatively peculiar symbol for obols, these being more often than not marked as « I » and, sometimes, as « O »). Marcus Niebuhr Tod's authoritative contributions to Ancient Greek numeral systems (and their so called « acrophonic » – Keil 1894, 253 note 1 – notations) are to this day the best place to start looking into the matter (cf. Tod 1912, 1913, 1927, 1937 and 1950). Schmandt-Besserat 1996 (a summary of Schmandt-Besserat 1992) will provide the scrupulous reader with a broader perspective on numerical writing in general.

[90]. That abacus inscriptions have to do – exclusively or almost exclusively – with monetary numerals is a very well-known fact, at least amongst archaeologists, epigraphists and French historians of Greek mathematics. Antoine-Jean Letronne (a fine archaeologist in his prime), Marcus Niebuhr Tod (a distinguished epigraphist his whole life) and Maurice Caveing (one of the greatest, if not the greatest historian of ancient mathematics, whose only fault was that he wrote in a doomed vernacular, now moribund) said it all a long time ago. Reading is believing and one cannot but rejoice at how good these scholars were and just how easy it is to look at things standing on their shoulders. Letronne 1846, 306 : « its <the Salamis abacus'> is a numerical scale which, twice, starts its sequence with the figure 500 and, once, with the talent (6.000). It always ends up with the chalkous (a copper coin), that is the smallest monetary denomination of old. For what we have here are monetary amounts and nothing else ». Tod 1945, 113 : « especially significant is the abacus from Salamis, now in the Epigraphical Museum at Athens (IG II² 2777), on which are engraved three series of monetary signs (not pure numbers) in descending order of value ». Caveing 1997, 229 : « first and foremost, the abacus was a tool for accounting, whose columns stood for monetary units (…). Therefore, we should not look at it as a substitute for pure, abstract numbers ». It is worth noting that even William Kendrick Pritchett – who staunchly opposed the idea that the same abacus Letronne, Tod and Caveing had in mind, that is the Salamis table, was a reckoning board – did not challenged the fact that « the chief reason for assuming that the table was an abacus seems to have been the series of monetary numerals at the edges » (Pritchett 1968, 200), that is : « the numeral signs are arranged in descending order, ranging from 1,000 drachmai to 1/8 obol, the two additional characters being Γ𐅁 (= 5,000 drachmai) and T (= talent or 6,000 drachmai). The lowest and highest money units are at the two ends of the scale. The system of notation is that employed regularly by the Athenians » (Pritchett 1968, 195).

obvious – « most Greek abaci seem to have been set up to handle monetary calculations, etc. » (Wyatt 1964, 269) [91] – is always the best answer to a question that deals with the most ordinary tools of everyday life. And – make no mistake about it – the ancient abacus was just another run-of-the-mill gizmo common people used one moment and forgot all about it afterwards – unless, of course, something strange happened right next to it [92]. Besides, it is only reasonable to assume that Ancient Greeks gave up finger counting and set up the abacus when they needed to, that is when they had to go through lengthy calculations or work out figures based on both decimal and non-decimal ratios. Needless to say, this is precisely what happened each and every time they reckoned to any degree of precision how many coppers make up how many obols and how many of these you need to have such and such amount of drachmas, minas or talents.

IF YOU PAY BEANS, YOU GET JURORS. A cautionary tale, which Aristophanes has one of his most level-headed and likeable characters tell, might just spell it out for us. How do you rip off your opinionated and gullible senior citizens ? Easy busy jurors squeezy – you set them on your political foes in court and you keep the whole lot both happy and hungry, feeding them scantily the leftovers from the pie you and your cronies have lavishly helped yourselves to :

> [T17] *Aristophanis Vespae*, 655-664 : « <Βδελυκλέων :> ἀκρόασαί νυν, ὦ παπίδιον, χαλάσας ὀλίγον τὸ μέτωπον. καὶ πρῶτον μὲν λόγισαι φαύλως, μὴ ψήφοις ἀλλ' ἀπὸ χειρός, τὸν φόρον ἡμῖν ἀπὸ τῶν πόλεων συλλήβδην τὸν προσιόντα, κἄξω τούτου τὰ τέλη χωρὶς καὶ τὰς πολλὰς ἑκατοστάς, πρυτανεῖα, μέταλλ', ἀγοράς, λιμένας, μισθώσεις, δημιόπρατα· τούτων πλήρωμα τάλαντ' ἐγγὺς δισχίλια γίγνεται ἡμῖν. ἀπὸ τούτου νυν κατάθες μισθὸν τοῖσι δικασταῖς ἐνιαυτοῦ, ἓξ χιλιάσιν – "κοὔπω πλείουσς ἐν τῇ χώρᾳ κατένασθεν". γίγνεται ἡμῖν ἑκατὸν δήπου καὶ πεντήκοντα τάλαντα. <Φιλοκλέων :> οὐδ' ἡ δεκάτη τῶν προσιόντων ἡμῖν ἄρ' ἐγίγνεθ' ὁ μισθός [Henderson 1998, 305 : <Loathecleon :> then listen, pop, and relax your frown a bit. First of all, calculate roughly, not with your counters but on your fingers, how much tribute we receive altogether from the allied cities. Then make a separate count of the taxes and the many one percents, court dues, mines, markets, harbours, rents, proceeds from confiscations. Our total income from all this is nearly two thousand talents. Now set aside the annual payment to the jurors, all six thousand of them, "for never yet have more dwelt in this land". We get, I reckon, a sum of one hundred and fifty talents. <Lovecleon :> so the pay we've been getting doesn't even amount to a tenth of the revenue] ».

Whilst it is just possible that the dutiful son character wishes to keep the pebbles out of his father's reach and sight, lest he gets too excited all over again and relapses even before his sobering up could begin, no one – in the last two hundred years – has missed the fact that Aristophanes set apart rough off-hand reckoning (λογίζομαι φαύλως, ἀπὸ χειρός) from accurate pebble computation (λογίζομαι ψήφοις) [93]. Few, on the other hand, seem to

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91. Based on Letronne's archaeological data and analysis alone (the Salamis abacus file, for short), Moritz Cantor, who could still read French, drew a similar conclusion according to which all signs (monetary numerals, huge dimensions and sturdily built) supported the inference that the Salamis table was a « Zahltisch eines Wechslers », that is a money-changer's counter (Cantor 1863, 133).

