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## Courage for sustainable development

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A virtue ethics perspective

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### Abstract

The whole Sustainable Development Goals (SDG) intends to orientate action toward a desirable, valuable future. In this way, their pursuit falls within the scope of normative ethics as part of axiology, which is the philosophy of values. If the axiology of the Anthropocene was to be studied, it would without a doubt underline the weight of science, which produced the knowledge at the origin of the “Anthropocene” proposal, but stands also as a powerful analysis tool as well as an assistant toward decision-making. However, sustainable challenges do not only stand as scientific issues, they imply to develop new ways of living thus entail social and cultural dimensions. That is why a discussion about axiology in the Anthropocene must go beyond the value and virtue of science. In this paper, we raise the need for other “virtues” (moral characters) complementary to science and, in particular, we explore the problem of “courage” in the face of the Anthropocene and sustainability challenges. We first discuss “virtues” as an approach to normative ethics before and beyond deontology (rules of actions) and consequentialism (effects of actions). In ancient Greek, “virtue” is related to “excellence”, it is a quest toward self-improvement intimately linked to the “*logos*”, the rational thinking. In this sense, we can understand the linkage of virtue to knowledge and knowledge production, but virtue is also a matter of practice, it is learned by the daily exercise of rational thinking in the way we behave. We then review the substantive meanings of “courage” considered as a cardinal virtue. Indeed, Plato identified it as one of the four cardinal virtues of humans, to be adjoined notably with wisdom, the perfection of knowledge. Beyond Plato, we intend to consider the evolution of the meanings of “courage” today in contrast with ancient texts, and apply such a philosophical investigation to the threats of current un-sustainable development and planetary crisis. We finally discuss our results, and conclude in the framework of the conference regarding the potential of the “courage” virtue in for scientists for both analysis and action in seeking for sustainable development. Indeed, regarding the SDG, we believe that courage is most relevant in the fight against inequalities (SDG 10), the fight against biodiversity loss (14-15), the shift toward responsible consumption-production (12) and the fight against climate change (13): all of these objectives together ask for the courage to face our deep dependence to nature, the planetary limits and re-interrogate our acts, and projected futures on that basis.

**Keywords:** Courage, Science, Virtue Ethics, Anthropocene

## **1. Introduction**

For at least a decade, literature has been developing that defends the relevance of a reinvestment of virtue ethics in the context of the Anthropocene (for instance: di Paola [2015]; Goffi [2009]; Pelluchon [2017]). This model of ethics takes its roots in Greek ancient philosophy, that is in a political, social, and even climatic context that seems far from ours. The reasons for this “return to roots” could then be interrogated.

The Anthropocene is first of all a scientific reality, its denomination comes from and echoes the geological description of time: it designates a rupture with the Holocene. It is an unprecedented phenomenon, and it constitutes in this sense a new representation of the world that is constituted, documented by scientists from various disciplines. However, this new reality points to our ways of living, acting as destructive and requires a shift, an engagement into a transition toward sustainable ways of inhabiting the world. Sustainability then demands an evolution of our cultures, of our values and in consequence falls into the scope of ethics as part of axiology, the philosophy of values. We wish to warn the reader that this paper has been written by two researchers from a western high-income country and that, consequently, we write from this point of view.

In this perspective, virtue ethics is relevant: as we will later develop, virtue ethics is primarily concerned with the individual and her progress thanks to the culture of virtues. It thus allows thinking the evolution, the transformation (Pelluchon, 2017) of the individual human being in accordance with ecological issues that we are facing.

Because the required transition is global, we support that sciences are also concerned. Guillaume (2021) identifies three challenges to knowledge in the Anthropocene: the continuing of its development in a move toward unification, that is, disciplines are not to remain isolated from one another; the implementation of knowledge into politics and ethics; its appropriation in culture. Scientific practices, relationships of sciences to society and cultures as they are today established are to be subject to transformation. In that perspective, it seems relevant to us to mobilize virtue ethics in a reflection on the figure of the scientist in the Anthropocene.

