NOEMA

2022, Vol. XXI, no. 3

Romanian Academy

*

Romanian Committee for the History and Philosophy of Science and Technology

This document was prepared with LaTeX 2_ϵ

Contents

CATCHING SPACE

Is There a Temptation of the Void Space in *Opus Postumum*?

Rodica CROITORU

Abstract

The Kantian *Opus postumum* can be seen, in general, as a metaphysical extension of some critical topics such as space, time, matter, substance, God, which in the *Critique of Pure Reason* have been treated in order to satisfy the requirements of a phenomenological knowledge. The present text deals with the rethinking of space in relationship with matter and in its absence, as a void space. In the form of sensible intuition defining space, the objects of the external senses are given to us, primarily in intuition, which the intellect relates through synthetic unity to the unity of the diversity of these a priori intuitions, a unity which is thought in their composition; it is not a form of our thinking, but an intuition of that which is nothing outside of our thinking and representation, and must be filled with matter, to repel the void space, which is in conflict with the original gravitational attraction. Its role is to understand, with the help of the ether, the phenomenon of the driving forces of aggregation, through the system of the connection of the diverse of these forces; so that, finally, to achieve the unity of the possible experience, after giving up the metaphysical temptation of the void space.

Keywords: space, matter, ether, gravitational attraction, driving forces, experience.

Opus postumum can be seen, in general, as a metaphysical extension of some critical topics such as space, time, matter, substance, God which, in the *Critique of Pure Reason* have been treated in order to satisfy the requirements of a phenomenological knowledge. The present text deals with the rethinking of space in relationship with matter and in its absence, as a void space. To appreciate the meaning of the metaphysical temptation achieved through the rethinking of the void space, it is necessary to examine, beforehand, the standard conception of space, exposed in the *Critique*, conception dependent on the outer sense of the knowing subject.

Space is, in this framework, a *pure form of the phenomena of the outer sense*, able to include the diversity of pure *a priori* intuition; it belongs to the conditions of the receptivity of our soul, the only ones enabling the receiving of representations of objects. Based on the spontaneity of human thinking, the diverse of *intuitions* is taken and bound, as to be converted into *knowledge*, through an action of *synthesis*, which is offered to the understanding to be conceptualized. If objects enabling the intuitions for conceptualization are put aside, what

remains is the pure intuition named space. Considered as such, space serves as the *form* of all phenomena of outer sense or as the *subjective condition of sensibility*, through which it is possible to receive an outer intuition.

The knowledge followed from the synthesis of outer intuition is only a *phenomenal* knowledge, for a possible experience, and what we refer to as external objects are no more than these representations of our sensibility, subsumable to this type of knowledge, the form of which is the space; confronted with this phenomenal knowledge, its true correlate, which is the *thing in itself*, is *not known* through the spatial form and, as such, it is not the object of experience. It follows that the way the space is thought, represents only a *quality of our receptive sensibility*, and the transcendental concept of phenomena in space tells us that, generally, what is intuited in space is neither a thing in itself, nor that space would be the things' own form; hence, every outer possible experience can bring us proofs in favour of the empirical reality of space, while the transcendental ideality of this concept disappears with the elimination of the condition of the possibility of experience, and the space is put as the ground of things in themselves.

It seems that Kant was content with this way of thinking space, in order to satisfy the knowledge of phenomena, and took it again, with some amendments, in the *Opus postumum*; these amendments rendered space the metaphysical opening necessary to its integration into a systematic whole.

Still in *Critique*, in their quality of pre-conceptualizing forms, space and concept share the form and the promise of conceptualizing together. But to take a better look on the difference between the two interacting forms, it is necessary to proceed to the external experience by thinking of the concept achieved through a representation during this external experience; and the difference between representation and concept appears clearer: the *first subordinates an infinite set of possible different representations*, but not as if the concept could contain this infinite set of representations in itself.

But space can be thought of as comprising this set of representations, thanks to the infinite simultaneity of all of its parts[1]. On this basis, the intuitive framework offered by space is considered as a magnitude or a *quantum*; and because space is a whole, whose decomposed parts are always spaces, that is quanta of space infinitely divisible, it is defined as a "*given* infinite magnitude"[2]. Relying on this, a difference can be made between the original *representation* of space, which is an a priori intuition, and the concept, which uses the spatial intuitive form, *to realize the synthesis of an empirical intuition.* And if space is not a discursive concept or a universal concept of relations of things in general, but a pure intuition, receptacle of a set of representations, it follows that it must enjoy uniqueness, and *we cannot represent but a unique space*; and when we talk about many spaces, they must be always understood as parts of a unique space.

These parts cannot be anterior to the all encompassing unique space, as component parts of it, but they can be thought of only in themselves. The space is essentially unique, and the universal concept of space in general is*grounded only on limitations.*

One of these limitations is that space *is not an empirical concept*, derived from external

[1] [Kant 1787] AA 3:40.
[2] *Ibidem*, AA, 3:39 / AA, 4:25.

experiences; because in order for certain sensations to be related to something external, the representation of space should be put as a ground; representation which cannot be extracted from the relationships of the external phenomenon through experience, but *the external experience is possible only through the thought representation.*

Another limitation, even more important by its consequences than the first one, can be seen in the thinking of the concept of *matter*, that is achieved within the spatial limits; through the outer sense, we represent the objects as being outside us and in space; this way, matter is not characterized by its *permanence*, that extends the limits of experience, but by its *presence* in space, filled by it[3]. Nevertheless, in order to associate permanence to matter, the concept of matter is exceeded, so as to think something *a priori* in itself, but which was not thought in itself; this results in a synthetic *a priori* statement.

This is another property of space, besides the first mentioned here of *limiting* the sensible objects: this other property consists in *supporting* sensible objects by the possibility of formulating synthetic *a priori* statements in relationship with space.

Space is, therefore, the only subjective representation that can be named *a priori* objective, since synthetic *a priori* judgments can be derived from the intuition given in space. The view on space as a subjective representation is valuable only for the human subject. Outside of the subjective condition, by which an outer intuition can be achieved when affected by objects of sensibility, the representation of space becomes meaningless.

This duality of dealing with space in relationship with the phenomenon is based on the fact that in knowledge we rely upon a *double* use of human reason which, in spite of the universality of knowledge and of its *a priori* production they have in common, are very different in terms of proceedings, thanks to the fact that the phenomenon consists of two constitutive elements: the *form of intuition*, which is given by space and time; it can be known and determined *a priori*; and the *matter* or the content existent in space and time, which contains an existence and corresponds to sensation.

With regard to the *content*, which can be given only empirically, we cannot have *a priori* but undetermined concepts of the synthesis of possible sensations, as far as they belong to the unity of apperception in a possible experience. But with regard to *form*, we can determine *a priori* our concepts in intuition, where we ourselves create our objects in space through a uniform synthesis.

Returning to the *representation* of matter in space, although we represent matter as being permanent, with regard to its size (respectively to the size of the material world) the answer is negative, namely that *the world has no extreme limit according to space*; otherwise, it would be limited by the void space[4].

Instead, because it is a *phenomenon* that should be submitted to the conditions of experience, the world cannot be limited by a void entity; as a consequence, this void entity could be not given in a possible experience, which would be void of content; and it would be void of content, because the void space is neither a correlate of things, existing by themselves, nor an empirical condition, which would constitute a part of a possible experience; the void

[3] *Ibidem*, AA, 3:18.
[4] *Ibidem*, AA, 3:548-9.

cannot be the object of experience, even if the cosmic space would be open to infinity or, on the contrary, if it would be enclosed between certain limits.

We should think the world as an absolute *whole*, outside of which there is no correlate of the world with which it would be in a relationship; the relationship of the world with the void space would be a relationship of the world "with *no object*"[5], whereupon the limitation of the world by the void space has no meaning for knowledge; the world is not limited in space, but it is infinite with regard to extension; the inner determinations of a *substantia phaenomenon* in space are relationships, and it is only a totality of specific relationships.

We know the substance in space only by the forces acting in space, either of attraction, or of repulsion and impenetrability; and we know no other property that constitutes the concept of substance present in space, which we call matter.

The void space, characterized by the absence of attractive or repulsive forces, is useful, from this phenomenological view, as far as the limit of space filled with matter penetrated by active forces is invoked. It is a *negative* concept, characterized by the absence of the real. Therefore, its demonstration is done by invoking the degrees of reality, which cannot pass in experience from the full to the void; in this sense, it is said that if reality has a degree in perception, an infinite series of smaller and smaller degrees can range between this degree and its negation, accompanied by a determinate degree of receptivity of sensations of every sense; it follows that perception and, generally, experience cannot directly or indirectly prove the total absence of any real[6]; and if the absence of the real cannot be proved, then the absence of the void space cannot be proved either, because the total absence of the real from the sensible intuition cannot be perceived and deduced from any phenomenon and from the difference of degree of its reality.

When the intuition of a determinate space is real, none of its parts is void. However, the property of magnitudes, according to which no simple part is the smallest possible in them, is designed as the continuity of magnitudes. The space has such a property, and thus it is called *quanta continua*, since none of its parts cannot be given without its limitation in space. The space is therefore composed only from spaces, while the points from which it is formed are only limits or "positions of their limitation"[7]; and the positions presuppose the intuitions which must limit or determine them. But space cannot be composed only from positions as component parts, which could be done prior to space; it can then be concluded that it is continuous. Such a continuous magnitude is called "fluent", because the synthesis of the productive imagination of its production is a progression, which takes place in time[8].

**

This standard phenomenological view on space exposed in the *Critique of Pure Reason* takes in the *Opus postumum* a metaphysical step, together with the redefinition of the indissoluble relationship of space with matter; the idea of space "completely filled with matter"[9] is

[5] *Ibidem*, AA, 3:457.
[6] *Ibidem*, AA, 3:214 / AA, 4:172.
[7] *Ibidem*, AA, 3:211 / AA, 4:169.
[8] *Ibidem*, AA, 3:211.
[9] [Kant 1938a] AA, 21:219.

restated here, but sustained, this time, by the absence of intermediate spaces, which are void spaces surrounded or peripheral, since neither can be the object of possible experience. And they cannot make the object of experience, because intermediate spaces are associated with the non-existence (*das Nichtsein*), which cannot be perceived, and not with the absence of the real (*das Reale*) included in themselves, as in the *Critique*; the stating of the void spaces cannot be done on the basis of experience, neither mediated nor intermediated, being only an outcome of ratiocination[10], because the existence is the only one capable of being perceived and generating experience. The matter that fills the space, being extended everywhere, constitutes a *continuum*, circumscribing the space to be felt, composed by the totality of driving forces of matter. But, in order to arrive to the sense of space and to its corresponding matter, from where physical bodies are to be formed, the phenomenological limits of the *Critique* are surpassed by the supposition of the existence of a matter whose driving forces and movement precede in time the bodies formation and appear from themselves (*spontaneo*).

Kant says that "it should have a first beginning whose possibility is certainly inconceptible but whose originality and spontaneity is not doubtful"[11]. The originality and the spontaneity of this matter are bound of the term „ether". It is the original matter which, penetrating all bodies inside, move them continuously (as *potentia*), building up a whole; as a Universe, it is subsistent for itself but, at the same time, "it serves as the basis of any Other moving matter, building up a Universe for itself"[12]. The material from which the ether is composed of is a matter devoid of its specific driving forces, but endowed with "the agitation" by which it can maintain every other driving force in a constant and living activity in all places. This original matter, that exists only in thinking, and is seen as an original motor, is conceived of not as hypothetical, although it cannot be the object of experience. Nevertheless, it has reality and its existence can be postulated, because it is considered that without the acceptance of such a cosmic matter and of its driving forces, the space could not become an object of senses and, consequently, no experience related to the object could exist, either affirmative or negative. The existence of such an original matter devoid of form, penetrating all the spaces and *warranted only by reason*, can be postulated before experience, consequently *a priori*, but only in favour of a possible experience.

We start the experience by the intuitions framed into the spatial form; but in absence of something connecting intuitions to senses, real objects rendering an existence in general are not reachable; correspondingly, no particular existence, such as that of the magnitude can be obtained; its consequence would be that it leaves space void for experience[13]. This material, which is an *a priori* ground of that universally-possible experience cannot be considered hypothetical, and as a cosmic matter given originally as a motor cannot be admitted problematical, because it first designs the intuition which, in absence thereof, would be void and devoid of perception.

The problematic side of the experience built up from the intuitions framed into space is that space, as an object of knowledge, is our product, a created representation or an idea; we use the idea of space for knowledge, as a pure *a priori* intuition and as a ground of the possibility of perceptions achieved in the framework of this pure intuition. But, at the same time, going

[10] *Ibidem*, AA, 21:216: „ist bloß vernünftelt".
[11] *Ibidem*, AA, 21:216.
[12] *Ibidem*, AA, 21:217.
[13] *Ibidem*, AA, 21:217.

beyond the phenomenological view of the *Critique*, in the notations of *Opus* the idea of space is considered an object in the universal space, as would be "planets, comets, fixed stars and others"[14]. The concept of world, built up on the basis of these elements, relates to space as well, as a totality of the existence of everything existing in its framework, as far as an empirical knowledge of this concept is possible. The thinking subject creates a world for itself, as an object of the possible experience in space. Driving forces of the formal would exist.