92. There's nothing particularly inspiring about ancient abacuses and one has no problem understanding why people did not fancy the kind of chores they were supposed to help with. Some things never change and computational assignments have always been a pain in the neck (ἐνέργεια λυπηρά) : « ἡ μὲν οἰκεία ἡδονὴ ἐξακριβοῖ τὰς ἐνεργείας καὶ χρονιωτέρας καὶ βελτίους ποιεῖ […]. φθείρουσι γὰρ τὰς ἐνεργείας αἱ οἰκεῖαι λῦπαι, οἷον εἴ τῳ τὸ γράφειν ἀηδὲς καὶ ἐπίλυπον ἢ τὸ λογίζεσθαι· ὃ μὲν γὰρ οὐ γράφει, ὃ δ' οὐ λογίζεται, λυπηρᾶς οὔσης τῆς ἐνεργείας [the proper pleasure of an activity makes it accurate, last longer and improves it. (…). Pain that belongs by itself to an activity, on the other hand, destroys it. For example, someone loathes and can't stand writing or doing sums – well, he'll neither write nor will he do sums, because he finds it annoying] » (*Ethica nicomachea* X 5, 1175b 13-15 et 17-20). For the sake of decorum, we won't dwell upon the secret life of ancient abaci. That being said, if one were to dig for unsavoury details, he would unearth the usual amount of dirt and then some. One always does, especially when bankers are involved and money changes hands faster than you can count. A short fragment from Lysias will suffice to remind us of the close proximity – if not intimate kinship – between whoring and banking, two of the oldest and most lucrative trades of the civilized world : « ἐφ' ἑτέρου μὲν γὰρ εἴρηται ὑπὸ Λυσίου ἐν τῷ ὑπὲρ Καλλαίσχρου, "μετ' ἀβακίου δὲ καὶ τραπεζίου πωλῶν ἑαυτόν" [the word "abacus" is used in still another sense by Lysias in his *On behalf of Callaeschrus* : "selling himself between an abacus and a counter"] » (*Pollucis onomasticon* X 105, 221.12-14). Already Johann Georg Baiter and Hermann Sauppe suggested – p. 191 of their 1850 edition of the Attic orators – that the word ἀβάκιον does not mean here « gaming table (*tabula lusoria*) » but « counting table ». They went even further and suspected without much proof, as Carey – p. 418 of his 2007 edition of Lysias orations and fragments – rightly pointed out, that the *servus argentarii* was the employee servicing both the *mensula* and the *mentula* (the syntagma πολεῖν ἑαυτόν, as it occurs in the Lysias' fragment possibly for the first time, has been discussed with references to Lysias and later sources by Colla 2012, 50-51). True enough, it is immaterial to ascertain here whether the hired hand worked both jobs or not, and I may have made the point a bit flippantly, but, folks, there's a serious issue here : the moral of the story is that wherever banking counters were to be found [a], abaci were not far away. Not to mention the fact that τράπεζα and ἄβαξ are occasional synonyms and therefore may refer at times to the same thing, as the epigraphic evidence from one of the Corinthian surviving specimens (SEG XI 188) shows : « ΔΑΜΟΣΙΑ ΚΟΡΙΝΘΙΩΝ » is inscribed on the lower right corner of the abacus, that is to say : δαμοσία <τράπεζα> – as Donati 2010, 10a-b took good notice : « the δαμοσία Κορινθίων identifies the counting table as the property of the Corinthian state [10b] with the feminine singular gender of δαμοσία alluding to τράπεζα (table) and not the masculine ἄβαξ (abacus) ». [a] As a matter of fact, we know where the Athenian counters were traditionally located, somewhere in the northwest corner of the Agora (cf. Thompson & Wycherley 1972, 171 note 12) – a corner Socrates and Hippias were pretty familiar with, as evidenced by Plato's *Apology* (17c 7-9 : ἐν ἀγορᾷ ἐπὶ τῶν τραπεζῶν) and *Hippias minor* (368b 2-5 : ἐν ἀγορᾷ ἐπὶ ταῖς τραπέζαις).

93. By contemporary standards the « Dean Ireland Scholarship for the promotion of classical learning and taste »'s test is definitely elite philologists' stuff – how many people, apart from Sten Ebbesen, Philippe Hoffmann and a chosen few, do you know who would be comfortable with translating off-hand, either in Latin hexameters or in Greek iambics, stanzas from Spenser's *The Faery Queene* ? When it was established back in 1825 (cf. *Parecbolae*, 1846, 203-207), it was meant for undergraduate students (who, by the way, were no longer eligible to take it after their sixteenth term, that is beyond their fourth year). As it happened, [T17] caught the examiners' imagination around 1844, for they required that year's candidates to translate Aristophanes verses and comment, albeit shortly, on their content – technically-wise if we are to judge from their other requirements… for instance, that same year, Fufidius' scam (cf. *Horatii saturae*, I, 2.14 : « quinas hic capiti mercedes exsecat [Rushton Fairclough 1926, 19 : five times the interest he slices away from the principal] ») was to be assessed

have noticed that the digital calculations Bdelukleôn is running by his old man stick to the same monetary denomination : as a matter of fact, however conspicuous, the approximate sums (ἐγγὺς δισχίλια, ἑκατὸν δήπου καὶ πεντήκοντα) are all expressed in talents (τάλαντα). As a result, although the domestic whistle-blower is keeping track of a whole lot of coin, no fancy conversion is called for and even his intoxicated, delusional jury-duty fiend of a father has no problem following the money and figuring out that he's been seriously bamboozled. Just the same, few have taken notice of the fact that when Philokleôn finally catches up and realises he and his fellow minions have been feasting on crumbs [94], he takes the figures of the racket he's been involved in and rounds them up to the nearest decimal, a tithe precisely – give or take fifty talents, that is (which is, by the way, more than he would earn in several lifetimes as a juror).