We choose in particular to focus on the virtue of courage. On the one hand, this choice is motivated by a rather straightforward and shared intuition: it requires courage to face the scientific reality of the ecological crisis and to put into question our ways of living. On the other hand, courage as a virtue has a long history in philosophy, coming back at least to Plato. This allows us to position our argument in continuity but also in contrast to this philosophical inheritance that is in an evolving line which echoes the understanding of sustainability as an evolution, a transformation.

We choose moreover to discuss courage rather than fortitude. Courage and fortitude have similar meanings, but fortitude primarily concerns mental strength, it firstly refers to the internal dispositions of the subject. Yet, although internal dispositions are essential for the development of virtues, these last are firstly to be observed in situations, in action, in behaviors. In this sense, we prefer to discuss courage rather than fortitude in order not to have this accent on the mental state over action.

In the following section, we first position virtue ethics as being before and beyond the other main models of ethics (deontology and consequentialism) and support its particular relevance in the Anthropocene. In section 3, we elaborate our conception of courage as a virtue. We discuss in section 4 the place of courage in sciences and finally, in section 5 we justify the importance of virtue ethics for scientists in the Anthropocene.

## **2. Positioning of the paper: Virtue Ethics before and beyond Deontology and Consequentialism**

The origin of virtue ethics leads us back to the Ancient Greek philosophical tradition. The Greek term for virtue “*arete*” can as well be translated into “excellence” (Pellegrin, 2016): an excellence sought in anyone’s behavior. The expression of virtue is thus first in situations: a virtuous agent would be recognized for her habit to act virtuously. As a habit, virtue is to be learned, it is commonly considered that every human being possesses the seeds of virtue and that they are to be cultivated by daily exercise, by moral education. A virtuous behavior requires good use of practical wisdom. In this sense, even if the virtuous agent acquires virtuous behavior as a habit, the exercise of virtue demands engaging in reasoning, in an evaluation of the situation. It is not pure instinct. Practical wisdom, *phronesis* in Greek, also understood as prudence in action, is described in Aristotle’s texts as the right deliberation (Pellegrin, 2016). This deliberation conditions the rational choice regarding the way to act. The *phronesis* is an intellectual virtue and, by its use, is the condition for the other virtues. Virtuous actions according to Aristotle are always a right measure, each virtue being a mean between two extremes (Aristotle, 2014). As an illustration and to anticipate our next argument, courage is the mean between cowardice and rashness, respectively lack and excess of courage. However, each virtue expresses the opposite of lack and excess, thus virtue as a mean does not express mere moderation in Aristotle’s views but is an extreme as well. This translates the difficulty to reach virtue.

Acting appropriately is nevertheless not enough to act virtuously. The action has to be done with the right motivation: someone who acts for fear of punishment or in seeking personal reward is not virtuous. Virtuous action is recognized in the absence of regret and of any kind of reluctance in the decision of doing it. In consequence, virtuous actions are not limited to an insensitive rational choice, but ask for a full affective investment of the individual. This lack of regret, of difficulty in the resolving to act makes place for *eudaimonia*, happiness, the true aim of any human life. An affective difficulty in the ethical act indicates that the subject is not yet fully virtuous, but, again, it is by

practicing that the habit will be developed and make the action easier. The culture of virtue joins the accomplishment of any human: happiness (Annas, 2007).

Virtue, as singular, actually gathers several virtues that are linked one to another, and that may ever be conditioned one to another as the previous example of the *phronesis* that conditions other virtues. We will not subscribe here to a given and fixed list of virtues. On the contrary, we will assume that, over time, space, and cultures, diverse conceptions of virtues have existed. In that perspective, the number of identified and/or identifiable virtues may have evolved along with, obviously, their denominations.

Plato, for instance, identifies four cardinal virtues: temperance (*sophrosyne* - self-control, mastering of pleasures), courage (*andreia* - capacity to judge formidable threats), wisdom (*sophia* - excellence of knowledge), justice (*dike* - the perfect ordering of different virtues in a whole) (Brisson & Pradeau, 2016; Plato, 1966).

