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Towards a science of the individual: the Aristotelian search for scientific knowledge of individual entities

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Abstract

This article seeks to take a step towards recognizing that science can deal with the concrete and individual as well as the universal. As there is a long tradition going back to Aristotle, I shall concentrate on some of his texts, according to which science deals only with the universal, although his work also contains texts of a very different tenor. He tries to improve the process of definition as an attempt to bring science closer to the concrete, but ends up realizing that there are some unreachable limits. There is, however, a second Aristotelian approach to the problem in *Metaphysica* M 10, a passage which takes scientific rapprochement to the individual further by introducing a distinction between science in potential and science in act. The former is universal, but the latter deals with individual substances and processes. Aristotle himself acknowledges here that in one sense science is universal and in another it is not, a position that raises important ontological and epistemological problems. Some suggestions are also offered concerning the kind of truth applicable to science in act, that is, practical truth.

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1. Introduction

Is a science of the individual possible? Is there room for scientific knowledge concerning concrete individuals and singular events and processes? There is a long tradition in the negative going back to Plato and Aristotle, according to which

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science concerns only the universal.¹ When we leave Plato's metaphysics (or Hegel's),² this axiom becomes quite a problem for science and for life: we are surrounded by concrete substances, wrapped in singular events; but science deals only with the universal. Science thus distances itself from the understanding of life, and therefore from living experiences and the feelings linked to them. A good many of the outbreaks of modern romanticism and vitalism have taken up this gap between science and life as the cause of their rebellion. Since at least Rousseau, at least, vehement protests have been raised against this separation of the intellectual aspects of the human being—supposedly directed at the universal—and the emotional ones, supposedly confined to the concrete. According to the Romantics, this separation has been compatible with an attempt at a practical imposition of the intellectual on the sentimental, of science on life. Such schizophrenia and violence is inevitable if we insist on science dealing *only* with the universal.

This article seeks to take a step forward from the historical and conceptual points of view towards the discovery of philosophical bases which may enable us to find a remedy for such a cultural schism. To this end, any step towards the recognition that science can also deal with the concrete and individual seems promising and positive. I shall concentrate on some of Aristotle's texts, as a certain interpretation of his work was one of the causes of the schism, and yet his work also contains texts that might help us even today to remedy the situation: 'But where danger lies,' wrote Hölderlin, 'there also what saves grows.'³

2. The first sally in search of a science of the individual: definition

Aristotle made some steps towards the rapprochement of science as conceptual and universal knowledge (the *logikōs* perspective) and the knowledge of concrete individuals and processes (the *physikōs* perspective). He makes an attempt at this rapprochement by means of different observations that improve the process of definition as stated in *Posterior analytics*,⁴ but ends up realizing that there are some unreachable limits. The most important work in this regard is to be found in *De anima* II, *De partibus animalium* I and *Metaphysica* ZH.⁵

¹ See, for instance, Aristotle's *Metaphysica* 1086b 33, 1040a 23–25, 1036a 8 and *De Anima* 417b 22.

² In Plato, each Idea is a concrete entity in itself, while having the function of abstract universal concepts regarding the sensible entities. Hegel speaks of the *concrete universal* as the dialectic synthesis of the general-abstract and the particular.

³ Cit. in Heidegger (1962), p. 28. My translation.

⁴ The canonical place for an exposition of the Aristotelian theory of definition is, of course, *Posterior Analytics* (especially the second book). Here we are not directly concerned with such an exposition, but with the various changes introduced by Aristotle in his theory and practice of definition, especially when he tries to approach individual beings. For a recent and important discussion on Aristotelian theory of definition of kinds, see Charles (2000). See also Bolton (1987).

⁵ From now on, I will quote Aristotelian works using the following abbreviations: *PA*: *De Partibus Animalium*; *GA*: *De Generatione Animalium*; *DA*: *De Anima*; *PN*: *Parva Naturalia*; *Meta*: *Metaphysica*; *APo*: *Analitica Posteriora*; *EN*: *Ethica Nichomachea*; *EE*: *Ethica Eudemia*; *Pol*: *Politica*; *SE*: *Sophistici Elenchi*; *Rhet*: *Rhetorica*; *Poer*: *Poetica*. The English translation of Aristotelian texts are from W. D. Ross and J. A. Smith (1908).

In *Meta Z* 12, Aristotle reduces all the genera that could form part of a definition to one: ‘There is nothing in the definition except the first-named genus and the differentiae’.⁶ He goes on to reduce the genus to the species: ‘The genus absolutely does not exist apart from the species-of-a-genus, or if it exists but exists as matter’.⁷ In a third step he reduces the species to differentiae: ‘clearly the definition is the formula which comprises the differentiae’.⁸ The fourth step reduces all differences to the last: ‘clearly the *last* differentia will be the substance of the thing and its definition’.⁹

Therefore, if it were possible to effect the process properly, dividing by the differentia of the differentia,¹⁰ then the whole definition and, what is more, *the very substance*, would be contained in the last differentia. This substance would have to be individual.