WHEN DID YOU GET TO PULL THE PEBBLES OUT OF THE BAG THEN ? The answer to that question should be clear by now : you pick up the counting board when you cannot trust your fingers to do the job, either because you run out of digits before the calculation is over or because the ongoing computation involves more variables than your hands can handle on their own [95]. Albeit in short supply, literary evidence points precisely in this direction (and in this direction only) : the abacus main strength and, as a result, its primary utility and overall interest laid in its reliability in carrying on long-drawn-out reckonings, especially when they involved back and forth permutations between decimal and non-decimal operands. Alexis' carousers – whom we've already met ([T11] and [T15]) – and the bull artist from Theophrastus' portrait gallery [96] offer a glimpse into the abacus' workings :

> [T18] *Theophrasti Characteres* XXIII 6, 130.20 - 132.26 : « καὶ ἀγνώτων δὲ παρακαθημένων κελεῦσαι θεῖναι τὰς ψήφους ἕνα αὐτῶν καὶ ποσῶν κατὰ χιλίας [a] καὶ κατὰ μίαν καὶ προστιθεὶς πιθανὰ ἑκάστοις τούτων ὀνόματα ποιῆσαι καὶ δέκα τάλαντα· καὶ τοῦτο φῆσαι εἰσενηνοχέναι εἰς ἐράνους αὐτῶν· καὶ τὰς τριηραρχίας εἰπεῖν, ὅτι οὐ τίθησιν, οὐδὲ τὰς λειτουργίας, ὅσας λελειτούργηκε [Diggle 2004, 131 : when he finds himself sitting next to complete strangers he will ask one of them to work the calculator, and then he does an addition counting from the thousand-drachma to the one-drachma column, and putting a plausible name to each item, and reaches as much as ten talents, and says that these are the sums he has contributed towards loans for friends – and he has not included the trierarchies and all his other compulsory public services] ». [a] κατὰ χιλίας is Wilamowitz 1898's, 522 conjecture. It is widely accepted on account of the fact that, on the one hand, ancient abaci lacked a 600 drachmas column (whereas they actually had one for the 1000 drachmas) and, on the other hand, the figure 600 (καθ' ἑξακοσίας) may be explained as a confusion between the alphabetic and the acrophonic values of X (it being understood that abaci's markings are usually consistent with the acrophonic system).

[T18] and [T15] deal with similar situations : Theophrastus' braggart and Alexis' partygoers – ἐρανισταί both, as it happened – were in for more than a few rounds of additions and conversions.

Ὁ ἀλαζών. On top of the five talents worth of charities he handed out during the famine (5) as well as the civic contributions he's burdened with as the wealthy citizen he pretends to be (6), Theophrastus' fraud boasts about the ten talents he allegedly spent helping out friends in need. And our friendly neighbour certainly has been busy comforting indigent pals, for he's making up stories about liberalities whose figures are supposed to

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according to Roman moneylending customs and laws : « what was the usual rate of interest at Rome ? Mention some of the laws by which it was regulated ».

94. As suggested in a scholium (*Scholia in Aristophanis Vespas*, *ad* 663), Bdelukleôn worked out the figure on the basis of jurors daily pay (τριώβολον τῆς ἡμέρας), times the number of jurors (ἓξ χιλιάσιν), times the number of available months in a year (δέκα μῆνας). While the reasoning is sound and the τριώβολον as well as the number of jurors are solid enough figures (MacDowell 1971, 222 ; Sommerstein 1983, 198 ; Biles & Olson 2015, 293), three hundred court days – year in, year out – is undoubtedly more often than the Athenian calendar actually allowed and the jurors – all six thousand of them – could actually stand if they were to attend every day (Hansen 1979 reduced these figures significantly, whether he went too far or not, he was definitely headed in the right direction, as pointed out by Harris 1986).

95. That much should be uncontroversial – but it isn't. Who disagrees ? Franco Lo Piparo, for one, is of a different mind altogether. Admittedly, there's subtle and there's too subtle – and some at least of Lo Piparo's distinction are so subtle they're lost on me – for instance, the distinction between an Aristotelian notion of « symbol » and its opposite un-Aristotelian number : « our text does not claim that words are symbols of facts. Rather, it says that – when discussing – we use words-that-are-symbols » (Lo Piparo 2003, 184). His examples, on the other hand, are delightful – even when they prove exactly the opposite of what they are supposed to show. In this particular instance, let's follow Lo Piparo to the market and meddle in his salesman's business. Hermogenes buys and sells sheep and uses counters to keep track of his transactions. Does he really need them ? Better safe than sorry… but let Lo Piparo tell us more about it : « this is how our salesman keeps accounts : he matches sheep and pebbles so that he puts one of these in his bag each and every time he buys one of those and does the opposite when he sells instead of buying ». If Hermogenes does not make a mess of it (that is if he does not get drunk and miss the one-to-one relationship between sheep and pebbles), at the end of the day he'll have as many sheep in his barn as he has pebbles in his bag. By Lo Piparo's math, ten pebbles equal 10 sheep (that is the four sheep Hermogenes bought to start with, minus the two he sold at some point, plus the eight more he purchased before calling it a day) » (Lo Piparo 2003, 184). Let me ask again : does one need an abacus or even a bunch of pebbles to count up to ten (add four, subtract two, add eight… equals ten – attaboy !) ? Whatever the answer, unless one can't be bothered to properly match one pebble and one sheep as need be while keeping track of both at one and the same time (in Lo Piparo's terse scientific prose : « se non ha fatto errori nell'operazione della messa in corrispondenza uno-a-uno di pecore e sassolini, alla fine dei suoi affari avrà tante pecore quanti sono i sassolini che si trovano nella sua bisaccia »), then he has no business counting them at all, with or without an abacus !

96. It is worth noticing that Theophrastus mentioned the abacus on no less than three different occasions. As a matter of fact, in addition to the boastful man ([T18]), the abacus reveals peculiar features of two other characters : the moron (XIV 2, 106.3-5) and the arrogant man (XXIV 12, 134.15-17). While the former's absentmindedness is farcical and heartening, the latter's high-handedness is more informative, i.e. more supportive of the monetary and commercial agenda I've been pushing all along – see [T23] below. Millett 2007 (in particular 69-70) and Pertsinidis 2018 are two short, student-friendly introductions to Theophrastus work. Cf. Lane Fox 1996 for a more detail-oriented, almost book-length study (in particular, 134-135).

add up as high as ten talents, that is as much as sixty thousand drachmas. True enough, [T18] doesn't say much about the average amount of such loans [97], but – as Diggle 2004, 439 observed – the « κατὰ χιλίας καὶ κατὰ μίαν » suggests that loans covered the full range of columns. If this is true or even half true, it does not matter how clever with their hands Theophrastus' mythomaniac and his audience were supposed to be ; only an abacus would have allowed them to navigate through the fairly long string of operations involved in [T18]'s reckoning divagations.

