Thinking and Acting "Within the Box" and Thinking and Acting "Outside the Box": "Deliberative Democracy" and the Model of Scientific Brainstorming Groups

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Abstract

The paper confronts the model of the scientific group researching aspects of a common topic and the, obviously ideal, model of democracy. If science is an emblem of human knowing, including the best way of a common endeavour, both the institution of science and the coagulated groups of researchers were considered in the dominant ideology of the last century as opposed to democracy. However, even though democracy involves all kinds of non-specialised groups of population, it is superior to the highly specialised groups of scientists just from an epistemological standpoint. And the ultimate reason-to-be of knowledge is the good of every and all human beings, thus of mankind, isn't it?

Keywords: democracy and "deliberative" democracy, science, groups of scientists, epistemology, competency, common goods.

Contents

1. The challenging definition

Partisan ideologists, and not scientists, have trumped up words as well as meanings attached to old words in order to fool around and show what a clever “technical” competency would be *sine qua non*, i.e., their own competency, and to “legitimise” their masters, namely and deeply, their own worldviews strongly internalised.

An example is the “deliberative democracy” formula. Actually, it is based on *absurd* presumptions: since humans are rational beings, thus they reckon the information related to situations, discern and decide accordingly, and since they are social beings indestructibly interdependent, they discuss everything and consult each other; thus, all of them decide according to the best ideas considered by the community of consulted persons, irrespective here of the source of ideas. And the more so, the ideas concern the public interest, common problems obviously solved in a common way. From this standpoint, deliberation is *dialogue*, in its ancient Greek *ideal* representation (prototype) of communicative relations in a society of rational beings. And thus, *democracy can be but dialogical, deliberative*.

In the ancient image, even the source of advice or ideas gave only rational, thus true/good/beautiful directions. The goddess, the Muse, in *Ion* of Plato was certainly an unquestionable authority: in the first, literal sense, just because it was a transmundane entity, but as a metaphor, just for its generation of good/true/beautiful ideas, capable of impressing the poets. But even these ones were this time mundane authorities: because of their ability to inflame and exalt both the listeners and the critiques, as in a chain of iron rings attracted one by the other because of their attraction by a magnet.

However, poetry is different from “prose,” from the everyday common public problems. Just in this “prose,” a surpassing of the magnetic chain of authority takes place. *That chain was a unidirectional series*, or the *real situation of humans involves a bidirectional, feedback relation*: in Aristotle, even in the *oikos*, there was a shared authority, although the ultimate one was of the father, but in discussions and in fact, the mother expressed her reasons and opinions related to the preservation and prosperity of the home and its indwellers. And when it was about the common problems of the *polis*, the elected authorities exerted their responsibility only on the basis of publicly exposed free points of view of “parties” and publicly decided solutions as the most rational, beneficial to the community. Ideally, this was a “collaborative democracy”[1], even though in reality this collaboration was marked by different and opposite group interests, but always *in the class of free citizens*.

Well, the modern representative liberal democracy is far away from that ideal image. It is based on the structural economic and political *asymmetry of power* between the rulers and the ruled, consisting in the power and powerlessness to control the means of production, of existence, the societal organisation in order to control the resources of human life. This asymmetry means also the *dominance of the dominant class ideology*: that is not an elegant demonstration of the fairness of the benevolent swayers in an inevitable, eternal, and inherited order of things but an aggressive imposition of ideas *by all means*, or anyway by all spiritual means, much removed from the rational quest of causality and evaluation of results, and *much removed from dialogue, namely, from collective deliberation of equal participants on equally promoted logical arguments*. But since the mandate of representatives is not imperative at all[2], the autonomy of representatives to impose policies opposed to the interests of society and its “99%” of the population is assured, including through the *symbolic violence* of the most harmful and irrational ideas, which are the Only Truth irrevocably decreed, every other idea being considered “disinformation,” and “confusion” and “disorientation” being only the result of the logically coherent

alternative ideas to the Only Truth.