After reducing the whole definition to the last differentia, we need to consider the two meanings contained in the notion of differentia: (a) something establishing *logical* limits (the features differentiating, in the definition, one species from another) and (b) something *physically* constitutive (the features constituting the individual). As the physically constitutive features, the differentia is the form in the matter,¹¹ that is, it is nearer to matter and has more content than the species. This last differentia is the individual form, to which a science of the individual would have to refer.¹²

After this reduction, genus finds a place as matter, that is to say, it does not exist at all beyond the species belonging to the genus, and in them it exists as matter.¹³ But it should be added that for Aristotle, *genos* and *eidos* are not taxonomically fixed categories.¹⁴ Therefore, the same scheme of reasoning may be applied to the species with regard to the individuals comprising it. That is, species do not physically exist other than as matter in individuals.

The unity of matter and form is established in several Aristotelian texts, especially in *Meta H* 6,¹⁵ *DA* II 1 and *PA* 1.¹⁶ In these texts, matter and form are no longer considered as opposed but as the same thing seen in different ways,

⁶ 1037b 30–1038a 4.

⁷ 1038a 5–8.

⁸ 1038a 8–9.

⁹ 1038a 19–20. Italics in the original.

¹⁰ *Meta Z* 1038a 9 and *PA* I, 642b 5–644a 12. On the role of differentia in Aristotelian theory of definition, see: Balme (1987); Falcon (1996); Inciarte (1974); Pellegrin (1987).

¹¹ *PA* 643a 24. There are two manuscripts reading ‘en tē hýlē tò eidós’ (Y and Δ). All the others have ‘tò eidós en tē hýlē’, which is the version that I have taken here.

¹² There is a current debate about whether Aristotelian forms are specific or individual. In this regard, see Frede (1985); Furth (1988, 1990); Gill (1989); Lefèvre (1995), A. C. Lloyd (1981); Loux (1991); Witt (1989).

¹³ *Meta* 1024b 8, 1038a 6, 1045a 23, 1058a 23, 1058b 6; *PA* 643a 24.

¹⁴ In this regard, see Balme (1962); Gotthelf (1985); Lennox (1980, 2001), G. E. R. Lloyd (1996); Marcos (1996); Pellegrin (1982).

¹⁵ ‘The proximate matter and the form are one and the same thing, the one potentially, and the other actually’ (*Meta* 1045b 16–21).

¹⁶ *DA* 412a 21– b 10 and *PA* 645a 36.

insofar as it may be another (potential) and inasmuch as it is what it is (act). Thus considered, substance ceases to be a compound, for there is now nothing to combine, and it becomes an original unity. Indeed, the form in act is the totality of substance.¹⁷ Matter does not disappear, what disappears is the composition. What is peculiar in these texts is that, before the unity of substance is established, emphasis passes from the matter/form pair to the potency/act pair.¹⁸ The transition from the first pair to the second would seem to be a precondition for tackling the problem of the unity of definition and of substance. The form of an individual is its act and consists in the maintenance of the structure making its existence possible; it acts by unifying matter, which, when it functions in a unitary way, is none other than form itself.

Consequently, in this way, Aristotle has gone a long way towards the rapprochement between *physis* and *logos*, between actual reality and science. If on the basis of the definition we could determine the last differentia, in other words individual form, form in matter; then we should have a science of the individual. Unfortunately, however, it is not as simple as that and major difficulties soon arise.

In *PA* I 643b 10ff., problems arise when connections are established between *physis* and *logos*. The definition that will lead to the last differentia, dividing by the differentia of the differentia, is not feasible, so when distinctions are made between the various genera of animals, progress is via several parallel sets of differentiae, which do not come together in the final set, so it is better to proceed according to common knowledge, grouping together those individuals that share a given constellation of characteristics (differentiae) that we cannot compress into one.¹⁹ As David Charles points out, 'It is no exaggeration to say that the study of biological kinds precipitated a crisis in Aristotle's thinking about definition.'²⁰

On the other hand, a profound reform is required in expressing reality and understanding the function of conceptual language in order to go further with the rapprochement between *physis* and *logos*. It seems that Aristotle himself soon realized that the ideal of perfect univocity was unattainable.²¹ A name refers to what several substances have in common, their genus or species. Therefore, in principle, scientific language would not serve to express things in act. Aristotle, however, asks the poet to imitate actions so as to bring them before our eyes,²² and recognizes that metaphor has the power to express things *as in a state of actuality*.²³ Art

¹⁷ As is expressed in H6 and very explicitly in *PA* 645a 30–36.

¹⁸ 'But if, as we say, one element is matter and another is form, and one is potentially and the other actually, the question [as to whether substance is one] will no longer be thought as a difficulty' (*Meta* 1045a 22–24). See also *DA* 412a 9, Charles (1994); Frede (1994); Gill (1989) and Hughes (1979).

¹⁹ For example, it is understood that birds are warm-blooded, oviparous, winged, feathered, hollow-boned, beaked and toothless; each of these differentiae may be the extreme of a different set and none of them need include all of the others.