Ὀι ἐρανισταί. Even under the best of circumstances, dinner arrangements are a sensitive matter to say the least, and you'd better discuss them beforehand, lest you get into an argument as soon as the party's over and party animals start turning on each other. This is precisely what makes [T15] an awkward and potentially hilarious situation : instead of sleeping off the booze or having it off with the flute girl [98], as any decent bloke would have done instead, A and B picked up a fight over the price of mussels, cabbage and sea-urchins – what's wrong with you people ? One thing they got right though : whether they went at each other intoxicated or not, there's no way they got to the bottom of the matter relying only on their fingers for adding seven coppers of this, one drachma of that, three of those at ten obols each. etc. We ignore whether eventually A and B found some sort of closure (for all we know, they might still be quibbling and tossing the pebbles around). If they ever did, they had to thank the non-decimal notations on the abacus they called for and put to good use to add and convert – as needs be – non-decimal monetary denominations like coppers, obols and drachmas.

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WHAT DO [POSITIONALITY] AND [HYBRIDITY] TELL US ABOUT ARISTOTLE'S PEBBLE ANALOGY ? For the sake of brevity, we have left aside a few additional allusions to the abacus and a number of passing mentions of the counters in ancient Greek literature – they sing pretty much the same tune anyway [99]. All in all, if I'm right or even half right, then the best way to make sense of Aristotle's analogy is also the most natural, insofar as it is consistent with most of the epigraphic and literary evidence available. Specifically, everything we've gathered so far warrants two related claims. The first is that – contrary to what [ARITHMETICAL BIAS] would have us believe – there's more to the abacus comparison than just plain arithmetic. Insofar as abacus assisted calculations were first and foremost pecuniary transactions, they routinely involved operations and conversions related to monetary and weight standards. More to the point, if plain numbers and plain arithmetical rules entered the Aristotelian picture at all, they didn't do so for their own sake (wherefore the [PROXY] label our first assumption will henceforth go by). Our second claim is that Aristotle was not so much interested in comparing calculation and argumentation as such (let alone language at large), as he was in comparing why (and how) they both fail. As a matter of fact, the whole point of the pebble analogy is failure ; in this particular instance, failure to detect and prevent abusive value shifts affecting words and counters (wherefore the [FAILURE] label etc.) [100].

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[97]. For what it is worth, Demosthenes (or, perhaps, Apollodoros himself, which is somewhat ironic considering there was no love lost between the two) recorded two such loans granted to Nicostratos, a friend turned foe, for an amount of 300 (which the former eventually condoned) and 1000 drachmas (an ἔρανος contribution for the latter's ransom) : « τάς τε τριακοσίας, ἃς τῷ ἀδελφῷ αὐτοῦ ἔδωκα ἐφόδιον ὅτε ἐπορεύετο ἐπὶ τοῦτον, ἀφιείην αὐτῷ, χιλίας τε δραχμὰς ἔρανον αὐτῷ εἰς τὰ λύτρα εἰσοίσοιμι [Bers 2009, 59-60 : I forgave the loan of three hundred drachmas that I gave his brother when he travelled to get him and said I would contribute a thousand drachmas towards his ransom] » (*Contra Nicostratum* 8, 204.20-23). Demosthenes again – in an early speech against his guardians over his father's squandered estate – listed amongst the assets that should have been bequeathed to him a number of loans : « ναυτικὰ δ' ἑβδομήκοντα μνᾶς, ἔκδοσιν παρὰ Ξούθῳ, τετρακοσίας δὲ καὶ δισχιλίας ἐπὶ τῇ τραπέζῃ τῇ Πασίωνος, ἑξακοσίας δ' ἐπὶ τῇ Πυλάδου, παρὰ Δημομέλει δὲ τῷ Δήμωνος υἱεῖ χιλίας καὶ ἑξακοσίας, κατὰ διακοσίας δὲ καὶ τριακοσίας ὁμοῦ τι τάλαντον διακεχρημένον. καὶ τούτων αὖ τῶν χρημάτων τὸ κεφάλαιον πλέον ἢ ὀκτὼ τάλαντα καὶ πεντήκοντα μναῖ γίγνονται [MacDowell 2004, 24 : in maritime assets he left 70 minas on loan to Xuthus, 2.400 drachmas at Pasion's bank, 600 at Pylades', 1.600 with Demomeles son of Demon, and various loans of 200 or 300 amounting to about a talent. The total sum of this money comes to more than 8 talents 50 minas] » (*Prima in Aphobum oratio* 11, 45.11-18). Korver 1941, 14-15, Thompson 1979, 227 and Millett 1991, 157 note 38 have suggested that the twenty odd loans Demosthenes mentions amongst his non-earning assets did not yield interests and are to be considered ἔρανος-like credits (Bogaert 1986, 22 disagrees). In which case, the amount of operations Theophrastus' schmoozer has his occasional acquaintance lay down on the abacus might be ridiculously high – hardly out of character, ain't it ? Be that as it may, sums may well be imaginary, the computation is not – Theophrastus' fraud may be fabricating names and contriving figures, but he calculates as if the amounts were all too real, on the abacus that is.

[98]. Admittedly, there is more about ancient musician women than meets the classicist eye (cf. e.g. Burton 1998, Harmon 2005, Goldman 2015, etc.), starting with the label itself – « flute girl » – which may well be an anachronistic fabrication (cf. West 1992a, 1). That being said, Old Comedy clichés apart (cf. e.g. Gianvittorio 2018), Alexis' characters – especially A (a man after my own heart) – strike me as they would not think twice before going for Philokleôn's bold manoeuvre and snatch the αὐλητρίς for their personal comfort… *Vespae*, 134 : « ὁρᾷς ἐγώ σ' ὡς δεξιῶς ὑφειλόμηνμέλλουσαν ἤδη λεσβιεῖν τοὺς ξυμπότας· ὧν εἵνεκ' ἀπόδος τῷ πέει τῳδὶ χάριν [Henderson 1998, 391 : did you see how handily I sneaked you away just when you were supposed to start sucking the guests ? for that you owe my cock here a favor] » (you can quote me on that).

[99]. For instance, Pindar's tenth *Olympian* opening strophe relies heavily on ancient accounting jargon : indebtedness (χρέος) and repayment with interests (τόκος), etc. Several scholars have thus come to the conclusion that the poet chose the ψᾶφος metaphor accordingly, that is in reference to the pebbles used in money-calculations (Norwood 1974, 111 ; Kromer 1976, 426-428 and Faraguna 2008, 36-37). Others have been more nuanced (Verdenius 1987, 60). All in all, the poet seems to have conflated two images when he mentions the flow of his song washing away his debt : on the one hand, the clearing of the counters off the counting table after the reckoning has been successfully carried out and, on the other hand, the washing away of the pebbles swept by the ever-rolling wave.