We imagine that the subjective representation of space relies on cosmic space as universal basis, which is something existing for itself, although void[15] (thus, cosmic space is that by which we have to understand void for our possible experience). And although the space as a form of intuition has before it a cosmic space, we must retain, Kant reinforces, the idea of the *Critique*, according to which we have nothing to do with spaces[16], but with space, as a unique concept, and this one is the *cognoscible space or the sensible space* in opposition with the *intelligible* one, which is only subjective, and the substratum of all possible perceptions, making up a system of the driving forces of matter; the unique concept of space is achieved according to the rule of identity, as an absolute unity, in order to render space as an object of experience, and it is an absolute whole of the general determinism of sense objects[17].

That what is before the sensible space, as a supposition, is the intelligible space, subordinated to the space with a proper cognitive value. The uniqueness of space does not speak about parts of space and time, but about places (*positus*) in space and time[18]. Otherwise we would not be able to think the infinite in space. And another ground of thinking of the space as being unique is different from the phenomenological one invoked in the *Critique*, but specific to a work meant to pronounce a final point on the system of the transcendental idealism, namely: the idea that all the phenomena of matter and all their driving forces are connected to the whole Universe, because space is an absolute unity. This is why one can admit a universal principle of their reciprocal action, consisting of real reciprocal relationships, and existence is not possible in a different way unless every object is thought in this reciprocal action with any other and is admitted a priori, as given in the phenomenon, to make the object of experience.

This is one of the relationships in which space should be thought with the subject, concerning the diverse of the representations it contains, respectively its consideration as a sensible intuition. The other one relates to the fact that the diverse of representations makes *a priori* synthetic statements possible; in this way a principle of the synthetic *a priori* statements is produced, substantiating the transcendental philosophy, as a result of the double relation of reason with the objects.

The dynamic function of space as an intuition consists in putting the diverse of the intuition as phenomenon, as *dabile* and, at the same time, it is an *aspectabile* as phenomenon, preceding the representations of apprehension, and it is a synthetic *a priori* thought, according to a generally determined principle (*intuitus quem sequitur conceptus*), in which the subject puts

[14] *Ibidem*, AA, 21:145.
[15] *Ibidem*, AA, 21:4.
[16] *Ibidem*, AA, 21:90. [Kant 1938b], AA, 22:49, 517.
[17] *Ibidem*, AA, 22:518.
[18] *Ibidem*, AA, 22:517.

itself in the collective unity of the diverse of intuition[19]. This first relation in which the space can be considered, shows *that it is not a discursive representation from concepts in pursuit of the universal*, but on the contrary, it is an *intuitive representation, an intuition of the singular*; therefore, it is not a thing for itself (*entia per se*) and a sense object in the sensible intuition, which would be given from outside to our representation, but it is the subjective of the intuition. But once more, this intuition is neither empirical, given in objects of perception, as an empirical representation with awareness; nor it is a representation of something existent, but it is the *formal of the synthetic unity of the diverse in the intuition in its composition*, consisting in coordination and subordination, being contained *a priori* identical in its representation, through an universal concept.

But space is also, as depicted in the *Critique*, a quantum, which can be given only as a part of another even bigger quantum, because space is a magnitude (*quanta*). Here, the cosmic space can be thought of by the bigger quantum, something that in the phenomenology of the *Critique* is missing. The magnitude precedes the empirical intuition with awareness or the perception, and presents itself as an *a priori* intuition, by which the diverse is incorporated in intuition as a *phenomenon*, as the subject is affected; otherwise, it would be a *thing* (*reale*), which could exist without our representation, thus it is not a subjective determination of intuition. So, only as a phenomenon the magnitude and the diverse are incorporated in the intuition of space as its subjective determination, which is why it exists only in the subject and not in itself.

Therefore, we have:

- the concept (*conceptus*) of space, developed from the diverse of the intuition in the limits of space;
- the pure sensible intuition (*intuitus*)[20] of space, containing the absolute unity in the composition of the diverse of representations; and as a formal of the diverse of this intuition, it goes to infinity.

By this movement of synthesizing the diverse in the subject of representation, the subject constitutes itself with the help of its outer sense, in absence of which the representation of space would not be possible.

The space and the movement of its description according to the three dimensions of corporeality, the surface, the line and the point, which are prime mathematical sentences (*axioms*) of intuition, not objects of perceptions as real existing things, carry on the collaboration between the *self-constitution of the subject* and the *composition of the diverse in the pure intuition*; by this collaboration, the subject constitutes itself as an *object*, and not as a derivative from something given (the outer world), thus giving grounds to the problem of the transcendental philosophy, which is: „how is synthetic *a priori* knowledge possible". From this self-constitution follows a progression to infinity, represented as an infinite given; it is space, in whose tri-dimensionality the things and their changes are framed, as if these would be real things. In the form of space as sensible intuition, the objects of outer senses are given

[19] *Ibidem*, AA, 22:44.
[20] *Ibidem*, AA, 22:12.

to us first in intuition, and the objects are understood by relating the *a priori* intuitions through the synthetic unity of the diverse, unity thought in their composition. And it is not a form of our thinking, but the *intuition* that outside of our thinking and representation is *nothing that is void, because only if the outside is filled with matter, there is both the original gravitation attraction and the diversity of the real felt through sensible intuitions.* The role of the intuition of filled space is to achieve, with the support of the ether, the phenomenon of driving forces aggregation, within the system of connection of the diverse of these forces; so that, finally, to accomplish the unity of the possible experience. By relinquishing the metaphysical temptation of the void space, Kant once more entered the light of modern thinking.

References

[Kant 1787] Immanuel Kant (1787) *Kritik der reinen Vernunft*, in Kants Werke **3**, Akademie Textausgabe.

[Kant 1938a] Immanuel Kant (1938) *Opus postumum, Kant´s handschriftlicher Nachlaß*, Erste Hälfte (Convolut I bis VI) Band VIII, Berlin und Leipzig.

[Kant 1938b] Immanuel Kant (1938) *Opus postumum, Kant´s handschriftlicher Nachlaß, Band IX*, Zweite Hälfte (Convolut VII bis XIII), Berlin und Leipzig.

Concepts Regarding the Agricultural Use of the Danube Meadow. Antipa-Saligny Dispute

Aurel LUP[*]

Abstract

This paper synthesizes the ecological view of biologist Grigore Antipa and that of the noted engineer Anghel Saligny on the agricultural use of the Danube Floodplain. History gave satisfaction to Anghel Saligny's constructive conception. However, this conception proved to be ecologically unviable. The paper describes the key moments of this dispute, the evolution of the irrigated agricultural system in the Danube Floodplain, the effects on the environment, the financial aspects of Saligny's engineering concept. We have also assessed (in financial terms) the consequences of this concept, a damaging agricultural system for both the state and farmers. It is considered erroneous to continue the policy of rehabilitating old, expensive, energy-intensive and non-environmentally friendly irrigation systems. The author are concerned about the future of large-scale agriculture that concentrates economic power in the most favorable agricultural agrozone while the country's disinherited peasantry earns their living in an increasingly hostile external environment.

Keywords: Danube Floodplain, Romania, Grigore Antipa, Anghel Saligny, agriculture, irrigations, ecology.

Introduction

In the first half of the 20th century, two top personalities of Romanian science - a biologist and a builder - alternately imposed their conception on the most fertile agricultural area of Romania - the Danube Meadow. Today, the two great men of Romanian science belong to history, whereas their conceptions were exploited by their descendants in a different way and with ecological and economic consequences that are still the subject of disputes today.

At the beginning of the 20th century, the Kingdom of Romania, nicknamed the Granary of Europe due to the large share of grain exports, did not excel in terms of yields per surface unit. Compared to the agricultural countries of Western Europe where Romania exported cereals due to a higher production per capita, it obtained lower productions per hectare but close to France (Tab. 1).

[*]Professor, PhD in Agricultural Sciences; member of the CRIFST Branch – Constanța

Crop	Romania (q/ha)	France (q/ha)	Germany (q/ha)
Wheat	11.8	13.4	19.8
Corn	11.4	12.0	-
Barley	9.8	13.0	18.6

Tab. 1. Source: Axenciuc V.- Romania's economic evolution, Vol.II Agriculture [Axenciuc '96].

Under these conditions, it is not surprising that attention was directed to the Danube Meadow where, thanks to the periodic alluvium, the productions per hectare were some of the richest. However, a permanent systematic agriculture could only be practiced on land permanently removed from the influence of water, which meant the need for damming. This is how the Dutchmen Dithmer and Langeweld, who 10 years before had failed in the Danube Delta at Mahmudia, dammed the area of 1,058 ha in Chirnogi in 1904, and the results were promising, so the damming of another 334 ha continued in 1905-1906 ha at the royal estate Mănăstirea, then another 3,150 ha at Giurgeni, and between 1906-1910 another 1,910 ha at the Spanţov state farm between Oltenița and Mânăstirea, reaching an area of 7100 ha in 1910, but the continuation of this action claimed the establishment of regulations and norms applicable to larger areas, possibly for the entire Danube Meadow. This was the moment when the two titans of Romanian science would enter the scene, at first the builder Anghel Saligny and then the biologist Grigore Antipa.

Materials and method

The materials used were primarily bibliographic ones, respectively specialized works that describe the activities in the field chronologically, the results obtained, both those presented in reference works and those confirmed by statistics. For the author, the long-term consequences of the conceptions of the two protagonists, the builder Anghel Saligny and the biologist Grigore Antipa, are primarily important. Naturally, the two totally contradictory conceptions were applied at the time within the limits of the decision-making power they had during their lifetime. After their death, it would be the turn of other decision-makers to adopt one or the other of the two concepts regarding the use of the Danube Meadow in accordance with

Results and discussions

The authors of the two concepts regarding the economic use of the Danube Meadow, Anghel Saligny and Grigore Antipa

In 1910, as head of the land improvement service in the Ministry of Agriculture and Domains, Anghel Saligny[1] initiates the Law for the enhancement of land in the Danube flood zone.

[1] Angel Saligny (1854–1925); b. Şerbănești village, Galați county; Romanian engineer and scientist. Academician (1897, university professor in Bucharest. President of the Romanian Academy (1907–1910); Minister of Public Works (1918–1919). He used reinforced concrete for the first time in the world in

Based on the engineering concept, the law stated the almost total damming of the meadow by means of continuous and unsubmersible dikes.

In order to test the results, the premises from Spanțov is declared experimental and transferred to the administration of the Land Improvement Service. Inside this enclosure, a module was built for the study of infiltrations, but the results were not published. The premises at Spanțov had a drainage network and the collected water was delivered over the dike through a pumping station [Botzan '91].

In terms of agricultural production, it was excellent due to the very fertile soil during the first years after the damming. The experimental results showed that the soil was so rich that the plants did not react to the applied fertilizers.

Instead, the results regarding the technical and economic efficiency of the drainage system have not been published, but it is known that the removal of water excess from the drained lands is the main problem of the lands reclaimed from water. Regardind this problem, Gh. Ionescu-Șișești, who had administered the experimental estate from Spanțov for several years, draws attention to the need for a continuous observation of the water movement in these premises and a collaboration between water improvement specialists and agronomists [Botzan '91].

The application of the provisions of the 1910 law regarding the non-submersible damming of the Danube meadow initiated by Saligny contradicted a long traditional exploitation of the Danube meadow for fishing, within which this annually flooded meadow, which offered ideal conditions for the reproduction and growth of fish fry in a natural regime, was thus considered a natural annex of the extensive ponds, fishponds, but also the ecological conception of the biologist Grigore Antipa[2], who even in the year of the appearance of the law initiated by Saligny had published a work in which he assessed the concept of excessive damming of the Danube Meadow as wrong.

Therefore, in 1912, Antipa made a memorandum in order to establish a Consultative Commission within the MAD in which the engineering and ecological conceptions are discussed.

Saligny supports the unsubmersible damming of the meadow between Giurgiu and Brăila, except for the large lakes, but does not exclude the damming of other sectors as well, and that the surfaces behind the dams be drained and returned to agriculture.

In the following, we consider it appropriate to quote directly from the Hydro-improvement Valorization of the Romanian Danube Meadow and the Delta published in 1991 under the editorship of a collective of authors (M.Botzan, C.Haret, I.Stanciu, I.Vișinescu and L.Buhociu) participants or supporters of the land improvement programs built in the second half of the 20th century under the communist regime.

the construction of grain silos (1884); he designed (1888) and directed the construction of the metal bridge over the Danube at Cernavodă (1890–1895), the longest in Europe at that time. He designed land improvement works, especially irrigation and floodplain reclamation.

[2] Grigore Antipa (1867–1944). Romanian biologist. Academician (1910). Founder of the Museum of Natural History in Bucharest, which was named after him. He elucidated the problems of the biological productivity of the Danube and the NW part of the Black Sea, he laid the foundations of the Romanian School of Hydrobiology, Ichthyology and Oceanology. Author of a modern ecological conception of biosociology and bioeconomy of the biosphere. The initiator of dioramas and one of the creators of modern museology. Member of several foreign academies.

