

The autonomy of science in a systems theoretic approach

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Abstract

Evandro Agazzi singles out one of the fundamental knots of Modernity: the demand for autonomy. Science was one of the first human activities in demanding its own autonomy. In a complementary sense, the autonomy of science has been one of the major factors contributing to the development of Modernity. The search for autonomy, as Agazzi suggests, has put in the hands of humanity positive and important results, but it has also led to some excesses. As a consequence of such excesses, at the decline of Modernity, a certain cultural uneasiness and a strong request for new balances and connections became manifest. Agazzi so proposes to activate the systemic approach to obtain such new balances. Science will thus fulfil at best its own constitutive goals, beginning with autonomy, certainly, but also in respect and consideration of other fields equally autonomous, like ethics. Finally, we must also clarify that the systemic approach proposed by Agazzi does not eliminate human freedom, nor practical rationality, but, to the contrary, makes them possible and powerful.

1. Introduction

Well known internationally as one of the most prominent philosophers of science of our times, Evandro Agazzi has also elaborated speculative researches in the most important areas of philosophy. Actually, the interest he developed in logic and philosophy of science did not stop him from entering the present debate on problems inherent in ethics, political philosophy, epistemology and ontology with great lucidity, depth and timeliness. Indeed, we may affirm that precisely his deep investigation in philosophy of science naturally brought Agazzi to extend his research also to other fields. Such dynamics emerges in the unique reflection he has left us on Modernity, a reflection that borders on philosophy of history and on that of society and culture. In this respect, Agazzi has given a very fecund contribution. He has argued that the search for autonomy is one of the essential traits of Modernity. From this finding, he has detected one of the most decisive causes of our contemporary cultural uneasiness, i.e. the very excesses of autonomy. Besides that, he has also identified and developed an adequate cure for this pathology: the systemic approach.

I will try to present such original contributions of Evandro Agazzi to today's philosophy. To begin with (section 2), I will discuss on Modernity as a search for autonomy. This claim for autonomy appears in largely heterogeneous fields. We will actually confront ourselves with the autonomy of the subject, and with that of nations structured in modern times, with the autonomy or

separation of powers, as proposed by Locke and Montesquieu, but also with the reciprocal autonomy of the different spiritual and practical fields of human life, especially art, morality and science.

The central problem, at the dawning of Modernity, was how to obtain and increase the autonomy starting from the hierarchic relations typical of ancient and medieval times. In the present days instead, the problem has changed radically. It consists, actually, in finding the way to balance the excesses derived from the reciprocal isolation between different fields of human life, i.e. we try to overcome – in the words of José Ortega y Gasset – “the barbarism of specialization”, we beg for integration procedures, but trying at the same time to avoid a return to hierarchical relations.

The matter, right now, is not so much the subjects' autonomy, as the possibility to avoid their isolation and pathological disaggregation, so that the success obtained in autonomy will not become its own nemesis; it is not so much a question of autonomy of nations, but, rather, of inserting the latter in a super-national or global order; it is not, again, a question of the autonomy of science, but, rather, of its integration in the whole building of knowledge and, on the other hand, in the whole of human life, avoiding to fall back into a hierarchical relation, which this time would inevitably conduct us to the supremacy of science. We are not confronted then with an eminently modern problem, but with a problem *generated by modernity*, and not by its failure, but by its very success, maybe even excessive, in pursuing autonomy.

It seems obvious that a comprehensive philosophy of science should be involved seriously in the correct integration between science and all the other aspects of human life, primarily because the most popular positions in this respect are not very satisfactory. On one hand, in fact, scientism asserts a sort of supremacy of science on life and expresses a superiority of the scientific vision of the world. On the other hand, its most radical critics foster an anti-scientific mentality which results like-wise inappropriate. It is necessary to consider if there is a mid-way between the extremes – both rebuttable, in Agazzi's judgment – of scientism and anti-science.

