# Aristotelian Perspectives for Post-modern Reason (I)

**Phronesis, Scientific Rationality and Environmental Responsibility**

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# Introduction

In the Modern Age, certainty became the highest and most sought-after espistemic value, even more valued than truth, and the so-called scientific method was seen as the surest path to certainty. Indeed, human reason became identified with the application of a supposed scientific method of Cartesian or Baconian inspiration. The domain of the practice became considered either one more area for the mere application of the scientific method, an application which would lead to human progress, or as an area beyond reason. One of the stereotyped convictions attributed to the enlightened mentality is this: insofar as human life in all its extremes becomes more rational, that is, more scientific, practical problems will begin to be solved. Indeed, Rousseau, in his *Discourse on the Sciences and the Arts* (1750), pointed out that human progress did not always go hand in hand with scientific and technical progress, which today is a self-evident truth that is not discussed. On the other hand, dual accounting, that is the consideration that science is fully rational and the other areas of human activity are not, as well as an insult to common sense, has rebounded against science itself, for its practical aspects cannot be hidden, and it is hardly possible to parcel off a purely logical context, as that of justification set out to be.

It is obvious that not even the application of a supposed scientific method can guarantee the progressive character of our practical decisions. To this evidence there has been added the recognition of science's own practical aspects. This evolution has convinced many of the impossibility of obtaining certainty even in the domain of science, which has given rise to diverse forms of desperation regarding the abilities of human reasoning. This oscillation between the obsession for certainty and desperation with regard to reason has been the tune most frequently danced to in modern times.

Yet today we do not want environmental problems to be left entirely up to the expert's decision or the irrational imposition of power or arbitrariness, but to be tackled in reasoned dialogue, on a footing of equality, by scientists, technicians, lawyers, politicians, businessmen, private individuals, representatives of social movements - and indeed philosophers! We are recognizing, at least implicitly, the possibility of being reasonable in an area where we do not expect absolute certainty, and we accept that human reason goes beyond the limits of science and technology, that reason is more deeply rooted in human life than a mere method could ever be. To reach this point we have had to come a long way as far as our concept of reason and science is concerned, and have also needed a great deal of experience - bittersweet experience - regarding the practical consequences of science. Everything would seem to show, then, that the most typical extreme positions of modern times are being abandoned, and that we have entered the post-modern period[1].

My intention in these pages is to explore the possibilities of a project of basically Aristotelian inspiration for the integration of the theoretical and practical aspects of reason, for the search for a happy medium between the extremes of logicism and irrationalism. In my opinion, this outlook has

much to contribute to the on-going debate on the rationality of science and on the environmental questions that its application brings up. This is, indeed, a particular aspect of the relationship between reason and practice, but not just any aspect: traditional philosophical problems are arising now, and they will continue to come up in the future, in direct connection with environmental matters - this will be an area and a way for the classical topics of philosophy to reappear. Rationality, good and evil, justice, the relationship between being and value, the objectivity or subjectivity of knowledge, etc., are venerable philosophical topics that we shall have to reconsider in the light of environmental problems, as they were once tackled in connection with questions of politics, theology, society, science and economy.

I shall now outline the steps that my exposition will follow, together with other considerations necessary for it to fall within the limits of a short piece. In the first place, we need a correct characterization of Modern Age which makes it possible to explain the causes of a bad relationship between theory and practice. This is an extremely complex and multi-faceted task. Here we can hardly even approach a full idea of modernity. What we can do, however, is point out one of its most essential characteristics[2], in some wise the cause of many others and especially near to the interests of this paper. I mean the predilection for certainty, which is a constant of the modern spirit, just like the energetic and cyclic irrationalist reactions. Obsession with certainty and sceptical desperation are mutual causes of each other like pre-Socratic opposites. We shall speak of this in **section 2 ('Modern Age and Actual Age: from the search for certainty to fallibilism')**.

Secondly, we must go through the Aristotelian concepts which may, in my opinion, take us out of this thankless to-ing and fro-ing. What I mean basically is the Aristotelian notions of prudence (*phronesis*) and practical truth (*aletheia praktike*). In **section 3 (Prudence in Aristotle)**, I shall set out the contents of Aristotelian prudence and the contribution that it can make to the present debate. An analogous study of the notion of practical truth will be set out in the second part of this paper[3].

The concept of prudence is one that has been taken from the area of Aristotelian practical philosophy, where absolute certainty is not expected, but neither are decisions left to mere arbitrariness or imposition. The novelty consists in that, when we recognize, as we do today, that science itself is a human action, the notion taken from practical philosophy may be used for understanding and integrating scientific rationality. When science is characterized as an activity governed by prudence, it moves away from both the logicist and the irrationalist poles, from the obsession with certainty and from the 'anything goes', from algorithm and anarchism. Furthermore, if science is made a prudential activity, it will be much easier for us to connect its particular way of rationality with that of discussions, decisions and environmental actions.

Although it is true that Aristotelian notions can be suggestive, it is not true that they do no more than answer contemporary questions. For them to be active in the on-going debate on the relationship between theoretical reason and practical reason, they must be developed, *updated* through

contemporary texts. The profit from this manœuvre is double: it makes Aristotle's concepts available for the present debate and gives some contemporary ideas a very comprehensive and fertile philosophical framework, the Aristotelian framework. In the remaining sections. I shall try *to bring* to the current debate the Aristotelian notion of prudence through the fallibilism of Peirce and Popper and through Hans Jonas' imperative of responsibility. The fallibilist attitude is, to my mind, the most suitable post-modern characterization of scientific rationality and of human rationality, and applied to environmental problems it would give rise to the so-called principle of responsibility.

In **section 4 (Prudence and scientific rationality: *Do not block the way of inquiry*)**, I maintain that in science a fallibilistic attitude alone opens the doors to prudential reason, and that the ontological and anthropological bases of prudence are also suitable for fallibilism, founding it and encouraging it. In Aristotle, there are certain fallibilistic attitudes but they are ambiguous and combine with other statements in which science is characterized as universal and necessary knowledge. In this regard, Peirce's texts are most useful and clearest, and, of course, nearest to the present problems of science. Fallibilism is for him an attitude, that is something practical - rather than a concept or a rule it is the scientific attitude *par excellence*. On the basis of the fallibilist attitude there stands what may be the ultimate and most universal rule of scientific rationality: *Do not block the way of inquiry*.

In **section 5 (Prudence and environmental responsibility: *May human life remain possible***), I set out to bring the Aristotelian idea of prudence to the on-going debate on the environment. I shall proceed as in the previous case, showing its proximity to and continuity with the present notion of responsibility as treated by Hans Jonas. Again we have an Aristotelian concept that can be developed or, as Jonas himself would say, improved on, by a notion of today. In return, this present notion is supported by a very articulate and coherent ontology. Jonas sets out the so-called principle of responsibility as the ultimate element of the moral control of our relationship with the environment: *Proceed in such a way that you do not endanger the conditions for humanity's indefinite continuity on Earth.*

I consider that Peirce's and Jonas's formulations - each in its own area, respectively that of science and that of ethics - the expression of one and the same attitude, of one and the same *actual* - and therefore post-modern - way of understanding rationality, and that both fit perfectly into a metaphysical framework of Aristotelian inspiration. Essentially, these ideas are convergent, and respond to one attitude and may be based on one Aristotelian conception of reality, and together they offer a good answer to questions for their scientific rationality and their environmental responsibility.