²⁰ Charles (2000), p. 312.

²¹ 'It is impossible in a discussion to bring in the *actual things* discussed [*autà tà prágmata*] [...] Inevitably, then, the same formulae, and a single name, have a number of meanings' (*SE* 165a 5–14, my italics).

²² *Poet* 1451b 29; 1455a 23–26.

²³ *Rhet* 1411b 24–26.

approaches concrete living reality, but science does not. Again we are faced with the unsatisfactory schism.

After this set of difficulties, it is not surprising that there should appear in Aristotle a certain mistrust in *logos*, and with it, a certain mistrust in the possibility of definition, the bastions of which Aristotle tends to see as a heuristic support that must be surpassed.²⁴ What gains ground in the face of univocal definition is analogy (and the concept understood as analogy), which allows for a great approximation to *physis*. This is one of Aristotle's great discoveries, the possibility to remain on neutral ground between the univocal and mere equivocality.

3. The second sally in search of a science of the individual: science in act

Our first sally in search of a science of the individual, by means of a reform of definition, resulted in failure, but on the way we learnt something: we now know that genus and species are in concrete things as matter, that is, as potency; we know that matter and form in concrete substances are not two distinct things but the same thing seen in different ways; we suspect that if knowledge of the concrete can be expressed in any way, it will be by analogy, simile, or metaphor. For the moment, however, science seems able to see things only in their universal aspect (that is, matter or potency), which does not enter the realm of the actual. Furthermore, it would seem that metaphorical language is foreign to science. What, then, must be done? To dream of a science of the actual capable of expressing itself in metaphors. Here, I shall concentrate on the possibility of a science of the actual arising.

There is an Aristotelian text in *Metaphysica* M 10 which allows for something of this nature. I shall quote it before commenting on it as I believe it to be a key text:

The statement that all knowledge [*epistème*] is universal, so that the principles of things must also be universal and not separate substances, presents indeed, of all the points we have mentioned, the greatest difficulty, but yet the statement is in a sense true, although in a sense it is not. For knowledge [*epistème*], like the verb 'to know', means two things, of which one is potential and one actual. The potency, being, as matter, universal and indefinite, deals with the universal and indefinite; but actuality, being definite, deals with a definite object,—being a 'this', it deals with a 'this' [...] For if the principles must be universal, what is derived from them must also be universal, as in demonstrations; and if this is so, there will be nothing capable of separate existence—i.e. no substance. But evidently in a sense knowledge [*epistème*] is universal, and in a sense it is not.²⁵

²⁴ I agree with some authors that a change may be observed in the relevance that Aristotle gives to definition. As David Balme (1990, p. 54) once affirmed: 'if I had the courage of a Pierre Pellegrin, who simply walked in and demolished classification with one blow, I should be tempted to say that definition and its associated apparatus became irrelevant to Aristotle as it has done to modern philosophers of nature'. On this point, see also Pellegrin (1990, pp. 45–46).

²⁵ *Meta* M 10 1086b 14–1087a 26, my emphasis. I keep here the original translation by Ross and Smith, but 'science' or 'scientific knowledge' would be a more standard translation for '*epistème*'.

In short, the problem in question, which is the most difficult and which does not end with the refutation of Platonism, may be said to lie in the fact that substances are individual, while the cognizable is universal; therefore, our knowledge, if it is genuine, will not be of substances as such, and if it is, then it will not be genuine knowledge. Idealism or scepticism, that is the question, and that is our dilemma!

Let us examine this dilemma in greater detail. Before attacking the solution to the problem, Aristotle establishes that one point cannot be renounced: we must understand that substances are separate and individual.²⁶ This being so, he wonders what their principles or elements will be like. These principles²⁷ will have to be universal or individual. In either case, problems of an ontological or epistemological order will arise.

If the principles are individual, then ‘real things will be just of the same number as elements’ (an ontological problem), ‘and the elements will not be knowable’²⁸ (an epistemological problem). The ontological question lies in the fact that there would in no sense be anything common to more than one thing, each entity in the universe would be individual in the absolute sense, constituted by its own individual principles, which are excluded from any relation with those of all other entities. Yet we do not like this option, for we, like Aristotle, want to be able to say that the syllable *ba* is somehow the same as the syllable *ba* and not that the second syllable is an entity bearing no relationship to the first. The epistemological problem is inevitable if one continues to accept the doctrine that science is concerned with universals. If nothing is universal, then scepticism cannot be avoided.

If, on the other hand, principles were universal, the epistemological problem of their incognoscibility would disappear, but this solution poses new ontological problems: if the sum of the universals is a universal, then we shall be left without substances, for the universal is not substance. And this is another fixed point in our discussion.²⁹ If, on the other hand, the sum of universal principals could give a particular, then we should have something which is not substance coming before substance, as if the colour green came before the apple. The rejection of this possibility is something else which cannot be questioned.

