

WHAT IS NATURAL AND WHAT IS NON-NATURAL IN CANCER?

Ана ВАЗАК¹

ЧТО ЯВЛЯЕТСЯ В РАКЕ ЕСТЕСТВЕННЫМ, И ЧТО НЕЕСТЕСТВЕННЫМ?

Ана БАЗАК

Abstract. The point of the paper is that, between the cultural means to fight cancer – medical research and practice, as well as social measures to create a healthy environment, healthy food for all and a harmonious and trustworthy social organisation – it is also the moral education promoting the assumption of values of *the truth-the good-the beautiful* in the individual behaviour and the precedence of the *social ideal* over the individual aspirations. This involves a change in and the assumption of the dialectic of the *individual* and the *human species/society*. The ill man, and even more the cancerous person, does struggle with the disease as an individual. But in order to being serene, the cancerous person must consider himself/herself as a part of the human species.

This conclusion is developed after the description of cancer as both natural and un-natural phenomenon. The logic of the demonstration is based on Aristotle's holism and teleology – where the *telos* of the organism is more than the sum of the *teloi* of its parts (including cells) –: and since the organism and the up to down determinism cannot be overlooked, and the coherence and strength of the organism are explained not only by the functionality of its complex deep levels but also by its relations with its milieu, a humanistic culture with direct altruist values assumed by the individuals and the social ideal as the backbone of the humanity of humans is a powerful stimulus to fortify the organism and its struggle against the irreversibility.

Keywords: cancer, *telos*, measurement, precision, fragmentariness, naturality² and un-naturality/naturalness and un-naturalness, irreversibility, social ideal, man as species being.

¹ Romanian Committee of History and Philosophy of Science and Technology, Romanian Academy; Bucharest, ROMANIA.

² I used this old form – *naturality* – because for us the modern *naturalness* is too related to the human attitudes (to unaffectedness, i.e. a distancing from the artificial, the requirements of culture/civilisation, as the Italian *disinvoltura*, easiness, unconstraint). Naturalness means also the quality or state to being natural, but the old naturality – though it meant also a 'natural feeling' – seems for me to be more connected to an abstract natural character.

Contents

1. Instead of introduction
 2. The “modern” view on cancer and beyond
 3. Methodological presumptions of the paper
 4. Methodological preamble regarding the attitude of the supporters of the integration of teleology within the scientific outlook
 5. Cancer as a natural and un-natural phenomenon
 - 5.1. *The idea of natural character of cancer*
 - 5.2. *Life and telos*
 - 5.3. *Naturality of cancer in front of reductionism*
 6. Therefore, cancer as non-natural phenomenon
 7. Cancer as enemy
 8. Prophylaxis of cancer
 9. Instead of conclusion: how to fight cancer?
-

Резюме. Суть статьи заключается в том, что между культурными средствами для борьбы с раком – медицинскими исследованиями и практикой, а также социальными мерами по созданию здоровой среды, здоровой пищи для всех и гармоничной и заслуживающей доверия социальной организации – значение имеет также нравственное воспитание и содействие допущению ценностей истины–добра–красоты в индивидуальном поведении и старшинству социального идеала над индивидуальными устремлениями. Все это связано с изменением и допущением диалектики человека как вида и индивида и человеческого общества. Больной человек, и более того, пораженный раковой опухолью – борется с болезнью как индивидуум. Но для того, чтобы быть спокойным, раковый больной должен оставаться человеком и считать себя частью человеческого рода.

Этот вывод развивается после описания рака в качестве и естественного, и неестественного явления. Логика демонстрации основывается на холизме и телеологии Аристотеля – где телос (*telos*) организма больше, чем сумма *teloi* его частей (в том числе клеток) –: а так как организм и «сверху вниз»-детерминизм нельзя игнорировать, и согласованность и сила организма объясняются не только функциональностью его сложных глубоких уровней, но и его отношениями со средой, гуманистической культурой с ее прямыми альтруистическими ценностями, которые индивиды принимают, и социальным идеалом в качестве основы человечества – все это является мощным стимулом для укрепления организма и его борьбы с необратимостью тяжелого заболевания.

Ключевые слова: рак, *телос*, измерение, точность, фрагментарность, естественность и неестественность / натуральность и ненатуральность, необратимость, социальный идеал, человек как биологический вид.

Содержание

1. Вместо введения
2. «Современный» взгляд на рак и не только
3. Методологические предпосылки статьи
4. Методологическая преамбула относительно позиции сторонников интеграции телеологии в научный кругозор
5. Рак как естественное и неестественное явление
 - 5.1. *Идея естественного характера рака*
 - 5.2. *Жизнь и Телос*
 - 5.3. *Естественность рака в глазах редукционизма*
6. В свою очередь, рак как неестественное явление
7. Рак как враг
8. Профилактика рака
9. Вместо заключения: как бороться с раком?

1. Instead of introduction

Cancer is the most *terrifying*, mysterious and important illness of man. Though it was discovered that cancer affects not only humans, and not only animals – but all of them? – Cancer is/may be the *criterion* towards which the gravity of chronic (non-infectious? non-traumatic?) diseases is, at least subjectively, “measured”. Namely, if one has no cancer but a different malfunctioning of organs, “it’s OK”: because something that is not cancer may be reverted and reversed (it is not irreversible like cancer), and cured with non-invasive and invasive means (not only stopped, and not only for a while); at least, this is the common perception. Therefore, the most frightening thing in cancer is its imminent *irreversibility/menace of irreversibility* and its obviousness as an *imminent* moment anterior to death. Cancer means death, while other diseases – only unpleasant episodes.

On the other hand, cancer is the *model* of the illness: a state – but a sudden, unexpected and never expected transformed state – that interrupts the sweet routine of life, a *limit situation* when someone is pushed in a brutal manner to think to the meaning of life just in a moment when he/she can no longer change the projects and course; somehow as in Tolstoy’s *The Death of Ivan Ilyich* [1886]. And cancer is a model of illness because it is the most redoubtable adversary of man, being *at war* with man and forcing this one to be at war with it [Kampmark 2017].

And in this meaning of model, cancer is a *metaphor* too/bears the metaphors of irreversible bifurcation of the human existence, naturalising and privileging even the worldviews and policies [Vallis and Inayatullah 2016] which prove either the neglecting of cancerous diseases or the active intervention.

Cancer is, first, *detected* and, according to the modern Western medicine, *measured* in order to be immediately countered through medicines and radical extirpations. Anyway, the hypotheses at the beginning of the treatment must not be “arbitrary functions” – or they must be considered as just they are, arbitrary – and they must lead to *precision* (that may differ from the first expectations from around the detection) because otherwise they do not justify the treatment. However, as in the scientific research, the experience of the treatment – in fact, the patient undergoes an experiment (he/she is the subject-object of the experiment) – leads to further confirmations/refutations, adjustments of both the treatment and the *ad hoc* theory of the concrete cancer of the concrete patient.

2. The “modern” view on cancer and beyond

I use here the word placed between inverted commas to draw attention to the meaning already given by the Renaissance spirit: as mathematical correlations / in fact as *measurability* as a condition of knowledge/understanding. The study of cancer has evolved just in modernity – mostly cancer is a “modern” illness, or it hit the consciousness of people in modern times – and the physicians have passed from treating it by alleviating the suffering and, eventually, by simple extirpations to efforts to cure it: and this effort supposed to understand the level of the “infection”. They have drawn up a table of successive signs and symptoms of the cancerous disease of a patient in the track of the old medical anamnesis. But the study has advanced only along with the technical devices based on mathematical translation of the states of the patient.

Therefore, cancer itself must be *measured* – and obviously, every measurement is a *relation* and emphasizes both the related elements, as well as the *ontological* levels of these elements, and the relations as such –. Thus, the measurement transposes/“translates” the states of the patient in “images” which are the analogy of these real states; all the comparisons are made through the transposition of states in simpler data (reflecting the criteria of normal and ailing states) and measured “mechanically”/in analogical way (like the general and local temperature), these simple measures giving the tableau of the real state; or, with the emergence of digitization in computer sciences, the analogies suppose an extra *decomposition* of, much more data now, in numbers, stored in numerical form and *re-composed* in signs corresponding to the real states. The measurement is always repeated, and the more it is more accurate and concerning more details – so, a more careful decomposition and re-composition – more repeated and more integrated within a creative interpretation, the more successful it is. Consequently, in this process of measurement, we witness different *ontological* levels – the inherently *holistic real* state, different inherently *fragmentary measures* (temperature etc.) as corresponding representations of different aspects of the real state, the *numbers* which are the abstract decomposition of the information gathered through fragmentary measurement, and their re-composition in more or less holistic views about the real state –; and it is important to not confound these levels: that is, *to not reduce the real state to some results of the measurement*, or to not consider the representations or the numbers as real.