[100]. For we lack conclusive evidence concerning how calculations were actually performed on the abacus, we haven't indulged in a thorough, albeit tentative, reconstruction of what could have possibly gone wrong on the counting board when chips were pushed around. If I were to single out the one line of speculation that – in another life – I'd pursue, I would say that, for all practical purposes, tracking pebbles

Before we expound [PROXY] and [FAILURE] in more detail, let us first clear a technical hurdle involved in shifting the focus of Aristotle's analogy away from the arithmetical bias that has traditionally plagued its interpretation : is Aristotle's choice of words consistent with the idea that merchant arithmetic and bean counting were the kind of calculations he had in mind when comparing poor reckoning and poor debating skills ? In so many words, yes.

Λογίζομαι (ἐπὶ τῶν ψήφων). If one were to ask what exactly Aristotle's « λογιζόμενοι » ([URTEXT], 165a 9-10) were counting, the answer would be as vague as the verb is rich in nuances – most likely a jest (« the counters, you silly ») or a shrug (« just about anything and everything the counters can stand for, I guess »). So late in the game, an attempt at narrowing down the polysemy of the expression by virtue of its association with the pebbles would look like cheating or begging the question, to an extent. That being said, the fact remains that, whether the counters are explicitly mentioned or not, λογίζομαι was used to refer to all sorts of practical computations, for the most part involving money. To stay in character, supportive fathers do not fare much better than abusive ones in Aristophanes' family sagas, especially when their offspring develop expensive addictions ; their financial problems, however, were referred to and assessed in the same terms, as Strepsiades – the onanist opsimath who got in deep with the sharks and thought philosophy was the easy way out (think again !) – put it when prompting the houseboy to bring him the ledger on a sleepless, anguish-fuelled night [101] :

> [T19] *Aristophanis Nubes*, 16-20 : « ὁ δὲ κόμην ἔχων ἱππάζεταί τε καὶ ξυνωρικεύεται ὀνειροπολεῖ θ' ἵππους. ἐγὼ δ' ἀπόλλυμαι ὁρῶν ἄγουσαν τὴν σελήνην εἰκάδας· οἱ γὰρ τόκοι χωροῦσιν. ἄπτε, παῖ, λύχνον κἄκφερε τὸ γραμματεῖον, ἵν' ἀναγνῶ λαβὼν ὁπόσοις ὀφείλω καὶ λογίσωμαι τοὺς τόκους [Halliwell 2015, 21 : he lets his hair grow long and his life's an obsession with horses and chariot-racing — he even dreams of horses. Meanwhile I'm distraught as I watch the moon reach the twentieth day of the month. All that interest mounting up! Hoy, slave, a lamp! And bring me out my accounts. I want to read how many my creditors are and work out the interest] ».

People being people, they hold grudges over money more than over anything else : now and then, family members fritter away their next of kin's heritage, trade partners turn on each other, bankers rob their clients blind – business as usual. It is hardly surprising then that ancient legal courts offer a wealth of lexical evidence ; and λογίζομαι figures prominently in all kinds of financial litigations : embezzlement of funds and goods, misappropriation of estates and revenues, miscalculation of profits and costs, concealment of property, creative accounting – you name it [102].

> [T20] *Lysiae De bonis Aristophanis ad aerarium* 9-10, 184.23 - 185.3 : « συκοφαντούμεθα καὶ κινδυνεύομεν περὶ ὧν οἱ πρόγονοι ἡμῖν κατέλιπον κτησάμενοι ἐκ τοῦ δικαίου. καίτοι, ὦ ἄνδρες δικασταί, ὁ ἐμὸς πατὴρ ἐν ἅπαντι τῷ βίῳ πλείω εἰς τὴν πόλιν ἀνήλωσεν ἢ εἰς αὑτὸν καὶ τοὺς οἰκείους, διπλάσια δὲ ἢ νῦν ἔστιν ἡμῖν, ὡς ἐγὼ [10] λογιζομένῳ αὐτῷ πολλάκις παρεγενόμην. μὴ οὖν προκαταγιγνώσκετε ἀδικίαν τοῦ εἰς αὐτὸν μὲν μικρὰ δαπανῶντος, ὑμῖν δὲ πολλὰ καθ' ἕκαστον τὸν ἐνιαυτόν, κτλ. [Todd 2000, 203-204 : we are being attacked by sycophants and are on trial for the property which our ancestors justly possessed and handed down to us. And yet throughout his life, gentlemen of the jury, my father spent more on the city than on himself and the members of his family : twice what we now possess, as I often heard him calculate. Do not convict prematurely of wrongdoing the person who spends little on himself bur a great deal every year on you, etc.] ».

Being under suspicion as an accessory in a scheme involving a transfer of seizable assets, Lysias' client may or may not be trusted implicitly – all the more so since he seems to have been the only witness of his father's reckoning. That being said, we have no reason to think that the jurors understood the λογιζομένῳ αὐτῷ as referring to anything else but the process of calculating the expenses the defendant's old man incurred on behalf of the city.

More to the point, when both words (λογίζομαι and ψῆφοι) occurred in the same sentence, before you know it, you are counting money or someone is counting money for you. Demosthenes – referring back to Aeschines – and Theophrastus said it all :

> [T21] *Aeschinis Contra Ctesiphontem*, 59.3-9 : « ὅσπερ ὅταν περὶ χρημάτων ἀνηλωμένων διὰ πολλοῦ χρόνου καθεζώμεθα ἐπὶ τοὺς λογισμούς, ἐρχόμεθα δή που ψευδεῖς οἴκοθεν ἐνίοτε δόξας ἔχοντες·ἀλλ' ὅμως ἐπειδὰν ὁ λογισμὸς συγκεφαλαιωθῇ, οὐδείς ἐστιν οὕτω δύσκολος τὴν φύσιν ὅστις οὐκ ἀπέρχεται τοῦτο ὁμολογήσας καὶ ἐπινεύσας ἀληθὲς εἶναι, ὅ τι ἂν αὐτὸς ὁ λογισμὸς αἱρῇ [Carey 2000, 185 : when we take our seats at an audit session for expenditure over a long time, we may sometimes come from home with false impressions, but still when the account is reckoned up there is

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on the abacus must have been nearly impossible to begin with. As far as we know, the abacus simply did not allow one to display anything but the outcome of the reckoning. As [T18] and [T15] are to suggest, we can safely assume that most calculations run on the abacus went through more than just one step – why bother otherwise to get out the counters and set up the reckoning board in the first place ? So many steps, so many manipulations resulting over and over in a different configuration of the counters on the abacus. Each successive arrangement on the pebble-board modified and replaced the one it resulted from and was superseded by the one it led to. Since we are not aware that the abacus would record any previous stage of a calculation, short of working them backwards and comparing (mental) notes along the way, it must have been extremely difficult to nail down exactly what went south. And, to be sure, a number of things could have gone wrong : a displaced counter, or a shortcut replacement between non-adjacent columns, etc.