And, because of this dominance, and however theoretically the ability of rational choice of voters is loudly claimed, the tacit official assumption about the ruled is that of children naturally submitting to authority and aiming at assuring their comfort just by this submission, at the same time using naïve lies in order to maximise it. Why would the representative liberal democracy question, in public dialogues, the principles and rules of liberal governance? Why would this governance need a critical public sphere[3] fuelled by competing ideas? Rather, it needs and constructs a public space filled with ideas of the single structural power of capitalist logic, including through the forms of apparently opposed groups: which, nevertheless, *represent and promote the same structural power of the holders of capital*

Therefore, *on the one hand*, democracy is in principle deliberative; its reason-to-be of governance in the name "of the people, by the people, for the people"[4] is just the free expression of public opinions and their free rational criticism and thus, of the best rational decisions. And on the other hand, "*the people" is as a child and must be preserved as childish as possible*, just in order to submit without opposition, from fear, ignorance, and habit: thus,*on this other hand*, public deliberation, public dialogue must be either cancelled, silenced, ridiculed – yes, in the most liberal democracies – or made to be *the most formal possible*, ousted of rational arguments all the way and of rational, logical conduct in the treatment of the expressed viewpoints.

Theoretically, liberal democracy is characterised by the existence of opposition parties, pluralism of political views, constitutional separation of powers, free elections, and media institutions independent from the state. But since the real and fake opposition parties never challenge the structural capitalist power, since the private media institutions in no way want to oppose the capitalist power but to strengthen it, since the accepted political views are only variants of the Only Truth, since neither the separation of the legislative, executive, and judicial branches of government infringes the capitalist structure and goals, where is deliberative democracy situated? And, giving this time an empirical proof, since the elections are manipulated even in democracies – not only in the moment of emptying the ballot boxes and counting the results but also previously with fake polls and with *ad hominem* arguments and not *ad principiis*, with propaganda never (rationally) focusing on policies all the way – where is deliberative democracy situated?

Rather, does this liberal democracy not resemble "illiberalism"?

"Deliberative democracy" was characterised by the existence of independent associations, free access to information, transparency, the dialogical principle of responding with arguments to the opposed idea/argument[5], and the organisation of the procedure of deliberation[6]. From this standpoint, it was compared with the scientific acknowledgement of truth.

2. The model of science

Science is made in the frame of scientific dialogue, that is, scientific debate. It's only the arguments / empirical and theoretical proofs that legitimate the choice of a scientific idea/theory. In this respect, science is not democratic; not the majority decide, but the most coherent and proven theory, even if sustained by only a few researchers.

But science is based just on “cultural conflicts” whose greatest worth is just their generative power of *criticism*. Because the reason-to-be of science is knowledge, namely, to learn from it, its exercise supposes the sincere curiosity of researchers and their honesty in their critical thinking, related to the rational self-control in examining their own interests, theories, and worldviews. As a result, science is constructed through ardent and transparent criticism because the supplied theories are not and must not be considered incommensurable, and just in virtue of their comparison their truth values can be established, and thus, science is *fruitful*[7]. Earlier, Robert Merton sketched the same features of science, and though their appearance was sociological/ethical, they came from the same epistemological requirements[8].

3. Management of democracy

Obviously, humans manage the situations they go through and are given. Concerning our topic, just because of opposite classes which structure our modern society, and thus because of the pressure from below – from the population without which there are neither sources of private profit nor political legitimacy to preserve the structural power asymmetry – the upper strata had to institute a democracy based on consultation of the people, not only through voting. The “collaborative democracy” is an *organised* tripartite institution of the state, the employers (representatives/associations of private companies), and the employees (trade unions), where the “consensus” depends on the relations of forces and where the leading belongs to the employers, mostly and ultimately supported by the state. Theoretically, the tripartite stakeholders are the decision-makers; they would represent “the people,” although their relationship is, as we see, fundamentally asymmetric.