To attempt a reply to this question, in a second passage (section 3), I will refer to the systemic approach proposed by Evandro Agazzi. This systemic perspective intends society just as a system, inside which there are various subsystems reciprocally related to each other. Therefore science and technology are both interpreted as social subsystems. With such premises, it is clear that the philosophy of science may develop itself as a social philosophy and a theory of society. The “toolbox” of the philosopher of science becomes much heavier: without setting aside logic, semantics and epistemology, it seems necessary to be equipped with an adequate knowledge of social theory and practical philosophy. Today, this convergence of domains appears unavoidable.

On one side, techno-science seems a factor that cannot be set aside in the configuration of society. It is not possible anymore to understand contemporary society while ignoring the techno-scientific factor. On the other hand, instead, the very social aspects of techno-science demand attention. Science and technology would appear incomprehensible without an accurate interpretation of their social aspects and their links with other social subsystems. Agazzi's thesis may, therefore, help us today to overcome the challenge of integrating techno-science in the whole of human life.

2. Modernity as autonomy

Autonomy is certainly a desirable value and a key concept in modern thought, particularly in Immanuel Kant. Nevertheless it could turn into a "slippery" concept if autonomy is constituted as a prime and absolute value and not compensated by the necessary connections with other desirable values.

In *Il bene, il male e la scienza* (1992) Evandro Agazzi underlines that the passage from the Middle Ages to Modernity was characterized by a series of demands of autonomy on behalf of different intellectual and practical domains, starting with demands set to theology, which tended to occupy, so to speak, the top of the pyramid of knowledge. It is historically true that the autonomous exercise of reason in philosophy had already been claimed in the 13th century by the theologian and philosopher Thomas Aquinas. In his *Summa Theologiae* (1, q.1, a.2), he stressed that it was necessary to remain in line with the "natural light of the intellect" for solving prevailingly philosophical matters. The autonomy of natural science was further claimed by Galileo, whose intellectual and personal adventure may be interpreted as a search for the autonomy of science, rather than a clash between science and religion. Machiavelli, in turn, sustained the autonomy of political science and inspired British liberal scholars, who widened this principle to the economic domain, likewise did Kant and the romantics as referred to art.

As in many other areas of knowledge, Kant brought this journey into autonomy to a critical point. Kant himself, moreover, argued clearly for the autonomy between the three parts of the sphere of knowledge: science, morality and arts. Actually, he dedicated each one of his three great *Critiques* to each one of these parts. According to Kant's intention, each of these three domains counts with independent objectives and values, and each with a specific argumentative style. The way chosen by Kant will be followed again both by Weber and by Habermas, who will also give an interpretation of Modernity as the mutual autonomy of these three large domains.

In a first sense, certainly the most basic, we could interpret autonomy as independence of judgement. In this sense, each field may judge on the basis of its own criteria and values. So, for example, a work of art may be valued positively in the light of merely aesthetic criteria and, at the same time, negatively concerning its political repercussions. A scientific research project may result excellent on the basis of scientific criteria and values, but at the same time, economically or ethically unsustainable.

In a more ambitious sense, instead, we may intend autonomy not only with reference to evaluation, but also referred to action. In this way, to remain with the previous example, both the artist and the scientist will be able to act independently inside their own operative area without considering the exterior criteria of political, economic or moral character.

A third and more radical interpretation of autonomy implies the total absence of external controls limiting, for example, scientific activities. As Evandro Agazzi (1992: 13) points out, the acceptance of the first level of autonomy “does not imply that of the second, as also the second level does not include the third”.

We note, first of all, a parallelism between the demand for autonomy coming from different areas of knowledge and the search for autonomy in the political and social fields. A good example could be the origin of nations, and the healthy tendency to the internal separation of powers. The aspiration to autonomy in the political sphere was not actually experimented as a simple fact, but as a just demand. The same may be said on the intellectual level, for which the freedom of philosophical, scientific and artistic productive thought was perceived as a desirable good and as a sure form of human progress. Following in this example, the autonomy of nations and that of the powers of the State depended on an extremely delicate balance of forces and on the will of reciprocal respect. As we know, often this balance resulted too fragile, this will too feeble, and the temptations of overwhelming the other nations too strong and dangerous. The newborn entities frequently wanted to become the head of a new hierarchic order. It so happened that some nations born with Modernity imposed themselves on others, limiting or eliminating their autonomy. In a similar way, the judiciary power tries sometimes to colonize the executive power and vice-versa.