The principles of Peirce and Jonas can, however, be taken as inadequate as a characterization of human action, for they do not take into account its creative aspects. The truth is that both, though they do not guarantee it, are directed towards *creative discovery*: they set out to ensure that it will be possible at any moment, while nurturing and fomenting the conditions for it

and removing obstacles. They uphold the openness of human action so that it can adjust to the future course of events, always open and never completely determined. The present article will therefore require a later development in which the notion of creative discovery is tackled along with its connection with the Aristotelian concept of *practical truth*.

## Modern Age and Actual Age: from the search for certainty to fallibilism

Among the characteristics of modern thought is the predilection for certainty[4]. The search for certainty has been one of the signs of identity of a whole intellectual tradition, of what Husserl[5] calls 'European science'. According to Husserl, the abandonment of this search steeps us in crisis, in scepticism or in any type of naturalism. However, as Kolakowski[6] rightly observes, neither Descartes nor Husserl managed to distinguish between the subjective feeling of evidence and the objective evidence of truth. Consequently, in many of the modern philosophical traditions, the pursuit of certainty has become a threat to the pursuit of truth, an impulse towards different types of idealism and a cause of crisis (by inference and by reaction) rather than an antidote to it.

The pursuit of certainty - *infallibilism*, in the words of Laudan - is one of the legacies of Cartesian philosophy. One could state, as Clarke does, that Cartesian science is defined in terms of certainty rather than in terms of the truth of the explanations proposed.[7] A text in which Decartes himself sets this point out clearly is:

'What can it matter to us for something to be absolutely false if anyway we believe it and we do not have the slightest suspicion that it is false?'[8]

Or, if a negative formulation is required, 'any knowledge that can be rendered doubtful must not be called scientific'[9] and 'I treat [...] as false everything which is merely likely'[10] These words give the tone of what would from then on be the object of the quest for the scientific method.

It is, in any event, a question of establishing methods whose results will be certain knowledge, methods which we can only trust, whether or not subjective certainty is accompanied by objective truth.

Francis Bacon initiated another route of access to certainty, this time with an empirical and inductive character. According to Bacon, the inductive method is the *art of invention* and *machine*, as well as *formula*, *clear and radiant light*[11], and other similar boons. Those of Bacon's ideas with the greatest influence on subsequent scientific thought are those which he expressed in his second book of the *Novum Organum*, that is his inductive logic, the so-called Baconian method. In general, and as Rossi states, many have seen in Bacon the constructor of a gigantic 'logic machine' doomed to not being used. With the Baconian method, according to Spedding, we cannot do anything. We consider it a subtle, elaborate and ingenious mechanism, but one which can produce nothing[12]. In spite of everything, Bacon's image as the founder of the new science thanks to his discovery of the inductive method was greatly appreciated by the founders of the *Royal Society* and the authors of the great illustrated *Encyclopædia*.

In what situation do we place the practical with regard to rationality when the first value is certainty?

Many modern thinkers begin their writings with the observation of the disappointing state of the philosophy of human things in comparison with natural philosophy, that is the natural science. Dissension and lack of certainty, both in metaphysics and in moral philosophy, are the points causing the greatest unrest. Both Descartes and Hume, to mention two of the

most noteworthy, feel that the model that inquiry into mankind should follow is that of natural and formal sciences, which have already opened up a path, a method to certainty and consensus. So, Descartes set out to find 'the highest and most perfect moral science, which, presupposing a knowledge of other sciences, is the ultimate degree of wisdom'[13]. Naturally, Descartes had to settle indefinitely for what he called 'provisional morals'. Hume stated with his empiricist approach base on the inductive method, 'Where experiments of this kind are judiciously collected and compared, we may hope to establish on them a science which will not be inferior in certainty, and will be much superior in utility to any other of human comprehension'[14]. This science will imply the extension of the principles of Newtonian natural philosophy to the study of human nature, and within it to the study of morals. Regarding politics, Hume has still fewer doubts, and states categorically that it can be reduced to a science endowed with a degree of certainty almost as perfect as that of mathematics[15].

But this naturalist approach to the study of man, which in principle promises the so longed-for certainty, leads to further disappointments and carries with it the germ of its own destruction, in the long term threatening natural science itself, which will always be an activity and product of human freedom and reason. Today we know from experience how these tendencies implicit in the naturalist position itself have been developed, but in Hume, the whole trajectory is already indicated. Naturalization of moral studies seems to demand a methodological reduction of the normative and the evaluative, which will end up being established as a definitive ontological reduction of human reason and freedom, which are mutually inseparable and inaccessible to the empirical method and never totally explained from strictly naturalist bases. Thence are derived an emotivism and an irrationalism which threaten science itself insofar as its practical aspects are recognized along with its inability to produce absolutely certain knowledge. Hume assures that 'We speak not strictly and philosophically when we talk of the combat of passion and of reason. Reason is, and ought only to be the slave of the passions, and can never pretend to any other office than to serve and obey them'[16]. Paradoxical though this may seem, this resignation that the practical should be the place for feelings derives from a reduced notion of reason, excessively bound up with a given idea of science and method and an extreme valuation of certainty.

In Hume there is no renunciation of certainty, the basis of which is confided to habit, but one of reason. Predilection for certainty leads Hume to irrationalism, not to scepticism[17]. Karl Popper sums up the situation as follows, saying that, according to Hume, the scientific method is inductive, but:

'... induction is completely invalid as an inference. There is not a shadow of a logical argument that would support the inference to a generalization from statements about the past (such as past repetitions of some 'evidence'). He [Hume] said that in spite of its lack of logical validity, induction plays an indispensable part in practical life [...] Thus there is a paradox. *Even our intellect does not work rationally*'. [...] This led Hume, one of the most reasonable thinkers of all time, to give up rationalism and look at man not as

endowed with reason but as a product of blind habit. Acording to Russell **this paradox of Hume's is responsible for the schizophrenia of modern man**'.[18]

If anything can be learnt for the present it is that we lack a notion of practical reason that is well structured and free of traditional errors. Practical criteria cannot depend on a supposed scientific method and cannot aspire to confer absolute certainty on our decisions, but we do not have to go without reason in practical situations, as there is no need to identify reason with a supposed scientific method or with the sure way to certainty. In part, the obstacles encountered by Hume and Descartes in the development of an idea of practical reason have been abolished, for today we are aware that sciences are not governed strictly by the Cartesian method or by the inductive method, and that they are far from reaching complete certainty, which does not make them directly irrational. Above everything else it is the renunciation of the obsession with certainty that enables us today to imagine a suitable notion of practical reason.

It will be said that a notion of practical reason already existed in Kant. And this is so. But two observations must be made in this regard. In Kant, unlike in Hume, there is a radical denaturalization of practical reason, which today seems unacceptable. Such is the case that for Kant, prudence mainly has nothing to do with practical reason, but with theoretical reason, paradoxical though this may seem. This means that he excludes it from the nucleus of morals and considers it a mere technical ability for the pursuit of happiness[19]. In the Modern period, from Descartes to Bacon, any technique was considered to be no more than applied science, and that if any problem arose in practice, it was due to deficiencies in theory. This view of science as immediately applicable soon spread, as we have seen in Hume, to morals, so the application of a science of man, which would not present genuinely technical problems, but only theoretical ones, would solve the problems of human happiness. Philosophers of the Enlightenment felt attracted by this new way of approaching human affairs. Kant shared the technological optimism of his day although he was the first to resist the concept of morals as a technique, that is, as the application of a science of man to the pursuit of happiness (happiness, by the way, previously defined by that very science). Kant, on the other hand, sought to protect morals from influences external to the very freedom of the subject. He did this by excluding the traditional contents from the nucleus of practical philosophy. According to Kant, prudence lies rather in theoretical reason, as it could become a mere applied science[20]. In the interests of autonomy of reason, Kant separates morals radically from nature, setting it in the sphere of the freedom of the subject. The attempt to protect morals from naturalism leads to the new excess of putting it in the hands of logicism. The categorical imperative is, at root, of a logical character: *Behave in such a way that you might also want your maxim to become universal law*. The 'might also want' invoked here is, as Jonas[21] states, that of reason an its concord with itself, an ability which would only be negated by self-contradiction.