The example of Plato allows us to introduce the link between virtue ethics and politics. Indeed, the parallelism is direct between the virtues of a single human and the virtues of the City (Plato, 1966). The ideal Republic that Plato imagines is organized in three orders, each of them fulfilling a specific function: laborers, Guardians, and the governing class (the best among the Guardians). Temperance in the City is reached when the wisest class is governing the others. Courage is to be mastered by the Guardians that aim to protect the City and to maintain the law within it. Wisdom is associated with the governing class and the Guardians in the deliberation toward political action. The last virtue, justice, is positioned as resulting from the correct articulation of the three orders between them, just as three organs in the same body.

We argue in this article that virtue ethics goes before and beyond the two other main ethics models: deontology and consequentialism. The first one of these two considers an action as ethical if it complies with a set of rights and duties that can be defined a priori, out of any specific situation; whereas the second one positions the ethical choice as the result of a calculation that focuses on the expected effect of actions and compares them.

Ethics virtue goes before these two other models of ethics chronologically, but we argue that it precedes them as well in the sense that virtue can be the fundamental of ethics without needing to refer to a set of rights or to a calculation mode that would be more fundamental. We follow here the argument of Kawall (2017) who takes a non-controversial example of a wrong action: torturing puppies. He aims to explain why this is wrong thanks to virtues only. He reasons that it is wrong because of the formidable pain that it would inflict on them, pain that would move the virtuous agent thanks, in particular, to its virtue of compassion. For this reason, the virtuous would disapprove of the act, and in reason of this disapprobation, torturing puppies is wrong. Then, it could be argued that Goodness and Wrongness are arbitrary, only relying on subjective judgment rather than objective properties. To answer this counter-argument, Kawall introduces an analogy between the judgment of

a virtuous and our visual perception: even if this one is dependent on the way our brain interprets the image it received, it fundamentally depends as well on the human eye, on our perceptive apparatus. This point refers to the distinction between innate and acquired at the heart of virtue ethics: virtue is cultivated and is thus acquired for a part, but it also comprises a part of innate, each individual possessing the seeds for the development of virtue. Even if potentially differently developed, we all have a certain sense of compassion. This clarifies as well how the praised virtues may change from one cultural context to another without resulting in a complete relativization of virtue ethics.

Moreover, we argue that these parts of innate and acquired, this dimension of the culture of the virtues makes virtue ethics particularly relevant in the context of the transition toward sustainability. This argument positions virtue ethics beyond deontology and consequentialism. Indeed, the ecological crisis calls into question our ways of living and with them, not less than our way to inhabit this planet and our relationship with the world. In that sense, an ecological transition is inseparable from a cultural dimension. Because virtue is cultivated, it allows for the description of a “process of self-transformation” (Pelluchon, 2017) which starts from human, in its corporeality, and with it from its relationship to the world. Furthermore, this transformation is complete in the sense that it engages our reasoning as much as our affects. This affective dimension of sustainability is also highlighted in the ecosophy T of Naess (Pelluchon, 2017) and by Albrecht in the need to answer solastalgia, that is pain while seeing our home, close environment transformed, destroyed (Albrecht et al., 2007).

A virtuous action demands as much to deliberate properly as a full emotional investment in the action. Pelluchon gives the example of the learning of the aesthetic experience of nature: the knowledge of our links, of our dependence on nature contributes to it as well as the sensory experience of it. These two dimensions nourish each other.

In contrast, the main models of environmental ethics do not allow describing such a transformation of the individual. Indeed, biocentrism can be considered, depending on the formulation, as a form of deontology (deriving rules from the acknowledgment of a right to live of every being - see for example Taylor [1986]) or of consequentialism (seeking for maximizing the satisfaction of biological needs - see Attfield [1994]) (Maris, 2010). Ecocentrism gives a non-instrumental value to ecosystems or species, thus it departs from nature and then addresses the individual in terms of moral obligations (Pelluchon, 2017).