In the intellectual sphere, the scientific vision of the world and the rationality of technological efficiency tried to rule and colonize the life world (*Lebenswelt*)¹. Such subjugation arose in the wake of the thought of Descartes and Bacon and of Newton’s physics, and found an enabling

¹ The concept of lifeworld - in German *Lebenswelt* - comes from the phenomenological tradition, and has been recently used by Habermas under the meaning of “background horizon of experience” and of “pre-reflective” life, from which, as a starting point, we may give meaning to whatever may be affirmed.

atmosphere in the illuminist and positivist mentality. We note, therefore, that an autonomy, which is fair at the beginning, can degenerate first in autarchy and then in new hierarchical impositions, both in the scientific and in the political field. In fact Agazzi writes:

Today the tendency to discuss over again these different points is clearly evident [...] operating a critical revision of the concept of autonomy, without, after all, letting us get involved in forms of obscurantism, retrograde involution or negation of the positive aspects certainly contained in the declarations of autonomy and liberty that we have considered (1992: 13).

We, as postmodern, maintain the advantage of a more profound historical perspective. We also have, thanks to this very advantage, the obligation to be fair in our balances. Neither the ideology of scientism and technologism, with its tendency to the hierarchical dominion of techno-science, nor the anti-scientific and anti-technological attitudes, which deny autonomy to techno-science, are satisfactory from our point of view. We know also that the enterprise to make life more scientific and technical has made at the same time dreams come true and generated new monsters. Today we are conscious of the fact that techno-science, which is substantially a positive reality, has fostered some epistemic and non-epistemic values that deserve recognition: cosmopolitanism, objectivity, rigour, liberty of criticism, precision, efficacy, judgement impartiality and even others that have been extended to different areas of human action, and that are not alien to the progress of liberty and justice.

The spreading in all directions of the techno-scientific domains, on the other hand, has not always brought positive results to human life and to the lives of the other habitants of the world. If, on one side, we have assisted to a growth of knowledge and wellbeing, on the other, we have also favoured the end of certain values and different traditions, we have triggered pain and suffering. The 20th century is the proof of how the most brutal totalitarian intentions have fed themselves with the most advanced scientific means to produce suffering and destruction. So, the century that met undeniable progress, like the improvement of anaesthesia and antibiotics, also saw the development of the most efficient techniques to produce death and destruction. It would be naïve or dishonest to give the fault to techno-science, though we must recognize, in any case, that similar results would not have been possible without its contribution. Should we wish to draft a temporary conclusion, we could say that it would not be reasonable to put at the helm of human life only techno-science. Likewise, we cannot consider it totally self-sufficient, as it must be inserted in a net of limits, counterweights and pondered controls, without cancelling its legitimate margin of autonomy.

If we accept that decisions in science may be good or bad, as they may be rational or irrational, we affirm – or we suppose implicitly – that the criteria of goodness and rationality are independent from science, and we place ourselves outside of scientism. We recognize that the identification of human reason with the sole scientific method, and the plain correspondence between techno-

scientific progress and human development are naïve and misleading. On the other hand, we cannot reject, with a puritan attitude, the entry of techno-science in our life, as some people persist to maintain.

To sum it up: the ancient and the medieval world have pursued a hierarchical type of order. The modern world instead has been fascinated by the idea of autonomy, mostly brought to the extremes in terms of autarchy, so imposing at times new hierarchies. It therefore appears that today's world must find a different and more harmonic balance, with the just weight given to relations and horizontal connections amongst science, morality, art and other various areas of human life.

Both. closed hierarchy and autarchy, are terms full of constraints and dangers, and find reciprocal nourishment and support. Today we are trying to balance these two opposite tendencies, trying to find a more efficient mediation, a form of connection between different areas of human life, each one with its own values, interests and criteria. This is, without a doubt, one of the main challenges of post-modernity, if not actually the main one of our time.