Consequently, this form was and is not enough; the people feel not (“fully”) being represented within. Consultation had to be developed by including different “mini-publics” constituted *ad hoc* and assuring both a higher substantial[9] legitimacy of policies and an improved perceived legitimacy by the ruled. These “mini-publics” are technical, discussing the problems and procedures of a given topic/policy *within the dominant goals of politics,* established once for all by the ruling strata. The “mini-publics” are constituted on the basis of a “(quasi) random selection” of both “lay citizens with non-vested interests”[10] – like the jurors – and on the basis of self-constituted groups for local/particular pressure for the implementation of their own interests: associations of parents, of patients, of citizens from a neighbourhood, of academics, professionals, cultural figures, etc. In order to prevent a conflictual image of competing interests with the decision-makers, an organised consultation of “mini-publics” is set up on the occasion of initiation of laws, rules, changes in the situation of all of these citizens.

However, these groups are *not* decision-makers; they are only *pressure groups*[11], integrated within the consultation process when they have significant resources (ability to promote their own interests) and when they accept “the informal rules of the game”[12]. Thus, they “deliberate” only as a careful promotion of reasons for their points of view, but not as decision reflecting the most coherent, substantial, and durable standpoint.

There are, obviously, some restrictive criteria explaining the limits of consultative/“deliberative” democracy. One is the fitting of the particular/local interests promoted by associations with the general interests. But here, not only the particular

but also the general public interests must be considered. Would (all) the general interests promoted by the state be really general, benefitting the entire population, and not only in the short term, but also in the long term? And would all the particular interests promoted by advocacy groups be really beneficial, both for the particular groups promoting them and for the entire population? And would the general interests promoted by the state be beneficial for its population, as well as for the world population, if these general interests of the state do not accord with the general interests of the world population? Is this pattern of democracy *within the confines of a state*, and whose "maxi-public" is that of structural decision-makers, while it is embellished with the consulting of "mini-publics," not rather impossible, namely inefficient for both the internal and world population? But are not only the particular "mini-publics" but also the particular populations enclosed within the borders of particular states able to suit the general world interests? Which is more important, as the most fundamental criteria (thus, in the long term): the particular interests/states or the general world interests?

A general answer is simple: if the formative influence of all the institutions develops a narrow social conscience, enclosed within the limits of a state, then the mobilisation of humans for the global solving of global problems is obviously weak. And if ultimately politics and policies depend on the capitalist logic of domination, can we remain within the pattern of the role of science in directing the political decisions that stabilise this logic and deepen the gap between particular and global interests? Can science really be the leader in the present state of emergency if "knowledge, as a generalized capacity for action, acquires an 'active' role (that is, is put to work) in the course of social action only under certain circumstances, namely where social action does not follow purely stereotypical (effortless) patterns (Max Weber), or" (follows a) "ritualized social conduct"?[13]

Rather and less cryptically, the model itself of science was transformed within the frame of liberal democracy into a strange means of annihilation of democracy: as *technocracy and social engineering* made by the experts supporting the elites, whose decisions would be the Only, "because Scientific," Truth.

4. The epistemological background of groups of scientists

A group of scientists is interested in the knowing of a topic, indeed, for arriving at truer theories about it. Historically, the group was a net of informal communication between thinkers: a main information in the construction of philosophical and scientific theories was just the reference to other, competing or convergent, theories, not as an argument from authority or, conversely, as an appeal to false authority, but in order to better chisel the actual arguments and proofs, to highlight principles and basic structures, to not repeat errors, and to show the history of the understanding of the topic. The constitution of scientific institutions – such as the universities and academies – where the distinction between disciplines was cardinal just in order to clarify the scopes and limits of scientific research, brought about institutionalised groups of scientists and scientific communication: long time within a discipline, and later cross-disciplinary because focused on topics understandable only by the addition of different perspectives.

The progress of scientific research, meaning also and always the scientific instruments and methodologies, gives not only new information and theories within the existing explaining patterns but also breakthrough changes[14], generated not only

as proven discoveries as epistemic units but also as results of the communicative atmosphere and the communicative means of scientists.