101. On Strepsiades' financial troubles as an « outstanding Athenian example of a "consumption loan" », cf. Millett 1991, 66. A representative selection of material evidence about money circulation and loans, is gathered in Bogaert 1976, who previously studied the world of Greek credit in Bogaert 1968 (cf. in particular 37-60 for a study of ancient banking vocabulary). For a more recent survey – building on Bogaert – cf. Shipton 2008.

102. I defer to Cuomo 2001, 20-24 who has already reviewed and discussed the evidence I hint at here, and refer the reader to Cuomo 2013 for a few sound suggestions about ancient numeracy, accounting and accountability (cf. already Davies 1994).

none of you of so grudging a disposition that he leaves without admitting and agreeing that the figure proved by the reckoning is true] ».

[T22] *Demosthenis De corona oratio*, 227.1-5 : « εἶτα σοφίζεται καὶ φησὶ προσήκειν ἧς μὲν οἴκοθεν ἥκετ' ἔχοντες δόξης περὶ ἡμῶν ἀμελῆσαι, ὥσπερ δ', ὅταν οἰόμενοι περιεῖναι χρήματά τῳ λογίζησθε, ἂν καθαραὶ ὦσιν αἱ ψῆφοι καὶ μηδὲν περιῇ, συγχωρεῖτε, οὕτω καὶ νῦν τοῖς ἐκ τοῦ λόγου φαινομένοις προσθέσθαι [Yunis 2005, 87 : next, he <Aeschines> made a very clever suggestion : you are to disregard the opinion that you had of us when you came here from home, and, just as when you audit people for supposedly retaining surplus funds but acquit them if the figures balance and there is no surplus, so in this case too you are to concur with the evident force of the argument] ».

[T23] *Theophrasti Characteres* XXIV 12, 134.15-17 : « ἀμέλει δὲ καὶ λογιζόμενος πρός τινα τῷ παιδὶ συντάξαι τὰς ψήφους διαθεῖναι καὶ κεφάλαιον ποιήσαντι γράψαι αὐτῷ εἰς λόγον [Diggle 2004, 135 : and you may be sure that when the arrogant man is reckoning someone's account he instructs his slave to do the calculations, work out a total, and write him out an invoice for that amount] ».

As is well known, Aeschines and Demosthenes did not get along very well [103]. Still, they would have agreed between them – and with Theophrastus – on one thing : whomever the finger of blame should be pointed at, λογισμοί, λογίζομαι and ψῆφοι definitely belong together and have a distinct reek of money about them.

Παρακρούω. If we are to believe ancient lexicographers [104], a similar case might be argued for the other expression associated with the counters in [Urtext], namely the verb παρακρούω :

[T24] *Harpocrationis Lexicon in decem oratores*, Π 28 : « παρακρούεται· ἀντὶ τοῦ ἐξαπατᾷ. πολὺ δ' ἐστὶ παρά τε τοῖς ἄλλοις Ἀττικοῖς καὶ παρὰ Δημοσθένει ἐν τοῖς Φιλιππικοῖς. μετῆκται δὲ τοὔνομα ἀπὸ τοῦ τοὺς ἱστάντας τι ἢ μετροῦντας κρούειν τὰ μέτρα καὶ διασείειν ἕνεκα τοῦ πλεονεκτεῖν, ὡς καὶ Σοφοκλῆς που "ὡς μήτε κρούσῃς μήθ' ὑπὲρ χεῖλος βάλῃς" [παρακρούεται (strike aside, mislead) for ἐξαπατᾷ (deceive). It occurs often both in the other Attic <orators> and in Demosthenes' *Philippics*. The word is a metaphor derived from how people who weigh or measure something flick the measures and shake them to obtain a profit – as Sophocles says somewhere : "that you neither flick nor exceed the rim"] ».

Did Aristotle actually use παρακρούω in [URTEXT], 165a 15 to convey the idea that smart pebble-movers take advantage of less experienced ones by fixing the counters ? Tempting though this is – after all, meddling with the counters for profit is not so different from tipping the scales – we'll leave it at that and will only allow that nothing in [URTEXT] rules out the possibility that παρακρούω means cheating unwary people out of their money through a wicked sleight of hand.

[PROXY]. Despite the overwhelming epigraphic and literary evidence suggesting the opposite and against a solid consensus amongst some of the best archaeologists, numismatists and historians of Greek mathematics – [ARITHMETICAL BIASED] interpreters have long been labouring under the wrong assumption that the purpose of Aristotle's pebble analogy was to draw a parallel between computation and speech tout court – as if the way we work out numbers in general could shed any light on how we misuse words. This is, of course, misleading on several counts. First if not foremost, nowhere does Aristotle compare numbers and linguistic expressions as such, their features or their relations to the things we talk and make calculations about. In fact, [URTEXT] offers little support to the idea that, when Aristotle referred to counters, he was leaning on a kinship of sorts – or any kinship, for that matter – between calculation and speech themselves. He wasn't. As [COMPLICATION BIAS] and [HYBRIDITY] discussions have made it abundantly clear, leisure calculation or counting for the sake of crunching numbers – not to speak of more abstract forms of ancient logistic [105] – were anything but a priority for those who

[103]. On character assassination and Aeschines and Demosthenes rivalry, cf. Worman 2004, 2008, 213-274, 2018 and Kamen 2020, 60-86. Since the winner takes it all, on Demosthenes portrait of his foe as a Theophrastean character – a comic one of course – cf. Rowe 1966 ; stylistic and linguistic issues of the crown speech have been addressed in Yunis 2001 and, more recently, in Murphy 2016.

[104]. On Harpocration's glossary, cf. Dickey 2007, 94, both concise and much to the point. Same entry in Photius (Π 253), Suda (Π 373), Lopadiota (Π 18), etc.