Grigore Antipa, who also headed the State Fisheries Directorate, "proposed discontinuous damming of the meadow only on the higher beams, totaling about 130,000 ha of the almost half a million ha of meadow; the submersible breakwaters, crested at 8–8.5.0 hdg, were to be overpassed, on average, once in 10 years. It was argued that the damage caused to agriculture during the years of flooding of the enclosure was compensated by the lower cost of the works, without putting fish production into jeopardy" [Botzan '91]. The advisory committee, however, decided in favor of the immediately profitable perspective of Anghel Saligny. The beginning of the project consisted in the unsubmersible damming and drying of the land thus obtained on a large portion of the Danube, between Giurgiu and Brăila, excluding, however, the large ponds on the Domain of Brăila (Big Island of Brăila) and the large permanent ponds connected to the Dobrogean side of the River Danube. [Botzan '91].

The First World War prevents the materialization of the Saligny plan, but in 1921 a work by I. Vidrașcu appears, which with hydrological arguments supports the Antipa conception. In support of the naturalistic conception, Vidrașcu also comes with examples from other countries (USA, Italy, France, Hungary) and draws attention to the danger that the hydraulic balance of the Danube will be changed through continuous damming, which, lacking the major riverbed, could cause large floods by breaking the dikes. Vidrașcu also brought other arguments, such as:

> *At the same time, it was foreseen the intensification of the alluvium of the mouths of the Danube and the increase of navigation difficulties on the Sulina channel. With the rapid decrease in fish production, in the ponds lacking the spawning and growth area and the soil fertility of the dammed enclosures, deprived of the fertilizing input of periodic alluvium, it was predicted that these enclosures would become overgrown by infiltrations that would be impossible to control by pumping stations for the discharge of water over the dykes.* [Botzan '91]

With all the arguments in favor of the Antipa variant, Eng. N.Georgescu, Saligny's successor at the head of the Land Improvement Service, continues the works on the Saligny variant, the damming program in the Danube meadow targeting an area of about 352 thousand ha.

The partisans of submersible dams, led by Antipa, would however win their case in 1929, when the conclusion of the Commission on Dams convened for this purpose concluded: *"the total damming of the Danube from Calafat to Brăila, with unsubmersible dams at the 1897 water level is completely excluded. However, in 1965, the area dammed on the Danube was more than 200 thousand ha."* [Botzan '91]

In 1929 (4 years after the death of Saligny) Antipa will impose his point of view by initiating the *Law for the administration of state fisheries and the improvements of the Danube flood region - PARID*, which will also include the Land Improvement Service. On this occasion, the Improvements Council that operated within PARID approved in 1929 a delimitation of uses by area: fisheries, forests, pastures and agriculture (arable), a division recognized later as *instructive and useful*. Antipa continues to support his conception and in 1932 publishes a general plan for the improvement of the Lower Danube, in which the submersible damming of a maximum area of 130 thousand ha was foreseen.

Regarding this program, Gh. Ionescu-Şişeşti will hold two conferences on Radio Bucharest in 1935, in which he makes some recommendations regarding agricultural technologies on floodplains once every few years. It should be noted that it is recognized that high yields are obtained in the first years, and also their decrease after 4-5 years due to the rapid drying up of the natural reserves of the soils, but also due to infiltrations at the dams, followed by swamping at the bottom of the old lakes and ponds. In conclusion, he recommends vigorous pumping and fertilizer applications .

The agricultural use of the Danube Meadow during the period of socialist agriculture

Among the criticisms brought to the ecological conception of the biologist Antipa, it is also the fact that the imperative of gaining new land for agriculture was underestimated, especially arable land [Botzan '91] and that 15 years after the end of the 2nd World War (in 1960 n.a.) this conception will be refuted. In 1960, nothing was denied, instead it was confirmed the communist regime's obsession with increasing the arable area to 10,000 thousand ha, although Romania had, and still has, one of the largest agricultural and arable areas per capita from Europe (over 0.4 ha/loc. arable land). It is true that, in terms of productivity per hectare, land improvements and irrigation in particular were supposed to correct this state of affairs.

This is how the Danube meadow with its water at hand and its historical lakes and ponds covering an area of over 400 thousand ha was the first to be attacked. Dewatering continued immediately after the 2nd World War, reaching at the end of 1989, 418 thousand ha of which 224 thousand ha were arranged for irrigation [RED '93]. During the intensive exploitation of these surfaces, the predictions from 1935 of the agronomist Gh. Ionescu-Şişeşti, energetic pumping and application of fertilizers, came true. The current director of the National Institute of Land Improvements INSPIF recently recognized (in 2008) that no less than 111 pumping stations are used to evacuate water, i.e. to discharge it over the unsubmersible dikes, and that their installed power and flow rate surpass the irrigation water supply stations in terms of these parameters and application of waterings in irrigation systems.

At the debate on the problems of the Danube meadow that took place on 08-09 May 2008 under the high patronage of the Academy of Agricultural and Forestry Sciences - ASAS, there was a lot of talk about the need to keep the unsubmersible dyke at the rate of 1% (that is, the dykes could be overpassed once in 100 years, but the phenomenon of infiltration through dams 24 hours 24, 365 days a year was ignored. This is because large areas of the old lakes had their bottoms below the level of the Danube and the water from the infiltrations - including the wasted by irrigation could only be eliminated by throwing it over the unsinkable dykes. In a table with more statistical data regarding the complex developments in the Danube Meadow in the closed drainage column that would have solved the infiltration problem for the most part, the figure stands at 22,522 ha, i.e. the 10th part of the area arranged for irrigation or 5.3% of the dry area.

Little was said about the real problems, or about the difficulties of the hydro-improvement development of the Danube Meadow and its preparation for irrigated agriculture in the

period before 1989. The specialists in the field: researchers, designers, builders worked out - lately in global agreement - project after project, and the presidents of C.A.P. signed them "as mayors", being aware from experience that they would never pay their debts. After 1990, however, the same specialists recognized and wrote about the difficulties of developing the Danube Meadow and especially about the consequences of the partial realization of the projects. At the debate on 8–9 May 2008, the Director of INSPIF will acknowledge:

> *The desiccation-drainage works together with the application of the entire complex of hydro-ameliorative measures were expected to be carried out in 4 stages:*
>
> 1. *Damming and evacuation of surface water through main drainage channels;*
> 2. *Elimination of surface water excess by abundant canal networks (collection canals, interception canals, etc.);*
> 3. *Water drainage from the soil profile and irrigation on dry ground;*
> 4. *Completion of complementary surface drainage works, rehabilitation of irrigation systems and improvement of saline and sandy lands.*
>
> *Due to the partial completion of the 3rd stage (tubular drainage was introduced only on 5% of the drained surface) and the failure to complete the 4th stage, the following deficiencies were reported in the drainage systems:*
>
> - *the appearance in wet periods of surfaces with excess moisture, especially in depression areas, which total almost 20% of the area of the enclosures;*
> - *on certain surfaces with mineralized groundwater, located at a shallow depth, due to high evapotranspiration, which creates a water deficit of 200-300 mm per year in the soil, processes of secondary salinization of the soil appeared, especially the depression areas where irrigation was applied without ensuring drainage.*
>
> *During the wet periods, the low lands in the Danube Meadow, and especially those at the base of the terraces, suffer from excess moisture. If in a wet period we also have high levels in the Danube, due to infiltrations through the body and foundation of the dikes, the excess moisture manifests itself in the enclosures and behind the defence dikes.*
>
> *Water evacuation from the premises is provided by 111 stations that have an installed flow rate of 419 mc/s. Pre-pumping stations were also built in some drainage systems. There are 79 of them and they add up an installed flow of 142 mc/s.* [RED '93]

The cost of land improvements in the Danube meadow

Defense works - dikes 1,158 km, drainage on 418 thousand ha and irrigation on 224 thousand hectares represent an investment of 2,200 million EURO. If we add the agricultural land preparation works - deforestation, deforesting, initial water evacuations, modeling -

leveling, the movable and immovable heritage of the approximately 400 agricultural farms, private property constructions, other infrastructure works and other goods, the total value of land and defense works is estimated at around 8.8 billion EURO or around 14 billion USD [RED '93].

This figure presented by ISPIF (Institute for Studies and Designs for Land Improvements) in the Debate on the problems of the Danube Meadow and the Delta in 2008, represents only part of the investments made by the Romanian state in land improvement works. The 224 thousand ha of irrigation facilities and 428 thousand ha of drainage in the Danube Meadow represent only about 7% and respectively 13.5% of the total development since the end of 1989, while according to World Bank estimates, Romania invested about USD 50 billion in land improvement works (ISPIF, 2009).

The economic efficiency of the irrigated farming system

Hydro-improvement development projects are actually investment projects, and their economic efficiency is evaluated according to the specific methodology, the net income or additional benefit being part of the economic category *differential rent II*. Design parameters were characterized by a high profitability rate obtained by designing high yields per unit area: 6,000 kg/ha wheat, 10,000 kg/ha corn, over 3,000 kg/ha soybean and sunflower, 30 t /ha potatoes or 50 t/ha sugar beet (levels obtained in experimental fields). At the same time the volume of expenses was projected at the lowest level.

In the exploitation phase, however, due to non-compliance with production technologies, harvests were much lower, which led to low efficiency or lack of efficiency (see Tab. 2).

The unsatisfactory economic results from the production units were obtained in the conditions where the state heavily subsidized the cost of irrigation water, delivering it to state agricultural production units, cooperatives, research or other beneficiaries at rates far below its cost. Over time, as the irrigated areas increased and the country's economic situation worsened, the gap between the real cost of water and the rates at which it was delivered to agricultural production units was expected to decrease.

A first attempt to increase the tariffs for the services offered to agriculture by the companies operating land improvement works, present in each county (IEELIF), was in 1978, when increased tariffs were established by State Council Decree no. 471/1978. For example, for 1,000 m3 of water delivered to agricultural units, a rate of 144 lei/1,000 m3 was proposed instead of 18 lei/m3 of water, which meant an 8 time increase of the old rate. A 2nd attempt to increase the tariffs took place in 1987, when by the State Council Decree no. 329/1987, increased tariffs were proposed for both the maintenance works of the irrigation infrastructure and for water pumping, this time on electricity consumption steps, the highest tariff being 397 lei per 1,000 m3. In both cases, DGEIFCA specialists performed calculations regarding the impact of the new tariffs on the production units' budgets, concluding that the cooperative units cannot bear them, so their application was abandoned. However, for the following years it was foreseen to reduce the gap as follows: in 1988 agricultural units were to bear 34% higher tariffs, in 1989 the increase was 60%, in 1990 the increase would have been of 80%

compared to the old tariffs , and for 1991 tariffs covering the cost of water were foreseen [RED 06].

Crop	Average production kg/ha		Value production lei/ha		Technological costs lei/ha		Profit/ loss lei/ha	
	S.A.E	A.P.C	S.A.E	A.P.C	S.A.E	A.P.C	S.A.E	A.P.C
Wheat	3509	3083	6364	5592	4723	5237	1641	355
Corn	3492	3816	5147	5827	7230	7005	-2083	-1178
Sunflower	1570	1603	5538	4955	5178	4584	360	371
Soy	1010	765	3774	2493	5350	3982	-1576	-1489
Sugar beet	-	23909	-	9007	-	10852	-	-1755
Potatoes	15024	10167	16815	9884	26587	17130	-9772	-7246

Tab. 2. Production per ha, value production, technological expenses, and the economic efficiency of some crops in zone I, irrigated in proportion to 65% in the period 1986–1988. SAE-State Agricultural Enterprise; APC-Agricultural Production Cooperative. Source: Ministry of Agriculture - Economic Directorate.

Let's not forget that these last years of the communist regime were those of the restitution of foreign debts when the state could no longer afford to subsidize irrigation. In the 19 years (1971–1989) in which a cumulative area of over 30 million hectares was irrigated, the state's losses were close to 20 billion lei, the average degree of subsidy over the entire period approaching 70% (see Tab. 3).

Period	Irrigated surface thousands ha	Water cost mill.lei	Revenue based on tariffs mill.lei	State losses mill.lei	The degree of water subsidy %
1971*-1975	4335.5	3175.7	771.7	2404.0	75.7
1976-1980	7097.8	5660.7	2292.6	3368.1	59.5
1981-1985	9388.0	10630.5	2891.5	7739.0	72.8
1986-1989	9424.3	9538.0	3157.1	6380.9	66.9
Total	30245.4	29004.9	9112.9	19892.0	68.6

Tab. 3. State costs for irrigation exploitation, revenues collected based on tariffs, state losses and the degree of subsidization of irrigation in Romania in the period 1971-1989. Source: A.Lup - Irrigation in Romanian agriculture.

During the period in which damming, drainage and irrigation works were carried out on the cultivated areas in the first years after draining, large productions were obtained, and the calculations showed a high profitability.

The economic efficiency of the land improvement works executed in this unit is high, allowing large increases in production and net income, as well as reductions in the cost price. Thus, the value of global vegetable production increased in this unit (Borcea Island) after damming, drying and the introduction of irrigation on part of the protected area (3760 ha) from 2,200,000 lei in 1950 before the damming, to 45,700,000 lei in 1967. The net income

increased accordingly, from 1,100,000 lei to 18,800,000 lei. The cost price in lei/kg decreased, in the same situations, from 0.84 lei/kg to 0.40 lei/kg for corn and from 1.29 lei/kg to 0.62 lei/kg for sunflower [Hâncu 09].