The communicative group of scientists was and is a research group. Both as a group and as its members, the researchers are determined not only by their scientific passion, their desire to be recognised by their scientific communities – and why not? by the general public – but also by their ideological worldviews, which impregnate and mediate their individual feelings, and which mostly are the dominant ones: a) because of their education and also b) because of the psychological solving of the cognitive dissonance; because the cognitive dissonance cannot be supported longtime, people erase those information and messages which, although seeming moral, just, and logical to their individual minds, oppose the dominant values according to which their own lives and hopes are framed; and obviously, c) because of fear. Consequently, the scientific groups should not be considered something that would be different from and superior to the ordinary people, in virtue of their scientific enthusiasm and cooperation and in virtue of their democratic gathering, because this enthusiasm and cooperation are marked by and subordinated to the general pattern of political "prudence," and their democracy does not transcend the limits of the topic and the social paradigms circumscribed from outside science. Within these limits, the most daring brainstorming is not only allowed but prescribed, imposed; because this technical brainstorming is necessary both for those who rent the science and for the tenants also.

Science, as a special type of activity to arrive at solid knowledge, is only a *means* for the common wisdom and efficient action of humans. We know that everything is both a means and an end, but the end of thorough knowledge through specific inquiry and fathoming belongs only to the scientific researchers, who subordinate their results to the human community as such[15].

The *brainstorming* process/debate within scientific groups is a way of scientific research. The members are *experts* from the same area of interests or from different ones, who, by fathoming the common topic in an absolutely free and autonomous atmosphere within the given limits, arrive at new and unexpected ideas generated just by direct and free communication. In this respect, an *inappropriate* term was coined: "think tank," *as if* only the experts would think and, in virtue of this superiority, would have the right to decree "the truth."

From an economic standpoint, science is a *service*; it belongs to the sphere of services. Theoretically, it is a service for humanity as such, more humbly, for the production of goods. In reality, science is in the service of economic and political decision-makers. Science does not decide but advises. Thus, it is "consulted." And thus, the scientific groups, which do not decide either, acquire the features of capitalist society: beyond the passionate quest for truth, which is the peculiarity of scientists, they need recognition, not only of their fellows but also – and rather, since the recognition within the communities of researchers depends on the academic institutions which ultimately have a political direction – of the net of economic and political decision-makers. In brutal language, the scientists need to be bought by – and thus to sell themselves to – those who have control of social and natural resources.

4.1. *The model of groups of nuclear plant scientists*

A nuclear plant is a system of n systems with n sub-systems. Each of them is studied and developed by specific groups of

scientists. Both all of them and groups of systems are studied and developed by *groups* of these specific groups of scientists related to their specific systems/sub-systems.

In their focus on the specific problems of possibility, coherence, efficiency, and safety of the nuclear plant, all these scientists are concerned with the *input* (the items of fuel and raw material, water) only to the extent that this input is important for the fulfilment of the desired parameters of the nuclear plant. The same is true of the *output*, and although the management of waste belongs to the responsibility of the nuclear plants, neither the amount of funds for the research of management of waste nor the practical management as such reflects the inclusion of input and output within the systemic topic of nuclear plant scientists. Actually, these scientists focus on the *throughput* (the elements and aspects of the nuclear plant): it is the "black box" necessary to be open by them.

Strictly from the standpoint of professional efficiency, it's normal. And indeed, the understanding and procedures of the nuclear plant system of systems is the topic of this group of scientists. But if so, this group cannot be the model of an efficient and anticipative approach to the social impacts of human knowledge. Rather, the group of waste management scientists is not very structured[16]. Anyway, Kant's proposition in the 1784's*What is Enlightenment* – that professionals need to obey their circumscribed tasks but in their spare time, they are obliged to think about the entire social organisation and to express their sound critique for the betterment of this social organisation and for teaching the common people how to use their reason in the same autonomous manner as the intellectuals – seems to dissolve the infatuation of these intellectuals that only they would give the model of advanced comprehension of the functioning of society.

5. Democracy as technocracy

Aiming at the accuracy and high precision of data, which emphasises more precise conditions of phenomena, thus, more reliable theories[17], is a main feature of science. But accuracy belongs to the technicalities of science, to the high specialisation and consideration of "details," which proves to be fundamental in the insight of causes and functioning of phenomena, including those determined by human intervention in existence, thus generating a permanent new reality. However, the grasping of meanings of the phenomena by laymen does not need that high accuracy. People can *detect*[18] the intertwining and direction of things[19], and this detection is enough[20] to arrive at sound common theories/wisdom and efficient action.