3.1. *The ontological problem: a realistic basis for universals*

How can we get out of this *aporia*? I think that we can do it by examining its ontological and epistemological roots. Let us begin with the ontological ones, which especially affect universals, for their cognoscibility is guaranteed, but their

²⁶ *Meta* 1086b 16ff.

²⁷ Here we can consider ‘principle’ and ‘element’ to be synonyms. The element takes part in the formation of the substance while the principle, on the other hand, need not. Here, however, Aristotle refers to matter and form, that is to intrinsic principles which are, therefore, also elements.

²⁸ *Meta* 1086b 21.

²⁹ The textual base in Aristotle is forthright. The assertion that the universal is not substance is reiterated several times in his metaphysical work: *Meta* Z 13, 14, 16 and M 10 1087a 1. The universal is thought of as substance, asserts Aristotle, by those who investigate from the point of view of *logos* (*Meta* 1069a 26–28), while most people recognize plants and animals as substances (*Meta* 1069a 31ff.).

reality is not. In the first place, all this stems from upholding ‘that apart from the substances which have the same form there are Ideas, a single separate entity’. Aristotle goes on to say that this is not necessary: ‘the *a*’s and the *b*’s may quite well be many and there need be no *a*-itself and *b*-itself besides the many, there may be, so far as this goes, an infinite number of similar syllables’.³⁰ In any event, rejecting Platonism is not enough. Even if what is common to the *a*’s is not *a*-itself, they must have something in common if we wish to save the realism of the concepts. Let us for the moment remember that the connection between two syllables, *ba* and *ba*, Aristotle calls *similarity* (*hómoiai syllabai*).³¹ The relationship of similarity is very important for by means of it we can relate two or more substances which are neither identical to each other nor completely different. The relationship of similarity lies between identity and difference, and is the real basis of concepts: it is what is known by conceptual knowledge: ‘Things are like [*hómoia*] if, not being absolutely the same, nor without difference in respect of their concrete substance [*ousía*], they are the same in form [*eídos*]’.³² Aristotle insists that the discovery of similarity requires active cognizant and creative subjects: ‘... in philosophy also an acute mind will perceive resemblances even in things far apart’.³³

What, then, is similarity? We can see it as a relationship established between two things by means of a cognizant subject. The relationship of similarity is not in things in an actual way. It is in them in a potential way, as a capacity to appear similar to a cognizant subject. The discovery of similarity is not always easy and it cannot simply be imposed on a passive subject. On the other hand, however, it is not a purely subjective creation, but has a basis in reality, as this tripartite relationship of two objects and a subject is only established correctly if the objects *can* be perceived as similar, if in them there is an objective potential basis for establishing the relationship.

The intention of this movement suggested by Aristotle is clear. It is meant to save at the same time the individuality of actual forms, the universality of the concept, and its objectivity. That universals may not exist as separate entities, and in actuality, does not mean that they are completely bereft of reality, for they have their own degree of reality as potential. Potential and possibility, in Aristotle, are a part of reality.³⁴

It may be understood that the generic exists potentially in individual substances, as matter: ‘The genus is the matter of that of which it is called the genus’.³⁵ This is not an isolated statement; Aristotle reiterates this doctrine of genus as matter in many

³⁰ *Meta* 1087a 5–10.

³¹ For an Aristotelian treatment of the concept of similarity see *Meta* 1018a 15–20 and 1054b 4ff.

³² *Meta* 1054b 3–5.

³³ *Rhet* 1412a 12–14. See also *Rhet* 1412a 11–19, 1406b 20ff., 1410b 17–19, where Aristotle equates simile and metaphor, as well as *Poet* 1459a 7ff., where he affirms that to be a master of metaphor is a ‘sign of genius’. Consult also *PN* 464b 5ff., where the author emphasises the difficulty of discovering interesting similarity.

³⁴ ‘There are some who says, as the Megarics School does, that a thing ‘can’ act only when it is acting, it is not hard to see the absurdities that attend this view [...], so that it is possible that a thing may be capable of being and not be, and capable of not being and yet *be*’ (*Meta* 1046b 29–47a 24).

³⁵ *Meta* 1058a 23–24.

parts of his work.³⁶ In my view, Aristotle goes beyond suggesting that the logical genus attributed to a substance, when it is true, is no more than a representation of physical matter in the cognizant subject. One of the objective potentials of substance consists in the ability to be seen as an instance of such a genus. Thus, *this* dog (substance) is seen as *a* dog (genus) by certain cognizant subjects given that this concrete individual possesses among its objective capacities (matter) that of being seen as a dog by those cognizant subjects. Let us say that the real basis of the concept is the matter of the substances. We obviously do not have before us here a supposed raw material, shapeless and uncognizable, but the substance itself seen as potency.

As we have interpreted it, the common or general is matter (not the form in the physical sense, which is always individual). Matter is substance itself except insofar as it can be another, change, be seen as similar, or be what it actually is. The universalizable and potential is the species or genus or matter; while the act is individual, the form or essence in physical sense, the same substance seen as what it is being. Of course, matter does not exist separate from concrete substance—this is precisely what Aristotle rejects of the Platonists—without risking the possibility of realist knowledge.