A prove of what I am saying is the constant presence in today's debate of terms like dependence, conciliation (of family life and work), solidarity, dialogue, links, web, net, globalization, European community, globalization, etc., all of them tending to compensate excesses in matter of autonomy (Marcos, 2012). In my opinion, one of the most promising suggestions for reaching the longed balance is certainly the new theorisation of the systemic approach elaborated by Agazzi.

3. The systemic perspective of Evandro Agazzi

In Agazzi, we find an acute diagnosis of the pathologies of Modernity, partly similar to that of other philosophers of the 20th century, as for example Habermas (1968). In general, we could speak of a sort of isolation illness, of a disconnection between the different fields of life and knowledge, of a loss of balance in the search for autonomy. Such disconnection has engendered a hypertrophy of techno-science, identified by Agazzi as scientism and technologism, and by Habermas as the scientific colonisation of the life world.

We could in any case point out a further, and deeper, affinity between the thought of Evandro Agazzi and that of Jürgen Habermas, i.e. the philosophical use of the systemic theory. However, the different ways they use the same theory discloses very significant differences for the development of our argument. While in Agazzi, in fact, the general systems' theory is useful to build new links between different areas of human life, links that avoid opposite poles as undesirable as hierarchy

and autarchy, in Habermas the systemic logic is seen rather as a threat for the correct links between science, art, morality and the life world.

In a certain sense these differences are decisive. In fact, if Habermas' interpretation of systems theory were the only possible one, then the use made by Agazzi should be reconsidered. We think, therefore, that a further interpretation of the systemic theory is possible, able to solve our initial problems – i.e., disconnection and colonisation – without triggering new ones.

Agazzi's systemic perspective opens a demand for the dignity of ethics, without falling into easy moralism. It is the very logic of each subsystem, particularly of the techno-scientific subsystem, that indicates how one should pay attention to moral criteria:

It is necessary to take up again here the discussion on human beings and try to discover the whole scale of values that inspire their actions, recognizing that their profound freedom consists in their possibility of self-realizing by honouring such values. This does not imply to plead for an imperialism of morality or practical philosophy on science and technology, but simply for an autonomy inscribed in a context of meaning, where science may recuperate its complete human dimension. For this reason the demand for a practical philosophy invites us also to consider and introduce the great themes of a genuine philosophical anthropology (Agazzi 2001: 51).

Even further, ethics itself is seen as an integral part of the system, like a subsystem amongst others, set at the same level, not so much as an alien area to be layered over the others in a dominating position. The type of rationality presupposed in all these spheres is the same, that is, the human rationality that supports action both in the scientific and the ethical system as well as in any other one. The key to the success of such an integration resides in the fact that in Agazzi there is no rigid link between systems and necessity. That means that human action, conditioned as it is by some kinds of systemic limits, remains, however, free and undetermined by any systemic automatism. It is so for what concerns techno-scientific production, as well as for moral, political, economic and aesthetic aspects.

Thus Agazzi develops decisively the general systems theory, elaborated for the first time by Ludwig Von Bertalanffy (1968) and born in the field of cybernetics and biology. As is well known, such theory, because of its very general and abstract character, retains sufficient plasticity to make possible its application in many areas of reality. The possibility of its application also to the relations between techno-science and other fields of human life was actually suggested to Agazzi himself by a book which Jean Ladrière contributed to the UNESCO convention in 1974. In Ladrière's prologue we read:

This book is for those – university students, professors and people interested in culture – who wish to clarify, on one hand, the complex relations between scientific knowledge and the technology generated by such knowledge, and, on the other hand, the impact of science and technology on culture,

in particular on morality and aesthetics. Impact with a double effect, as it were to say: a dismantling of culture and an attempt to restructure it (Ladrière, 1978: 9-10).

This means to affirm that such restructuring will move forward from techno-science. We are in front of the same landscape we have often described: there is an excessive breakup amongst different areas of human life, which may be potentially colonised by techno-science. The book also goes all the way back from the sphere of knowledge to the life world, with the goal of considering the impact of techno-science on the industrialised societies and on those on the way to industrialisation. Furthermore, the clear intention here was to suggest the possible use of the general systems theory as a theoretical frame to think the relationships between different fields, characterised as subsystems of the social system.