In Aristotle, on the other hand, happiness is man's natural and legitimate aim, whereby it was possible, according to Aubenque, 'to integrate the

*technical* moment of the correct choice of means in the definition of morality'[22].

The second observation concerns the certainty of what Kant takes to be really practical. No comparison can be made between the splendid certainty which Kant attributes to Newtonian science and the *practical faith* in postulates necessary to give consistence to the practical use of reason. In an atmosphere of extreme valuation of certainty and of the scientific method, the Kantian foundation for practical reason, which, in short, leads to the postulates of human freedom, the immortality of the soul and the existence of God, was not believed or taken seriously. Kant expressed his admiration and respect for two areas of reality, *the starry sky above me and the moral law inside me*. But to keep them separate is not sustainable, for indeed he who looks at the stars and grasps moral law is a human being who takes part in the two areas of reality, as a system subject to physical laws and as a free being. The integration of the two spheres seems necessary without the negation of either of them. But if we separate to such an extent the degree of certainty that we attribute to the knowledge of each of them, and if we set such a high value on certainty, then the so-called practical use of reason runs the risk of immediately being seen as one more mask of the irrational, as a concession of Kant's to his beliefs, affections, desires or interests. The historical proof that this two sets of accounts cannot be tenable for long is what happened to Kantian tradition. Either it tended towards an idealism that suppressed the peculiarity of the practical and made it depend for everything on theory by identifying the rational with the real, or it drifted towards an irrationalism in which the pure use of reason had the same fate as the practical use, until it was seen as one more mask of the will to power[23]. The pure and practical uses of reason must be integrated and must support each other, for today we know that they either stand or fall together[24]. But this requires a reconsideration of the ideal of certainty and of the nature of science which has only come about in the twentieth century.

Since Hegel and since Nietzsche, several campaigns have been launched in the pursuit of certainty. One of the last ones in favour of certainty, automatism and the segregation of the practical, based on the identification of reason with science, was called Neo-positivism (and it was pursued as the so-called *received view*). Its internal decadence apart, it was Popper's philosophy and Kuhn's criticisms that put an end to this venture, and with it to a way of making philosophy of science. Kuhn laid forth the practical aspects of scientific rationality. As he states - in my opinion, rightly - 'Recognizing that criteria of choice can function as values when incomplete as rules has, I think, a number of striking advantages.'[25]. In Popper, a clear renunciation of the ideal of certainty and a re-instatement of truth are to be notice.

The recognition of the practical implication of science, both in its genesis and applications and in its justification, and the renunciation of the idea of certainty no doubt mark the end of the epoch in which the supposedly scientific method was shown as the zenith and model of human reason, where all philosophy aspired to ideal of certainty or took its failure as the failure of reason, first in the practical terrain and then, as an inexorable

consequence, in the theoretical. Today there is an abandonment of the logico-linguistic conception of theories in favour of a pragmatic conception of science. Science, it is said, is action. But, as previously the possibility of a practical reason was not clear, nor was its articulation with theory, the rationality of science itself has been questioned. Kuhn has been accused of being relativist and irrationalist, an accusation which he has rejected, but without going so far as to construct a philosophical basis on which to base this rejection. For their parts, Peirce and Popper, each in his own way, have tackled this subject but both have recoiled, paradoxically, to quasi-Hegelian positions.

Science taken as action, as the art of research, of teaching, diffusion of knowledge and application, etc., can and must be judged with criteria that cannot in themselves be exclusively scientific or merely arbitrary, but a part of the general rationality of human life. The birth, then, of new disciplines, of new ways of making philosophy of science, such as *bioethics*, *environmental ethics* and *STS studies*, is not just a collateral phenomenon, a momentary collision point between science and practical thought, but an indication of a new way of conceiving rationality itself, or at least an indication of the need for this new reason.

I believe that the time has come to perfect concepts and attitudes that have always had a vocation to integrate the theoretical and practical planes without ruling out either of them, concepts and attitudes which were born to avoid the swing of the pendulum between the logicist and irrationalist extremes (between Permenides and Heracleitus, between Charybdis and Scylla).

## Phronesis in Aristotle

Aristotle characterizes prudence (*phronesis*) as

'A true and reasoned state of capacity to act with regard to the things that are good or bad for man.'[26].

By means of this definition he distinguishes prudence from other notions. Given that it is a disposition, or state of capacity (*héxis*), it will be distinguished from science (*episteme*), for prudence will be knowledge linked with human action. In the second place, as it is practical (*praktike*), its result will be an action, not an object, which distinguishes it from art or technique (*tekhne*). The demand for rationality and truth ('*...metà lógoy alethe'*) distinguishes prudence from moral virtues and sets it among the intellectual ones. Finally, the fact that it deals with what is good and bad for mankind, and not right and wrong in an abstract way, sets prudence apart from wisdom (*sophia*).

So far we have sketched the limits of the notion of prudence and others akin to it, and the points where they overlap[27], but we must not forget that 'Regarding *practical wisdom* [*phronesis*] we shall get at the truth by considering who are the persons we credit with it'.[28]

Texts about prudence suggest that it is an intellectual virtue, but that it implies experience lived, which concerns both means and ends, for its final horizon is the good life as a whole, and that it is at the service of wisdom, that is, it is an instrument for obtaining this. However, Aristotle goes as far as to say:

'We ought to attend to the undemonstrated saying and opinions of experienced and older people or of people of practical wisdom [*phronimos*] not less than to demonstrations; for because experience has given them an eye they see aright.'[29]

In general, prudence pursues wisdom and wisdom stimulates human prudence. It is best to 'possess both, or preferably prudence'[30]. Of animals, Aristotle says that they too are prudent[31], but as they lack wisdom their prudence is certainly limited. For all this, prudence is worth pursuing for itself, regardless of its possible usefulness, given that it is a virtue[32].

Prudence is a virtue, and virtue, for Aristotle, is:

'a state of character concerned with choice, lying in a mean, i.e. the mean relative to us, this being determined by a rational principle, and by that principle by which the man of practical wisdom [*phronimos*] would determine it.' [33]

Virtue, therefore, is a habit or disposition to choosing the right medium between excess and shortage. But this is not easy, for the right means is not the arithmetic mean. To find it we need another rule. This rule will be the one established by the prudent man and applied just as he would apply it. In short, we cannot determine what is or is not virtuous without the concurrence of the prudent man.

The mid point is dictated by reason or by the straight rule of the prudent man. This reason or straight rule is, rather, correct reason, that is corrected reason. It is the limit to which a process of correction tends, one of elimination of errors, by relation to the end sought:

'[...] there is a mark to which the man who has the rule looks, and heightens or relaxes his activity accordingly, and there is a standard which determines the mean states which we say are intermediate between excess and defect, being in accordance with the right rule (*katà tòn orthòn lógon*)'[34].