### **3. Substantive meanings of “courage” as a cardinal virtue**

As mentioned previously, courage is identified as a virtue since, at least, Plato. In his works and notably in the *Republic*, the paradigmatic *andreia* (courage) is the *andreia* of the guardians, in charge of maintaining public order and above all protecting the *polis* (city) between external threats (Plato, 1966; Zavaliy, 2020b). Thus, the *andreia* concerns firstly the courage of the soldier facing an enemy, that is facing a potential death, and who still holds his position and fights for his City. The *andreia* is

thus political (*politikos*). Like any virtue, courage is to be cultivated and Plato develops widely the training of guardians, this allowing us for understanding the role of reasoning and the activity of affects in the exercise of courage. Indeed, cultivating courage consists in a culture of the *thumos*, the anger necessary to engage in risky behavior and thus necessary for courage (Plato, 1966; Zavaliy, 2020b). The *thumos* also refers to a certain ferocity and animality. Its culture consists in the channeling by reason and in its reorientation toward the interest of the City: any personal interest must disappear in the motivation of the guardians. The only threats that are to be feared and in face of whom the *thumos* must be felt are the threats that go against the interests of the City. The reason intervenes in the establishment of the knowledge of the situation, in the appreciation of the faced dangers. It is a characteristic that can be found as well in the Aristotelian description of the *andreia*. The philosopher describes courage as the right mean, the right measure between cowardice and rashness, between fear and confidence, this right measure being informed by the knowledge of the situation (Aristotle, 2014; Zavaliy, 2020a). Courage according to these two authors is thus not the absence of fear. Besides, Aristotle recognizes as well the intervention of the *thumos* in engaging in courageous action (following Zavaliy [2020a] in his interpretation of Aristotle [2014], 1117a4-6). However, contrary to Plato who does not forbid the existence of courage in other situations than military fight, Aristotle reduces the *andreia* to this single situation, to the courage to face a noble death (Zavaliy, 2020a, 2020b). Through this criterion of nobility, the predominance of the general interest over personal interest can be understood. A difficulty that appears in consequence of this statement is however the relationship between the virtue of courage and *eudaimonia*: how does risking his life at fighting contribute to a happy life? A plausible answer is that the aimed *eudaimonia* is not the one of the individual but the one of the City, or rather the maintaining of the City in order to provide to its inhabitants the conditions to reach *eudaimonia* (Zavaliy, 2020a).

As previously argued, virtue ethics gives space for cultural variations through, for instance, differences in the identification of virtues. For this reason, the descriptions of Plato and Aristotle would be considered situated in their epoch. As such, we will assume that the predominance of courage as military courage echoes the mythical context of that time. Aristotle's account of courage can even be read as an attempt to bring back the virtue of courage to the Homeric conception of courage (even if he refutes that any true example of courage can be found in Homeric texts) (Zavaliy, 2020a). Moreover, we may suggest that the particular importance of the military courage in Plato's texts is called by the aim that the philosopher is pursuing: the description of courage is notably elaborated in the *Republic*, which is in an effort for imagining a just, ideal Republic.

In consequence, we will consider that courage as we understand it today has evolved since its Greek preceding *andreia* without negating the heritage of this one in current thought. To defend this argument, we will refer to examples that are recognized in popular culture as expressing courage.

We will retain from the above that courage always implies a *facing*: for the Antiques, it consisted essentially in facing the imminent possibility of death. We argue that this point is too restrictive for the common understanding of courage. The courage in face of physical danger is of course still recognized as such (we can think for example about the fireman in face of fire) but we would as well introduce a political courage that does not imply an enemy exterior to the City, in a more contemporary understanding, exterior to society. As a first example, we will think of the famous act of resistance of Rosa Parks, done despite the risked sentence. In general, the fight of the Black people for the equality of rights between Black and White people offers an example of a political fight intern to a State risked despite physical danger.

Another example to which we will refer is the one of Simone Veil, a French politician who carried the law for the legalization of abortion in France. This political fight remained famous for its success, but as well for the violence of the insults and threats that she had to endure. Demonstrating courage is not just exposing herself to a physical danger, but also to a psychological one.