3.2. *The epistemological problem: towards a science of the individual*

Let us return to Aristotle's text in *Meta* M10, where we meet with the other root of the *aporia*, which is epistemological. This time it especially affects individual substances, which are obviously real, but we do not know if they are scientifically cognizable.

In this case it is Aristotle himself who creates the problem on stating that 'knowledge [*epistémē*] is of universals'.³⁷ If this statement is taken as definite and unqualified, then we are plunged into a disconcerting *aporia*, for paradigmatic substances will be outside what is scientifically cognizable, along with, if we will, all that actually exists, for, as Aristotle says, we may not expect a definition of the act and it must suffice us to grasp it by analogy,³⁸ nor is there demonstration or definition of individual sensible things,³⁹ nor of essence,⁴⁰ or of principles.⁴¹

However, the distinction between the logical perspective and the physical one, and the affirmation of individuality of physical form and of essence, and also of

³⁶ In *Meta* D 60 and 28, in Z 12, H 2, in I 3, 7 and 8, and in *PA* I. See especially: *Meta* 1016a 24–28; *Meta* 1024b 1–9; *Meta* 1054b 28–29; *Meta* 1057b 38–1058a 2; *PA* 643a 24 and the already cited *Meta* 1058a 23–24. Frede (1990, pp. 127–128) finds some problems in this interpretation of genus as matter. Lennox (2001, pp. 167–168) supports this interpretation of genus as matter with arguments taken from zoology. A debate was held on this question between R. M. Rorty (1973, pp. 393–420; 1974, pp. 71–77) and M. Grene (1974, pp. 51–69). According to Grene, when genus is called matter, we must adopt a very metaphorical interpretation, as a 'matter' of study. However, Balme (1992, p. 114) points out that Aristotle makes no distinction between physical matter and logical genus: both are a way of considering 'what is potentially X'. Scaltsas (1994, pp. 3 and 33–35) states that matter is universal insofar as it can belong, at different times, to different substances.

³⁷ *Meta* 1086b 32ff.; see also *Meta* 1036a 8, 1040a 23–25 and *DA* 417b 22.

³⁸ *Meta* 1048a 35–b1.

³⁹ *Meta* 1039b 28–30.

⁴⁰ *Meta* 997a 31–33.

⁴¹ *GA* 747b 27.

the unity of matter and form, suggest that in Aristotle we may find another kind of knowledge (*álle gnosis*),⁴² different from the pure science of universals.

Aristotle himself seeks to resolve the dilemma that he created in the text (*Meta* M 10). He does not completely deny his previous thesis that knowledge is of the universal, but develops it to leave room for the scientific knowledge of the individual, keeping for the science of the universal certain important functions and its realism. In the last part of the text, Aristotle establishes the existence of two types of science and knowledge: actual and potential. He also establishes a correspondence between the types of knowledge and the object of that knowledge. Actual knowledge will be of the actual, and potential knowledge of the potential.⁴³

But he says more: ‘The potency, being, as matter, universal and indefinite, deals with the universal and indefinite’. Here, ‘the potency’ means potential science. Potential science is indeterminate and universal, and deals with the indeterminate, of the universal, and—if we wish to finish the set—the potential and material. On the other hand, science in act, correspondingly, ‘deals with a “this”’, that is, with an individual, a being in act, the determinate, the form or physical essence, with each substance or concrete process.

In science in act, the subject and object meet at a certain time and a certain place, on a certain occasion. Since Parmenides, it has been traditional to be concerned with the stability of knowledge. The classical strategy consisted in founding the stability of knowledge in the known object, which led Plato to propose the reality of Ideas. The moderns have taken the stability of knowledge to the subjective pole. The stability of knowledge in act rests on the stability of the act itself. We must bear in mind that the act in not something that is over and done with in an instant. The Aristotelian notion of act—as is clear in *Metaphysica* Θ 6—is not bound up in instantaneousness, but in the fullness of presence, which can be prolonged in time; for we can by the same act see and keep seeing, live and go on living, think and continue thinking, meditate and keep meditating, be happy and stay happy.⁴⁴

The moment we put science in the grounds of the practical, which is the case of science in act, we can also apply to it the considerations that Aristotle uses in relation to the virtue which must steer the action; prudence. The prudent man ‘will be engaged in virtuous action and *contemplation*’, and will be thus in a stable way according to circumstances. The good and prudent man bears with dignity all the vicissitudes of fortune and always acts in the best possible manner, under any circumstance. Science in act, guided by prudence, thus acquires the same stability as virtue. ‘For no function of man’—Aristotle states—‘has so much permanence as virtuous activities (these are thought to be more durable even than knowledge of the sciences)’.⁴⁵

Indeed, although both poles change, they do so together. Science in act is a *stable* knowledge of the changing, of the contingent; a living knowledge, actualized by a

⁴² *GA* 742b 32.

⁴³ The idea is that there should be a correlation between the type of knowledge and its object. See *Meta* 1072 b 18–20, *DA* 425b 25 and 430a 5.