**Therefore, prudence requires experience:**

'Young men become geometricians and mathematicians and wise in matters like these, it is thought that a young man of practical wisdom cannot be found. The cause is that such wisdom is concerned not only with universals but with particulars, which become familiar from experience.'[35]

Experience is time and memory, but not just any lapse of time, but one which one has spent reflecting, trying to understand the nature of the things we see, of the actions we do and what happens to us. Experience is the memory of a time lived and thought, for it is the fruit of succeeding corrections.

But let us remember that prudence itself is a virtue and, moreover, 'it is impossible to be practically wise [*phronimos*] without being good'[36]. Therefore, nobody could be prudent without following the ruled dictated by prudence. Nobody could be prudent without having been already. This vicious circle (or virtuous one, depending on how we look on it) is resolved by education and action, that is, by action steered by somebody prudent until one becomes prudent oneself[37].

The prudence of an experienced person serves for drawing up rules, 'since the universals are reached from the particulars'[38]. But *methodological prudence*, so to speak, cannot consist simply of a set of rules and meta-rules for the formulation and application of rules, which in turn would generate the same problems of definition and application, but at a higher level, 'for the error is not in the law nor in the legislator but in the nature of the thing'[39].

Therefore, prudence also constitutes the criterion of application, interpretation and, when necessary, modification or violation of the rule. Aristotelian prudence is rooted in the indelegable experience and in responsibility - in the risk, Pierre Aubenque would say - of each human being. Man cannot cede the risk of decision and action (nor, obviously, can the scientist) to any rule or automatic process of decision.

Not even the laws of the city can be applied completely literally. Aristotle warned that such a process could lead to grave injustice. The application of the law to the case requires something very much like prudence: equity (*epieíkeia*)[40].

'The reason is that all law is universal but about some things it is not possible to make a universal statement which shall be correct.'[41]

The proper application of the law is not guaranteed by science alone, as in the case of Plato's king-philosopher, but rather science itself, for belonging to the general, is subject to the same problems as the law in its relation with the concrete[42].

But this does not condemn us to irrationality or to subjectivism in our practical decisions, for prudence is not science, yet neither is it simple opinion or skill[43], it is genuine rational knowledge with the intention of

objective truth. Research must be understood as a part of human action, decisions taken in it are practical decisions falling under the jurisdiction of the Aristotelian concept of practical truth, the type of truth that prudence seeks[44].

In conclusion, Aristotle achieves a noticeable integration of knowledge and human action, of freedom and nature, as well as of the ends of science which we call instrumentalist and realist. This composition is not arrived at in the Platonic way, where the science of Ideas will be the ultimate practical guide. Aubenque assures us that:

'in man, Aristotle does not set one against the other, but maintains both: contemplative vocation and practical demand. But the latter no longer finds its model and guide in the former, and must look on its own level for a rule which, nevertheless, will still be intellectual or "dianoetic".'[45]

This integration is achieved, then, through prudence and practical truth: scientific research is still part of human action and, as such, is subject to the ethical rule of prudence, and to the service of the ultimate of man's ends, happiness, which in turn consists in true knowledge, as well as co-existence[46] and a moderate degree of welfare[47].

Science is rooted in human life, in practical values, in time and in experience through prudence, which is a virtue and is intellectual; or, more correctly, through the prudent person. Furthermore, this prudential conception of human reason is rooted in a very realistic, profound, fruitful and commonly accepted idea of human nature: 'desiderative reason or ratiocinative desire'[48].

## Prudence and Scientific Rationality: 'Do not block the way of inquiry.'

For some of today's thinkers, like Peirce and Popper, it is clear that in empirical science we cannot reach certainty, that no method exists[49] that in any way guarantees the results of research, either in the context of discovery or in that of justification, or in any other. Popper sums up the situation thus:

'As a rule, I begin my lectures on Scientific Method by telling my students that [the] scientific method does not exist.[...] I assert that no scientific method exists in any of these three senses. To put it in a more direct way: (1) There is no method of discovering a scientific theory. (2) There is no method of ascertaining the truth of a scientific hypothesis, i.e., no method of verification. (3) There is no method of ascertaining whether a hypothesis is 'probable', or probably true.'[50]

If anything characterizes reason in critical rationalism, that something is more of an attitude than the observance of a supposed scientific method, and that attitude is not exclusive to the scientist, but advisable for any person who in any walk of life wishes to act in a reasonable way. It is, of course, the fallibilist attitude.

Charles Sanders Peirce once wrote of himself that he was a thinker about whom critics never found anything good to say. One of his critics went as far as to say that Peirce did not even seem to be absolutely sure of his own conclusions. The sentence, naturally enough, was not conceived as praise, but Peirce used it, ironically, as grounds for pride, for 'infallibility in scientific matters,' he said, 'seems to me irresistibly comical'. He even thought of adopting the term 'fallibilism' as a name for his ideas. Fallibilism, together with a great confidence in the reality of knowledge and an intense desire to learn, made up, in his sight, the core of his thought[51]. Peirce insists that the fallibilist attitude is the one to be desired in a scientist and that indeed arises from experience: 'Persons who know science chiefly by its results -that is to say, have not acquaintance with it at all as a *living inquiry*- are apt to acquire the notion that the universe is now entirely explained in all its leading features'[52]. What has been growing since Newton, together with scientific knowledge, is the awareness of its limits. In other words, the fallibilist attitude is the fruit both of the scientist's personal experience and of several centuries of experience of the scientific community, as is the prudence in general of human experience. The fallibilist attitude arises from our proven inability to predict with certainty what future science will be like[53], which is a consequence of the lack of a regular method. The method is formed with research[54], and its future alterations are as unforeseeable as the very content of future science.

It is true that sceptical tendencies are not new, but the fallibilism of the twentieth century has some distinctive aspects. In the first place, it is relative to a very specific undertaking of human knowledge, modern science, and as such, closes a circle of confidence in the possibility of human knowledge of reality and the command of it to become complete and certain by the application of the scientific method: it closes, therefore, modern times and depends on the experience acquired during them, it is not just another edition of Pre-modern or Modern scepticism. On the other hand,

this fallibilism is not exactly sceptic, rather by distinguishing truth from certainty, it can continue to trust in the truth of most of our knowledge, although it maintains that we shall never be definitely and perfectly sure of knowing what part is indeed true. Present fallibilism has not lost hope in the possibility of true knowledge, but of certain knowledge. Moreover, present-day fallibilism rests on what Popper has called critical common sense, that is, there is no question - far from it - of doubting everything out of frivolity, out of pure play or out of method. Nothing could be farther from the fallibilist spirit than frivolity or methodical doubt. Never should criticism be taken as a destructive intellectual game. In other words, all our knowledge is subjected to a potential revision, for in any part of it errors may exist, but one must only really doubt when there are reasons for doubt. There are very clear statements by Peirce and also by Popper in this regard. Popper says: 'There is a certain triteness and staleness about it that reminds me a little of a habit which I dislike: that of philosophizing without a real problem.'[55] Fallibilism is in connection with a serious idea of research and its aims: 'Rational discussion must not be practised, however, as a mere game to while away our time. It cannot exist without real problems, without the search for objective truth.'[56]

Peirce's criticism of methodical doubt is even more relevant in this context, for it is set clearly and consciously in the surpassing of modernity. Peirce accepts the common statement that 'Descartes is the father of modern philosophy'. He tries to sum up the spirit of Cartesianism in four essential points, the first of which he formulates thus: 'It teaches that philosophy must begin with universal doubt'. Peirce makes the following commentary on it:

'It seems to me that modern science and modern logic require us to stand upon a very different platform from this [...] We cannot begin with complete doubt. [...] A person may, it is true, in the course of his studies, find reason to doubt what he began by believing; but in that case he doubts because he has a positive reason for it, and not on account of the Cartesian maxim. *Let us not pretend to doubt in philosophy what we do not doubt in our hearts*'.[57]

Present-day fallibilism, rather than a thesis is an attitude. It is thus characterized by Peirce[58] and Popper[59]. An attitude, according to the dictionary, may be taken to be a disposition[60]. Prudence is just that, a disposition (*héxis*). Prudence and fallibilism are both attitudes, but are they the same attitude? Let us remember that prudence is intellectual and practical, and that fallibilism undoubtedly is, too. Both are intellectual insofar as they consist in a certain knowledge obtained from past experience. Both are practical inasmuch as they prepare us in some way for future action. Prudence is the virtue that produces practical truth. From my point of view, fallibilism as a guide for scientific action tends to the same end.