In these different examples, it can be noticed that a characteristic that remains common to the Greek conception is that the cause for which the subject accepts to face danger, to expose herself to it, goes further than the personal interest and concerns a defense of, a demand for justice or for Good. Courageous action is altruistic. In consequence, courage implies as well reasoning, it is an act or a series of acts guided, oriented by reason.

Because it implies a danger, an exposure to it, and to some extent suffering from it, the subject cannot keep an affective distance to her action, this last cannot be just cold insensitive rationality. The agent is necessarily affected and her affects will necessarily intervene in her engagement in action (we could remember the Greek *thumos*, more generally a discussion could be led on the question of the affects leading the agent to engage in risky action). A courageous action constitutes a full experience, implying in dialogue reason and affects.

Among these affects, but without reducing them to it, is of course to be found fear. In that sense, as courage demands to channel and overcome her fear, it consists as well of an internal facing. To fear could be adjoined as well the idea that courage can be found in facing anxiety. Whereas fear has a defined and immediate object, we distinguish anxiety by a worry about the future. Indeed, anxiety accompanies the perception of a threat whose actual realization, the situations that it will create, are rather unpredictable and beyond the control of the subject (Anderson, 2004). Facing anxiety means thus facing indetermination, uncertainty, a kind of unknown.

#### **4. Courage Virtue and Sciences**

Due to their seeking for producing knowledge, *known*, scientists are logically dealing with unknown, with uncertain. Making science is even seeking for this uncertain, in the sense of seeking for widening



the field of the known, but as well in the sense of the culture of doubt, of the (re)questioning and (re)testing of hypotheses, of what is thought to be known.

In line with that perspective, the epistemologist Bachelard describes the scientific mind as a constantly fighting mind, in a violent effort to overcome “epistemological obstacles”, among them: opinion based on observation (opposed to experimentation) but as well the abusive will to generalize, to make system. The scientific mind progresses then by rupture, in destroying and reorganizing knowledge. In that sense, the scientific mind must always remain open to newness, to this fight (Bachelard, 1996; Bontems, 2010).

We would interpret this position of the scientist as a perpetual seeking for the right amount of confidence in her result, more generally in the current corpus of science as she knows it. This position is finally the one of fleeing in front of the tempting comfort that would offer a complete trust in sciences as established.

In counterweight and by this open-mindedness, this acceptance of instability, of an *uncertain*, we would suggest that practicing science has to do with anxiety and in the end with certain courage.

We have however stated that courage as a virtue is a political courage, at least an altruistic courage. Yet, considering that sciences are among all an affair of truth, they do not immediately appear as seeking for good.

Research in technology offers nonetheless multiple (ancient as well as contemporary) examples of a direct relationship between scientific activity and politics, understood in the large sense of what relates to the *polis*, the Greek City-state, or the society. We understand here “technology” in the sense that its etymology suggests: the meeting of *techne* and *logos*, the co-constitution of techniques and knowledge. We can refer to the concrete example of the “Internet of Things” (IoT), a growing economic sector, supporting deep transformations of our societies and sector in which scientific research participates actively: a quick search on Scopus gives almost 25,000 scientific articles mentioning in their title the expression “Internet of Things”. However, the various devices and uses that this area concerns raise important privacy and security issues, as summarized by Karale (2021). They are thus far to be ethically or politically neutral. It can be added that the digital sector to which IoT is related takes its part in the ongoing ecological crisis. Estimating the carbon footprint of the global digital sector is complex and always subject to uncertainty, but it can be assessed between 1.1 to 1.4 GtCO<sub>2</sub>e in 2020, which represents 2-2,5 times the global footprint of France (figures from Roussilhe [2021] and *Estimation de l’empreinte carbone de 1995 à 2020* [2021]). Social issues can as well be pointed to, the Ph.D. thesis of Marquet (2019) illustrates it: he studied the controversy and issues caused by the installation of data centers lived by the inhabitants of a city at the North of Paris.