We accept, to start with, the autonomy of techno-science as a desirable value². In Ladrière's words: "The growth of the scientific field's autonomy means that this field has each time the necessary resources to ensure its own support [...] and growth" (1978: 46). It seems positive that techno-science frees itself by and by from rather uncontrollable external circumstances. Such a freedom could though give the idea of techno-science as a closed system, entirely free from external influence and therefore coinciding with *the* global system.

Some philosophers of technology (Ellul, Mumford and Winner, for instance) have insisted on the danger of a completely autonomous technological system, tending to grow independently from life styles, traditions or any other external value, including those expressed by a democratic will. Even from the sphere of the philosophy of science and technology there arose voices of criticism against an uncontrolled spreading of the scientific vision of the world, and, in general, of scientism. Already Kant himself recognized our need of worlds other than the scientific one, especially those of morality and art. In a period when the problem of the links between these fields existed already, Kant affirmed the theoretical legitimacy of each one and argued for their mutual autonomy. We could then hold that if techno-science should acquire the characteristic of a closed system or if it were to become a global system, it would obviously enter into a conflict with other spheres of knowledge and with the life world itself.

Agazzi indicates the price of such extreme solutions. In the first place, the moral field is reduced to the intimacy of individuals (becoming so a simple act of will or a fideistic act), with the consequent removal of a public rational debate on its problems. Secondly, morality is reduced to an object of scientific explanation (and, why not, also of technical manipulation), examined by

² Science and technology maintain each one its own peculiarities, but it is a given fact that nowadays they assume a symbiotic behaviour. In a systemic perspective we may categorize these two realities – science and technology – as subsystems of the techno-scientific system, which, in turn, can be considered as a social subsystem.

psychology, sociology, neurophysiology and genetics. In this sense, “the 20th century – writes Agazzi (1992: 146) – has known a fundamental eclipse of this branch of philosophy, namely of the philosophical research that looks for the clarification of the meaning and for the proposal of guidelines for an *ethical commitment*”.

Not only does the moral field result so blurred, but also the natural world is colonised by artefacts, that bring also, at the same time, to positive and negative results. On the negative side, we can argue that the sacred dimension of nature is eliminated, the fine arts are bound within the dark realm of the irrational, various traditions and values are debased, religion, wisdom and everyday experience lose value, and common sense is imprisoned in the world of insignificance. As already pointed out, what is outlined here has also produced adverse reactions that are to be correctly diagnosed as symptoms. In particular, in the field of morality, Agazzi (1992: 146) recalls with satisfaction how “in recent years a certain interest for ethical problems has arisen, and this is a very significant signal, in fact it is the sign that the scientification of the ethical field does not attain a positive result, and therefore the moral aspiration of man rises again strongly and underlines its difference with respect to the scientific dimension”.

In the light of such considerations, the very systemic perspective may help us to overcome the contrasts amongst distinct and autonomous fields, without cancelling their differences nor the conditions for their specific autonomy. The main conclusion we may reach from such systemic approach is that, for pure systemic reasons, techno-science must respect in its development the values inherent to human life. This perspective, capable of rehabilitating ethics, is certainly alien to any type of moralism. As we will see, in fact, the duty of respect just mentioned does not emerge from moral reasons, but from systemic ones. We do not ask scientists as such to identify themselves, driven by altruism and good intentions, with the very values of the political, juridical, economic or ethical system. We are rather making clear that also the specific values of techno-science are realized thanks to the respect for the other areas of human life. This approach consists in highlighting that the colonisation of human life by techno-science could be pursued only at the cost of a loss of faith in techno-science itself. The excessive imposition of the scientific vision of the world ends up being an obstacle for scientific development itself, and the lack of social control on technological development ends up frustrating the very technological progress.