However, there is a difference: Aristotle did not clearly conceive prudence as a guide for scientific procedure. Something similar may be inferred if we put together two of his statements on this point: in the first place, he states that prudence seeks after the way of producing wisdom[61],

while in the second he says that science is part of wisdom[62] In any event, however, he was not very explicit on this point.

A second difference is concerned with the fact that today's fallibilism depends on a concept of science that Aristotle could not have. Aristotle thought that science was knowledge of the universal and necessary[63]. Of prudence he says that it is quite obvious that it is not science, 'for it is, as has been said, concerned with the ultimate particular fact, since the thing to be done is of this nature'[64]. It is a fact that nowhere in this text does Aristotle recognize the possibility of a scientific knowledge of the particular, nor does he directly accord prudence the category of guide of science, although he always considers it an intellectual and practical disposition according to reason and truth. Judging from this text, Aristotle does not seem to be a fallibilist as far as scientific knowledge is concerned. He goes as far as to say explicitly that when one is somehow sure of something and one knows its principles, one has scientific knowledge[65].

Thirdly, fallibilism today depends on a historical experience that Aristotle could not have had, the experience of the development of modern science, of the hopes deposited in it, of the memory of its successes and of the gradual recognition of its limits.

We could take as another difference the fact that prudence is not at the service of a partial end but of generally living well, that is, happiness, while fallibilism seems only to affect science. But fallibilism soon becomes critical rationalism and, in this form, shows an unstoppable tendency to be applied to more and more areas of human action. Popper's use of critical rationalism in the terrain of political thought is a good example.

For all that has been said, I consider that fallibilism would be today's version of prudence, or perhaps prudence *brought* into today's debate, shaped by the experience that we have today. The fallibilist attitude consists, in short, in assuming that, however much one trusts the truth of what one knows, an error may always be present and that this conviction must guide our actions. This disposition may doubtless be called prudence, it is prudence in today's form, born from our historical experience. It is also the genuinely present form or reason (the reason of *Actual Age*). This attitude, which in itself is practical, has in turn may practical implications. The practical consequences of fallibilism may be expressed succinctly in the following maxim formulated by Peirce:

*Do not block the way of inquiry*[66].

According to Peirce, inquiry cannot be blocked, not because it is an end in itself[67], which would make it a futile game, but because each and every one of us may be wrong, and to block the way out of the error would be rather irrational. That is, although we honestly believe in the truth of our ideas and have done our utmost to submit them to criticism, we cannot avoid thinking that even so they may be wrong, and we cannot avoid acting accordingly, that is, avoiding the block to search. But this implies that research must go on *for the very reason* that its object is the development of true knowledge (may the tautology stand) and well-being.

Consequently, any action that tends to hinder or block the course of research must be considered both irrational and immoral. There are many

attitudes of this type: dogmatic pedagogy, deficient information, forgetting or despising different traditions, subtle or brutal censorship of criticism, out-of-control and threatening applications of technology, hypocrisy and academic corruption, secrecy in research, and others.

On the other hand, Aristotelian prudence is a disposition which takes on full sense in conjunction with a given idea of the world and of mankind. Pierre Aubenque has researched into what this ontology and this anthropology of prudence are. Prudence has no sense amid chaos or in a world of which it can be said that 'what is rational is real and what is real is rational'. Well, fallibilism takes on full sense together with the same ontology and anthropology as Aristotelian prudence, whence the connection between the two also affording a benefit to fallibilism, which becomes much more lucid and fertile in connection with a metaphysics like Aristotle's. Fallibilism today, as much as Aristotelian prudence, harmonizes well with an ontology and anthropology built on a basis of the notions of potency and act; they both harmonize with a pluralist ontology that contemplates a reality formed by many substances, like persons, animals, plants and elements, a reality with its own dynamic, not subjected to concept, but open to human intellection.

## Prudence and Environmental Responsibility: 'May human life remain possible.'

Hans Jonas' environmental ethics are clearly set in a post-modern attitude as he rejects some clear dogmas of Modern Age, for example that which says that there are no metaphysical truths or that which states that there is no way from the 'is' to the 'ought'. But he is not postmodern, rather he is *actual*, combining intellectual modesty and mistrust in certainty with the quest for an objective basis; he explicitly renounces the utopian outlook, he does not identify science with reason but develops criteria of judgement independent of techno-science precisely in order to judge its applications.

Many of these features bring the environmental ethics of Jonas nearer to the ideas we have been setting out. Their principle of responsibility corresponds clearly to Peirce's maxim of not blocking the way of inquiry, and both suggest the same concept of rationality. Furthermore, Jonas explicitly recognizes his Aristotelian leanings in his writing, so his concepts may fairly easily be linked with those of Aristotle.

In what follows I shall attempt to relate Jonas' responsibility principle with the Aristotelian notion of prudence and with Peirce's maxim. At the same time I shall highlight the link between scientific rationality as Peirce understands it and environmental responsibility as Jonas sets it out[68]. The ideas of both men, and with them the new rationality that they suggest, are reinforced when seen against a background of ontology and anthropology of Aristotelian inspiration.

Hans Jonas' responsibility principle, in one of its formulations, states: 'Behave in such a way that you do not endanger the conditions for mankind's indefinite stay on Earth.' It is a principle of respect and care for life in general and of human life in particular, is born from an attitude of intellectual modesty and of the recognition that while our capacity for foresight has grown, it has grown much less than our scope for acting on the environment. Furthermore, the information we obtain ends up being released to the general public and constitutes in itself a causal factor. This feedback loop makes the future dynamics of society and nature even more unpredictable. Nature, too, for it has fallen under mankind's power and depends to a great extent on our knowledge, on our decisions, and in general on the progress of human society.

The ethics of responsibility is an uncertain one, one which has given up certainty in favour of respect for reality, which accepts the inescapable risk of action, so much so that the fear of that risk is in part what serves it as a prudential guide (***heuristic of fear***). It is indeed this fallibilistic attitude that will lead to a demand for a constant openness to the future. Jonas' texts in this regard are perfectly clear:

'The one paradoxical certainty here is that of uncertainty.'[69]

'We know, if nothing else, that most of these will be changed. It is the difference between a static and a dynamic situation. Dynamism is the signature of modernity. It is not an accident, but an immanent property of the epoch, and until further notice it is our fate. It bespeaks the fact that we must always figure on novelty without ever being able to figure it out; that change is certain, but not what the changed condition will be '[70].

Of the politician he says:

'For no general rule of ethics can make it a duty, on the mere criterion of subjective certainty, to risk committing possibly fatal mistakes at others' expense. Rather must he who wagers on his own certainty take the never excludable possibility of being in error upon his own conscience. For this, there exists no general law, only the free deed, which in the unassuredness of its eventual justification (even in the mere presumption of its self-confidence, which surely cannot be part of any moral prescription) is entirely its own venture.'[71].