At the same time, the measurement lights the specific of physicians as *methodologists*. Indeed, the professions focusing on *know-how* – as the engineer and the physician – has a distinctive quality: that to translate into practical means / that to create what in general people desire. Concerning the ends of the engineer and the physician, people know only what they want; concretely and concerning only the physician, people desire to be healthy, to reverse/turn the cancerous disease into the previous healthy process of life. And the physician transposes these desires into a *methodology* of steps, succession of steps, levels and kinds of drugs and procedures, therefore programmes of cures. All of these involve – and generate, as an appropriate basis – more general patterns of thinking using the methodology and the medical technology /the information provided only by peculiar medical technologies (and from this standpoint, indeed, the “medium is the message”, as McLuhan said) without which a coherent and up-to-date system of remedies is no longer possible.

There is undoubtedly a contradiction – manifest in oncology too – between the precise mathematical data giving the limits of normalcy and the measurement of the gravity of cancer (all of these data allowing the *protocols* respecting the newest methodology) and, on the other hand, the individual character of cases. To solve this contradiction is not difficult: none of these aspects ought to cover/overwhelm the others, and patients instinctively assume the use and results of the medical apparatuses and codified reasons and rules of treatment in protocols, while at the same time desiring to be considered in a personalised manner. However, *the only condition to control this contradiction is but the exclusion of extra-medicine constraints from the medical process.*

Certainly, the “personalised” manner involves also social and cultural advices towards the patient, a larger view of the physician, that includes the understanding of the social and cultural dependence of cancer and the concrete illness of the patient, but it cannot ignore the necessity to use the data provided by the medical equipment and protocols. The more complex view (actually, the holistic view) – necessary today in tackling every phenomenon, and not only the health, health care and malady, and obviously not only cancer – supposes to transcend the direct, material constituents of the states of the human body, even the cellular and atomic and sub-atomic levels of the material constitution of these states, or rather to interpret them with the help of psychical and informational forces too and without shyness; it supposes to relate the medical and extra-medical aspects of the human life; but surely, it does not suppose the disdain towards the necessary direct correlations and measurements, which are absolutely useful for the understanding of different aspects of the disorders of the human being.

3. Methodological presumptions of the paper

Reading the information transmitted by researchers, I constructed three directions of reflections (and research) linked to the understanding and countering of cancer:

(1) The presumption that cancer is a *natural* phenomenon: and in this frame the investigation of its manifestation and functioning, its “essence” and the stressing of its naturality and un-naturality;

(2) the presumption of its harmful, even malefic character – and in this frame the analysis of *treatments* and *prophylaxis*; in fact, this direction is the most difficult, including because of the *intertwining of the inner logic of scientific approach and the logic of extra-science/logic exterior to the inner requirements of science*; anyway, this was and is the first space of the research of cancer, because it is practical and answers to practical and immediate healing problems: the development of this space has led and leads to the upstream space of theory (1) as well as to the downstream space that follows (3);

(3) the presumption of the necessity to “*compensate*” cancer at the level of “*trans-medical*” *tackling* (at the level of psychology and ethics), either because it cannot be healed and its advancement implies horribly painful feelings linked to the coming of the final moment of life, or because it is prevented by an “alternative” view about health and the human life (and death).

Therefore, the spaces of research are intertwined and at the same time have their relative autonomy. And again at the same time, these spaces involve the interlinking of both the theoretical and practical levels of the medical science/art, and its scientific and philosophical levels. This interlinking does not concern only one space, though it manifests in different degrees in each of them, and obviously in different moments of the historical research of cancer.

4. Methodological preamble regarding the attitude of the supporters of the integration of teleology within the scientific outlook

As in the Call for papers for the 14th International Symposium on Biocosmology, many researchers have felt and feel the necessity to exceed the shortcomings of the mechanistic manner of the modern science, whose emblem was the world-machine metaphor and whose belief in the absolute certainty of science because of its self-evident principles was based on the analytical method and has generated a glorious development of disciplined *fragmented* views on concrete realms and their cause-effect series. There are at least two directions proposed by researchers in order to fulfil this task: one is to do away with the equivalence of science with the predominance and independence of measurements and transformations of the inorganic/matter, and the return – obviously, in a spiral, namely the return is not a superposition of the new pattern of thinking and the ancient one, but a development of the former with the means of the new scientific acquisitions – to the image grasping the *organic* relationships of mater and spirit and the *complex and unified* characteristics of the existence: *organic, holistic, ecological and systemic*, in the words of Fritjof Capra [1988]; the other is, by starting from the model of the living (and not from that of the inorganic), to re-integrate *teleology* in the system of causes and explaining factors of the world (as the BCA insists). These directions converge “though” they have as “founding fathers” Aristotle and Einstein.

These directions – historical – are very important and support the continuous development of knowledge/science only if they are conceived of as historical, as all the other moments of knowledge, and with modesty/self-criticism/sense of humour. In other words, neither they can be viewed in a dogmatic manner. This problem of the dogmatic and non-dogmatic view about science comprises both the *contents paradigm* framing science in a certain moment and the scientific *methodology*. Concerning the first aspect, it is obvious that today one no longer considers Aristotle's physics as being only “words” towards Newton's science (as Kropotkin opposed them in an otherwise excellent paper, holistic and integrative of man and nature [1893]. Differently put, one is able to review and (critically) assimilate all the “old” signs of human wisdom.

Concerning the second aspect, the *organicity* and *unity* of life processes must not suppose the disdain of the “rationality”/strict logical manner to tackle these processes and problems: on the contrary, the intertwining of matter and “spirit” (not in the simple Cartesian way), the challenges rose by the research of new phenomena in a non-conventional manner have more and finer answers if the scientific methodology/the scientific rigour is observed.

The problem is not the rationality/the rational knowledge, the “too much” of them, but the lack of rationality because of the extra-science/economic, social, political logic. And the problem is that the focus on isolated systems from their environment and the “mechanistic” manner (cause-effect lines) to tackle the *real* cause-effect *network* and *canopy/tree branching* was determined by both the *inner* logic of science (the modern science was at the beginning and the scientific analysis needed, and in a way still needs, “disciplined” fragmentation and putting – as “thesis” for the scientific research – of the “simple” Aristotelian logic of the excluded third as ground of further inquiries) and the *extra-science* logic. This means that a certain pattern of thinking is *historically determined*, and we must not reduce this complex determination only to one aspect or another. As we cannot ignore the mechanistic pattern of thinking, so we cannot even overlook the economic, social and political constraints of the epoch. The ban of teleology was the result of the mentioned complex determination.

And certainly and somehow paradoxically, this prohibition is ever more strange and bigger nowadays because of the present neo-liberal mainstream rule: although the strong development of science – and just as a result of the analytical method – has led to the breaking of the former limits of disciplines, to inter and trans-disciplinary approaches.

Anyway, the prevention of teleological questions harms not only the ultimate finality of science and technology – that to provide humans the means of a *beautiful and creative life of all* – but also their inner logic. Because: the teleological questions are not (only) philosophical, but also scientific, intertwined with the classic Aristotelian questions about the material, formal, efficient causes. In any case, the tendency (the feeling) that teleology is/becomes more and more important prefigures the necessary *unity of science and philosophy*: a unity resulted from the development of the modern science, from its self-criticism/change, so from the supply of a very

complex representation of the existence, and not from the ancient unity of science and philosophy where the tableau of things was, inherently, simple. Teleology = unity of science and philosophy.

This integrated approach of the classical *causal* and the *teleological*, of the *system* we focus on in the research and desire of healing, and the *rest*, i.e. the *environment*, helps us to understand the *relative* character of dichotomies we use when we discuss the diseases; for instance, cancer is not a typical traumatic disease as the wounds directly produced by weaponry in wars, but – the more so as there are also indirectly produced illnesses, manifested as post-traumatic diseases as a result of the entire atmosphere of wars [Hagopian 2015] – it may be a non-typical traumatic disease, where not only the injuries as such and their close environment, but also the complex networks and atmosphere which have contributed to it constitute its aspects. And obviously, cancer is not a typical non-infectious civilizational disease – as the plague and smallpox were the typical infectious diseases, or the different epidemics – but it may be a non-typical even infectious civilizational disease.