Common people do not aim at the professional understanding of the deep causality of specific phenomena: there always is *oikeiopragia*, the feeling and acting (as being) "at home" in one's own job/task, thus the interest of common people is only to see the *connection of things and their meanings/influence on them*. And they can do this. Democracy is not a caricature of absurd intermingling of inconsistent opinions within scientific rigor, but a *common supervision of humanity over the conditions, means, and ends deployed by the different human communities*.

Consequently, the democratic model is based on a rational allocation of competences in judging the public problems. This means not only a normal *distinction* between the highly "technical" procedures of tackling phenomena and their causality,

thus their scientific explanation, and, on the other hand, the understanding of the meanings of these phenomena within a systemic connection related to the life of humankind in its environment. As only the scientists from different domains have the competency and responsibility to supply coherent, sound, and reliable theories about the topics they circumscribe, so the general public – not only from a country but from the entire human species – has the *competency to understand*, when it has free access to information and really free debate, the meanings and consequences of human action on both local communities and the global community of mankind. Thus, the democratic model means also the *emphasis and strengthening of the general public competency and means to exert it*.

The democratic model does not mean and lead to a cacophony of voices of particular and arbitrary opinions generating only an inconsistent landscape of "judgements of taste" not through cognition but through imagination[21], and thus, of whose disciplining would require their submission to the Single Truth manifested, for the sake of impression/of variety, as some forms of truth, carefully chosen so as to not challenge the *status quo*; but the democratic model involves the positing of the capability of common people to judge and decide in their best interests what the best alternatives are for their present and future reality.

By discerning between the technicalities emphasised by science and the meanings and consequences of phenomena and human actions for all human beings, for mankind, democracy is really a social organisation based on *both specific professional competency and a high social competency of the entire population*: proved through its high social responsibility able to anticipate, thus, to prevent perverse effects of the *application* of scientific research. Technology is this application, and only the democratic approach can differentiate between its social consequences and understand that the technological progress itself is historically and socially imposed from outside the scientific and technological research. As this high social competency, democracy is really technocracy.

6. Thinking "within the box" and thinking "outside the box"

The groups of scientists focused on a specific topic, however vast and complex it may be, are technical groups, only in principle neutral from a social-political standpoint: they discuss only the elements, internal interdependencies, and procedures of and towards the considered (technical) object. But there always are the "upstream" and the "downstream" of the technical objects. Science itself has developed by a dialectic of "thinking within and outside the box". But this metaphor is, in science, like a set of Matrioshka dolls: each doll is a "box," and the analyses by technical groups related to different aspects of a circumscribed topic are included within an always bigger "box." But if so, we once more see that the (ideal) model of democracy transcends that of the scientific group: because the "box" of democratic deliberation is the biggest, comprising many big "boxes" which contain other "boxes."

The scientific groups impact policy-making only if they remain in their biggest "box" and do not "interfere" within the "box" of policy-makers, thus within the biggest "box" of democracy. The policy-makers themselves consider their "box" bigger than that of democracy, but their "box" is only that of the "box" of administration plus the "box" of (the representation of) the upper economic and political upper strata.

An involuntary self-ironical contradiction promoted by even the present scientists shows the importance of this metaphor. On the one hand, they consider themselves the representatives of human knowledge and the knowing process as the proof and metaphysical reason-to-be of the place of humans within the universe. In other words, they consider themselves human beings always searching for and interpreting the meanings of things for the human species. On the other hand, they reduce their endeavour to strictly technical, namely, "incomprehensible for laymen" stuff. In this, they are "more than humans," but thus, non-human. This is their *elitism*: towards the majority of the world population that is ruled, but never towards the principle of class domination, irrespective of their eventual contempt towards concrete rulers.