'*All Statesmanship Is Responsible for the Possibility of Future Statesmanship* [...] Nonetheless – remembering what we have said before – even the most skeptical estimate of historical prognosis leaves at least one basic certainty, itself a prognosis, that political spontaneity will remain necessary at all times, precisely because the excessively intricate web of events will, in principle, never conform to plan[72].

'We contend that to build upon this certainty [...] is at least as irresponsible as was [...] to rely on the uncertain. [...] From all of this it follows that, while today there is as little a recipe for statecraft as there ever was, the time spans of responsibility as well as of informed planning have widened unprecedentedly'.[73]

Jonas does not believe for a minute that his ethics alone can bring about complete good, but, aware of his limits, he merely seeks to protects the conditions of freedom, of happiness and the future assuming of responsibilities, in the same way as prudence, rather than squarely producing practical truth, protects and cultivates the conditions for its appearance, in the same way that Peirce recommends as the ultimate maxim of reason, as a more universal and peremptory norm of the method, to look after the conditions of free research and not to block the way of inquiry. The ethics of responsibility is then far from any utopian idea:

'But no less should one distrust those who pretend to know about a future destination of their own or every society, about a goal of history, for which all of the past was but a preparation and the present is only a transitional stage. '[74]

'But in believing to know the direction and the goal, Marxism is still heir to the Kantian regulative idea, which is stripped of its infinitude and wholly transposed into the finite [...] We post-Marxists (a word still sounding audacious[75] and certainly mistaken to many) must see things differently.'[76]

In short, the rational attitude consists above all in a protection and stimulus of creative capacities which will allow future adjustment to conditions that we cannot foresee:

'[...] the spontaneity or ***freedom*** of the life in question – the greatest of all unknowns, which yet must be included in the total responsibility. [...] It can be so in one way only: respecting this transcendent horizon, the intent of the responsibility must be not so much to determine as to enable, that is, to prepare and keep the capacity for itself in those to come intact, never foreclosing the future exercise of responsibility by them. The object's self-owned futurity is the truest futural aspect of the responsibility, [...] In the light of such self-transcending width, it becomes apparent that responsibility

as such is nothing else but the moral complement to the ontological constitution our *temporality*.'[77]

'We omit here what lies beyond these duties of guarding and preserving: obligations to ends which none other than he first *creates* as it were out of nothing. For creativity lies outside the tasks of responsibility, which extends no further than to making it possible, that is, to keeping intact its ontological premise, the being of man is such. This is its more modest, but more stringent duty.'[78]

On the other hand, Hans Jonas' responsibility ethic is totally realistic, seeking its basis in the object, which will be the object of responsibility, in the good that resides in being ('an *ontic* paradigm'[79]). It seeks an objective basis in the demands for care and respect, an objective basis even for the subjective feeling of responsibility. We feel responsibility towards living things and this feeling is correct insofar as such living things have a value in themselves, inasmuch as they are objectively valuable and would be even without our recognition of that value and without our feeling of responsibility. 'What matters,' he states, 'are things rather than states of my will.'[80] Which is tantamount to saying that what has value is truth, and not so much subjective states (like certainty). To sum up: ' The objectivity must really stem from the object.'[81]

But objective good is basically a possibility which requires realization, actualizing, for which the contribution of the responsible subject is required. The paradigm of this situation is the child, a fragile existence which requires care to continue existing, which is like demanding to be more, and that demand is directed to the responsible subject, who has to protect and provide for the full realization of his possibilities.

'Not duty itself is the object: not the moral law motivates moral action, but the appeal of a possible good-in-itself in the world, which confronts my will and demands to be heard – *in accordance with* the moral law. To grant that appeal a hearing *is* precisely what the moral law commands: this law is nothing but the general enjoinder of the call of all action-dependent 'goods' and of their situation-determined *right* to just *my* action'[82].

The ethics of responsibility eschews the universal norm, formal duty, as it does action for action's sake, full subjectivity. In this regard, it is again close to the Aristotelian balances between abstract formalism and pure arbitrariness. Its realist foundation makes it insecure, not subject to strict formal norms, but it also makes it objective, not subjected to whim, in the same way that prudence too is neither law nor whim, but a norm incarnate, responsibility culminates not in a rule for the conservation of the environment but in the responsible being who recognizes the otherness of the object of his responsibility and at the same time his openness to possibilities that will come into existence with his help. In this Jonas differs from the most typical extremes of modernity, whose paradigmatic exponents could have been Kant and Nietzsche. the concrete character of responsibility permits - or rather demands - the integration of intellect and sentiment ('hence choice is either desiderative reason or ratiocinative desire, and such an origin of action is a man'[83]):

‘A theory of responsibility, as any ethical theory, must deal both with the rational ground of obligation, that is, the validating principle behind the claim to a binding ‘ought,’ and with the *psychological* ground of its moving the will, that is, of an agent’s letting it determine his course of action. This is to say that ethics has an objective side and a subjective side, the one having to do with reason, the other with emotion.’[84]

‘Existentialism is the modern extreme of this ethics of subjective intention (cf. Nietzsche’s ‘wil to will,’ Sartre’s ‘authentic decision,’ Heidegger’s ‘resoluteness,’ etc.), where the worldly issue is not by itself endowed with a claim on us but receives its significance from the choice of our passionate concern. Here the self-committing freedom of the self reigns supreme.’[85]

In opposition to Kantian ethics, Jonas confirms that ‘[But] the good is the ‘cause’ at issue out there in the world [...] Morality can never have itself for its goal’[86]. Jonas recognizes that Kantian morals also appeal to sentiment, but ‘What is unique is that this feeling is directed not at a material object but at the law itself[87].’

Still other features of responsibility may be added to confer continuity with Aristotelian prudence, for example, the temporary and contingent character of its object and the global nature of its perspective which covers the object of its care completely:

‘[...]the object of ***responsibility*** is emphatically the perishable ***qua*** perishable’[88].

‘The child as a whole and in all its possibilities, not only in its immediate needs, is its [parental responsibility’s] object.’[89].

The paradigmatic examples of responsibility, that of parents and children, that of the politician and the public weal, tell us just how far this is so. The parent cannot, and must not, make his son his own creation, he cannot bring him happiness in his hands, but he must protect and ensure the conditions for it, among which are the child’s freedom and spontaneity. Nor can society and each of its members expect everything from the politician, but they can expect him to stimulate and protect the conditions in which everything is possible, those in which active members of society can work for the public weal and individual happiness. Jonas’s responsibility and Aristotle’s prudence, look to the common good, but they are not methods for its effective production, for there is no method for it, for it is produced in an ever-new world, in an ever-new subject, and they are rather generators and protectors of the conditions for global good, in an uncertain but habitable world.

## Conclusion

During the Modern Age, reason was identified with the scientific method, the principal objective of which consisted in the quest for certain knowledge. From there, the practical became considered an area for the mere application of science, whereby it lost its own character and its touch of uncertainty, risk and responsibility. Practical certainty through the application of science was never achieved, so a second possibility became available: renouncing the rational characteristic of action; human action would be guided only by forces of an irrational nature. But there soon appear the practical aspects of science itself, which is thereby also subject to the forces of the irrational. Human reason, and with it science, is now no more than a slave of passions or a mask over the will to power.