5. Cancer as a natural and un-natural phenomenon

5. 1. *The idea of natural character of cancer*

A first interesting problem is that the natural character of cancer – as of all the other non-traumatic diseases – is a “modern” (philosophical and scientific) *idea*. Obviously this character/idea is *historical*, i.e. firstly people have considered the diseases as brought about by some maleficent spirits, then they/the physicians have begun to observe the manifestations and changes produces by illnesses, and certainly outlining anamneses and searching for *causes* related to and issuing from the behaviour of humans.

A first group of such causes the thinkers became conscious of was that of *excesses*: excesses of *too much*, not of too little, because the lack and malnourishment were social conditions one could only alleviate (if) but without questioning them. But both the *too little* and the *too much* have showed to humans – philosophers and physicians – that originally the natural condition of humans was the natural balance and harmony of the human body – and soul – and at least some ill states were the result of excessive, bad behaviour of people with their own beings.

Letting here aside the ideological aspect – with its conservative nostalgia – Plato was the thinker who stressed that most of diseases were the result of the *too much*: of the artificial imbalance produced on bodies – and souls – by the artificial elements of civilization; Plato has compared the “natural”³ healthy life of the primitive Greeks with few needs in an autarchic manner satisfied in the household economy (Plato, *Republic*, 372c-d), and the affluent in artificiality life of the “modern” Greeks of every big polis: even the division of labour became artificial, the needs too, people have confounded the real needs with those imagined by the expanded dynamic of the social interdependencies (see Plato, *Republic*, 373a-d); in this type of “fevered state” (idem, 372e), the logic of trades needing the fuelling of needs in order to have demands arrives to pervert the healthy behaviours: “cooking assumes the form of

³ It was human, thus already artificial.

medicine, and pretends to know what foods are best for the body” [Plato, *Gorgias*, 464d] and thus “cookery is flattery disguised as medicine” [idem, 465b]; as a result, “Doctors, too, are something whose services we shall be much more likely to require if we live thus than as before” (*Republic*, 373c-d).

Besides the excesses generating unhealthy imbalances, Plato and Aristotle (as well as Hippocrates) spoke about a general state of the body *and* soul: a *general* state generated naturally *from within*/from the internal constitution and treated with *both local interventions* (“expects his physician to give him a drug which will operate as an emetic on the disease, or to get rid of it by purging or the use of cautery or the knife” [*Republic*, 406d]) and *general prophylaxis* (temperance in diet, gymnastics, see music and gymnastics „not for the soul and the body except incidentally, but for the harmonious adjustment of these two principles by the proper degree of tension and relaxation of each” [idem, 411e-412a]).

In Aristotle, the theoretical construction of: – the *four causes*, – the *telos* and – the *form* that gives the essence of things (and not only the form, but also the peculiar form of an individual thing, this peculiar form being the *sunolon* [Bazac 2014, 2015]) has allowed a very modern representation of the disease; if we do not neglect some external factors which may generate changes in the functioning of the human body – and au fond, the behaviours are external, formal causes – the disease as such is a transformation *both from within*, generated by the internal act (energy/*energeia*) or constitution of the peculiar *telos* of the organism, *entelecheia* (*Metaph.*1050a), and *from without* : as a concrete form/*sunolon* – the concrete state of the organism – that pushes the organism to stay, at least for a while, in this *sunolon*, i.e. to be sick. The disease is both the result of the *telos* of the organism, i.e. the act/the becoming of the organism according to its pattern/form, and to the *efficient* causes of health or illness (diet, gymnastics, walking). So yes, the disease arises from within, but the organism is related by many links with its environment: the temperance in diet and the moral behaviour were, for Aristotle too, manners to correct the mater-energy exchange of the organism in its environment and the body-soul unity: “all potencies are either innate, like the senses, or acquired by practice”; “not only things which are inherent in an object are its causes, but also certain external things, e.g. the moving cause”, “Health, disease, body; and the moving cause is the art of medicine“, [*Metaph.* 1047b32-33; 1070b23-25, and 30-31].

Accordingly, the natural character of cancer consists just in its origin *from within*, i.e. in the *direct internal causes*, even though they are connected with *external indirect causes* in the environment of the organism. As a result, the *remedies* are both inside the organism, arising from its internal power to self-correct, and from within. Therefore, *all* types of causes must be searched for and analysed. But some ones neglect either the causes *from within* or those *from without*.

Concerning the internal causes, one may note: some ones see only the physical-chemical causes, but others are interested in the teleological ones *too*. The first situation illustrates the well-known “dilemma” of “mechanism” vs. “teleology”; it is in fact, a childish opposition: see the demonstration of teleology in [Bechtel and Abrahamsen, 260] *mechanisms* (as structures with functions) and *dynamics*, thus

mechanisms in real time emphasising their manifestations as cyclic organisations with oscillations, are autonomous “far from equilibrium and must maintain themselves as such or die”; and that cells as interactions between molecules/molecular structures [Pebay-Peyroula et al.] are results of dissipative/irreversible processes where the internal information is part of/helps the energy transfer *ultimately from without* [Baverstock and Rönkkö]; this external environment – both internal to the living structures (organism, from organs/structures of cells) and external to it – comprises/consists of both material, i.e. physical and chemical structures and processes, and immaterial or informational structures and processes; both types of structures and processes bear and are moved by the *teloi* of the above material elements and structures; and by the *telos* of equilibrium within the living structure, and within the organism, thus considering their environments and exchanges also [Ames 2018]: “a modest deficiency of one of the nutrients/cofactors triggers a built-in rationing mechanism that favours the proteins needed for immediate survival and reproduction (survival proteins) while sacrificing those needed to protect against future damage (longevity proteins)”.

Therefore, the *teleological* comprises the impulses and ad hoc material organisations and re-organisations moved by and constituted of all the informational elements [Baverstock 2014] and mechanisms of every mentioned material element and structure and of all of them. Thus, the teleological comprises the intertwining of the *teloi* of *different levels* (organism, organs, cells, chemical substances), including of the mind and psychic: the teleological is thus the result of n “mechanical” aspects. And again: these mechanical aspects are imbued with informational ones, nowadays deciphered; this deciphering leading to the possibility of separate treatment of information/starting from information in order to manipulating the material reactions of chemical elements (see, from 2006 on, the *genetic modification* of t-cells and their reprogramming so as they could recognise the proteins on the surface of cancerous cells and destroy them [Bonifant et al. 2016; Levine et al. 2017]; or the *genetic modification* of proteins related to anti-tumour immunologic responses [Kottke et al. 2016]; or the genetically modified/reprogrammed stem cells acting directly in living organs in order to repair them, see the works of Manuel Serrano and team [2013], or to substitute them [Cai 2013; Xuan 2018]; or the nano substances transformed into carriers selectively targeting and eliminating senescent cells, [Muñoz-Espín et al. 2018]; or preventing the maturation of protein shell that surround viruses and thus stopping their ability to be infective [Wang 2017].

And with regard to the external causes: see 1) the importance of epigenetic changes for the constitution of new adaptation of organisms (only a part of highlanders have acute mountain sickness, the other part having already integrated the new internal changes in the functioning [Meier et al. 2017]), and the phenotypic plasticity, and the impact of ecological interaction on the basic biological processes [Dall 2012; Muraille 2014]; 2) [Réformes...2017]: the poverty led to the reduction of food, so not to mention the balanced and quality food. Are these external causes important, beyond our commonsensical experience that the material and spiritual conditions matter for the human life? Yes, they are: 3) see the model where

information and its carriers as substances specific to a pre-cell state act as *interface* between the cell and its environment [Baverstock 2011], and just this interface has the function of attractor – a tendency and landscape with a tendency – emphasising the importance of environmental conditions for the health of cells; and the fact of multiple factors (manifested concretely at immediate level) which may generate phenotypic plasticity in cancer cells [Jia et al. 2017]; while between those factors at immediate level we may find the extracellular matrix (the spaces between cells) and the substances filling it [Tian et al. 2013].

5.2. *Life and telos*

As it has long ago constituted, the understanding of life has arrived to the philosophical concepts of *conatus* – which is the internal *telos* of an organism to maintain itself as such – and the scientifically observed and experimented concepts of *internal stability* of the *internal environment* (*milieu intérieur*) through the entire *functioning* of the organism [Claude Bernard 1865, pp. 89–92, 122–130] that works at every level of the complex of living system.