7. Instead of conclusion

Knowledge, that is, science (meaning also technology), is a *common good*[22], like the air, water, and land; and like human beings as such. It has its own specific features, which are not different from and contrary to the deployment of human reason by non-scientists, by any other human being. Accordingly, both science and scientists are models for humans and illustrate their uniqueness only to the extent that they do not develop in an anti-rational, anti-humanist direction.

When scientists, proud of their high competency, value only their appurtenance to their scientific communities and ignore that to the human species, when they are active in exercising their knowledge but incredibly passive towards the indefensible and the unjustifiable from a rational, scientific standpoint, they show that they think in their "box," they are locked in their "box," irrespective of the appearance of this "box."

Both humans in general and scientists live, think, and act in groups that give them particular features. But no matter how strong the particularities are, humans are "species beings" (Marx): they know that beyond their "*Umwelt*," their narrow (Jakob von Uexküll) or larger ambient, there are the *human capacities*: *reason* (*logic* beyond the control of the access to the world, *construction of meanings*, and their *assessment*) in *sociality* – or sociality in reason –, *which assures every human being to belong to humanity, to be its representative, and to be moved by the human symbols constructed as universals, beyond restrictive interests*.

If the groups of scientists situate themselves near and under the command of ruling groups and are opaque to universal values, they close themselves "in their box," in the "box" of *social paradigms given outside science*: their knowledge influences humans only through the detour allowed by the ruling strata. The time wasted by this detour can be spared only by thinking "outside the box," through the democracy of universals, of the human species.

Footnotes

[1] The obviously modern term is *collaborative governance*, meaning the institutional setting up of *organised* private and public groups/interests. The present common example is the tripartite commission of the state, the employers' representative structures, and the trade unions.

[2] And first of all, the mandate of the *entire system* of legislative and, more importantly, of political power is not imperative

towards the ruled: neither towards the interests of the local ruled nor towards the interests of the entire population of a country, and much less towards the interests of the world ruled. *The restrictive private interests (both national and international) are imposed as laws in and by the legislative institutions, and thus "everything is legal"*. This is why the type of representativeness, concretely the imperative mandate, is so important. See, for instance, the privatization of local land – in many regions of the world, a collective property of the local communities or collectively administrated by them – and the discretionary destruction of groundwater, biodiversity, and air: even under the pretext of "green," "environmentally friendly" investments, letting alone those cynically advanced. For the "green" investments, see Paul Bouet, "Solar Extractivism," *Horizons*, e-flux, October 2022, https://www.e-flux.com/architecture/horizons/496006/solar-extractivism; Aïda Delpuech & Arianna Poletti, « En Tunisie, le mirage des projets solaires », *Le Monde Diplomatique*, avril 2024.

[3] In Habermas's meaning: as autonomous towards the control of the state, a typical Enlightenment creation (*The Social Transformation of the Public Sphere* (1962), Cambridge: Polity, 1989).

[4] U.S. President Abraham Lincoln, *The Gettysburg Address*, November 19, 1863.

[5] In fact, this logical principle, opposing the *ignoratio elenchi* logical fallacy, must be included in the set of logical principles – opposed to logical fallacies – which must be followed in any dialogue. For the understanding of the *corruption of logic*, which is at the same time an *epistemic corruption*, see Ana Bazac, "What If (There Would Be / Would Have Been)? (The Concept of Alternative from the Physical Domain to the Historical One)," *Noema*, XX, 2021, pp. 41-78.

[6] John S. Dryzek, André Bächtiger, Simone Chambers, Joshua Cohen, James N. Druckman, Andrea Felicetti, James S. Fishkin, David M. Farrell, Archon Fung, Amy Gutmann, Hélène Landemore, Jane Mansbridge, Sofie Marien, Michael A. Neblo, Simon Niemeyer, Maija Setälä, Rune Slothuus, Jane Suiter, Dennis Thompson, Mark E. Warren, "The crisis of democracy and the science of deliberation: Citizens can avoid polarization and make sound decisions", *Science*, Vol. 36, issue 6432, 2019, pp. 1144 – 1146.