[105]. The kind of higher, more speculative disciplines investigating the true nature of numbers, their many properties and relations, which Plato had already set apart as a matter of course while separating the theoretical requirements of philosophers interested in numbers theory from the all too practical needs of ordinary people busy measuring and counting off everyday things (*Philebus*, 56d 4 - 57a 4). It is not always easy to determine whether Plato thought of philosophical logistic as a science all onto itself and to what extent exactly it was germane to other branches of human knowledge and overlapped with them – most notably arithmetic (cf. e.g. *Gorgias*, 451a 8 - 451c 5 and *Respublica* VII, 525a 10 - 527c 10). Insofar as neither is to be mistaken with counting and measuring crafts – the only maths vulgar calculators were supposed to know and arguably cared about anyway – we won't try to address the issue here. Klein 1934-1936 brilliantly raised the problem and went a long way toward solving it ; half the story though it is, Majolino 2012 may be considered the final word on this as well as on a number of related matters, most notably ancient dislike for fractions – also addressed most competently in Knorr 1982, Vitrac 1992, Mendell 2008 and Acerbi 2019. It is a little out of our jurisdiction and we probably should trust our layman's instincts and leave it out, but Boyer 1968, 66 may have something there : « it is likely that the widespread use of the abacus accounts at least in part for the amazingly late development of a consistent positional system of notation for integers and fractions ». As a matter of fact, as pointed out by Carl Boyer himself, insofar as « the abacus can be readily adapted to any system of numeration or to any combination of systems » (Boyer 1968, 66), it made it perfectly natural to treat fractions as multiple subunits : on the counting board, a chalkous does not look anything like an eighth of an obol… rather, it takes eight coppers coins to make an obol. Likewise, on the abacus, an obol is not a sixth of a drachma, but six obols make a drachma, and so on and so forth. For it stands out as the most astute description of how abacus computations were likely to be performed, let's hear it from Henry Mendell : « I may need to divide 2 drachmas equally among 5 people. Well, I multiply 2 drachmas by 6 obols per drachma to get 12 obols, which, in division, gives me 2 obols per payee with 2 remainder. But I multiply these by 8 coppers per obol to get 16 coppers, so that I can disperse 2 obols 3 coppers. The remaining copper is not worth much, so I will just give it to anyone » (Mendell 2018, 205-206).

conceived and built the counting tables which have survived to this day [106]. In fact, if these are any indication of what ancient designers and users looked for in their abacus, then it is safe to assume that all they cared about was the comfort of merchants, retail-traders, accountants and other money handlers who dealt with numbers for no other reason than to buy and sell goods, charge interest rates or exchange currencies. Counting coin is where pebble boards really shone and proved most useful, so it definitely stands to reason if we assume that arithmetical operations by themselves hardly entered the picture for Aristotle. If they came into play at all, it was by proxy : while there ain't no such thing as two arithmetics, if Aristotle's pebbles were to be meaningful in any way, knowing one's numbers properly was not the same as moving counters around on the reckoning board. Provided that we understand Aristotle's abacus simile along the lines of the epigraphic and literary evidence available – as we should – it become obvious then that it presupposed numeracy all right, but it was not about numeracy itself. To begin with, granted that coin and weight calculations follow now and then the same arithmetical rules through and through, the fact remains that they do not reflect arithmetical procedures alone. Monetary and ponderal conventions are at least as important and they have their own set of rules concerning conversions between different denominations : it is not because one and one is two and three times four equals twelve that, say, an obol was worth eight coppers in Athens and twelve in Aegina or that it took seventy drachmas here and one hundred there to make a mina – this is simply the way monetary standards work, to the fishmongers' delight if we are to believe ancient humour [107]. Moreover, just as Aristotle took for granted that dialectical patsies had basic language proficiency and at least minimal argumentational awareness, it is only fair to assume that he also presupposed that inept calculators had at least crude numerical understanding and elementary computational training. However inexperienced and little acquainted with semantic subtleties, inferior debaters had to know enough Greek and questions and answers routine to follow a discussion, indeed to be involved in one ([URTEXT], 165a 15-17). Likewise, incapable though they were of carrying out digital feats with the counters on their own and poorly equipped to spot them on the abacus, incompetent calculators must nonetheless have known enough maths to sit at a counting table to start with and toss the occasional pebble around ([URTEXT], 165a 14-15). That being said, Aristotle's simile did not dwell on either, that is to say : it is neither primarily nor specifically about numeracy and computational articulateness as such, any more than it is about literacy and discursive fluency per se [108]. What is Aristotle's pebble analogy all about then ? Pebbles… what else ? And this is precisely the feature [ARITHMETICAL BIAS] has traditionally taken out of the equation, namely the fact that Aristotle compared logistical and linguistic symbols insofar as they are useful tools but require a degree of savoir-faire and must be handled with care. As a matter of fact, there can be little doubt that Aristotle's turn of phrase lays stress on the counters and those who used (and misused) them rather than on computation as an art or on reckoning at large. In other words, the emphasis of the analogy is definitely on the pebbles, the handling of which is the area of expertise – or, rather, the lack thereof – around which the whole simile revolves. Why else, of all calculators, would Aristotle have singled out those who are good – and not so good – at moving the stones ? One might object that we're taking a liberty with the text when we claim that

106. Instead of skimming through the exhibits all over again, let all be reminded that even the most [ARITHMETICAL BIASED] abacus specialist – in a moment of great insight – acknowledged that « the Salamis abacus <IG II², 2777> is inscribed with three sequences of numerals, *monetary* numerals as it is *always* the case with abaci's numerals » (Schärlig 2001, 66 – his emphasis).