"It seems interesting to us that the richness of the soils of the Danube Meadow due to the accumulation of organic matter during the floods is ignored, but also the well-known fact that with the damming and drainage this fabulous fertility will become a legend" as expressed by the pedologist I. Munteanu who - dedicated many years to soil research in Lunca and the Danube Delta. The same author thus summarizes the effects of the drainage of the Danube Meadow:

- Aridification of the climate and over-drying of soils;
- Increase in soil salinity;
- The rapid depletion of organic matter and the decrease in fertility, the impoverishment of soils in organic matter, favored by the hot and dry hydrothermal regime of the area and the low degree of humification of organic matter;
- The formation of the crust, the dusting of the surface horizon and the appearance of the risk of wind erosion;
- The risk of bringing to the surface the sandy or less fertile substrate that can be exposed to deflation;
- Reduction of biodiversity [RED '93].

In conclusion, the pedologist appreciates that through a rational exploitation, under an irrigated regime, the negative effects can still be avoided, which did not happen, just as it did not happen in other parts of the world either.

According to FAO statistics, approximately 50.0% of irrigated lands worldwide are affected by salinity, to the point of becoming unproductive. In Iran, Iraq, Egypt, Pakistan, over 70% of agricultural land is affected by salinization. The phenomenon is mainly attributed to the neglection of drainage on the lands exploited under irrigated regime. Due to the very high costs, it is appreciated that restoring the fertility of these soils is a difficult problem and is questioned.

In India, the area affected by salinization and siltation is estimated at 7 million ha. There are annual losses of 200–300 million ha of agricultural land worldwide due to salinity. The total area of irrigated salty perimeters is estimated at 50 million hectares, the most affected being the facilities in Asia and Africa [RED 06].

All these things being known, the Danube Meadow is the first area scheduled for rehabilitation due to the installation here of the large national and transnational neolatifundia whose purpose is not to combat the drought but to maximize a profit whose destination is unknown.

Conclusions

The fight between the two conceptions regarding the agricultural use of the Danube Meadow, the ecological one of the biologist Grigore Antipa and the engineering one of the builder Anghel Saligny, that had lasted for almost the entire first half of the 20th century, ended with the victory of the latter, a victory largely due to the agrarian politics of the communist regime for which the quantity, respectively the extent of the agricultural surface prevailed over the quality of the land resource.

Tens of billions of USD were spent to transform hundreds of thousands of hectares into arable land, never recovered. Instead, the forests have disappeared - although wood is more expensive than wheat - the ponds full of fish have disappeared, and the lands reclaimed from the water have degraded.

The projects to restore the natural balance in the Danube Meadow are considered shallow and are rejected by the followers of the expensive engineering concept. Instead, in the name of profit maximization, productive technologies are promoted with the risk of further degradation of the land resource.

The specialists - designers and builders - do not rule out some adjustments to the constructivist programs, but for an uncertain future, while currently the destructive and damaging land policy of the old regime continues.

References

[Axenciuc '96] Axenciuc, V. (1996) *The economic evolution of Romania, vol. II Agriculture*, Romanian Academy Publishing House, Bucharest, p. 536.

[Botzan '91] Botzan, M. et al. (1991) *The hydro-ameliorative exploitation of the Romanian Danube Meadow and the Delta*, Agricultural technical propaganda editorial, Bucharest, p. 50.

[RED '93] (1993) *Romanian encyclopedic dictionary*, vol.I., Encyclopaedic Publishing House, Bucharest, p. 83.

[RED 06] (2006) *Romanian encyclopedic dictionary*, vol.VI, Encyclopaedic Publishing House, Bucharest, p. 263.

[Hâncu 09] Hâncu, S., Jelev, I., Codreanu, M.M. (2009) *The Danube, the Meadow and the Danube Delta. Agriculture and environment. Present and perspective*, BREN Publishing House, Bucharest, p. 80; 109.

[Lup '97] Lup, A. (1997) *Irrigations in Romania's agriculture*, AGRIS Publishing House, Bucharest, , pp. 223–230.

[Rădulescu '68] Rădulescu, N.Al., Velcea, I., Petrescu, N. (1968) *Geography of Romania's agriculture*, Scientific Publishing House, Bucharest, p. 253.

Remote Sensing — Short History (II)

Manuel VAIS[*]

Bucharest University

Abstract

Some important steps from preparing the Landsat program are presented and also the Roumanian contribution to the program.

Keywords: Remote-sensing, LANDSAT program, Landsat mission.

The first commercial remote sensing program was marked by the placement in orbit of the ERTS-1 (Earth ResourcesTechnology Satellite) satellite, later renamed, to outline its utility, **LANDSAT-1**. However, its preparation began much earlier.

Thus the first multispectral image was acquired during the Apollo 9 mission in 1968 on board which four Hasselblad cameras with film were mounted in an assembly so that they could be operated simultaneously. The four spectral bands were:

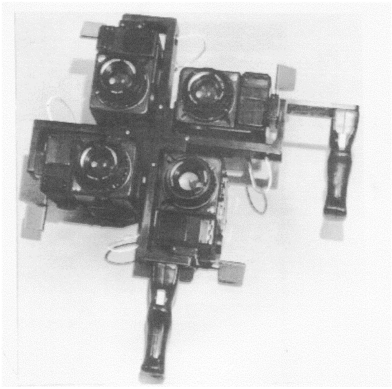


Fig. 1 Montage of four Hasselblads cameras with film, for simultaneous multispectral photography.

1. Spectral band one: blue;

[*]Bucharest University, Geological and Geophisical Faculty, Research Center „GEOMATICA".

2. Spectral band two: red;
3. Spectral band three: green;
4. Spectral band four: inphfrared. (see Fig.).

This first multispectral image acquired during the Apollo 9 mission was of the San Diego area in California: (see Fig. 2).

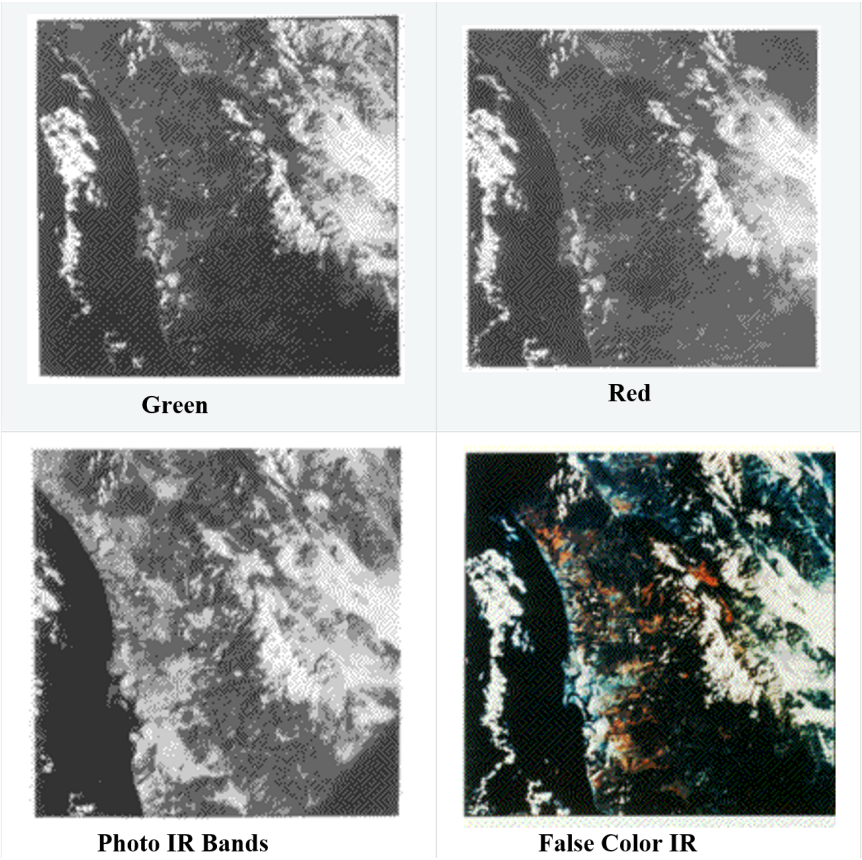


Fig. 2.

During the same period of preparation of the first LANDSAT mission, a lot of algorithms for processing the future images were studied and realized, of which we mention the transformation of the main component, as well as the determination of NDVI - the normalized difference vegetation index.

The first concerns regarding the assimilation and use of remote sensing techniques appeared in Romania, within the Department of Photogrammetry at the Faculty of Railways, Roads,

Bridges and Geodesy within the Bucharest Construction Institute, under the guidance of prof. univ dr.ing. Nicolaie Oprescu NASA PI (Principal Investigator) code G – 27940.

Later, the concerns were supported and then coordinated by the Romanian Commission for Space Activities within the National Council for Science and Technology, a commission that published the Romanian Remote Sensing Bulletin for this purpose.

The Romanian remote sensing bulletin in which the list of researchers admitted to NASA as well as the list of titles and the summary of these topics were published.

The Field Laboratory of the Bucharest Construction Institute was built and put into use, located on the banks of the Dunavăț canal, equipped with calibration equipment, both for aerial photogrammetry and for satellite remote sensing. (see Fig. 6).

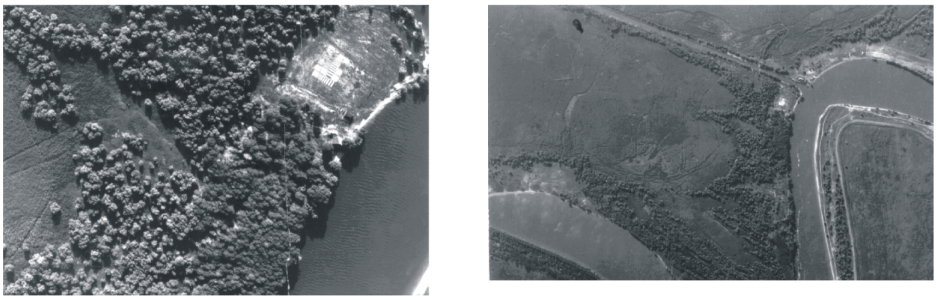


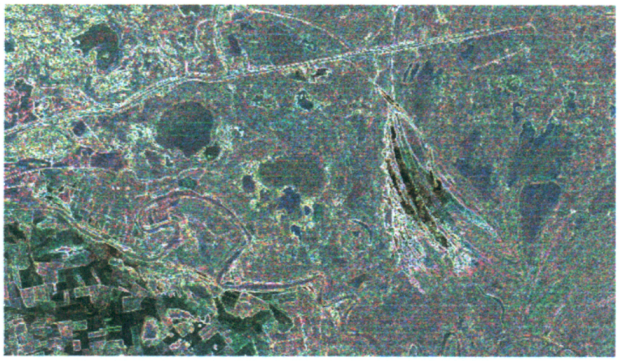
Fig. 6. The field remote sensing laboratory from Dunavăț (Danube Delta), On the left is the calibration gauge, and on the right is the overall view.

As part of the collaboration with this department, the author developed a package of LANDSAT digital data processing programs [Vais 1980], used in all research contracts that had as a partner the Photogrammetry Department of the Faculty.

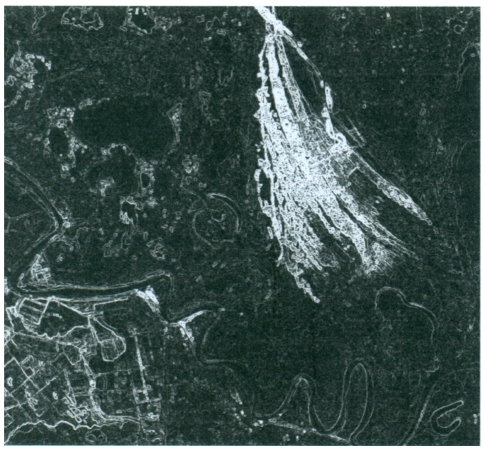
This program package, the result of using the accumulated mathematical knowledge (statistical processing) and the author's experience as a programmer, together with the rich experience in photogrammetry and remote sensing of Professor Nicolaie Oprescu, was made up of three components, namely:

- a component for transforming the LANDSAT recording format into one designed by us;
- a calculation component;
- a component for providing reports necessary for interpretation, obtained both from the initial data and from the transformed ones (eg one- and two-dimensional histograms, densitometry, thematic maps).

The calculation component was based on the Karhunen – Loeve matrix transform, which ensures the compression of a space with at least four dimensions, as in the case of LANDSAT – MSS recordings in which each pixel (pixel = picture element = image element) is characterized by four responses spectral, in a two-dimensional space at most. Also known as the principal component transform, it classifies the program package in the class of PCA (Principal Component Analysis) applications.



a.



b.

Fig. 7. LANDSAT - TM image from August 20, 1989, representing the beams from Caraorman and the field laboratory area from Dunavat. The works were done by the author, during the documentation internship at the Remote Sensing and GIS Laboratory of the Department of Geography, University of Nottingham, under the guidance of Prof. Paul M. Mather, in 1996. **a**) The histogram equalization and Sobel contour strengthening. **b.**) The principal component transformation (PCA).

At the same time, when calculating the equalized histogram, the numerical algorithm for the Fourier transform was used.

After 1991, the establishment of the Romanian Space Agency (R.O.S.A.), diversified the collaboration between the author and the aforementioned department, through research contracts [Vais 1993, Vais 1995, Vais 1996], also materialized through communications at various international scientific events [Oprescu, Vais and others 1995, 1996, 1997, 1997a, 1998].