⁴⁴ See *Meta* 1048b 20–30.

⁴⁵ *EN* 1100b 12–1101a 4.

subject that is also changing. It is stable not only for being a knowledge in act, but also in action. It is knowledge seen from life and, therefore, accompanied by perception and emotion, by all the feelings aroused by contact with concrete substances and processes.

Whenever we are cognizant of an act we are cognizant of individuals (or singular events), but we are capable of it, largely, thanks to possessing universal concepts which are the means of that cognizance. Of course, these concepts are obtained creatively from the experience of the individual,⁴⁶ and they have their objective basis, if they are correct, in individual substances.

The general is intermediate. It is a bridge between knowledge of the concrete and knowledge of the concrete. We learn ‘through the genus’. This instrument is of great importance as it vastly enhances the capacity of knowing the individual. Animals, Aristotle says, ‘have no universal judgement but only imagination and memory of particulars’.⁴⁷ Obviously, the lack of conceptual instruments limits their capacity for knowledge of the individual. Nevertheless, however important they may be, we must not lose sight of the fact that universal concepts, and the language in which they are formulated, are instruments at the service of knowledge of concrete reality and of its communication.⁴⁸

Now we can also clarify the function of science as potential: the science of concepts, laws and theories. If science in act consists in an agreement; an integration or unification of subject and object, science in potential consists in a *representation* of matter in the mind, of genera in concepts. Theoretical truth, for its part, may now be understood as the ideal correspondence, considered in the abstract, of ideas and the potential aspects of things. Indeed, it is not just by chance that counterfactual and dispositional statements exist in science. This type of knowledge and its corresponding truth (the fitting of the representations to the represented) is exclusive to the human being. Animals do not possess it and God does not need it. But we cannot make the mistake of identifying knowledge in its most essential sense with science in potential, which is no more than a means for attaining the most genuine knowledge, the knowledge in act of what is in act. This is a phenomenon experienced by any cognizant being, whether a beast, a man or a god, they all genuinely know in act what is in act: singular objects and processes. Knowledge is thus seen as a single phenomenon with different modes, one of them human.⁴⁹ Potential science, though, is peculiar to man. What is stated here is that *human* (and only human) knowledge of the actual *can also be* scientific. It could be a contemplation assisted by science, from scientific knowledge. We could now accept a modified version of the classical assertion ‘science is of the universal’ as ‘where there is a (rigorous and objective) knowledge of the universal, there is science’.

⁴⁶ *Meta* 980b 28–29; *EN* 1142a 13ff.

⁴⁷ *EN* 1147b 3ff.

⁴⁸ This suggests a parallel between technique and contemplation, since both are applications of science in potential. Knowledge in potential is useful for technics, for we see something as what it could be, nature as a resource. Some of these possibilities are actualized by technical action.

⁴⁹ Artificial cognitive systems belong to the human mode. Perhaps—and I say this as mere conjecture—they are only capable of potential knowledge.

This vision of science also has methodological consequences. The handling of abstract concepts, in the web of their connections and implications, is where the Aristotelian methodology of science, expounded in *APo*, has its greatest sway. But in contact with reality it becomes clearly inadequate. When we obtain or apply concepts, in the act of cognizance of the actual, we need the help of all human experience of reality and of all the sources of creativity. Therefore, the methodology expressed in *APo* is partial and instrumental and, being an instrument, is subject to the relative control of its function. The user of such an instrument is free to alter or shape it to the extent necessary for his ends. Therefore, the most general criteria of action in science are no more than the criteria governing human action in general. Therefore, the ‘methodological’ discourse of the greatest scope will have to be sought in practical philosophy (in *EE*, *Pol*, *Rhet*, *Poet* and, more especially, *EN VI*).⁵⁰

4. Practical truth and science in act

The concept of science in act has important methodological and linguistic implications. On one hand, as we have said above, the general (concepts, laws, theories) is a bridge between knowledge of the concrete and knowledge of the concrete. The methodology of the *Analytics* only serves to move between concepts, laws and scientific theories. To move onto and off the bridge, and bring science and life into contact, we need prudence (*phrónesis*) as our methodological guide. On the other hand, as for linguistic aspects, it is clear that if science wishes to approach the individual, the concrete, it needs the support of the whole metaphor family (comparisons, analogies, models or metaphors as such). The construction and interpretation of metaphors depends on the creative discovery of similarity.⁵¹ Yet, apart from the methodological and linguistic aspects of the science of the individual, in Aristotle we can find some suggestions concerning the kind of truth applicable to such a science: *practical truth* (*alétheia praktiké*). Let us remember that the science of the individual would be science in act of what is in act, that is, science