Every life process is not only – as it was the well-known definition – a matter, energy, information *exchange* of the living system (organism but also living structures/cells) and its environment (therefore, this environment is also that inside the organism but exterior to the discussed living structure), and the constitution of *autonomy* of structures in this exchange process [Ruiz-Mirazo and Moreno 2004; Ruiz-Mirazo, Pereto, and Moreno 2004]: but also a *cognition* process where the three elements (matter, energy, information) move, evolve, transform, decay according to the learning/informational process and both the local and general results of this process and the role of ‘observer’/‘participant’ of results/transformed structures in the ensemble of the living system [Miller and Torday 2017]. This idea was emphasised by Maturana [1970, pp. 26-27]: “A living system, due to its circular organization, is an inductive system and functions always in a predictive manner: what occurred once will occur again. Its organization (both genetic and otherwise) is conservative and repeats only that which works”.

Therefore, there are “*purposes*” (*teloi*) and *functioning* of “entities” (molecules, cells, membranes, synapses, *organs* – as structures of molecules/ dynamical mechanisms leading to the same results in constant conditions – tissues, organism) *at every level*; all *teloi* and functioning influence each other, in a hierarchy of levels where there is *both* top-down and bottom-up determinism and influence, and having a relative autonomy. The functioning has to deal with all these, actually the functioning means the control of input-output dynamics at every level (ex. transport of ions; or perceptions [Mansell and Carey 2015]), including, in an indirect manner, the inter-influence of *teloi*.

Life is thus a multi-level multi-controlling combined mechanism or reorganisation (where functions are signalled by the biochemical level of molecules). “At each and every level, the properties of the whole allow a large degree of autonomy to the component parts” [Chapouthier 2018].

All of these are understandable in an integrative Newtonian *and* telic view; not only in a telic view, as some ones like to ignore the mechanism. But what does telic mean? It is not opposed to causation/"mechanical"/physical-chemical causation, but it is the appearance of "systems operating on the basis of a program of coded information" [E. Mary, 1965 in von Glasersfeld 1990], i.e. the feedback processes between different final causes where "the goal is neither outside the mechanism, nor does it lie in the future" (von Glasersfeld, *ibidem*).

At their turn, cells as attractors are stable states toward which cells tend to evolve (*telos*) / all initial states converge to (the region of convergence is basin of attraction): cells are dynamic attractors (in "young" state/proliferative; or apoptotic) important, as intermediary level, for the biochemical processes and organic processes: all telic.

Or, in other words, life is a network of n networks at *all the levels* of the organism, where all the living processes (telic) have an input-output "Newtonian" cause-effect type of relations; all processes are at the same time conservative, attractive/telic, and creative [Sabelli 2001]. The creative processes, and with all the triunity/intermediary states/unity of opposites [Khroutski 2010], create opposite (bifurcation cascades, in permanent feedback movements) [Sabelli, *ibidem*]: patterns and their transformation, diversification, complexification at all levels, imbricating in "mosaic" – "where at each and every level, the properties of the whole allow a large degree of autonomy to the component parts [Chapouthier 2018, p. 9] – create *complementary* opposites, acting in synergy (Jaros) (and even cancer does act in this way); thus these patterns are and create teleonomic systems [Jaros and Baker 1995] having telentropy – measure of the likelihood of success to reach their *telos*; the interaction of systems is a transfer of telentropy (advantageous/disadvantageous).

And: When there are "*contradictions of systemic divergence*" [Bogdanov 1921, 1980] in the organism/between the levels of control / when the integrative process does not balance or compensate the differentiation/variability / there is less complementarity than opposition: the diseases of old age and *cancer* do occur.

Cancer occurs at the level of cells, but – according to the level of health of the organism – its *telos* may counter, at least for a while, the process at the lowest level (the fact that for a while one does not perceive the signals of disease is significant). Thus, cancer occurs when the feedback loops do no longer preserve the stability, plasticity, and robustness of the organism.

Cancer occurs when the organisation/re-organisation, thus adaptation and learning, thus *autopoiesis* [Maturana 2002], face disturbing (repeated) processes of disadvantageous transfer of *telentropy* (from the cancerous cell(s) toward the rest of the organism). The bio-field resulted and manifested as matter-energy-information bio-complexity (bioelectrodynamical and bioelectromagnetic changes).

Cancer occurs when the biochemical reactions inside cells communicating with other cells and the networks of intercellular reactions generate heterogeneity and differentiation which respond to noise/information from harmful tendencies (see Koseska and Bastiaens). We must not forget: cancer is a cognitive process, as life is.

Cancer occurs as a *shift* in cells [Chu, Lee, and Cho 2015] but as a result of combined environmental stress.

Cancer occurs at local level – breaking the healthy autonomy of structures and constituting as a new autonomy – but it is the enemy of the whole organism.

Death happens when the whole organism is defeated by cancer.

When life is tired to unfold, cancer is a new life, but parasitic.

5.3. *Naturality of cancer in front of reductionism*

Thus, the first space opens the questioning of the *naturality* as such of the biological states. Is it the result of “simple” *functioning* “or” is it a *purpose* of the living being (and man, since we are interested here only about the humans)? May naturality be equated with “normality”, and may normality be defined only in terms of physiology? Can we analyse naturality only in philosophical terms, i.e. with the concepts and meanings advanced by some philosophies/philosophical schools, “or” do we have to interpret these concepts and meanings from the standpoint of/with the processes emphasised by science? What is more useful for philosophy, and for science: to stay within the paradigm framework of a certain philosophy, “or” to simply use this framework as a supplementary means to falsify the medical doctrines/better, to show the *limits* of the paradigm within which both the medical and philosophical explanations takes place?

a) For example, is it enough today to oppose the “mechanic” physical-chemical explanations and the teleological ones (or to consider, as Kant did, that neither the latter are excluded because the living would not be the simple result of the fundamental forces of nature)? Would these forces be only material, viz. physical-chemical? Is today enough to transpose the difficulty of *holistic* functioning of matter-energy-information in nature as an *epistemological* problem/problem of means of knowledge: therefore, to transpose the real, the problems at the level of the *ontos* (not of ontology) into the realm of concepts posed by reason because our practical relation to the world requires a unified integral object (as Kant said)? Is the informational necessarily of telic nature, and would the *telos* at the level of cells and organs (I use the concept of organs as in Ukhtomsky: “any transient combination of forces that can attain a specific result can be an organ” [Ilyukhina, 84]) be stronger – and how – than the *telos* at the level or organism? Aristotle said that the *telos* of the organism is that which commands to the *telos* of the inferior levels, but in the light of the present science, of cell and molecular biology for example, would it not be rather a dialectical *intertwining* of *teloi*, including as the stronger influence of the different *teloi* of the cell (*telos* of the healthy cell, *telos* of the cancerous one [Miller and Torday 2017] – leading to the inevitable death of the organism? But is this metaphorically expressed (*telos*) process not constituted by *n* processes at molecular and cell levels designing a “simple” pattern of transfers and transformations when states of “more or less” generate new compensating states and transformations [Ames 2018] in an interesting coexistence and mutual reinforcing of hierarchical and heterarchical relations? And does this metaphor of *telos* not represent the tendency to

self-formation and stabilisation of the complex system of organism, with all its specific *teloi*?

b) The philosophical problems are sketching a complicated tableau: thus, though the naturalness of human living organisms is determined only by natural causes, these causes cannot be reduced to the most basic ones, the physics-chemistry of cells. In other words, may we understand the naturalness, or even normality, of the human organism only in terms of physical laws and chemical reactions at the level of cells, or do we must conceive of not only the biological integrating processes of the organism but also the bio-psycho relationships and integration of the organism and its environment? Or do we must consider that the unity of levels of the living organism (and, larger, of the existence as such) / the completeness / totality of the object (so, which must be integral) would be determined only by the tools of our reason lain under the sign of the practical (as Kant seemed to advance as one part of the antinomy he raised)?