[7] Karl R. Popper, *The Myth of the Framework: In Defence of Science and Rationality*(1965), London and New York: Routledge, 1994.

[8] Robert K. Merton, "The Normative Structure of Science" (1942), in *The Sociology of Science: Theoretical and Empirical Investigations*, Chicago: The University of Chicago Press, 1973, pp. 267-278.

[9] According to normative standards.

[10] Julien Vrydagh, Sophie Devillers & Min Reuchamps, "The Integration of Deliberative Mini-publics in Collaborative Governance Through the Perspectives of Citizens and Stakeholders: The Case of the Education Reform in French-speaking Belgium", *Representation. Journal of Representative Democracy*, 59 (1), 2020, pp. 95-116.

[11] Allan R. Ball, "Pressure Groups". In: A. R. Ball, *Modern Politics and Government*, London: Palgrave, 1988.

[12] Wyn Grant, "Pressure Politics: The Changing World of Pressure Groups", *Parliamentary Affairs*, Vol. 57 No. 2, April 2004, pp. 408-419 (409).

[13] Nico Stehr, “The Atmosphere of Democracy: Knowledge and Political Action”, pp. 69-92, in Johannes Glückler, Gary Herrigel, Michael Handke (Editors), *Knowledge for Governance*, in Knowledge and Space series, Volume 15, Heidelberg, Chicago: Springer, 2020, p. 81.

[14] For example, the fact that the all-assumed model of social complexity generated by social inequality became, as a result of new information, only one of the historical models about the development of civilisation, see Adam S. Green, “Killing the Priest-King: Addressing Egalitarianism in the Indus Civilization”, *Journal of Archaeological Research*, 29, 2021, pp. 153–202.

[15] One of the most evident manners to highlight the subordination of science to the humanity as such is its “subordination” to technology, “subordination” as substantiation of technology.

See Albert Bayet, *La morale scientifique : essai sur les applications morales des sciences sociologiques* (1905), Deuxième édition revue et augmentée d’une préface nouvelle, Paris : Félix Alcan, 1907, Préface, p. XIII :

> *“The physicist, like the sociologist, observes facts, reports, and records the results of his research; if he is mistaken, the propositions he brings to us are false; if he is not mistaken, they are (relatively and provisionally) true. But who will say that a locomotive, that a machine is true or false? These words here would have no meaning and no one would think of using them”.*

And p. XIV: “If the physicist seeks to discover true laws, the engineer sets out to discover not true machines - which means nothing - but machines capable of providing a given job under given conditions. Among the numerous machines which will be able to carry out the work, everyone also understands without difficulty that there will be less good ones and better ones; all will be scientific, if all are based on physical laws; all will be able to achieve the goal; but one will be more solid, the other less expensive, this one easier to handle, that one more efficient. The one which presents the most advantages and the fewest disadvantages will be preferable: it will not be true. However well imagined it may be, however dazzling its success, the day will come sooner or later when it will disappear to make way for new mechanisms. The role of the engineer is not to add an immutable stone to the building of scientific truth, but to imagine, in the shadow of this building, always provisional means of improving reality”.

[16] Nevertheless, see https://www.iaea.org/publications/14739/status-and-trends-in-spent-fuel-and-radioactive-waste-management.

[17] Jonathan D. Roslund et al., “Optical clocks at sea”, *Nature*, Volume 628, 2024, pp. 736–740.

[18] Henri Poincaré, “Lettre de M. H. Poincaré à M. Léon Walras” (1901), in Léon Walras, “Économique et Mécanique”, *Bulletin de la Société Vaudoise de Sciences Naturelles*, Vol. 45, 1909, pp. 313-325, reprinted in 1960, *Metroeconomica*, Vol. 12, No. 1, pp. 3-13.

[19] Because the phenomena manifest also in their mezzo-forms, graspable for the senses and reason of humans.

[20] Henri Poincaré, *ibidem*.

[21] If we use Kant's description of aesthetic choices.

[22] See Ana Bazac, "Citoyenneté et biens communs de la science",*Analele Universităţii din Craiova, Seria Filosofie*, nr. 32, (2/2013), pp. 105-129.