⁵⁰ The solution consisting in recognizing the existence of two types of science, one in act and of the actual, of the individual substances, and another of potency and the potential, material or general, has been pondered in very different ways: Thus, for Annas (1976, pp. 188ff.) and for Frede & Patzig (1988), this is an important text leading inexorably to the recognition of the existence of individual forms. However, according to other authors, such as Ross (1924, vol. II, pp 445–446) and Bonitz (1948–1949, p. 569 n. 1), this is an atypical passage whose doctrine, which is rather surprising, differs from what is usual in Aristotle. Reale (1993, p. 672) does no more than point out the disparity of the opinions. Tricot (1953) refers to a commentary by Pseudo-Alexander describing the situation in a tone of approbation. Scaltsas (1994, pp. 90, 91, 96, 252ff.) rules it out as Platonic and not very coherent. Nevertheless, there is nothing more Aristotelian than developing a thesis already propounded by means of fine tuning and distinctions, without rejecting it. This is precisely what Aristotle does here. Furthermore, *Meta M 10* is strictly parallel to other texts in *DA* (417a 10–15) and *PN* (439a 15ff.) concerning perception, and other passages clearly suggest the ideas of *M 10* (*DA* 430a 1ff.; 430aff.). Finally, Aristotle recognizes that rational contemplation of the contingent exists (*EN* 1139a 7–11).

⁵¹ I have dealt at length with the methodological value of prudence in Marcos (2001). The epistemic possibilities of the metaphor as a means of approximation to the concrete, together with its relationship with the notion of similarity are topics that I have dealt with in Marcos (1997).

here and now, science in action, a kind of science applied to the contemplation of the actual. According to Aristotle, the truth of human action falls under the jurisdiction of the concept of *practical truth*. This concept comes from practical philosophy, but as for prudence, we can find a use for it in the context of the philosophy of science. I shall attempt first to introduce the concept and then to apply it to what we have called science in act, or science of the individual.

4.1. The concept of practical truth

According to Aristotle, ‘of the part which is practical and intellectual the good state is truth in agreement with right desire ... Now this kind of intellect and of truth is practical’.⁵² The characteristics of practical truth may be summed up as follows: First, practical truth consists in the agreement between desire and intellect, but without either dominating the other, without either of them suffering violence to adapt to the other.⁵³ We can obtain practical truth only by the reconciling of these two poles, desire and intellect, at a middle and better point. But practical truth is *practical* because this middle point is not present until established by human action. This kind of truth happens by and in the action. The Aristotelian theory of action allows for the correct integration of desire as a motive for action, the intellect that knows how to do it, and the movement accomplishing the action. When the intellectually differentiated desire reaches a certain degree of specification, it connects with the repertory of available movements and becomes movement, becomes action. Thus, movement is differentiated desire, incubated by intellectual deliberation. Desire and intellect alter and build upon one another to become action. Here there is no relationship of means and ends, as if some were exterior to others, as if desire simply provided the ends and intellect sought only the means. The means used are not different from the end sought: they are the concrete form of the end, they are the end made movement.

In this regard, it may be said perfectly correctly that there is a kind of truth that is not conceived as an abstract agreement, but is made, or to be more exact, is made *actual*, for it already existed at both poles as potential. But that potential had to be actualized by the action of a subject. Such adaptation may then be understood as the actualization of a potential: insofar as the potential was real, the practical truth is objective, it is real *truth*; insofar as its actualization requires human intervention, it is creative, it is *practical*.

Finally, there is no automatic rule for creation or for the recognition of this kind of truth, yet arbitrariness is ruled out for it is an exercise ‘determined by a rational principle, and by the principle by which the man of practical wisdom [*phrónimos*] would determine it’.⁵⁴

⁵² EN 1139a 26ff.

⁵³ Let us remember that for Aristotle man is intelligent desire as well as desirous intelligence (see EN 1139b 6).

⁵⁴ EN 1106b 36ff.

4.2. Practical truth as the truth of science in act

The concept of practical truth, then, is thought of especially in the ethical and anthropological dimensions, as the self-realization of each human being by agreement of intellect and desire, as a process of the actualization of human abilities occurring in action and guided by prudence. Could we extend this notion of practical truth to include science? This would facilitate the recognition of the practical aspects of science and its insertion in human life, while at the same time avoiding the risks of relativism. We should thus discover a second dimension to the notion of practical truth. This time it is not principally a co-ordination of faculties of the soul, but rather an adaptation of the knowing subject to the known object.

In science in act, let us remember, there is an adaptation of two poles to each other, without either submitting to the other. Indeed, science in act consists, as we have seen, in the actualization of potentials thanks to the contemplative action of the cognizant subject. On one hand, the subject's science in potential is actualized, as is, on the other, the capacity of the object to be known, its intelligibility. Such an actualization constitutes a novelty, a meeting of subject and object at an intermediate and better point: the subject knows what he previously did not know in act (which is positive), and the object makes sense, it becomes part of a network of relationships integrated in the cosmos, it realizes more fully some of its own possibilities that remained silent. The capacities of subject and object are real regardless of whether they are actualized, but through contemplation they are actualized and become obvious, present. And the result is creative, subject and object constitute each other. From the anthropological point of view, this second dimension of practical truth also seems to be important, for the human being is made up not only of the intimate union of desire and intellect but also of knowledge in act. Finally, there exists no automatic method of achieving science in act, it is rather a matter of applying scientific theories, laws and concepts (science in potential) to the contemplation of reality with the guidance of prudence. Consequently, I think that it is correct to speak of practical truth as a truth of science in act. Science in act, as the human action that it is, has two faces—on one hand it is the fruit of human creativity and on the other it responds to the reality of things, it discovers the reality at the same time as it creates it. This idea is perfectly set out in the 'creative discovery' formula, which can be taken as a correct translation of *alétheia praktiké*, or, as Pigogine so beautifully put it, 'poetic listening'.