Therefore, if the natural causality of /within the living organisms is *complex and/but explainable in natural terms* – something which was not yet during Kant’s time – and on the other hand the ideas of the reflexive judgement/intellect faculty of man (as purposefulness) are only regulatory and not reflections of the real objective states as the determinative faculty of judgement arrives at, we must think the naturalness of the biological states neither as reducible to bottom up mechanical relations nor as a simple normativity introduced by the reason of medical doctors and researchers, but as Aristotle conceived of, as a state/”situation” of the whole organism felt and judged *from the standpoint of the subject*/the human as such [Spasov 1998], therefore the individual. There certainly are *parameters* – and, medically, protocols for grading “evidence of correlations as a means to establish causal claims in medicine and public health” [Dragulinescu, Parkkinen and Williamson] – which may measure, from without, the gradients of the functioning of the organism and its different organs, but actually naturalness is felt by the human that is the “animal which can individuate itself only in the midst of society” [Marx, 1857].

c) On the one hand, the naturalness is *felt* and after, is *thought*: consequently, it is both subjective and objective, both considered from within and from without. On the other hand, naturalness is somehow tantamount to the *good/useful/valuable* – and this is the Aristotelian/ancient basis of the treatment of diseases – and thus, to the *normal* state of the functioning of the organism and organs of the individual and, ultimately, felt as such by it. This normalcy of functioning depends, on its turn, on concrete conditions, and relevant situations of normalcy send to a larger picture of what is natural/normal/good from the standpoint of health than that supplied by a statistical analysis [Casini 2017]. Rather, from this point of view is more useful a large strand, punctuated by precise ties but offering space for objective and subjective variables: as Poincaré [1909] has showed, not everything is measurable, but only detectable.

In our Aristotelian terms, the finality of the organism arises *from within* and concerns the *whole* of that being. This Aristotelian viewpoint is all the more important as the humans are helped in order to be healthy by artificial means,

including artificial organs/functions. The whole individual may have different prostheses or organs in order to substitute the deficient or already inexistent functions. But he/she may feel good, even very good, because of the restored functions and the psychological integration, feeling and image of the self.

The end of a cancerous person is to fight cancer, to resist and to overcome it, even if for a while. The end of the medical personnel working with cancer is to help the cancerous person in his/her struggle. This situation is a *model* for all ill persons and doctors and nurses, and it is the only cause that legitimates the medical institution as such. Actually, the tackling of cancer highlights the truth (and the mutual human necessity) to consider each human being first as an *end* – therefore, assuming its morally acceptable end to fight for life, and for certain for a decent one – and only then as a *means*. Kant's *categorical imperative* forbids to considering cancer first as a means, or to considering the cancerous persons as a means for obtaining more money or for the parade of philanthropy.

To find out that one has cancer means to see the imminent death – that until this moment seemed improbable/far away, though everyone knows that he/she will die. But after the dramatic moment, the cancerous person is still the unique subject, the unique being whose death, and untimely death, is an *irreparable loss for him, the loved ones and the human species*. Once more, to help the preservation of humanity in the cancerous person – and this means of the human species in that person – is not a useless effort, “since anyway he/she will die”, but one with a high human meaning.

As a result, all the activities which consciously lead to the destruction of humanity and of the human persons – and even consciously to the development of cancers [Vltchek 2017] – appear once more as *immoral*: as if they were done by alien adversaries of the human species (see only Burtscher-Schaden, Clausing, Robinson [2017]).

d) If cancer is a *natural phenomenon* related to the impact of external facts on the healthy cell or to the internal decay of this one as a result of a complex holistic aging (of the organism, see again Bogdanov [1921, 1980], if it is a complex of disordered behaviours of cells (unlimited multiplication, premature death or too long lasting, even autophagy [Ohsumi 2001]) it is at the same time an *un-natural state*. From an *ontological* point of view: for the human being the *criterion* of naturalness is *life*, so *health* as the *sine qua non* condition of life, how finite it may be, and as a main *condition of human creation and development of meanings by humans*; consequently, a so dire disease – and as the antechamber of death – is not /is not seen as a manageable disorder leaving some room for cultural creation (culture is the *differentia specifica* of man) as a process of life: on the contrary, “cancer is not natural”, cancer is an un-natural *obstacle*, not an inanimate thing but a monstrous, deviant living, a living that destroys the normal living. Once more, the healthy human life is the *normalcy* because *only a relatively healthy human being is able to construct meanings and worlds*. By eating the human life, cancer is a parasite: which, as every parasite, dies when the suffocated organism dies.

e) But more: cancer is the questioning of the telic character of the human organism. The leading *telos* is that of the whole organism (Aristotle) and – since this

means the subordination of the *teloi* of the parts to the *telos* of the whole because, as Kant has explained in the *Critique of Judgment*, the natural (and not created by humans) things are those which are *organised* beings and, each of them, have their natural purposiveness where every part is reciprocally end and means, therefore intertwining so that “nothing is gratuitous, purposeless, or to be attributed to a blind natural mechanism” [Kant 1987, p. 255], and seeming to reflect the laws of necessity: that “nothing in such a creature is *gratuitous*” and “*nothing happens by chance*” [ibidem, p. 256] – the parts must not have their own/independent anti-holistic ends.

Therefore, how could cells overthrow the harmonic functioning of organs and organism, only this harmony realising the *telos* of the organism? Kant suggested, in the 18th century, that the harmony of the organism leads our reason to think that it would be the result of a natural purposiveness, but this is only an idea, a unity of representation of the different material/”mechanical”/natural intertwining of organs; but at the same time, said Kant, if one arrives to see the deep *telos* behind the natural processes, one must no longer think that they would depend both on natural mechanisms and natural teleology; because even the most evident mechanical processes/”blind mechanism” represent the relationships inside the organism as a whole: and “everything in such a body must be regarded as organized; and everything, in a certain relation to the thing itself, is also an organ in turn” [ibidem, p. 257].

Certainly, Kant’s image was anterior to the discovery of cells which, in cancer, seem or even *do not care about the surviving and integrity of the organism*. And he forged a theory that, first, seems un-dialectical (that teleology would exclude the “mechanical” relationships), but when one think more one grasps a beautiful dialectic. Everything is “an organ”, i.e. depending on the logic of the whole organism, or having its reason to be according to the whole organism. No organ may develop alone. But – and respecting the level of biological knowledge of the 18th century – we can imagine problems which accord with this dialectic. For example, an organ may grow in a deviated manner (for example the spine may have scoliosis), being even harmful to the organism. Nevertheless, this deviated organ may accommodate in the organism, or the organism may accustom to the deviated organ, however unpleasant and even painful is this to it. Or, a leg may be cut, but the organism survives. What is the most important is the preservation of the organism. Or, if we have in view healthy organs: all of these, deviated or healthy, must keep the organism as long as this one has its vital forces.

The natural processes in a living organism have their “mechanical” causes: the material etc. pointed by Aristotle and related to every process. But all these causes occur because all of them exist because of the *telos* of the organism.

Nowadays, this teleology is not belied by the development of cellular biology, molecular biology, biochemistry, and biophysics. These disciplines have showed only, I think, that there are *teloi* of cells etc., that these *teloi* are the result of the informational process that occurs at every level, and that there is a complex *intersection* of all the *teloi*. How does this intersection generate the *telos* of the organism – that ought to be outlined in the brain through different types of

informational processes which are stirred here – is yet to be investigated. But just the neuro-physiological research has showed that there is a strong *bottom up* determinism that correlates the parts in a coherent whole and counters the possible tendencies of deviation of different parts.

Cancer arrives – irrespective of its causes/I do not speak about its causes, and nor about the molecular and quanta, informational levels – at the level of cells. They seem to “forget” the previous normal pattern of functioning, and *normal even with bad inputs*. A new law of functioning appears. But, and obviously according to the general level of health / to the damages brought about by age and different illnesses, the organism counter a while the localised cancer. It even may offer a state of well-being. The *telos* of the organism – but certainly, this means that the body is subordinated to the mind, to the will to live/*conatus* at the level of consciousness, and all the forces of consciousness, all the stimuli are impulses consciously created by the human consciousness – is stronger than the new *telos* of cancer, and thus of the damaged *telos* of cells.

But then (and perhaps without treatment, or the proper treatment): the big *telos* of the organism losses the battle.

6. Therefore, cancer as non-natural phenomenon

If cancer is a natural phenomenon from the viewpoint of *life processes*, it is un-natural from the standpoint of *humans*. It is un-natural from a *cultural* point of view (culture is the specific difference of man).

Cancer is un-natural *for humans*, and its prophylaxis consists in re-arriving to natural conditions of the human life: but not to go back to a primitive “golden age”, but forward, through a humanistic approach.

Since cancer is a new “life”, parasiting the original / normal / natural one, it has its own *telos* (its own “form”). It opposes to the *telos* of the now de-formed organ, and to the *telos* of the organism: but this does not mean to reduce the problem of cancer to local reparations, because it is the enemy of the organism (somehow of the universe), and not only of local organs.

Therefore, fighting cancer, the focus on the internal local points must be completed with the focus on the organism-environment system (change of matter-energy-information in multi-layers organism-environment system). And although the causes of carcinogenic disorder/difference/variability/non-viability may be stored in the memory of cells, this genetic presence is in its turn a possible, not mandatory, cause of cancer; using Aristotle’s concepts, the most probable causes of cancer are the *actual* ones.