As a distant example, mining sciences can be mentioned as they combined fundamental sciences and research with industrial technical issues along with research toward new marketable products in the

18th century in Prussia (Klein, 2020). Klein, who studied these scientific activities among others in the same area and period, concludes as follows and we align ourselves with her conclusion: whereas the “technosciences” are often thought as new and specific to the 20th century, they are actually inscribed in a much longer history of dialogue and co-evolution of sciences and industry, of scientific and technological knowledge, of sciences and economic interests (Klein, 2020).

In addition, we would assume that fundamental sciences cannot be separated from politics either. Indeed, their development is framed by institutions whose funding and organization depend on the political and societal context (the history and role in the development of sciences of the learned societies such as the Royal Society can be mentioned to support this argument).

We would conclude, then, that sciences, in their practices, are a transformative force of society and in that perspective cannot be separated from the political.

On that conclusion and having suggested that scientific practice can have to do with anxiety and confidence, we will argue in the next section that the Anthropocene challenges the scientists in its behavior and practice and requires from her culture and exercise of courage understood as a virtue.

## **5. Discussion: Courage Virtue and Sciences in the Anthropocene**

We support that sciences nourish the Anthropocene in at least three ways:

- they instruct its scientific reality: the term “Anthropocene” itself originates from a scientist. Its factual reality is constructed by scientific research, the IPCC (Intergovernmental Panel on Climate Change) or the IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) can be mentioned as obvious examples;
- research activities in themselves actively participate in this reality by their ecological impact: travels for conferences are an obvious and on-the-point example, but more generally, it can be underlined that research activities participate in the global ecological footprint of the university campus (as an example see Genta et al. [2022]) and indirectly to ecological footprints of various sectors (the IoT example can be mentioned again here);
- in consequence of the two preceding points, sciences instruct our way of inhabiting the world, they are intrinsically linked to our representations, our ways of thinking, acting, and suffering in this world. Yet, it is precisely these ways of inhabiting the world that are pointed as destructive.

The required cultural transformation thus comprises a transformation of sciences, of our ways of making them, of their relation and status in the *polis*.

Moreover, we argue that facing this transformation issue, reacting to these three points requires from the scientist a courage that can be considered as relevant of virtue.

The first point obviously implies that a scientific courage in the Anthropocene consists in facing the produced scientific reality. Eco-anxiety is today a widely documented phenomenon (Panu, 2020) and we suggest that this verifies our previously argued idea of a link between scientific activity and anxiety. For a scientist, this indicates as well a collapse of the distance between subject and object in the researcher position: she cannot maintain a distance to the studied object but is impacted, *affected* by it. This can be interpreted as an engagement in an experience in which (scientific) reasoning and affects dialogue.

A first courage thus lies in the reception of this experience, in the assumption of this collapse between object and subject, and, as a consequence, in engaging in re-interrogating our ways of making sciences, in our scientific practices. This means to face, to overcome several cognitive dissonances. Engaging into and cultivating an interrogating position and beyond it a transformation constitutes then a courage that answers, that faces our second point above.

It is to be noticed that the Anthropocene being a reality that goes beyond the individual, we assume that such an engagement is political and thus in coherence with the conception of the courage described previously.

The re-interrogation of scientific practices includes a re-interrogation of the way scientific results are disseminated. We can only observe the gap between the scientific knowledge we have and the absence of inflection in the trajectories of our societies. This would suggest that scientific knowledge is not enough to induce a complete self-transformation as required in the context of the Anthropocene. We suggest that to fill this gap, to increase its transformative power, the dissemination of sciences cannot limit itself to cold rational speeches, to the position of the scientist standing on a stage in front of her public, but rather take the form of a shared experience. We would like then to address to the reader this open question: How to make the sciences of the Anthropocene a shared experience?

For our part, we consider that a possible answer may be found in the development of interdisciplinary and transdisciplinary research.