Between the ethical and epistemic dimensions of practical truth there is no simple parallelism, but a strict continuity demanded by Aristotle's anthropology itself, by his theory of happiness,⁵⁵ and by his theory of action.⁵⁶ If the human being is desirous intelligence or intelligent desire, then the function of the human being will be the intelligent fulfilment of the desires of an intelligent being. And one of said

⁵⁵ See *EN*, I and X 6–8; *EE*, I and VIII 2.

⁵⁶ In this regard, see Charles (1984); Lear (1988) and Nussbaum (1978).

desires is that of knowing.⁵⁷ A life in general endowed with moderate well-being, in the company of loved ones and directed to the cultivation of knowledge would, for Aristotle, be a life of fulfilment and happiness.⁵⁸ But it should be borne in mind that the cultivation of knowledge is not simply a means to achieve happiness, but the concrete way in which it is realized, the content of happiness. And happiness, according to Aristotle, is an activity. A fulfilled human life, then, demands equally the agreement between desire and intellect and the knowledge in act of what is in act. ‘We state the function of man to be a certain kind of life, and this to be an activity or actions of the soul implying a rational principle’. The primordial function, then, of the human being, consists in leading a rational life, ‘and, as “life of the rational element” has two meanings, we must state that life in the sense of activity is what we mean’,⁵⁹ that is, life as a certain contemplative activity of the soul which cannot be orientated to anything other than the assimilation of substances in the primordial sense—concrete singular entities.

Thus understood, science does not hinder, but helps one to have the appropriate emotions,⁶⁰ for example compassion towards a certain animal, which we can experience *better* if we know something of evolutionary biology or neurophysiology; reverence for a starry sky which we can contemplate *better* through astrophysics. It does not conceal meaning, but helps to scrutinize and reveal it. It is one of the means at our disposal with which to understand better what pain or death is. It does not suppress mystery where it still remains, but contributes to a better pondering of its limits. It does not produce disenchantment, but admiration and aesthetic pleasure. Science thus understood does not have to be distanced from human life, it can facilitate happiness not only as well-being and communication but also as contemplation. And, while nothing justifies entrusting everything to science, nothing justifies neglecting it in our business of understanding and living.

This may amount to taking Aristotle beyond Aristotle, but it was he himself who made suggestions along these lines while dealing with astronomy and biology:

Of things constituted by nature some are ungenerated, imperishable, and eternal, while others are subject to generation and decay [...] Both departments, however, have their special charm [...] Indeed, it would be strange if mimic representations of them were attractive, because they disclose the mimetic skill of the painter or sculptor, and the original realities themselves were not more interesting, to all at any rate who have eyes to discern the reasons that determine their formation [...] for each and all will reveal to us something natural and some thing beautiful.⁶¹

⁵⁷ ‘All men by nature desire to know’ (*Meta* 980a 20). Another sentiment closely related to knowledge is admiration, which, according to Aristotle, is at the beginning of any research.

⁵⁸ See *EN* 1178b 18–35 and 1244b 24.

⁵⁹ *EN* 1098a 4–15.

⁶⁰ I am not trying to say that emotions must play any methodological role in scientific discovery, but that the results of science and scientific literacy can help us to feel better emotions, for emotions can also be better or worse, suitable for given circumstances or not (see, for example, *EN* 1125b 31–34). They must therefore be educated. This is part of Aristotle’s ethical teaching, and science can contribute to this education.

⁶¹ *PA* 644b 22–645a 24.

5. Conclusion

We have seen that Aristotle was concerned about the gap between scientific knowledge and concrete individual beings. He took some steps towards filling this gap by means of a reform of the process of definition, but he found some unreachable limits in the attempt. However, we may conclude that in Aristotle, despite his failure to bring universal science closer to the individual by means of a reform of definition, there *is* at least one text which mentions a science of the concrete and individual (*Meta* M 10)—and that this text is not an anomaly in Aristotle's thought but the expression of his thought at its most mature. The new strategy here consists in making a distinction between science in potency (universal and about the universal) and science in act (a 'this' dealing with a 'this'). Moreover, after this text, the role of the science of the universal is not cancelled out, but clarified and integrated, indeed justified in its pretensions to realism. We have also seen how the science of the individual, that is, science in act, also stands up in its own way in the court of truth, in this case practical truth. Finally, we can say that this Aristotelian perspective on science allows for a rapprochement between science and human life, for a better integration between knowledge and action.

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