On board of the LANDSAT -8 satellite, a new type of sensor, from a technological point of view, was installed, TIRS (Thermal InfraRed Sensor) in the thermal infrared field, for which, were also established procedures, for separation the LST (Land Surface Temperature) and thermal radiation from underground LSE (Land Surface Emissivity) which allows the development of applications regarding the geology of underground deposits (thermal waters,

					Spatial resolution		
Mission / Constellation	Lounch Data	Unworkable from:	The orbit altitude	Period for revisit	Multi spectral	Panchro –matic	Spectral value on:
LANDSAT MSS - Multi Spectral Scanner							
LANDSAT - 1	23.07.1972	06.01.1978	919 km	18 days	79/56 m		8 bits
LANDSAT - 2	22.01.1975	25.02.1982	919 km	18 days	79/56 m		8 bits
LANDSAT - 3	05.03.1978	31.03.1983	919 km	18 days	79/56 m		8 bits
LANDSAT TM – Tematic Mapper							
LANDSAT - 4	16.07.1982	14.12.1993	705 km	16 days	30 m		8 bits
LANDSAT - 5	01.03.1984	05.06.2013	705 km	16 days	30 m		8 bits
LANDSAT ETM - Endhanced Tematic Mapper							
LANDSAT - 6	05.10.1993	05.10.1993	705 km	16 days	30 m	15 m	8 bits
LANDSAT - 7	15.04.1999	06.04.2022	705 km	16 days	30 m	15 m	8 bits
LANDSAT DATA CONTINUITY MISSION							
LANDSAT - 8	11.02.2013	In activity	705 km	16 days	30 m	15 m	12 bits
LANDSAT - 9	27.09.2021	In activity	705 km	16 days	30 m	15 m	14 bits

Tab. 1.

What are the development directions of this program?

- Collection and archiving of moderate-resolution infrared solar reflectance and thermal imaging data, enabling substantial cloud-free coverage of the global land mass for a continuous period of not less than 15 years beginning in 2026;
- Consider the existence of a constellation of satellites (with the potential to increase the frequency of passage)
- Tracking multiple bands with greater special attention (eg for vegetation, temperature or humidity)

- Improving spatial resolution

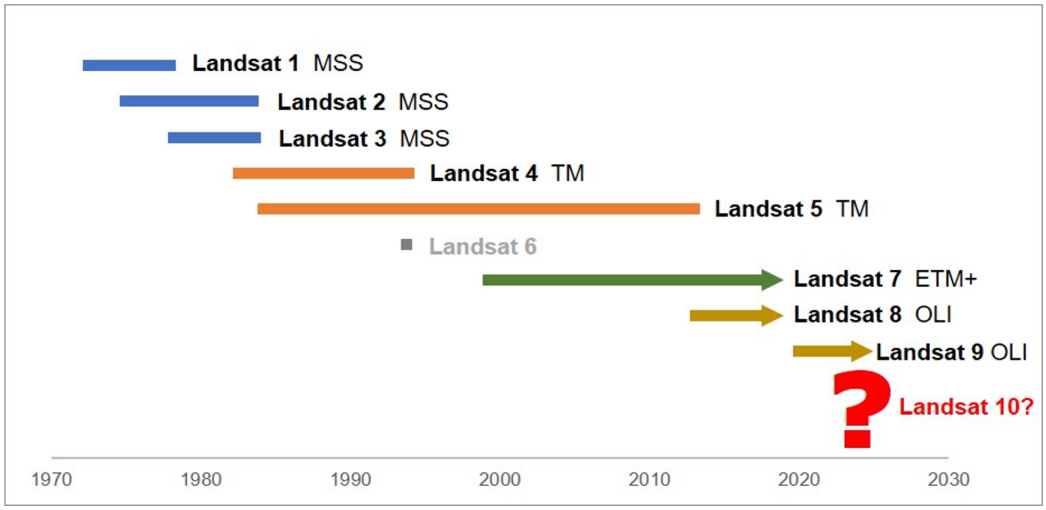


Fig. 8 The Satellites of LANDSAT program.

- Ensuring that newly acquired data, once integrated into the National Land Remote Sensing Satellite Data Archive (NSLRSDA), are sufficiently consistent with data from previous Landsat missions in terms of calibration, coverage characteristics, spectral and spatial characteristics, data quality data output and availability, to enable the detection and quantitative characterization of global land surface changes over multidecadal periods;
- Free and open access to a continuous stream of moderate-resolution data of quality and acquisition frequency consistent with over 50 years of Landsat observations, supporting the development and dissemination of a wide range of data products on a non-discriminatory and cost-free basis to users.

References

[Badea '15] Alexandru Badea (2015) Land Remote Sensing in Romania, *ROSA & ESA event.*

[***] *** Buletinul Român de teledetecţie [Romanian Bulletin of Teledetection]

[Vais 'a] Manuel Vais (2010) Contribuţii la problema mişcării sateliţilor artificiali de teledetecţie şi utilizarea imaginilor de teledetecţie pentru monitorizarea petelor de petrol în Marea Neagrã [Contributions to the problem of the movement of artificial remote sensing satellites and the use of remote sensing images for monitoring oil slicks in the Black Sea] PhD thesis.

[Vais '10b] Manuel Vais (2010) Teledetecţia — schiţă istorică [Teledetection – historical sketch], *NOEMA*, **IX**:228-240.

Tele-detection and Tele-presence: Approaching the Reality of Material Objects

Ana BAZAC[*]

Abstract

Starting from Aristotle's reflections, the paper discusses the possibility and the actuality of directly unseen material objects: not from the standpoint of ontology of objects, focusing on their persistence as such in time and space, but from an epistemological perspective, indebted to phenomenology, about the process of knowing those objects. This process begins with their seeing, but seeing as such involves two steps: detection and full visualisation. How to see distant, thus invisible objects, which may simply be inexistent? First, we discover them (on the basis of some effects and correlations of appropriable physical parameters). The core concept here is presence, however not in relation with past and future but with actuality or reality *for* the subject. After pointing the meaning of full visualisation, the last chapter suggests that no matter how precise is the measurement giving the tele-detection of distant material objects, they are not *fully present* if they are not directly felt by the sense organs, the gate to the human meanings of objects, i.e. if they are not given meanings, including practically, without being again *tele*-detected. However, we are used with their sketched presence, necessary step to their as many sided analysis, thus image, as it is possible; but we are not used with the *tele-presence* of members of the human species.

Keywords: directly unseen material objects, Aristotle, possibility, actuality, space, presence, tele-detection, measurements, ubiquity, tele-presence.

Contents

[*]Professor, Division of Logic, Methodology and Philosophy of Science, Romanian Committee of History and Philosophy of Science and Technology, Romanian Academy.

Aristotle's lesson

We depart from Aristotle's famous chapter 9 in *De interpretatione*, about the future contingents, i.e. about the *possibility* of the *future* events. What is now – and what it was – is/are *actual/existent/real*, so about it we may formulate contradictory judgements: from which only one of them is true, while the other is false[1]. Thus, this happens because our propositions correspond and must correspond to reality[2]. But when this is about future, so about a *potentiality* that only is to be given by human decisions and facts[3], we cannot formulate determinately or with precision that an event will *necessarily* take place/not take place. What is *actual* – namely, occurred or is occurring – can be understood as *necessary*, having or not the characteristics we consider they had/have or did/do not have: irrespective of what we say about them, they were/are, so our propositions about them are either true or false. But to say about *future* events that they will/will not occur necessarily, would suppose a *fatalism* that is not specific to things dependent on future human will and many circumstances[4]. The truth value of propositions about future events remains intact, but the truth-false analysis does not concern only one proposition – stating that the event will/will not occur – but the system of affirmative and negative propositions about the event: both the *possibility and impossibility* of the future event is true. But no one of the two is necessary, and thus neither their system. Since actual things are, they should have been necessary. But: 1) "it cannot be said *without qualification*[5] that all existence and non-existence is the outcome of necessity", and 2) there is a difference between the understanding that actual things show their actual causes (which "must needs be") and that the actual things are/would have been absolutely necessary. Aristotle rejected the fate as absolute necessity, because even if this necessity of actual things follows from their causes – and especially from their *telos* or reason-to-be – in reality the occurrence of things faces many and different accidental causes which intervene in the constitution of these things[6].

[1] In contemporary epistemological terms, Aristotle was both a semantic realist and an epistemological realist., meaning that the descriptions of real things have truth value (being either true or false), and that these descriptions represent, just by reflecting the real world, its knowledge.

[2] Aristotle analysed the logic pf propositions, but this doesn't mean he discussed only logical forms or logic as instrument. As it is known, Aristotle was an early representative of the explanation of language and judgements both by convention subordinated to reason and by their correspondence to things (semiosis). See [Aristotle OI] Chapter 4 (17a): "Every sentence has meaning, not as being the natural means by which a physical faculty is realized, but, as we have said, by convention"; Chapter 9 (19a): "events will not take place or fail to take place because it was stated that they would or would not take place", and "Since propositions correspond with facts, it is evident that when in future events there is a real alternative, and a potentiality in contrary directions, the corresponding affirmation and denial have the same character".
And Aristotle was equally interested of logic and epistemology, and of ontology.

[3] His famous example is that of a naval battle that may or may not occur tomorrow.

[4] For events which already occurred and are occurring now, their circumstances – said Aristotle – "have always been such that (the occurrence of events) is a matter of necessity". While for the events which may or may not occur in the future, their "circumstances are not influenced by the fact of an affirmation or denial on the part of anyone".

[5] I underlined, AB. This *qualification* is not related to logic, but to ontology: there are many facts which may interfere in the occurrence of things and which can deflect the process that would form from the initial causes. So, people must describe in a qualified manner the real situations, being sensitive to both the initial and the accidental causes.

[6] [Rossi '13]

For the future events, "there is potentiality[7] in either direction", to occur or to not occur and to have or have not such or such determinants. There are, Aristotle insists, many "alternatives", even if "some (alternatives) exhibit a predisposition and general tendency in one direction or the other, and yet can issue in the opposite direction by exception". Accordingly, we cannot say "determinately" that an affirmative or negative proposition about the future is true (or false), but "must leave the alternative undecided". In modern parlance, the future (and the past) is open[8].

In *Physics*, Aristotle underlined that there are two types of necessity, one reflecting and resulted from the accomplishment of the end of a thing/substance, thus from their *telos*, and the other, the *hypothetically* necessary, resulted from an assumption, related to the conditions allowing the telos of the concrete thing, but not purposeful causing it[9]. It follows that things existing as a result of accidental conditions are not only necessary *ex hypothesi*, but also possible *ex hypothesi*.

More: in *Metaphysics*[10], after pointing out that things which are possible but yet they do not exist, i.e. they are not in actuality, (and conversely, things which are possible to not being, they are (actual)), Aristotle emphasises that the actuality of things concerns only the *moving* things, namely their *change according to their entelechy / their internal capacity to have a reason-to-be*, and not the things which have as a property their intelligibility (AB, as the abstract concepts, and not only[11], as Aristotle says: the "non-existent things" *here and now*), because these ones have no entelechy and do not move. So, these things are not actual, but "they will exist actually", so they exist only potentially. And, what is of utmost importance, we cannot say that things existing only potentially will not/will never exist: because, if they would not be possible, they obviously could not be actual, but since they are possible, they will be as their essence with or without entelechy allows the conditions of actuality.

Nicolai Hartmann considered that Aristotle conceived of an *epistemological* possibility (where a thing is actual only if it is possible[12]), while the Megarian philosophers have showed that in the real world the *real possibility* (where a thing is possible only on the basis of actuality) requires already existing/actual conditions in order this possibility to become actual[13]. However, Aristotle too referred to conditions – as different types of causes determining the potentiality, actuality and impossibility of things – and the emphasis in a special level of reality, that of literary creation, is significant.

In Aristotle's *Poetics*, we read that the verisimilitude of a poetic work resides not in the narration of "what actually happened" but of "what could and would happen either probably or inevitably". Poetry is not history, says Aristotle, because the latter describes and docu-

[7] *Dunamis*.
[8] [Barnes '09]
[9] [Aristotle Ph] II, 8, 198b16–19; and [Rosen '18]
[10] [Aristotle MPh] 1047a, 1047b.
[11] An interesting example: the faults in IT programmes and models. They exist, but are not real, although they are actual when they simply are, in the presence of the users. Otherwise, they are *virtual*. These faults can be *detected*, i.e. *identified*, and even *diagnosed*, when they occur, by computational intelligence techiques, thus fault diadnosis systems [Palade '06].
[12] *Dunatos*, expressing the *dunamis* of that thing.
[13] [Hartmann '17]

ments "what happened", while the former – "what might happen". And thus, the actuality of things in history concerns individual facts, while poetry tries to transmit models of action, thus, general images about generally possible behaviours and action[14]. In order to transmit this generally possible, the poetic work must involve different methodological and concrete conditions (plot, characters, spoken reasoning, language, melody and spectacle); and only if they are met the possible facts transmitted by poetry are *credible*. In other words, the general tableau given by the work is not a copy of reality, but it is /seems possible: because it seems to be probable, or even necessary. The non-actual but imagined events and behaviours (thus not having they themselves entelechy) are nor certain, because they result from the internal logic of the work, requiring and generating internal cohesion of the plot and behaviours, but they must be credible. And the credibility of a fiction depends on how the happenings seem probable, thus possible[15].

So, things *hypothetically possible* – and perhaps actual – are according to time and conditions (actually, time is also a condition). But what if the above problems raised by Aristotle would consider space?