107. For a most succinct introduction to ancient Greek standards and the long-standing dissensions amongst scholars, see Duyrat 2014 and De Catallataÿ 2017. Marcellesi 2000 tackles a few practical problems Hellenistic monetary standards confronted ancient traders and accountants with on a daily basis. On the divergence between Aeginetan and Attic standards in particular, cf. *Pollucis Onomasticon* IX 76, 168.17-19 : « τὴν μὲν Αἰγιναίαν δραχμὴν μείζω τῆς Ἀττικῆς οὖσαν – δέκα γὰρ ὀβολοὺς Ἀττικοὺς ἴσχυεν – Ἀθηναῖοι παχεῖαν δραχμὴν ἐκάλουν, μίσει τῶν Αἰγινητῶν Αἰγιναίαν καλεῖν μὴ θέλοντες [since the Aeginetan was larger than the Attic drachma (in fact, its worth was ten Athenian obols), Athenians preferred to call it the "big drachma" rather than the "Aeginetan drachma", for they loathed Aeginetans] ». Athenaeus (VI 224c - 227b) relays several comic tirades against fishmongers, most notably a fragment from Diphilus' *Busybody* : « ᾤμην ἐγὼ τοὺς ἰχθυοπώλας τὸ πρότερον εἶναι πονηροὺς τοὺς Ἀθήνησιν μόνους. τόδε δ', ὡς ἔοικε, τὸ γένος ὥσπερ θηρίων ἐπίβουλόν ἐστι τῇ φύσει καὶ πανταχοῦ. ἐνταῦθα γοῦν ἔστιν τις ὑπερηκοντικώς, κόμην τρέφων μὲν πρῶτον ἱερὰν τοῦ θεοῦ, ὡς φησίν· οὐ διὰ τοῦτό γ', ἀλλ' ἐστιγμένος πρὸ τοῦ μετώπου παραπέτασμ' αὐτὴν ἔχει. οὗτος ἀποκρίνετ', ἂν ἐρωτήσῃς "πόσου ὁ λάβραξ", "δέκ' ὀβολῶν", οὐχὶ προσθεὶς ὁποδαπῶν. ἔπειτ' ἐὰν τἀργύριον αὐτῷ καταβάλῃς, ἐπράξατ' Αἰγιναῖον· ἂν δ' αὐτὸν δέῃ κέρματ' ἀποδοῦναι, προσαπέδωκεν Ἀττικά. κατ' ἀμφότερα δὲ τὴν καταλλαγὴν ἔχει [Douglas Olson 2006, 17 : I used to think it was only the fish-sellers in Athens who were no good. But apparently this breed is like wild animals : their very nature makes them treacherous everywhere. Here, at any rate, there's one who's outdone them all ; he's growing his hair long, first of all, as an act of piety – so he says. That's not the reason ; he's been tattooed, and he uses his hair as a screen to cover his forehead. If you ask him "how much for the sea-bass ?", he answers "ten obols", without specifying the currency. Then if you pay him the money, he charges you on the Aeginetan standard ; and if he has to give change, he offers Attic coins ! Either way, he makes money on the deal] » (*Deipnosophistae* VI, 225a 6 - 225b 10). On fishmongers' bad reputation, see Davidson 1993 and Paulas 2010.

108. It is perfectly possible to have a decent grasp of arithmetic calculations and still get into trouble with the pebbles for exactly the same reason average people – that it is to say people who have no problem at all grasping the general principles of verbal communication and dialectical disputation – are tricked on a regular basis by those who know better. Following a different line of argument and without cluttering up his minds (or the readers') with mentions of exotic historical evidence, McCready-Flora 2019, 55-56 has arrived to this very same conclusion, which I endorse without reservation : « a person could be great at doing sums, but baffled by moving stones around … verbal naïfs go wrong in the same way that leads to bad stone-movers getting cheated. Mathematical error, though, is not what separates marks from their money. What the hustlers understand (epistēmenōn <no point in messing with the Smurf – if you get it wrong, mate>) and weaponize is how to move stones (psēphous pherein) … all this entails that what lets the hustlers cheat is an instrumental failure distinct from the cognitive capacity to do sums. If the inept stone-mover suffers instrumental failure and the same goes for word-novices, then the errant word-novice also suffers instrumental failure » – my point exactly !

Aristotle's experts are not so much accomplished arithmeticians as they are individuals skilled at pushing the counters around. Granted, but let's turn the question around : what precisely do Aristotle's « ἐπιστήμονες » ([URTEXT], 165a 14) know that « οἱ μὴ δεινοὶ τὰς ψήφους φέρειν » (165a 15) don't ? Precisely. In fact, while anyone who picks up the counters shares, at least to a degree, the belief that we can depend on them, it is how deftly or clumsily we manipulate them that makes all the difference in [URTEXT]. Skilled and unskilled calculators alike put at least a measure of trust in their pebbles (otherwise, why use them in the first place ?), but only the former could trust themselves to come out on top of every transaction, especially the unfair ones.

[FAILURE]. Once we relinquish the idea that calculation as such took centre stage in Aristotle's abacus simile, it becomes easier to pinpoint what its terms were and why Aristotle brought pebbles and words together in the first place. More to the point, it is possible to turn the analogy on its head and set it back upon its feet by shifting its focus from trying to explain why computation and language succeed to trying to explain why pebble reckoning and dialectical argumentation fail – which, by the way, is so much more in character with the subject matter [URTEXT] is supposed to introduce us to, that is fallacies, paradoxes, falsities, improprieties and babbling. In fact, while [URTEXT] does not provide much in the way of comparing linguistic and computational habits per se (after all, we don't calculate with words any more than we speak in numbers, etc.), it definitely tells us that they both rely on symbols and – for this very reason – share the same liability : linguistic and computational substitutes alike are prone to inconspicuous and yet momentous variations, which we will fail to prevent as long as we do not come to terms with the fact that both linguistic expressions and counters may have different values. For this is the core of Aristotle's analogy : linguistic expressions are to argumentation as counters are to computation insofar as their worth may change without us always being able to keep up or keep track. Hence, linguistic symbols (ὀνόματα, λόγοι) and computational ones (ψῆφοι) play similar roles and, more to the point, have the same shortcomings. The problem with words is the same as the problem with counters – not because there's a however intimate or loose relation between argumentation and calculation, let alone between the way we talk and the way we reckon, but because words and counters fail us the same exact way when their value or their meaning as symbols shifts at the hands of unscrupulous debaters and malicious calculators without us taking duly notice or having the proper understanding of how it happens.

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[EPILEGOMENA]. How well do verbal and computational prestidigitation compare and, more importantly, what do they teach us about Aristotle's views on language and its workings ? Provided that we understand Aristotle's pebble analogy on its own terms as the kind of heavy-duty comparison people were expected to figure out without racking their brains, it fares well enough to drive home an important, albeit unsophisticated, truth about language – and what it tells us about language is that it is, by and large, a matter of savoir-faire : after all is said and done, the answer to the question « what do we ask of words ? » is not so different from the answer to the question « what do we ask of counters ? ». In a nutshell, we ask them both to be worth something and to allow us to go about our conversational and computational business on the assumption that this is going to be the case as long as we don't change our mind and agree to use either words or counters with a different value altogether. All that is required for it to work then is that we play by the rules, keep an eye out for those who don't and pay as much attention when we speak as we do when we give the change or check our balance. Where's the excitement in all that ? Beats me, but to quote again Aristotle's tribesmen of old ([URTEXT], 164a 27) : « it is better to be bored and right than to get robbed and outsmarted at every turn » – Amen to that.

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