Furthermore, in line with the systemic perspective, techno-science is seen as a system of human actions. We may consider this system as a subsystem of the social one, connected with other subsystems (political, economic, educational, military, religious, ethical, mass media...). We could amplify our discussion to affirm that all these subsystems form the framework, the social

environment, where techno-science is generated and operates. There are also natural subsystems – for example, the ecosystems and the planetary system – that constitute the other side of the setting where the techno-science subsystem lives. The exchanges of techno-science with all such subsystems are evident. Just think, for instance, that the techno-scientific system releases a good part of its research outcomes to the educational system, which, in turn, is able to form many people who increase or support the techno-scientific system itself. We could mention other examples, both in the domain of social and natural subsystems, but what we wish to point out here is that when we speak of techno-science we must think of an open social system, which interacts with many other systems. It may therefore be defined as an adaptive system, able to modify itself and its environment, within certain limits, to balance and develop itself. In sum, we are proposing to see techno-science as a human action system, social, open and adaptive.

The characteristics mentioned above are also in common with many other systems. The specificity of techno-science consists in its *constitutive functions*, that is, in the goals it pursues. According to Agazzi, science follows, in fact, two essential purposes: the development of rigorous and objective knowledge, and the diffusion of it. From his approach, technology will tend, instead, to an efficient knowledge and, at the same time, to its application directed towards innovation. Agazzi refers to these goals as “essential variables” of the system³. They are *essential* in the sense that they must remain within the limits of a certain critical range in order for the system to function and survive. It is intuitively clear that, if techno-science stopped producing rigorous, objective and efficient knowledge, if it stopped diffusing and applying it, then it would simply have ceased to exist anything that we could rightly name “techno-scientific system”.

The failure to realize the essential functions of the system may be caused by *internal tensions* or *external pressures*. In the first case it occurs inside the system itself – we recall, in this sense, the title of one of Kuhn’s books: *The essential tension* (Kuhn, 1977). In fact, it is true that certain tensions must be maintained and are essential to the survival and functioning of the system. Let’s think, for example, of the tension between tradition and criticism, or between simplicity and precision. If scientists were not educated in a certain scientific tradition, science itself would be impossible, but if criticism to this tradition was prohibited, then science would certainly come to an end. If a theory is totally imprecise, even if very simple, it is useless, but if precision is acquired to the detriment of understanding and intelligibility we are not in a better position. Techno-science,

³Agazzi distinguishes two variables essential to science, i.e. production of rigorous and objective knowledge (v1) and its diffusion (v2). Further proof of the fruitfulness of Agazzi’s ideas is the possibility of building a systemic theory of the communication of science through the simple expedient of registering v2 in a specific subsystem called “science communication”. For a development of this idea see Marcos 2010: ch. 6.

therefore, is determined by tensions, delicate balances, without which it could not work. At the same time these tensions imply a potential danger, from the moment that they may be shattered or lose balance in any direction.

For this reason we speak of “dynamic balances”, for which a non-catastrophic deviation may be internally compensated within the same system, as it occurs, for instance, with the homeostatic capacity manifested by living organisms. So, in historical periods when the biggest risk was the loss of a certain tradition, scientists have chosen to insist more on traditional values, instead of underlining those of criticism. On the contrary, in front of a risk of stagnation of a certain discipline, the critical aspect was encouraged. In this perspective, certain historical cases show a form of rationality that, without such interpretation, would appear incomprehensible.

It may also occur that the system suffers external pressures in addition to the internal tensions. In front of such possibility, the system may operate internal modifications or even modify its environment in order to recuperate its balance point or find a new one. Therefore, the history and philosophy of science should not ignore these external pressures if they really want to understand the techno-scientific system. But, in general, we may interpret the interaction with other subsystems in the light of the concepts of *input* and *output*. The techno-scientific system receives from the environment various types of input, like demands, supports and obstacles. On the other hand, the system issues to its environment some outputs, like rigorous, objective and efficient knowledge, as well as technological applications. In principle techno-science has to satisfy social demands, earn supports and reduce obstacles, with the goal of optimizing its essential variables.