Interdisciplinarity is not new, however, dissonance can be observed between a disciplinary tradition, organization, and specialization in science on the one hand and recurrent calls and praise for interdisciplinarity on the other (Andersen, 2016). Besides, both examples of research in technology from the previous section are as well examples of interdisciplinarity. In consequence, we do not consider interdisciplinarity as a mere ephemeral trend nor as a complete novelty. However, we consider the acknowledgment and seeking for interdisciplinarity as necessary in order neither to confine research in sustainability to a single discipline nor to confine it in several separate ones. Natural sciences and human sciences have been constituted respectively in excluding humans for the first one and nature for the other (Bonneuil & Fressoz, 2016). However, the Anthropocene designates the overflowing of one of these categories into the other: humanity has become a geological force,

and nature in crisis collides with our cultures. In consequence, understanding the Anthropocene as a phenomenon of the natural sciences requires integrating humans into models; understanding the Anthropocene as cultural requires taking into account nature, an environment that is not anymore a mere passive exteriority. In that perspective, the Anthropocene and with it sustainability cannot be grasped by established disciplines. They require overflowing.

We distinguish transdisciplinarity from interdisciplinarity by the strong link of non-academic actors that implies the first one, whereas the second one was considered as internal to the scientific domain in the argumentation above.

We subscribe to the principles of transdisciplinarity as described by Scholz (2020). They characterize transdisciplinarity by a strong collaboration between sciences and stakeholders from society in a position of equality and mutual learning. Scholz argues further that transdisciplinary is necessary to achieve sustainability due to the complexity of the issues to be faced and due to the different societal interests that are engaged in them and add to the complexity. In that perspective, it is difficult for a single community of scientists to pretend to be able to get a complete and comprehensive view of the issue at stake without engaging with the different stakeholders. This implies for the scientist to cultivate open-mindedness and readiness to combine her knowledge and practices with non-scientific knowledge and practices.

Interdisciplinarity and transdisciplinarity thus both demand open-mindedness to the scientist, demand her to face instability, (re)newing. This position echoes the description of the scientific mind of Bachelard that we have interpreted as a form of courage.

By this intellectual openness and by their definitions, interdisciplinarity and transdisciplinarity must result in new and plural knowledge and forms of knowledge, in new and plural ways of making sciences. Such transformations of sciences cannot but impact our ways of representing, acting, and inhabiting the world. In this sense, we answer here the third of the points we identified at the beginning of this section.

## **6. Conclusion**

Acting virtuously supposes to act appropriately and for the right motive. In this sense, the virtuous action requires the mobilization of reasoning for the determination of the right way to act and an emotional engagement: the real virtuous action is not undertaken reluctantly or in seeking personal profit. Courage as a virtue is primarily in Greek philosophy the courage of the warrior protecting his City. We argued that such a conception of courage is too restrictive for our time and proposed to understand virtuous courage as the altruistic action to choose to expose herself to danger, to physical or psychological suffering in seeking a Good or a justice that goes beyond her personal interest. Courage does not imply the absence of fear or anxiety but overcoming them for the right motive. We

have suggested that scientists, by cultivating criticism and doubt, in their refusal of excessive confidence in the current state of their knowledge expose themselves to, seek for uncertain. From this perspective, it can be argued that scientists cultivate a certain anxiety. In the Anthropocene, this thesis is verified by the scientific reality itself: by the threat that it represents and the demand for transformation that it constitutes. We suggest then that a first scientific courage lies in facing this reality. This means not to consider this last anymore as an observed distant scientific object but to receive it as impacting us as subjects. That implies abandoning an affective distance toward it, thus receiving it as a lived experience that makes dialogue reason and emotions. Courage then lies in engaging in an effort of transition. Indeed, sciences participate in the Anthropocene in documenting its reality but also in making this reality and in nourishing more broadly our representations of the world. They are thus part of the transition toward sustainability and that requires from the scientist an openness for re-organization of sciences, their practices, their relationships to society, that is a readiness to face newness and uncertain. There lies the second courage to be cultivated from our point of view. In this sense, we suggest that a relevant question in the perspective of the transition of sciences toward sustainability is not only how to share scientific knowledge of the Anthropocene but how to share the experience of it (experience understood as implying both reason and affects in the reception of knowledge). We argue from our point of view that interdisciplinarity and transdisciplinarity may be part of the possible answers.

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