7. Cancer as enemy

Cancer is terrifying because it is – at least for the general public and for the ill persons – something which is *not understandable*: not entering the scheme about diseases people have as a result of education and experience. And since it is not understandable, cancer *cannot be controlled*: it cannot, not only with the pills and

injections, or with definitively repairing surgery, people are used to, but not even with difficult surgery and radiation.

The control of a disease means to heal it: and ultimately, even with a little – only little – loss of the integral organism. In a unanimous view, one may lose one tooth, in the worst case a kidney, but not an eye or a leg. In other words, to heal a disease means to regain one's former *routine of life* and even one's *joy of life*. But cancer is the *extreme illness*: not only because it is not curable – or not for good and all curable –, not only because the treatment period is long, painful and full of incertitude, but also because it *destroys the routine of life and the joy of life in a decisive manner*.

And, cancer is the most terrifying because the spectre of its *irreversibility* is haunting the ill person and its loved ones. *The incidence of the absolute number of cancers has increased in most of countries*, irrespective of the decrease in incidence rates for some cancers because of early prevention and treatment. The modern lifestyle did not limit the number of cancers, just on the contrary: there is, indeed, a shift “from cancers related to poverty and infections to cancers associated with lifestyles more typical of industrialized countries” [Latest global cancer data, 2018]. Therefore, the most important challenge – for doctors and researchers – is the *quest of principles and “mechanisms” of reversibility*. And in principle, it is possible: with high tech interventions [de Grey 2010].

Therefore, neither the medical research did yet arrive to the understanding of these principles and mechanisms. For my part, I only question if the *how* and the *why* followed by researchers is *public for all* the medical institutions and doctors. And: *are all the new information a public/a common good?* Are there no people who die before time because the last medical methods are not available to them?

But, since cancer is the result of the whole way of living, with all the external influences on the human organism (and mind/including mind), it is not superfluous to mention that, though the illness depends on the internal dispositions and processes of the organism and thus the individual way of life is not the only source of falling sick, the *prophylaxis involves all the conditions of life*: alimentation (with the present advertising for different sorts of ersatz and poisoned products), water, air, noise, war, fear, alienation. *The care for life is a medicine against cancer*. And the medical treatment of cancer is both *holistic* and *focused*, highly technologically: but nowadays it is subordinated to the market relations, not only to the *telos* of the medical profession.

8. Prophylaxis of cancer

Since cancer is a *total* illness – involving all the aspects of a localised and generalised disease – its prophylaxis must be global too. In general, this prophylaxis is tantamount to the keeping of a *healthy lifestyle*. But what does a healthy lifestyle mean?

Let's put first the *physiological* condition (the well-known precepts):

- To not smoking,
- not drinking (too much)

- to eating many fruits and vegetables, less meat (fish and chicken), natural juices and teas, not milk but buttermilk, grains and germs, not (white) bread, etc.
- permanent use of internal purifications
- gymnastics/physical exercises”
- But we meet pieces of advice recommending to *not eat bought yoghurt, but to prepare at home cow cheese and yoghurt, and cultivate in one’s own kale yard the vegetables / or “buy ‘ecologic’”*.
- And at the same time, we are overwhelmed with *advertising for margarine and other products already scientifically proven to being harmful*. Is this not a conscious coming down with harmful information? (the notion *informatonosis* has been researched from 1999 on by Rudolf Klimek and team [Jasiczek, Klimek, Tadeusiewicz 2013]).

Who has the *time* and *money* to focus on this preventive life, since the daily schedule is related to a focus on (creative) work, social relations and help? Besides the habit to have a healthy lifestyle, this style needs help at least from the family members (in a familial “division of labour”).

Is it enough? And *are all of these materially possible for all?* Physiology means healthy physiology, but it is related to *other* human needs (in the well-known Maslow pyramid). Thus a healthy lifestyle comprises also the *psychological* condition. A good psychological condition is a *balanced* one (in order the human to feel good in his/her own skin, let’s remember the ancient stoic *oikeiosis*). Put in a *negative* form, the balanced psychological condition means:

- *To not fear that you cannot afford eating what is necessary to a decent healthy life;*
- *To not fear that you cannot afford paying your bills related to the everyday obligations;*
- *To not fear that you cannot afford a family and raising children (and raising them in a healthy – natural and social – environment);*
- *To not fear that you are lied by those who decide your life (to not fear that you have only formal freedom);*
- *To not fear the obstacles preventing you to having a decent life are permanent (to not fear the violence of the surrounding milieu and to not be violent);*
- *To not fear that you cannot manifest your creative powers and that you will be obliged “by the life/destiny” to spend the lifetime in humdrum/absurd/harmful for people/infamous activities [McKone 2013; Furedi 2006].*

Put in a *positive* form, a healthy lifestyle/psychological condition means:

- *To be aware of one’s own actions, motives and subjective conditions (Brăzdău 2013);*

- *To be aware of the results of one's own action: both on short and long term, and both concerning the individual and his loved ones and the other fellow humans, including those far away from the individual's circle;*
- *To be aware of the external conditions of one's own actions, motives and results;*
- *To be aware of the interdependence of one's own survival and the survival of other fellow humans, including those far away from the individual's circle;*
- *To be aware of the interdependence of one's own well-being and the well-being of other fellow humans, including those far away from the individual's circle;*
- *To be aware of the insufficiency of the individual goals, and to be aware of the existential human need of a social ideal [(something what Maslow conceived of as *self-transcendence*); but this *social ideal* means: 1) to transcend one's own egotism; and it is not the belief in religious transcendence; 2) the social ideal is more than a certain social goal, such as the simple and isolated anti-war sentiment; 3) to be aware of the necessity of *self-transcendence*]; all of these sending to the old cardinal importance of the human *reason* and *responsibility*;*
- *And to be aware of the consequences of different social ideals (to anticipate).*

Consequently, a healthy lifestyle means also a *social* condition:

- *To be sensitive to other humans, including to those far away from us, not only to need one's own belongingness to different groups (psychologically, this aspect is the *empathy*, or in the old word, *sympathy*);*
- *To recognise the humanity of others, irrespective of their distance from us/from the groups we belong to;*
- *To may put/imagine oneself in the concrete condition of others, irrespective of their distance from us/from the groups we belong to.*

May we ignore the *managing* condition implied in a healthy lifestyle?

- *To master/control oneself (this is the ancient *sophrosyne*);*
- *To deliberate (since awareness supposes deliberation);*
- *To have a reasonable speed of decision;*
- *To have a reasonable speed of action;*
- *To will things reasonable and fuelled by the social ideal;*
- *To dare to act in a consistent manner for these things.*

All of these are the ancient virtues, revisited in our modern times [Bazac 2017; Galtung 2017]. But we can add new modern concepts as

- *Dignity (in Maslow, this corresponds to the *recognition* by others – part of *belonging*; but dignity is more than recognition, it is esteem by others);*

- *To adapt* (that is not tantamount to simple conformism, but to self-judging).

Methodological warnings: 1) all features intertwine and every one of them supposes all the other ones (as the calculative *intellect* cannot be separated from *reason*); 2) the reaction and the purpose are intertwined in the functioning of each and all levels of the living organism; 3) therefore, the healthy life is not reducible – as some ones think – to physiology and simple abundance concerning the material needs; 4) therefore, the will to have an *individual* healthy lifestyle with preventive virtues is not enough; 5) and the external, social *conditions* have the same importance as the individual will.

The organism's *entelecheia* is related to different external *entelecheia*.

9. Instead of conclusion: how to fight cancer?

Accordingly to the above elements, the humans have to fight cancer when it is not, and not only when it is. And the first requirement of this battle is that of the consciousness of the inherent/inevitable/"natural" dialectical existence of the human individual as both finite *individual* and *participant to the constituting of the human species*, i.e. *bearer of humanity* and *responsible for the humanity of the species*.

The humans are moving living beings which, in the processes of perception and operation (including reaction), give *meanings* to meaningless objects and then live according to the surrounding objects/space/more comprising environment which are meanings-carriers. Neither the objects – as well as the other humans – are neutral after their relations with humans and nor the meanings are objective, unilateral and given once for all. And since the humans born in already existent societies, thus complexes of meanings, they are not only meaning-constructors but also meaning-receivers. But, in contradistinction to the animals [von Uexküll 1982], the reception and construction of meanings by humans are *socially* mediated, and at much lesser extent instinctually. People connect to each other through the sharing and confronting of meanings. These meanings get the form of *values* too, having the strongest force towards all meanings, obviously stronger than the simple animal instincts, since even the force and promotion of these instincts in humans need the values legitimising them in order to manifest. Well, the most important values are those forming the ancient triptych: *the truth-the good-the beautiful* as the meaning of the human life. Though philosophers have separated these values from the problem of the meaning of life – discussing only their logic, epistemology or aesthetical importance –, in the last instance just their unity giving the meaning of life explains all their meanings and depth.