Immobile autonomous things

The examples of unmoving things, given above, require two kinds of theoretical development: one, concerning the abstract concepts and the other – the not actual, i.e. not sensibly proven, simpler said, the not (yet)-seen objects. But the present paper is devoted only to the second, including because the aspects emphasised here are significant for the use of the former.

For the time being, we should rather be sensitive towards the difference between the abstract concepts and the invisible material objects. The *abstract concepts* are not invisible – on the contrary, they are present, and consciously, in all our thinking and speech – but they are *virtual*. The *possibility/impossibility* or *actuality* of abstract concepts depend on the intended meanings of the entire statement they are used within, while the abstract concepts themselves being generalisations of possible and actual facts. If the fictional objects (say, plots) are not actual but only possible because probable, the abstract concepts – created by humans in their experience – denote *both* possible/impossible and actual facts, and are characteristics of *both* possible/impossible and actual facts. The virtuality of abstract concepts does not mean that they are simply possible, but that they are used ubiquitously and may have all the meanings between non-existent and actual, may fulfil all the nuances of probable, possible, actual etc., because they both reflect and specify the deployment of individual facts, and construct them in the "actuality" of mind, namely, when the consciousness focuses on things and expresses them *in mente* or in communication.

[14] [Aristotle P] 9 (B), 1451a and 1451b: "For this reason poetry is something more scientific and serious than history, because poetry tends to give general truths while history gives particular facts".

[15] If we stop on Aristotle's observation in *De interpretatione*, that for future events there is potentiality in either direction (of occurrence and non-occurrence of the future events), we could mention – the fictional objects being analogous to future events – that the poet could develop the plot in many directions, and all of them would be equally credible: if the construction of the poetic work involves an adjustment of conditions or new conditions.

Presence of material objects

But the *material objects* can be actual and non-actual, present and not present, visible and invisible, in different combinations. For example: *actual* (and present) and *invisible* (as a building in a distant place) – or simpler, *present but invisible (e.g., a not yet excavated archaeological object) –, and non-actual* (because they are *not present* – like an airplane that is not in your yard) and *visible*, a drawn flying horse[16].

Therefore, the first aspect interesting for us is *presence*[17]. We do not remain at the epistemological meaning of this concept, we share – presence as frame of reference for the subject[18], but just in virtue of this fact sending to problems of the knowledge of presence, of approximations and truth – nor at the phenomenological one of the intentionality of the consciousness, that *brings into mental presence* things (ideas, memories, images, representations of material signs through the sense organs etc.) desired by or interesting for the consciousness, but we approach it in a simple scientific one, where the materiality of the object is an ontological feature[19]. In this frame, it should be said that not all the existing material objects, thus actual, are present. Although we can understand presence from the standpoint of the object – thus presence being a kind of its quality, since every object is somewhere –, in fact, presence concerns the *relationship* between the *subject* whose consciousness intends to see – physically and, on this basis, to understand the supposed material object – and this *object*. If the object can be felt directly by sense organs and by the instrumentality of devices and apparatuses[20], then it is *present*, and obviously exists in *actuality*[21]; it is not only presumed, a hypothesis, and neither is it only possible and nor only probable[22], in all these situations being *in mente*: no, it can be *described in its phenomenal aspects – or in some of its features as in mental/imagined representations or concepts*, thus it is present[23], thus actual, *necessarily* being here.

The concept of presence already suggests two little conclusions: one is that *actuality/reality*

[16] Obviously, here the example is not the drawing, but the flying horse.

[17] In Latin, the preposition prae means in front of, behind, around, near, from th cause of. *Praesum, -esse, -fŭi*, to be before, to be ahead. (*Esse*, to be). *Praesse* gave *praesentia*, being in front of, or, in Heidegger's term, at hand.

[18] In this regard, presence is universal because the thinking subject refers to something only in the moment he/she refers; presence is a universal ontological condition of the subject-object relationships.

[19] The objects of science are not only material, of course, and the non-material ones – from the consciousness to relationships, institutions and values – cannot be reduced to the material ones, but have include them.

[20] In an extreme point of view, Baas van Fraasen considered that only the objects detected by unaided senses are observable (seen), thus within the limits of experience. Marc Alspector-Kelly [Alspector-Kelly '04] has showed that "immediacy of experience is capable of disclosing to us truths concerning entities that are not detectable by the naked eye. Science and technology provide us with the means to see things we have never seen before".

[21] Therefore, the *sense data* of the subject prove the existence of the *external* world. This world is anterior and independent of any experience, but at the same time it appears to humans according to their experience within, thus to the ideas resulted from and opposed to this encounter. In this respect, we must acknowledge that "the world appears as our ideas shape and describe it".

[22] Roderick M. Chisholm, [Chisholm '89] p. 41, showed that when in propositions about present objects, witnessed by senses, we have in the subtext of our signalling of objects – even though this signal is expressed in *a de dicto* locution ("he perceives that there is...") – *de re* locutions (the thing... is perceived by him to be the thing...") with which we can substitute the *de dicto* formulae. But we cannot make this substitution when the statements express possibility.

[23] More: it is *self-presenting*, see [Chisholm '89] pp. 21-25.

is the result of presence. This is *not* an ontological statement, and it does not mean an objective idealism where the material existence is denied or rather subordinated to something other (to a concept or, here, to time flux and passage and successions of past/not yet, now, after). This does not mean either the Berkeley's subjective idealism, *because things have many determinants and multi facet verifications (including that of practice), and past and present time coordinates*: the objects/properties A, B, C, ... are *actual*, because they were proved through various practical and theoretical[24] verifications. This is the reason of the above statement about existing material objects which are not present. Certainly, we cannot say that these objects are actual (existent, real) thus necessary in the order of things, or *are* present because they *will* be proven, see Aristotle's future contingents' problem: in this moment these objects are only presumed, they *will* be actual after they *will be proven*[25]. Only a theory about the non-visible, non-observable object is not enough to assert its reality – thus, presence – but multiple ways to prove it outline it. Accordingly, the other conclusion is that actuality is not*pair* only with possibility, but also *with presence*.

Presence as such excludes time because it is always a moment[26], the moment of the awareness of the subject-object relationship, or it is *between* past grasping and knowledge of objects and the *future* process that will give the evidence[27] of these objects[28]. But presence involves *space*. In order the objects to be actual/real for the observers, they must be present, thus

[24] Therefore, the position upheld here is opposite to what is called constructive empiricism (having as a leading figure the above-quoted Baas van Fraasen); as Paul Churchland, [Churchland 85] p. 36, noted, "our observational ontology is rendered *exactly as dubiou* as our nonobservational ontology"; the truth or reality of objects is given by theories full of success, *but also by their evolution and change, verification (confrontation) in time; and this process is related to practice*. Abstractly, induction generates pessimism – we cannot exclude another fact that would contradict the theory and the reality of object – but concretely, induction itself is a process and is part of the construction of theory and the proof of the object.
Equally important, the successful theories about objects involve the prediction of objects according to their theoretical modelling, and when experiments confirm their effects and parameters we can assert the reality of objects ([Duhem '06] p. 28).

[25] Peter Wickers [Wickers '22] discusses just the credence of science based on future proofs. More: science offers historically relative truth and certainty just by confronting the immediate scientific knowledge. In this line, not the observable-unobservable distinction is very important from an epistemic standpoint, but the careful interpretation of the observable and unobservable levels, including the criterion of how fructuous are the ideas for future-proof examination.

[26] Although the paper is not devoted to ontology, we should mention that the current prevailing theory assumes the [*four-dimensionality* of objects, meaning that time is not an exterior objective flux framing the persistence and change of material objects, but a quality of objects themselves in the real process of persistence and change. And presence acknowledges both persistence and change that chisels and may foliate and mill the initial objects. In the present moment, and for the present experiencing of the perduring object, it is the summum of the changes carried over from all past moments. Simpler put, the present material object – but the subject is a material object, too, isn't it? – is the result of its history.

[27] In analytical approach, Miriam Schoenfield [Schoenfield '15] showed that our belief or acceptance of the whole body of its evidence depends not only on the accuracy of proofs, including their verification, but also "on what we think the connection between rationality and accuracy amounts to". In other words, besides our plan of collecting the facts and information as accurate as they are possible and according to rational hypotheses, equally important is the end of this plan. Just these two plans – one related to the gathering of proofs according to an *a priori* belief, and the other related to the *results* of the plan – together contribute to the rationality of our credence, by pushing our search for higher order evidence (exploration of facts based on new hypotheses etc.).

[28] Presence suggests rather the *kairos* – the proper moment or time interval for the grasping of the object by the subject: for the grasping of the object as actual, thus necessary.

in space. In fact, the space realises the temporal moment or interval of objects[29], and is the basis of scientific explanation[30]. *As objects depend on their history, so they depend on space*: on their different temporal configurations/ space in different temporal moments and on their horizontal relationships with other objects as well as their near and distant environment.

Objects in space

Space is always actual, because it is always filled with objects whose relationships give our image about it. In other words, space is always present for the subject because to feel and know objects means to feel them in space. And as the discussion about time involves the problems of circumstances and causes, so to stopping on space raises the issues of its conditions.

When it is about the ability of the observer to see objects, a main condition of space is the *distance* to the objects interesting for the subject. And since the ability of the observer depends on his/her limits of vision, the distance concerns the *far away* and the *near*, i.e. the space interval between the limit where the objects cannot be seen directly and the limit where they can.

Since the inexistent things in present are not actual – we could not even confer them entelechy, ability to move (according to their internal *telos*) – the humans and, obviously, the scientists endeavoured to bring into presence invisible objects. And if actuality/reality is the result of presence, the problem is the proving of directly invisible objects: not in imagination, not in mental demonstrations, but *realiter*.

There are, of course, no matter how huge they may be, objects far away from us, as well as minuscule ones very near to us, actually in the deep down of our material constitution and in the constitution of all things, also "far away" from us. All these objects constitute, as it is poetically said, the *macro* world, the *micro* world and between them the *mezzo* world, the world at hand directly for our sense organs. Everywhere the problem is to prove the objects we presume, because in all three worlds there are directly invisible objects for us, for all of the humans.

In order to make visible or graspable the material objects we need not only technical means which increase thousand times our visual acuity, but also clever hypotheses about the limits – thus, according to *criteria* – of the systems we consider. About molecules, cells, cosmic systems etc, their limits and the forces assuring the internal space of systems, thus of systems as such and of their internal objects, as well as their relationships with near and distant systems, we imagine *models*: as if they would be real.

[29] Even our expressions for presence in a temporal moment involve space, or the transposition of time in space, equating the temporal moment with spatial coordinates. See an illustration in Anthony Eagle [Eagle '16]: "a persisting object exists at those times at which it is located, no matter which parts it happens to have at those times, and give a locative characterisation of endurance".

[30] [Meyerson '27] p. 262.

Detection

What do we see when we make visible material objects? We see them as *phainómena*, i.e. appearances. But, as already the ancients explained, to see phenomena does not equate with their understanding: we may look at them but we do not see them, if this allusion to the meanings of the verb to see is allowed. We can, in continuation, to "see" either "Ideas", namely our hypotheses about systems etc., or, as Berkeley emphasised, ideas of their concrete elements, qualities (as distance and space as relationship) perceived by the mind. In fact, the real objects are blurred by our mental images/theories/ideas: both in the negative sense that we do not see what we are seeing but what is in our mind (as presuppositions, actually representations of former experiences and ideas generated by them), and in the positive sense that the clarity, perspicacity and efficiency of our seeing depends not only on our natural visual acuity, even helped by glasses, but also on the theories related to the objects we see[31]. The scientific research is based not only on observation of objects but also and necessarily on hypotheses and theories: which, as it is known, see before our sight and critically guide it in the process of observation, as our vision critically adjusts the old and new theories. Without ideas and theories[32], the world would be for us only a *kaleidoscope*, a view of forms (and a wondering in front of their beauty), meaningless and rather frightful, as Plato warned in its cave allegory.

However, we cannot have ideas without the perception of things by sense organs. Thus the first condition to see the essence, causes, and the world behind phenomena is just to see them[33].

What does to make visible not directly visible material objects mean? It does mean to *bring them into presence* for us, into *our* presence (or presence-at-hand, in Heidegger formula, presence *here*, in front of our sense organs). Once brought into presence, it also does mean to visually glimpse them[34]. Glimpsing means to have a first image about objects: thus rather superficial, an appearance without too many details. An ancient verb for the first view of

[31] [Berkeley 1708] sections. 9, 10, 13, passim.

[32] The qualitatively new way of seeing was considered from old the *thought* and/through the medium of *language*.
Rousseau emphasized that the sound language appeared because touching (others to communicate something) and feeling are limited to presence and to the *presence* of objects, namely at "arm's length", and also that sight as a means of communication is limited to the radius of such sight in a certain space; for this reason, voice – which is addressed to the ear and to a person located farther, and which refers to things seen – became a more effective means of communication than gesture, and the premise of communication was, of course, need: but it was not the need to share knowledge, but the need to manifest different passions (love, hatred, pity, wrath) ([Rousseau 1781] pp. 495, 497).
And, interestingly, because of the affects, the first words had not been words for literal descriptions, but figurative ones. Rousseau's example (p. 498) was that of a man who, because he was afraid of other people he met, called them giants, and only then he coined the word that included himself and the others, as men/people. The articulated character of language has developed from the unarticulated language, that of onomatopoeia, and that is why Cratylus, Plato's character, who claimed that terms have an intrinsic truth which is not dependent on the will/conventions of people, is not altogether untrue (p. 499, Rousseau).