This unsatisfactory result can only be avoided by having available a concept of practical reason independent from a supposed scientific method and free from the obsession with certainty, which is not compatible with practice. We find notions of this type in texts of Aristotle's practical philosophy. Indeed, the notion of prudence, as an intellectual virtue, and that of practical truth, bring together reason and praxis sufficiently.

However, these concepts may be beyond the present debate. They should be brought into it through genuinely present-day notions, which already incorporate the experience that humanity has acquired over time, and especially the experience accumulated during the Modern period. We need to develop Aristotle's ideas from a post-modern perspective.

Today, then, Aristotelian prudence is correctly expressed in the attitude of intellectual modesty and respect for reality that we find in thinkers like Pierce, Popper and Jonas, enshrined in the Peircian maxim of not blocking the way of inquiry and in Jonas's responsibility principle, which insists on the protection of the conditions for the continuity of life. These positions of contemporary authors are strengthened when understood against the background of Aristotelian ontology (there is a plurality of substances; being may be actual or potential, there is a path from *is* to *ought*. Man is desiring intelligence or intelligent desire; reality is not a copy of the concept, but is intelligible).

Furthermore, things being thus, we realize that a rational attitude is fundamentally the same in the different contexts of science and in other areas of human life. It is a question basically of protecting openness of human action in the future, for we know that it will have to tackle a (socio-natural) world whose future is also open. This attitude of protecting openness does not guarantee anything, but it is the best bet we can place in order for creative discoveries to continue to be made, so that man's and nature's creativity may survive.

# Notes

1 I have reserved the term ‘post-modern’ and derivatives, hyphenated, simply to refer to the time coming after the modern period. I shall use the term ‘postmodern’ in reference to a given style of philosophy, with a tendency to the so-called weak thought, relativism and æstheticism. This type of thought is *post-modern* chronologically, but typically modern in content, for it is a reaction like so many others that have counterpointed the progress of the enlightened rationalist project (nominalist, relativist and romantic, nihilist, existentialist, vitalist and irrationalist currents, etc.). The terms ‘actual’ and ‘Actual Age’ are used to designate a certain content for post-modern time, a different content, of course, from the merely postmodern, a content inspired in the notions of *act*, *actuality*, and *action*. So, ‘Actual Age’ will be the name of a period, like ‘Modern Age’, or rather, far from any historicist interpretation, the name of a proposal to give content to the post-modern period, which may or may not be fulfilled.

2 I do not mean by this that this is the *explanatory key* of modernity. I eschew the very notion of explanatory key when we are confronted by such a complex and somewhat diffuse historical phenomenon.

3 The notion of prudence is closely linked in Aristotle to practical truth. Practical truth may be useful to us in the present debate to integrate the objective and constructive aspects of science. The study of practical truth complements then, that of prudence. For reasons of brevity, I cannot go into it here, but would refer the reader to the second part of this paper: ‘Aristotelian Perspectives for Post-modern Reason (II). Practical Truth and Creative Discovery’.

4 Here I only study the valuation of certainty in its link with practical thought and then only in some especially important authors. A more thorough treatment of this topic may be found in A. Marcos (forthcoming): *Hacia una filosofía de la ciencia amplia*. Tecnos, Madrid.

5 Husserl, E. (1976) *Die Krisis der Europäischen Wissenschaften und die Transzendentale Phänomenologie* (The Hague: Martinus Nijhoff Publishers).

6 Kolakowski, L. (1975) *Husserl and the Search for Certitude* (New Haven: Yale University Press).

7 Clarke, D. (1982) *Descartes' Philosophy of Science* (Manchester: Manchester University Press).

8 Author's translation from: Descartes, R. (1969) ‘Secondes Reponses’, in *Oeuvres de Descartes Publiées par Charles Adams & Paul Tannery* (Paris: Vrin), vol. IX-1, pp. 113-4.

9 Author's translation from: Descartes, R. (1969) ‘Secondes Reponses’, in *Oeuvres de Descartes Publiées par Charles Adams & Paul Tannery* (Paris: Vrin), vol. IX-1, p. 111.

10 Author's translation from: Descartes, R. (1969) ‘Descartes à Mersenne, 5 octobre 1637’, in *Oeuvres de Descartes Publiées par Charles Adams & Paul Tannery*. (Paris: Vrin), vol. I, p. 450.

11 See Rossi, P. (1974) *Francesco Bacone* (Torino: Einaudi editore).

12 Quoted by Rossi *op. cit.*, p. 24.

13 Author's translation from: Descartes, R. (1969) ‘Lettre-Preface aux *Principes de la Philosophie*’, in *Oeuvres de Descartes Publiées par Charles Adams & Paul Tannery*. (Paris: Vrin), vol. IX-2, p. 14.

14 Hume, D. (1964) 'Introduction to *A Treatise of Human Nature*', in Thomas Hill Green and Thomas Hodge Grose (eds.), *David Hume: The Philosophical Works* (Darmstadt, Germany: Scientia Verlag Aalen), vol. I, p. 310.

15 In this regard, see Hume’s essay *That Politics May Be Reduced to a Science*.

16 Hume, D (1964) *A Treatise of Human Nature*, 2.3.3., in Thomas Hill Green and Thomas Hodge Grose (eds.), *David Hume: The Philosophical Works* (Darmstadt, Germany: Scientia Verlag Aalen), vol. II, p. 195.

17 This interpretation, which I consider extremely valid, is clearly set out in Musgrave, A. (1993) *Common Sense, Science and Scepticism* (Cambridge: Cambridge University Press), chapter 8.

18 Popper, K (1972) *Objective Knowledge* (Oxford: Clarendon Press), pp. 94-95. (My bold type.)

19 Cf. Aubenque, P. (1993) *La prudence chez Aristote* (Paris: P.U.F), appendix III.

20 Which confirms, by the way, that a post-modern conception of science obliges us to also reconsider practical philosophy, as we are doing here.

21 Jonas, H. (1984) *The Imperative of Responsability: In Search of an Ethics for the Technological Age* (Chicago: University of Chicago Press). Originally published as Jonas, H. (1979) *Das Prinzip Verantwortung: Versuch einer Ethik für die technologische Zivilisation* (Frankfurt am Main: Insel verlag).

22 Aubenque: *op. cit.*, p. 195.

23 Regarding the line of development from Kant to Nietzsche, see Conill, J. (1997) *El poder de la mentira* (Madrid: Tecnos).

24 The third critique perhaps comes nearer to the idear of *phronesis*, with a reflexive judgement on reason, as Heidegger points out and Gadamer reiterates, but so far it has been impossible to follow this line. In this regard, see Chateau, J. (ed.) (1997) *La vérité pratique* (Paris: Vrin), p. 251 n. 1.

25 Kuhn, T. (1977) *The essential tension: selected studies in scientific tradition and change* (Chicago: University of Chicago Press), p. 331.

26 *Ethica Nicomachea* (*EN*) 1140b 4 et seq.; see also 1140b 20 et seq. I take aristotelian texts in their english translation from Ross, W.D. and Smith, J.A. (eds.) (1908-1952) *The Works of Aristotle Translated into English* (Oxford: Clarendon Press).

27 On Aristotelian prudence, see Bodéüs, R. (1993) *The Political Dimensions of Aristotle's Ethics* (Albany, NY: S.U.N.Y. Press), pp. 27-30. An extensive monograph on *EN* VI may be seen in Chateau, J. (ed.) (1997) *La vérité pratique*, (Paris: Vrin). For the understanding of Book VI of *EN*, an indispensable work is Aubenque, P. (1963 [new edition, 1993]) *La prudence chez Aristote*, (Paris: P.U.F.). The chapter by Emilio Lledó on Aristotle's practical philosophy, in Camps, V. (ed.) (1988) *Historia de la ética* (Barcelona: Crítica), is also very helpful.