Further, people judge and prefer some values in accordance with the dominant ideas from a society. These dominant ideas – as all the ideas about society – are socially framed, reflecting, more than the complexity of the power relations as relations of forces within a society, the interests of the ruling strata. Since ideology is the characterisation of ideas as reflecting social positions, within the power relations, people judge ideologically. Thus, the meanings are not pure individual constructs, but *ideas* created with the ideologically coloured *concepts* of *society*.

Well, the routine of life means that people do not have time to think to the *meanings* of life and the *distant* consequences of facts, but rather to the immediate observations, tasks and correlations. But cancer – as the old age – leads to the preoccupation for the *significances* of thoughts, attitudes, decisions and results in particular moments but also in the whole life until then.

This is when and just because people confront the problem of *irreversibility*. Generally, this problem – and related not only to death but to the reactions and actions of the human beings – was not had in view, neither by philosophy and nor by the pragmatic domains. Nevertheless, the understanding of irreversibility as a landmark of the human life is imperious for the (ethical) education of the general public concerning irreversibility.

Yes, people know that their life in the *present* unique form on Earth is finite. Over time, they have imagined different manners and forms of their *individual* continuity after death. This was a solace for them and the importance of deities arose not only from the imagined omnipotence of these ones concerning the earthy life and destiny, but also from the function of guaranteeing the individual life after death. This life was to be that of the individual soul, the hoard amassing all the ideas and feelings the humans thought as giving them their worth and, again, their uniqueness. But what does it happen when people have matured enough so as to understand that the deities are only comforting ideas? Heidegger said that the fact of knowing that they will die puts people in the situation to live only in the present individual horizon. They certainly care about their dear ones and about the surrounding milieu conditioning their individual life, but that's all. They are beings-toward-death, there is no alternative for this, and the entire humanity of the humans consists of their little *everyday care* and *anxiety*: concerning the inevitable death and the appearance of uselessness of their life and efforts, countered only by the ideas which will not die only if they materialise in books or artworks or technology. However, these creations are exterior to humans and determine them from without and in an inexorable way: and do not even counter their death. The moral of this view – but, as we know very well, Heidegger did not deal with morality – was a deep pessimism, a profound sense of hopelessness of the human life. Man has appeared on Earth by accident, the individuals are mortal, and the meanings given by them during their finite life vanish. *Not the content of life was determinant for Heidegger, but death as proof of finitude.*

Before Heidegger, Nietzsche has considered that nevertheless there is a hope: the moral transformation of society, and its members. If so, well, but with what result, or why would be this transformation so valuable? The individuals are still mortal, are they? Or this has to do with the *joy of life*, mentioned by Bergson but not strange to Nietzsche?

The job of doctors is to prolonging the life of individuals and to healing them in order to taste this *joy of life*. But since the denouement is known – the more so in cancer – and the joy of life so ephemeral, what is the sense of their effort?

The joy of life is unique for every individual. But it does not concern only individual feelings and scopes. The (certainly, historical) limit of Heidegger was his incapacity to confront and understand the *dialectic* of the *human individual* and the

human species. (And the human individual is a *species being* because “*he makes the fate and fortune of the entire species his object*” [Margolis 1992, p. 332]). The course of the individual life is irreversible. But the species is living; and develops with the contribution of the life of every individual. As the individual may develop only in the midst of society – as Marx said – as the species survives only through the catena of individuals who live.

But only life is not enough. Life needs *content* (rich human relationships, creation, love, mutual help, generosity, solidarity), and the richer is the content the richer is the human life as such. *The human species survives only when the content of the life of its individuals is rich.*

The process of enrichment of the content of life supposes, obviously, rich experiences. Medicine helps this process. It helps to preserve such a healthy organism that humans may taste and create meanings which enrich the others and support their joy of life. The human intelligence consists in the capacity to make correlations and understand the *why*, as Aristotle’s causal approach has substantiated this. (But see a present analysis of the models and graphical tools of the causal reasoning [Pearl 2018]). But this capacity depends on *what* one puts in relation. If the meanings put in correlations are scanty – as in the phase of decrepitude, when the meanings of life are narrowing – the human intelligence can no longer moving forward. Briefly, the cardinal meanings which condition the rich and beautiful content of life are the *good behaviour/well-doing* so as to become, after death, a bed of “humus” for the memory and deeds of those remained, and the *assumption of a social ideal*.

The ill man, and even more the cancerous person, struggle with the disease as an individual. He/she focuses only on his/her state and struggle. This situation – when he/she neglects the others (letting aside the loved ones, others are important only as aid for him/her), or more exactly brings out the others/concretely, the *koinonia* (Aristotle), the human community/society from his/her universe of thoughts – does not help him/her. On the contrary, it impoverishes, weakens him/her.

Consequently, and this is my point, all humans, and including the ill persons, are, and must consider themselves, as *parts of the species*. Every individual is a mirror of the species, showing its stage, triumphs and weaknesses, but thus the individual must not only expect from the species/from the others, but also must mind the species. The care for the species and society, the altruistic preoccupations, must be permanent, including – and even *especially* – during illnesses. Feuerbach said that God signifies also the human community with which the believer talks, disputes and which it begs and puts his full hope within. Thus, God is an intermediary. The present cancerous persons who pray and are advised to pray are not only reduced to the relationship only with this intermediary, but also to the impoverished self-image of being only an individual. They are not taught that they are also members of the human species. And as a result, they are alone and frightened in front of death. They “know” that their death is definitive, even though they hope to live forever in the world of spirits allowed by God.

But if people consider themselves as members of the human species, they are more peaceful (somehow as the old Dacians considered death as the gateway toward

eternal life): they know that they do not/will not fully die: they *will survive as/within the human community*. And, the more they were preoccupied for its issues, the more they fought the factors limiting the humanity of *all the human persons*, the more they feel as future survivors.

The means to attain this view is the altruistic and disinterested behaviour *towards the encountered people*. This is the first proof of benignity assuring that you have chosen the right way in your life.

And the means to attain this view is the *social ideal*, the altruistic wish related – more than to the individual well-being or happiness – to the creative development of *all human beings*. The social ideal synthesises and gives the ultimate purpose of the human existence: as all the great religious reformers and philosophers have searched for, but did not arrive to it (Actually, the proof of this fact is Nietzsche's conclusion of *eternal return* showing that *there is no end or aspiration to an end* in the cyclical movement manifested in this model of answers to the meaning of life in all the religious and secular worldviews specific to the societies based on the ruptures between the individual and society). To have as a beacon the social ideal follows Aristotle's thoughts that *justice* is the best or even the whole of Virtue because it means to practice virtue "towards others", not towards oneself (*N.E.*, 1130a). And that: the most important goal of the rulers is to govern with justice, and if "it is the duty of the law-giver to make the whole city happy", "happiness cannot belong to the whole and not to its parts" (*Pol. II*, 1264b). Therefore, if the individual ideal is the individual happiness – and every man aspires to it, but (Aristotle) it's more valuable and more difficult to assure and support the happiness of the community, and this means of every part of it, in other words, every man must be able to, as Pindar (3. 62-63), the lyric poet said before Aristotle, ("Do not crave immortal life, my soul, but) *use to the full the resources of what is possible*" (my emphasis) – the social ideal is the active factor aiming to assure such social relationships so that every human being may use up the field of the possible. *Every human being must have a rich and soul-uplifting content of life.*

In fact, the reduction of behaviour – and accordingly, of the human horizons – to the kindness towards the encountered people (the close ones and the randomly encountered ones) is not enough: the proof is the coexistence of interpersonal love and kindness with depression and loss of the sense of life, but the reason is that the meanings given by humans to their life, these meanings generating different rhythms of life, reflect *the perception they have about their engagement into short or long term processes*. Their commitment into short term processes/short/truncated amplitude processes seems to them not enough. The balanced behaviour and *optimism*, a sine qua non condition of the human life (and illnesses), depends just on the amplitude and long term processes the humans are involved and act within.