[33] Berkeley ([Berkeley 1708] fragm. 95, 99) showed the synthetic image given by the sight, generating different ideas from those given by touch, a sense of the discontinuous.

[34] We exclude here the grasping with other senses. Berkeley had long proven that sight is "epistemologically" superior to the other sense organs because it provides the profoundest data on reality (colours, nuances, shades and lights, distance, space beyond the perceptible limit through touching and also because it

things is *dētĕgo, -ĕgĕre, -exi, -ectum*, to discover, to uncover, to exhume[35]. To discover is to cause to arise. The *detectum* object is the object as we first saw it: as it appeared to us, as it arose to us. Since we do not know the objects because they are covered, hidden, sheltered and protected precisely by their anonymity – *tĕgo, tĕgĕre, texi, tectum*, to cover, to clothe, to hide, to shelter, to protect, to defend, to keep/guard a secret – they must be de-tected, i.e. privated by their covering. Not every dis-covering is knowledge, but is its ground. Not every view is understood, but it is the basis of the understanding. Detection as discovery and visibilisation is relatively synonymous with *identification* (which is distinguishing, recognizing the thing).

The idea of *detection* is famous and ordinary in science. It involves a wide range of technical devices and technological sciences in order to allow man to see more and more material objects and scientific objects[36] very far away, very near and everywhere. Many of them are invisible, even the very near ones. Hence, detection is not easy. For example, in quantum mechanics we see the quantum objects only indirectly, by measuring some parameters and thus supposing them, and erecting on these suppositions theories which are, in their turn, demonstrated both by direct and indirect measurements and observations.

Therefore, the *first* moment of the relation between the curious subject and the material world he/she wants to see is detection. The *second* is the circumscribing of the detected object as visible, and present for combing it out; and *then* the practical-theoretical moments of search for its essence, causes and transformation follow.

So, detection means to making visible the objects located until then outside the visual field. By detection, they become present for the subject. And thus, able to be better observed: seen. *But they do not become fully present*: they can be seen even in the smallest details, but they remain far away.

Tele-detection

First, as near to us as they may be, the invisible objects are very far away from us. Thus, always detection is somehow *tele-detection*, detection of the far away. It is the basis of our further sighting, because the detected objects need to be clearer, more detailed, thus more able to be perceived in their complexity. What will we see next? The model of *tele*-detection is simple: the invisible objects are made visible as signals meaning different properties of the objects; they become present as *existent for the subject*, and thus the authentic objects which preoccupied him/her and which will to be the basis of further examination and thinking.

equips man with the first language: that in which the reproduction sign of reality is reality itself. See [Berkeley 1733] pp. 9-60; and [Berkeley 1708] section 46.

[35] Exhumation is not only an anthropological fact and historical information but also an epistemological one.

[36] Introducing here the concept of scientific object is rather risky. The scientific object is a problem, or more dryly expressed, a real object or an ideal one *described according to some criteria* and considered as future investigation objects. The scientific object is not a perfect superposition with the material (or the ideal) object it wants to tackle, but is similar to them. The intention was to signal that the scientific objects too are unknown besides their preliminary design and supply, and that they too are or may be invisible, far away or near. But the paper revolves only around the *material objects*, not around the ideal ones and neither around the scientific objects.

The scientific *tele*-detection is mediated by instruments. The scientific observation is also mediated, and it supposes both the direct vision on things and the mediated one.

The *ancient* dis-covering of material objects brought them into the eyesight, thus into presence, as *phenomena*. The ancient material objects were *appropriable*, and the will to see them had in view or expected either to simultaneously understand them from their appearance (and consequently, use them as simple appearances) or to contemplate them in order to transcend their appearance by the inference of deep causes[37].

The *modern tele*-detection is *ab initio* aware of the lot of *meanings* (theories, ideas, cultural universalism and particularism) and *facets* of the simple appearances. Thus, and even though the objects are visible, they seem to be invisible until they are dis-covered; anyway, they seem to be "far away". For us, detection is *tele-detection*, and includes the space and distances of the objects, as well as the distances between we, observers, and them.

But the more they are "distant" to us, the more their tele-detection means and requires *precision*, and *irrespective of not being absolute*[38] this precision is *sine qua non* for the instruments and the logic of *tele*-detection. Actually, for us to *tele*-detect things, to *tele-see* them, means to measure the space, the distances, and to consider the material objects in measured parameters. For us, the objects are or may be present, but invisible until they are measured.

Measuring objects pertains rather to tele-detection and reflects its sophistication through the instruments without which there is no detection at all. In this regard, we are dependent on the modern (*tele*)-detection and more, on its precision through measurements. By the way, we can have two remarks.

One is the recall of Henri Poincaré's observation about the cardinal measurability of all things. Not all things must be measured – his example concerns the feelings (as the economic satisfaction) – in order to be understood, and first in order to be detected. And, when we try to mathematise them – to measure them – we must be *aware, as mathematics is*, of the *hypotheses* we base on our *arbitrary functions* which are the premises of our measurements and we must try to eliminate those arbitrary functions[39]. Apart from the epistemological emphasis that the lack of awareness of hypotheses means to exceed the reason-to-be (*les justes limites*) of the scientific analysis and of mathematics, we should be sensitive to Poincaré's first remark: not all things (even containing material objects) need to be measured accurately in order to be detected. This remark suggests rather the ancient meaning of detection of appropriable phenomena, but beyond this we should not forget the *everyday empirical* detection. Accordingly, we could observe that in the ancient and empirical detection the material objects are invisible and not present, and perhaps not even presumed; in the modern *tele*-detection the objects are presumed, but obviously invisible and not present.

The other remark concerns the thesis of our *dependence* (literally and figuratively) on *tele-detection* (again literally and figuratively). This thesis can be interpreted in the two well-

[37] Contemplation needed space, i.e. social conditions for cognitive availability.

[38] Letting aside the historical character of instruments, the scientific precision is not absolute because the mathematics it is based on does not imply absolute precision; but it is as precise as we made/make it and we need it. In "human affairs", the formulas which pretend to fully describe them because they would be mathematically accurate and constant dependable are "pseudo-science" ([Lin '38] p. 5), in technical term, *reductionism*.

[39] [Poincaré 1909].

known antithetical *techno-phobia* and *techno-philia*. To the first we can answer that if we would consider the complex instruments of *tele*-detection as our ordinary eyeglasses which we master very well, then we could apprehend that it's not the lack of control over the instruments that frightens us but the *ends* they are used for. To the second, we should repeat the anterior caveat: apart from their internal determinism, the instruments as such do cause anything, only their users induce the ends; thus, the efficiency of instruments does not consist in shaping power as such, directing power as such, only their users have; clearer, the shaping power of instruments, however real at the technical level since it gives the scientific objects to the scientific scrutiny, depends on its users.

Nevertheless, *secondly*, *tele*-detection does not bring into physical presence the distant objects. They remain far away, but *virtually present* for us. Virtually: because they can be seen and scrutinised, they even may be receivers in the process of communication – as the "partners" within the radars which transmit – but *they are not fully present*. They are rather *data, parameters* for next scientific design of (models of) material objects[40] or of actions, *sketches* for the next real-world visualisation. The physical presence is far away: as in the paintings and sculptures made by a noted researcher in networks[41], transposing the coordinates of nodes and networks in images of these coordinates. They are not even sketches or schemes of real objects and world, but only visualisations of networks which are the basic structure of reality. The networks are not arbitrary, since every artwork lies on carefully chosen formulas. This transposition of "big data" was called a new "realism", i.e. emphasis of the deep down of structures of the world. But if some one would reduce art to scientific images or to schemes, he/she would be analogous to the *techno-philia* that does not consider the complex meanings and consequences of the technical transposition of the scientific imagination, but reduces everything to the complexity and marvel of technical means.

Ubicuity

It is clear that thinking means to bring into mental presence things hidden in our mind. It was clear that to see not seen material objects means to dis-cover them, namely to bring them into *our* presence.

But the detecting, grasping operation have two directions. One is the above-mentioned physical *bringing* of the object to the subject[42]. The other one, especially when this operation

[40] If we pass from physically distant objects to physically deep objects, so present but directly invisible, we can consider the informational decomposition of virtual/imagined objects, decomposition helped and realised by an advanced level of IT, the AI, as a metaphorical tele-detection in order to design those physically deep objects. In the following example it is about the design of proteins, i.e. of their shape (through combining informational neural networks). See [Wicky '22] and [Dauparas '22]. But although the assemblies resulted through AI modelling – and, once the software/programme is created and running, emphasising the "self-creativity" of the complex of neural networks through the relationships between the information of all the networks, AI is independent – ressembled to the predicted shape [Anishchenko '21], the objects created in this way are only spectres, and in order to become real they need to be created in the real world, in lab.

[41] Albert-László Barabási, see `https://www.barabasilab.com`.

[42] This movement itself – that supposes the subject's/observer's immobility, since this one is served by the material object – carefully prepared in its coordinates and the fitting of instruments to them – *lights* the object and is part of the *clarification* of the object. But since it is about a relationship between the

is not physically possible, is the subject's transposition into the world of the object, into the presence *of the object*. The modern tele-detection, the sophisticated relative of the periscope, can see remote objects, making them present and allowing even a presentification of their space (through imaging radar, for instance), the observers's *tele*-detection devices can receive signals as radio waves from the objects and process them in order to see some of their properties. Radio transmitters and *tele*-vision transmission are developments on the basis of tele-detection.

Therefore, just by bringing the objects into the visual field of the subject, he/she can plunge into their space. This plunging is, first of all, mental and supported by imagination, because *tele*-detection gives rather a sketch of objects, but is no less their appropriation/integration within the real and visible world and the appropriation of their space, as if the observers would glimpse them *being there*. This reverse movement of the subject corresponds, especially in the above-mentioned developments, to an old desired ontological feature of man: ubiquity. It is, once more, a mental ubiquity helped by something like Goethe's abstract and simple *Urphänomen* through tele-detection, but nevertheless it is the subject's presence between these ghost objects, in their space.

1 *Tele*-presence

After the detection of objects, they are visible. Accordingly, they can be scrutinised in order to be seen as completely as possible: including by analysing them, from as many points of view as possible, just because our ideas and theories about them cannot remain only at the level of skeletons but should have as much "flesh" as possible; our knowledge about them being gradually accurate[43] at the extent we penetrate into their concrete multiple facets and their integration. Opposite to detection – the grasping "in general", namely the presence of objects, according to some parameters – our fathoming, including by thorough examination with sense organs, emphasises the *whole* in its concrete dimensions, sides, "colours". Only this whole is "the truth", let's once more remember Hegel. So, after detection we see *phenomena*[44] – in the etymological meaning of the word – and then we search their deep causes, structures and integration in the world in various, including contradictory, relationships.

Through *tele*-detection, this emphasising of objects as visible means for us that they are present, but virtually. This virtual presence is a feature of the human civilisation. The development of civilisation led to the multiplication of *virtual*- or *tele*-presence of more and more objects which we are dependent on in order to more develop as humans. And we are not at all sorry for this *tele*-presence of objects; on the contrary, it is so integrated in our life that – as the humans become digital natives – one of the first understandings of babies is just the existence of *two types of presence: tele*-presence and presence as such[45].

subject and the object and thus about the understanding of the object, that means and is based on the deciphering of this relationship as such, even the subject undergoes a process of becoming "transparent", see [Heidegger '27] p. 26.

[43] [Schoenfield '22]

[44] Or, if we want to be euphuistic, εἶδος (εἴδε, at plural): originally, visible form.

[45] They distinguish these two types of presence and do not confuse them: they can see mother etc. on the screen of laptop, but do not ask "that" mother to do what they want; they ask only the present mother.

Human beings are material objects, too, which, if they are distant to us, can be *tele*-detected and made present via IT. We talk with *tele*-detected persons, we see them, we see even their facial expressions and wrinkles, but it's not enough for us. They must be fully present for us in order to really enjoy them. They are only *tele*-present, present by being far away from us. It's good to see and talk with people from all over the world. But only the real presence allows us to talk more with them, to understand them beyond the appearance and words transmitted by IT, to share with them more than essential propositions. And we are sorry for not being in the same space.

Even the *tele*-presence of objects is not full, total, plenary for us. We try to make them fully present by giving them all the *meanings* we are able to detect through our multi-sided scientific exploration and philosophical and artistic interpretations. Thus, the *tele*-objects do not become simply present[46], and not simple functions[47], but they are *as if* they were the synthesis of all we perceive through our sense organs, presence in as many facets as possible, ready-to-hand (in Heidegger's vocabulary), more or less rich virtual reality surrounding us. But, this *as if* is always appended with both our sentiment of their insufficient lightness and our imagination trying to better penetrate in their wholeness.

Sometimes, we attempt to do the same with human persons. But it's difficult to give all the meanings they have, since they are only tele-present.

Instead of conclusion

The ancient detection – of a pitcher with coins, buried under a tree – made present a supposed object to being there: a possible object. The modern *tele*-detection – observing objects only by means of instruments which scrutinise *both* the "near" invisible (cells, molecules etc.) and the distant one – does not make them present, but only *visible*. Or: it makes them *present at distance*. And their visibility varies between the limits given by the grasping of their coordinates and those given by more accurate containing of their features: visibility as sign of the different degrees of possibility and reality.