28 *EN* 1140a 23-24.

29 *EN* 1143b 10-13.

30 *EN* 1141b 21.

31 *EN* 1141a 26-28.

32 *EN* 1144a 1 et seq.

33 *EN* 1106b 36 et seq.

34 *EN* 1138b 22.25.

35 *EN* 1142a 12.21.

36 *EN* 1144a 35-36.

37 See also *EN* X 9.

38 *EN* 1143b 4.

39 *EN* 1137b 18-19.

40 Aristotle deals with equity in *EN* V 10.

41 *EN* 1137b 13-15.

42 *EN* 1107a 27-31.

43 *EN* 1142a 34 et seq.

44 *EN* 1139a 26 et seq.

45 Aubenque: *op. cit.*, p. 19.

46 *EE* 1244b 24.26; *EN* 1178b 18-19.

47 *EN* 1178b 34 et seq.

48 *EN* 1139b 4-6.

49 Nobody denies the existence of methods, in the plural, and standardized guidelines in science, as they exist, indeed, in any other human activity, however little developed, including the purely artistic ones. These methods, as Chateau (1997) suggests, are in the hands of prudence and out of its hands they were born (Aristotle said that the hand was the instrument of instruments). There are methods for gathering statistical data, for carrying out pharmaceutical controls and for designing experiments with particles or proteins. But these methods are plural, and are applied to very specific processes - they have not steered research from the beginning but have been the fruit of it, generated *during* research, and are subject to criticism, control and checking. What is denied here is the existence of the great universal, uniform, and logical scientific method. What is denied is the existence of a logic machine to produce or justify with certainty what science enounces. What is denied is the existence of a *metamethod* to generate, monitor and check the first-order methods and standardized procedures. What is denied most forcefully here is the identification of this supposed scientific method with human reason.

50 Popper, K. (1983) *Realism and the aim of science* (Totowa, N.J.: Rowman and Littlefield), pp. 5-6.

51 The information in this paragraph is taken from a short autobiographical piece, 'Concerning the Author', in Buchler, J. (ed.) (1955) *Philosophical Writings of Peirce* (New York: Dover), pp. 1-4.

52 C.S. Peirce, C.S. (1955) 'The Scientific Attitude and Fallibilism', in J. Buchler (ed.), *Philosophical Writings of Peirce*, (New York: Dover), p.53. (My italics.)

53 In this regard, see Rescher, N. (1984) *The Limits of Science* (Berkeley: University of California Press), chap. 7.

54 Nobody has expressed more beautifully or more concisely what method is, along with track and wake, than Antonio Machado in his line *'... se hace camino al andar...'* ('The way is in the walking.'). Nor is it easy to find a more perspicacious expression of the fallibilist attitude than Machado's *coplas*: *'Confiamos/en que no será verdad/nada de lo que pensamos'* ('We trust/that nothing we think/will be true.') or, in another version, *'Confiemos/en que no sea verdad/nada de los que creemos'* (Let us hope that nothing we believe may be true.').

55 Popper, K. (1983) *Realism and the aim of science* (Totowa, N.J.: Rowman and Littlefield), p. 85.

56 Popper, K. (1983) *Realism and the aim of science* (Totowa, N.J.: Rowman and Littlefield), p. 157.

57 Peirce, C.S. (1955) 'Some Consequences of Four Incapacities', in J. Buchler (ed.), *Philosophical Writings of Peirce* (New York: Dover), pp. 228-29. (My italics).

58 See Peirce, C.S. (1955) 'The Scientific Attitude and Fallibilism', in J. Buchler (ed.), *Philosophical Writings of Peirce* (New York: Dover), pp. 42-59.

59 When arguing against conventionalism, Popper states: 'My conflict with the conventionalists is not one that can be ultimately settled by a detached theoretical discussion [...] The only way to avoid conventionalism is by taking a *decision*: the decision not to apply its methods' (Popper, K. (1962) *The Logic of Scientific Discovery* (London: Hutchinson), p.81-2). In conventionalism, Popper seems to see a sort of legal fraud that cannot be attacked from pure logic. To answer conventionalism, Popper sets himself more in the terrain of moral attitude than in that of pure logic.

60 The Oxford English Dictionary defines *attitude* (sense 4, *attitude of mind*) as **deliberately adopted, or habitual, mode of regarding the object of thought**, while *disposition* (sense 2), in the same dictionary, is **[...] the condition or feeling of being (favourably or unfavourably) disposed *towards***, while sense 4 of *disposed* is **[...] in a (particular) mental condition or mood**.

61 *EN* 1145a 8-10.

62 *EN* 1141a 18-20.

63 *EN* 1140b 30-31.

64 *EN* 1142a 24-26.

65 *EN* 1139b 33-34. This question, cannot, however, be dealt with in such a simple manner. Many considerations would have to be added for a correct evaluation of Aristotle's position. For example, there is a text (*Metaphysics* M, 10) in which the typical position concerning the object of science is reviewed, and it is recognized that there may also be some kind of science of the particular. To follow this train of thought would take us too far from the present context. I deal with this question in 'Aristotelian Perspectives for Post-modern Reason (II). Practical Truth and Creative Discovery'.

66 Peirce, C.S. (1955) 'Scientific Attitude and Fallibilism', in J. Buchler (ed.), *Philosophical Writings of Peirce* (New York: Dover), p. 54. This obviously does not mean that a moratorium can never be established, or that financing a given line of research cannot stop. Sometimes this partial and provisional block of a way of inquiry may be a perfectly rational decision, as long as it is subjected to criticism and review.

67 This is how it is interpreted, in my view erroneously, by Richard Rorty.

68 I shall be citing Jonas extensively to show that the links are neither forced nor merely circumstantial. As far as I know, these links between Jonas' thought and Peirce's have not been explored. To my mind they are important, as they form the profile of a new idea of reason that is indeed today's. All the quotes from Hans Jonas are from his book: Jonas, H. (1984) *The Imperative of Responsability: In Search of an Ethics for the Technological Age* (Chicago: University of Chicago Press).

69 Jonas: *op. cit.* p. 117.

70 Jonas: *op. cit.* pp. 119-20.

71 Jonas: *op. cit.* p. 97.

72 Jonas: *op. cit.* pp. 117-18 (Jonas's italics and capitals). Hence, I believe, it is possible to speak on a rational basis, together with legitimacy of origin and exercise, of a legitimacy referring to the future, and which is lost as the politician strangles the possibilities of change, or which is won with the development of pluralism.

73 Jonas: *op. cit.* pp. 121-22.

74 Jonas: *op. cit.* p. 109.

75 It must be remembered that Jonas wrote this at the end of the 70s.

76 Jonas: *op. cit.* p. 127.

77 Jonas: *op. cit.* p. 107.

78 Jonas: *op. cit.* p. 130.

79 Jonas: *op. cit.* p. 130.

80 Jonas: *op. cit.* p. 89.

81 Jonas: *op. cit.* p. 130.

82 Jonas: *op. cit.* p. 85.

83 *EN* 1139b 4-6.

84 Jonas: *op. cit.* p. 85 (italics in the original).

85 Jonas: *op. cit.* p. 88.

86 Jonas: *op. cit.* p. 85.

87 Jonas: *op. cit.* p. 88.

88 Jonas: *op. cit.* p. 87.

89 Jonas: *op. cit.* p. 101.