We must not in any case forget that between the system and its environment there is a *feedback loop*, so that actions undertaken by a given subsystem cause indirect effects on the very same subsystem at the end of the cycle. In this way, for example, a loss of efficiency in knowledge production occurred in the techno-scientific system could influence negatively the economic system, and, at length, damage the financing of the techno-scientific enterprise itself. Or again: if science promotes researches contrary to socially recognized values, such as human dignity, health or safety, probably this would cause negative effects in other social subsystems, which would, in turn, react putting legal, economical or other kinds of obstacles to the scientific enterprise. These cycles are not necessarily of a vicious kind. Obviously, also virtuous ones may be created. Here too the examples, both historical and fictitious, could be multiplied at will. We prefer, anyway, to proceed in a different direction, outlining two important conclusive consequences.

In the first place, we note that, like any other system, techno-science demands a sound environment where it may be located. If, in the course of the maximization of its own essential

variables, techno-science suffocated the other surrounding subsystems, it could suffer negative consequences. Therefore scientists and technologists should tend to optimize, rather than to maximize, these variables. This means that the variables can grow only inasmuch as the functioning of the techno-science is compatible with the correct functioning of the other surrounding subsystems. To give an example, it is clear that if we were able to experiment freely on the pain of animals and humans, we could have more rapid information on the physiology of pain. However, scientific research must, at times, accept limitations and controls, otherwise social lack of confidence could decree the end of science, making it impossible. Research, supported economically by the citizens' taxes, cannot oppose openly the main social values. This would bring, actually, to legitimize forms of fiscal objection with respect to certain lines of research. If a government went crazy cutting funds for elementary education to favour research, techno-science would probably have benefits in the short term, but we would end up, in the long term, with substantial losses in the techno-science, because of the lack of generational replacement. The same may be affirmed for the relations of techno-science with many other fields.

In other words, techno-science will work out best if interconnected with other sound subsystems: with a democratic political system, a fair juridical system, a flourishing economical system, a good educational system, a healthy ecosystem, and so on, as well as with a right ethical system. Respect for values of the other subsystems, in line with the perspective we are developing here, is also useful for the very objectives of techno-science itself. Particularly, respect for ethical values and acceptance of external controls are necessary for the development of techno-science, in virtue of reasons that are not of ethical, but of systemic nature (aside from the fact that scientists and technologists, as persons, should act according to moral reasons).

Secondly, it is clear that, in spite of systemic necessity, there is in techno-science a margin, limited but real, for free decisions. The members of the techno-scientific system can actually influence intentionally other subsystems of the environment, directly or indirectly, and influence the functioning of their own system in line with their own goals, always in respect of some given limits. This means that techno-science will never be perceived as a simple instrument, as a means at the service of any intention. It is necessary, instead, to recognize that techno-science has its own goals. In consequence, its legitimate degree of autonomy must be respected.

4. Conclusions

Taking as a starting point the philosophy of science, Evandro Agazzi questions the role of science in the whole of human life. Through this question he supersedes the limits of classical philosophy of science, triggering a reflection that ends up in the realm of practical reason, of history and culture. So he singles out one of the fundamental knots of Modernity: the demand for autonomy. Science was one of the first human activities, in the wake of Modernity, to demand autonomy for itself. In a complementary sense, we should say that the autonomy of science has been one of the major factors contributing to the development of Modernity. The search for autonomy, as Agazzi suggests, has put in the hands of humanity positive and important results, but it has also led to some excesses. As a consequence of such excesses, at the decline of Modernity, a certain cultural uneasiness and a strong request for new balances and connections became manifest. Agazzi so proposes to activate the systemic approach to obtain such new balances. This approach enables us to point out the reasons that science has for respecting other fields, traditions, practices and values, especially those of ethical nature. Such reasons are not specifically of moral nature, but more appropriately systemic. In this way science will fulfil at best its own constitutive goals, autonomy in the first place, but at the same time it will also respect and pay due consideration to other equally autonomous fields, like the ethical one. Finally, we must also clarify that the systemic approach proposed by Agazzi does not eliminate human freedom or, much less, practical rationality; on the contrary, it reinforces and makes them possible.

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