The distinctions regarding the presence and actuality – and the far away – in different degrees are more refined and efficient than the observable/unobservable difference because they do not assume that the far away would not be real and thus, that the credence given to the existence of distant objects would be unreasonable. Unobservable objects before can be observed now with the aid of various instruments. Speaking ontologically, they are real. But the distant objects detected by us – and proven to be real – remain distant even after detection. They are "present" only in the form of tele-presence.

We can take the example of the detection of the pitcher with coins, buried under a tree. Even if we look through eyeglasses at the pitcher and at coins after their exhumation, we can value them – and use them – without a new unearthing. But in examples as dental radiography,

This ability to distinguish the two types of presence is related to the insight that only living persons move the toys in front of their eyes, the toys do not move by themselves.

[46] They never become simply present, because our awareness of their distant beingness is a tacit, subjacent and permanent idea in our representations of tele-objects.

[47] Or *use*, since they are "equipment" (*Zeug*, Heidegger).

biological samples examined through electron microscopy, stars looked at through telescope, houses and cars on a street in a far away city seen by radars, we cannot handle them without the continuous mediation of the mentioned apparatuses. Sure, we can retain the image and the biological and chemical features of samples and prescribe to the patient non-invasive medical procedures, but the precedent analysis through electron microscopy is "present" – and it is again prescribed in order to see the situation of tissues after medication – thus mediates the treatment. The same is for the dentist who always looks at the radiography in order to verify his/her medical procedures. While for stars and distant objects we can retain their coordinates, but we cannot see them without using again telescopes, radars etc.

Although this paper did not focus on the devices (of *tele*-detection), it's not insignificant to mention that like the objects, *the instruments, too, have different degrees of presence in the human consciousness*. These degrees depend, however, on the habitualness with the devices and on their popularisation in the ideological atmosphere. From this standpoint, there are more visible and less visible technologies. Obviously, the eyeglasses making more accurate the present objects are the more visible. The light bulb lighting rather present objects, the telephone, the gramophone, and the camera[48] which all of them brought and bring into presence distant objects or, better, signals of distant objects, as well as today the IT devices, were and are more visible than the radars, *minus those that measure the speed of cars*. This last specification is not made for the sake of joking but for remembering in passing that the attitude towards technologies depend also on how friendly towards humans are these technologies grasped. But all of these technologies have the same (philosophical) function: to bring into the presence of the subject non-present and even non-real, only supposed, objects, including humans. This function is accompanied with the understanding of the complexity of both objects and instruments, and of the complex, thus even contradictory features of their results[49].

The big problem of how we manage the tele-presence of objects and persons requires at least the caution of not remaining only at the level of sketches provided by tele-detection and tele-communication, neither at the level of models based on these *tele*-detection practices (the focus on circumscribed narrow aims). It's all about not sticking to remote sensing, *not reducing real objects to tele-present ones*.

References

[Alspector-Kelly '04] Alspector-Kelly, Marc (2004) Seeing the Unobservable: Van Fraassen and the Limits of Experience, *Synthese*, **140**(3):331–353.

[Anishchenko '21] Anishchenko, Ivan, et al. (2021) De novo protein design by deep network hallucination, *Nature*, **600**:547-–552.

[Aristotle OI] Aristotle (2005) *On Interpretation*, Translated by E. M. Edghill, South Australia: The University of Adelaide, Chapter 4.

[48] As on the façade of Casa Lleó Morera, in Barcelona.

[49] The difference in the civil and military use of these technologies is related to the level of pollution, imbalance in the resources (raw materials) these technologies deployed in civil or military domains use (and concerning the radars, even agglomeration of outer space with functional and already non-functional objects). This note does not suggest a Luddite type nostalgia, but the necessity of a unitary, integrated management of both the *input* of technologies (including science) and their *output*.

[Aristotle Ph] Aristotle (1984) *Physics* Translated by R. P. Hardie and R. K. Gaye (1930) in Jonathan Barnes (Ed.), Complete Works of Aristotle. Volume 1: The Revised Oxford Translation, Princeton University Press, 1984, `http://classics.mit.edu/Aristotle/physics.2.ii.html`.

[Aristotle MPh] Aristotle *Metaphysics*.

[Aristotle P] Aristotle (1932) *Poetics* in Aristotle in 23 Volumes, Vol. 23, translated by W.H. Fyfe (1926). Cambridge, MA, Harvard University Press; London, William Heinemann Ltd.

[Barnes '09] Barnes, Elizabeth; Ross Cameron, (2009) The open future: bivalence, determinism and ontology, *Philosophical Studies*, **146**:291-309.

[Berkeley 1733] Berkeley, George (1733) *The Theory of Vision, or Visual Language, Shewing the Immediate Presence and Providence of a Deity, Vindicated and Explained*, London: Printed for J. Tonson in the Strand, 1733.

[Berkeley 1708] Berkeley, George (1708) *An Essay towards a New Theory of Vision*, Retrieved September 10, 2022 from: `https://en.wikisource.org/wiki/An_Essay_Towards_a_New_Theory_of_Vision`.

[Chisholm '89] Chisholm, Roderick M. (1966) *Theory of Knowledge*, Third edition, Englewood Cliffs, New Jersey: Prentice-Hall International Editions, 1989.

[Churchland 85] Churchland, Paul (1985) The Ontological Status of Observables: In Praise of Superempirical Virtues (pp. 35–47) in P.M. Churchland and C. Hooker (eds.), *Images of Science. Essays on Realism and Empiricism with a Reply from Bas C. van Fraassen*, Chicago: University of Chicago Press.

[Dauparas '22] Dauparas, J. et al. (2022) Robust deep learning–based protein sequence design using ProteinMPNN, *Science*, 15 Sep 2022, `https://www.science.org/doi/10.1126/science.add2187`.

[Duhem '06] Duhem, Pierre (1906) *La théorie physique. Son objet et sa structure*, Paris: Chevalier et Rivière.

[Eagle '16] Eagle, Anthony (2016) Multiple location defended, *Philosophical Studies*, **173**(8):2215–2231.

[Hartmann '17] Hartmann, Nicolai (2017) The Megarian and the Aristotelian Concept of Possibility: A Contribution to the History of the Ontological problem of Modality, *Axiomathes*, **29**:209-223 (Translation by Frederic Tremblay and Keith R. Peterson of "Der Megarische und der Aristotelische Möglichkeitsbegriff: ein Beitrag zur Geschichte des ontologischen Modalitätsproblems", 1937).

[Heidegger '27] Heidegger, Martin (1927) *Being and Time*, Translated by John Macquarrie & Edward Robinson (1962). Blackwell, 2001.

[Lin '38] Lin, Yutang (1938) *The Importance of Living* London: William Heinemann Ltd.

[Meyerson '27] Meyerson, Émile (1927) *De l'explication dans les sciences*, Paris : Payot.

[Palade '06] Palade, Vasile, Cosmin Dănuț Bocănială, Lakhmi C Jain (Eds.) (2006) *Computational Intelligence in Fault Diagnosis*, Springer-Verlag London, (Advanced Information and Knowledge Processing).

[Poincaré 1909] Poincaré, Henri (1909) Lettre adressée à L. Walras le 30/09/1901, *Bulletin de la Société Vaudoise des Sciences Naturelles*, **45**, cahier 166 (1909), pp. 326-327. It was included by Léon Walras in his article "Économique et mécanique", *Bulletin de la Société Vaudoise des Sciences Naturelles*, **45**, cahier 166 (1909), pp. 311-325. Electronic version by History of Economic Thought Website.

[Rosen '18] Rosen, Jacob (2018) The Varieties of Necessity in Aristotle's Physics II.9, *unpublished*.

[Rossi '13] Rossi, Gabriela (2013) Chance and Accidental Causes in Aristotle: Metaph. E 3 in the Light of the Concept of Tyche, pp. 41-62, in Carlos Lévy and Stefano Maso (Eds.), *Fate, Chance, and Fortune in Ancient Thought*. Amsterdam: Adolf Hakkert Publishing.

[Rousseau 1781] Rousseau, J.-J. (1856) Essai sur l'origine des langues (1781, posthumously), in Rousseau, *Oeuvres complètes*, Tome troisième. Paris: Firmin Didot Frères.

[Schoenfield '15] Schoenfield, Miriam (2015) Bridging Rationality and Accuracy, *The Journal of Philosophy*, **112**(2):633–657.

[Schoenfield '22] Schoenfield, Miriam (2022) Accuracy and Verisimilitude: The Good, the Bad, and the Ugly, *The British Journal for the Philosophy of Science*, **73**(2).

[Wickers '22] Wickers, Peter (2022) *Identifying Future-Proof Science*, Oxford University Press.

[Wicky '22] Wicky, B.I.M. et al. (2022) Hallucinating symmetric protein assemblies, *Science*, **15** Sep 2022, `https://www.science.org/doi/10.1126/science.add1964`.

Isaac Asimov and the human space

The reason of science-fiction literature was and is to promote both the spread of scientific knowledge and interest, and the hope that the technological marvels will solve the problems of the human society. And in order to attract people's attention and to generate their enthusiasm towards science and its results, everything happened in the *human space*.

But the human space is very complicated. It is a *mezzo*- existential world, comprising both the objects appropriable by senses and simple auxiliary instruments like glasses, and the ideal entities (knowledge, theories, ideals, values, but also relations and institutions) the humans produce and use as criteria and stakes in their thinking and actions. The existential spaces they explore and seek – the many strata *micro*-world and many-strata *macro*-world (including the "hyperspace"), and their intertwining – are subordinated to the human one, obviously not because they would follow from it but from the standpoint of the *meanings* they have: for the time being, only for humans.

Isaac Asimov was one of the first writing about a special micro-world: that of IT, both within computers and robots. The formidable development of *computers* – even in their *merging* with the human mind and senses, as the present post-human dream directs – cannot, however, offer a solution to the natural exhaustion of natural structures and forces sustaining the human / rational life in Universe: for this reason, maybe a "God-like" computer exists even after the disappearance of this life, containing all the data and information resulted from it, but what is that for? (see *The Last Question*, 1956).

No *knowledge* about *nature* would be enough to countervail the irrational and self-annihilating behaviour of humans, the only hope being the cyclic resumption after the inevitable extinguishment (*Nightfall*, 1941).

And no knowledge about society would be enough to prevent the falling of the Galactic Empire (*Foundation*, 1942, 1944,). Modelled after the Roman Empire, this society, no matter how immense, is a copy of the modern, even post-war Western civilisation, in its official history representations: the flux of events given exclusively by aristocratic layers and different elites in their quarrels for power, rockets as interstellar ships connecting empires and kingdoms, traders who are sent to "less developed" planets in order to sell advanced technologies for much more their price and local Elders infested with traditions opposing the exchange, iron converted into gold paying as much minerals from the local mines as the traders can carry, client planets and independent ones – each appropriately treated –, intelligence nets and universities signifying both the peculiarity of science and information and their pressure for power (*Second Foundation*, 1953). And what about knowledge when there is erased information from libraries (*Foundation's Edge*, 1982)?

All of these are warnings, in the science-fiction forms and metaphors. In a scientific or philosophical analysis, they show *pessimism* about humanity's future despite its extraordinary knowledge and creativity expansion.

On the other hand, the IT world of robots is the occasion for a piercing of optimism. The internal micro-space of robots, i.e. their IT and bio-IT principles and programmes coordinating "the brain" of robots, their "positronic brains", is – as every human brain, and not only human – open to the mezzo-world of humans. This openness manifests through *moral*: that subordinates the quality of robots as *means* of humans to the quality of humans as *ends* in themselves, if we take over Kant's logic of the categorical imperative. But again, the robots' moral is a *mirror* of the human moral: both as fundamentally different from the real human moral in the mezzo-world beyond the personal life, and as a model for it. The Laws of robotics (*Runaround*, 1942/1950) – First Law: A robot may not injure a human being or, through inaction, allow a human being to come to harm; Second Law: A robot must obey the orders given it by human beings except where such orders would conflict with the First Law; Third Law: A robot must protect its own existence as long as such protection does not conflict with the First or Second Law, and (*Robots and Empire*, 1985) Zeroth Law: A robot may not harm humanity, or, by inaction, allow humanity to come to harm – cannot be superseded by any talk around "informational ethics". From a technical standpoint, the difficulty to follow these laws by *humans* and the time coordinates involved by their taking (harming for present, harming for future etc.) do not annul the laws, because they are formal; in Kant's terms, categorical and not hypothetical. But could we imagine the future human space, full of human penetration into non mezzo-worlds and victory over them, without the order put by these laws?

And if the robots got the point of these laws and they are exact means of the humans, does the same "metacognition" as that of the robots not generate a human space, filled with human relations and values, and not only with sophisticated objects? Well, Asimov warned again: in *The Naked Sun* (1956), a future (figured, obviously, by a distant planet) when the number of humans was methodically reduced and their rather *dolce far niente* long life, allowed by the robots doing all the works, is not desirable. Since creativity is individual (*How do people get new ideas?*, 1959), the more the people are, the greater the creativity. Certainly, they must be free to think, to debate, to create. The human space, the human context makes the strength of knowledge and its human results.

Editor