To have as a permanent *priority* the social ideal allows both the enrichment of the *content* of life and *resources to fight the suffering of a final illness*. The solution I see is to transform every ill person in a fighter not only for one's own health, but also for social justice and bright future of humanity. To surpass the generalised model of selfish individual may be a strong compensatory factor of the shock and suffering of

illness. But to do this is a difficult educative and transformative process. Philosophy has helped – from Aristotle’s activism to Kant’s categorical imperative – and still helps; actually, it is the main basis and support of this process. The well-known intentionality of the consciousness (Husserl) becomes the living in an intentional manner (“living intentionally”), conscious of and aiming at a meaningful life [Lindstrom 2016].

Therefore, to fight cancer involves a change in the education of society. A new worldview where the social ideal is the backbone, and death means only to re-melting in the Big Whole of the universe is related to a rich content of life: and the regret of the dying is not as excruciating as when his/her life and unique source of creativity were wasted.

Doctors are a part of the educators of society. In fact, all humans are – and in chief must become – educators, conscious beings about the ends and stakes of their activity and life, but doctors may be more active and concerned with the education of patients as “militants” until their last bit of the heart.

To fight cancer is a very *un-natural* phenomenon: it is *cultural*, of course. But the content of culture is the *responsibility* of humans.

References

- Ames, Bruce N. (2018). “Prolonging healthy aging: Longevity vitamins and proteins”, *PNAS*, published ahead of print October 15, 2018
<https://doi.org/10.1073/pnas.1809045115>.
- Aristotle. (1989). *Metaphysics*, in *Aristotle in 23 Volumes*, Vols.17, 18, translated by Hugh Tredennick (1933), Cambridge, MA, Harvard University Press; London, William Heinemann Ltd.
- Aristotle. (1934). *Nichomachean Ethics*, in *Aristotle in 23 Volumes*, Vol. 19, translated by H. Rackham. Cambridge, MA, Harvard University Press; London, William Heinemann Ltd.
- Aristotle. (1944). *Politics*, in *Aristotle in 23 Volumes*, Vol. 21, translated by H. Rackham. Cambridge, MA, Harvard University Press; London, William Heinemann Ltd.
- Baverstock, Keith. (2011). “A comparison of two cell regulatory models entailing high dimensional attractors representing phenotype”, *Progress in Biophysics and Molecular Biology*, Aug., 106(2):443-9. doi: 10.1016/j.pbiomolbio.2011.01.002. Epub Jan 31.
- Baverstock, Keith. (2013). “The role of information in cell regulation”, *Progress in Biophysics and Molecular Biology*, 111 (2-3), pp. 141–143.
- Baverstock, Keith and Mauno Rönkkö. (2014). “The evolutionary origin of form and function”, *Journal of Physiology*, Jun 1; 592(Pt 11): 2261–2265. Published online 2014, May 30. doi: [10.1113/jphysiol.2014.271775](https://doi.org/10.1113/jphysiol.2014.271775).
- Bazac, Ana. (2014). “Fidelity towards forms: an ontological approach” I, *Agathos: An International Review of the Humanities and Social Sciences*, Volume 5, issue

- 2, 2014, pp. 52–62, and “Fidelity towards forms: an ontological approach”, II, *Agathos: An International Review of the Humanities and Social Sciences*, Volume 6, Issue 1, 2015, pp. 24–40.
- Bazac, Ana. (2017). “Aristotle, the names of vices and virtues: what is the criterion of quantitative evaluation of the moral behaviour?”, *Dialogue and Universalism*, Volume 27, Issue 4, 2017, Values and Ideals. Theory and Practice: Part V, 175–188.
- Bechtel, William and Adele Abrahamsen. (2011). “Complex Biological Mechanisms: Cyclic, Oscillatory, and Autonomous”, pp. 257–285, in *Handbook of the Philosophy of Science. Volume 10: Philosophy of Complex Systems*, Volume editor: Cliff Hooker, Amsterdam, Elsevier.
- Bernard, Claude. *Introduction à l'étude de la médecine expérimentale*, Paris, Baillière et Fils, 1865.
- Bogdanov, Alexandr. (1980). *Essays in Tektology* (1921), Translated by George Gorelik, Seaside, Ca., Intersystems Publications.
- Bonifant Challice L.; Hollie J. Jackson, Renier J. Brentjens, Kevin J. Curan. (2016). “Toxicity and management in CAR T-cell therapy”, *Molecular Therapy Oncolytics*, vol. 3.
- Brăzdău, Ovidiu. (2013). “The Consciousness Quotient': introducing the consciousness experience as a research variable in psychological assessment”, http://www.consciousness-quotient.com/wp-content/uploads/2013/03/Consciousness-Quotient-Ovidiu-Brazdau-TSC-2013-Talk-on-CQ_2.pdf.
- Burtscher-Schaden, Helmut; Peter Clausing, and Claire Robinson. (2017). *Glyphosate and cancer: Buying science (How industry strategized (and regulators colluded) in an attempt to save the world's most widely used herbicide from a ban)*, Vienna, Global 2000, Glyphosate_and_cancer_Buying_science_EN_0pdf.
- Cai, Jinglei et. al. (2013). “Generation of tooth-like structures from integration-free human urine induced pluripotent stem cells”, *Cell Regeneration*, 2:6, <https://doi.org/10.1186/2045-9769-2-6>.
- Capra, Frijof. (1988). *The Turning Point* (1882), New York, Bantam Books.
- Casini, Lorenzo. (2017). “Malfunctions and teleology: On the (dim) chances of statistical accounts of functions”, *European Journal of the Philosophy of Science*, 7, pp. 319–335.
- Chapouthier, Georges. (2018). *The Mosaic Theory of Natural Complexity: A Scientific and Philosophical Approach*, Paris, EMSHA Éditions.
- Chu, H.; Lee, D., Cho, Kh. (2015). “Precritical State Transition Dynamics in the Attractor Landscape of a Molecular Interaction Network Underlying Colorectal Tumorigenesis”, *PloS One*, Oct 6;10(10):e0140172. doi: 10.1371/journal.pone.0140172. eCollection 2015.
- Dall, Sasha R.X.; Alison M. Bell, Daniel I. Bolnick, Francis L. W. Ratnieks. (2012). An evolutionary ecology of individual differences, *Ecology Letters*, <https://doi.org/10.1111/j.1461-0248.2012.01846.x>.

- de Grey, Aubrey, with Michael Rae. (2008). *Ending Aging: The Rejuvenation Breakthroughs That Could Reverse Human Aging in Our Lifetime*, New York, St. Martin's Griffin.
- Dragulinescu, Stefan; Veli-Pekka Parkkinen, Jon Williamson. Grading evidence of mechanisms in physics and biology, <http://blogs.kent.ac.uk/jonw/projects/grading-evidence-of-mechanisms-in-physics-and-biology>.
- Furedi, Frank. (2006). *Culture of Fear Revisited* (1997), London, Continuum.
- Galtung, Johan. (2017). *Freud-Einstein On Peace*, June 26, <http://www.eurasiareview.com/26062017-freud-einstein-on-peace-oped>.
- Hagopian, Joachim. (2015). *Big Pharma and Post Traumatic Stress Disorder (PTSD): The Deadly Toll that Permanent War Takes on US Soldiers, Awaits the Rest of Us*, January 24, <http://www.globalresearch.ca/big-pharma-and-post-traumatic-stress-disorder-ptsd-the-deadly-toll-that-permanent-war-takes-on-us-soldiers-awaits-the-rest-of-us/5426666>.
- Ilyukhina, Valentina A. (2015). "Contributions of Academicians A.A. Ukhtomsky and N.P. Bechtereva to Multidisciplinary Human Brain Science." In *Anticipation: Learning from the Past. The Russian/Soviet Contributions to the Science of Anticipation*, Mihai Nadin Editor, 81–100. Heidelberg New York Dordrecht London: Springer.
- Jaros, Gyorgy G. *Synergy of Complements in Living Systems*, <http://www.iss.org/primer/jaros.htm>.
- Jaros, G.G. and A.B. Baker. (1995). "Safety and Accidents in Anaesthesia: The Use of Teleonics", in *Systems for the Future: Proceedings of the Australian Systems Conference*, pp. 33–39.
- Jasiczek, Dariusz; Rudolf Klimek, Ryszard Tadeusiewicz. (2013). "Informatonosis – an information disease affecting the society", in Rudolf Klimek, Dariusz Jasiczek, Ján Štencl, *Explained Cause of Cancer*, Krakow, Hermes Management, pp. 79–84.
- Jia, D.; M.K. Jolly, P. Kulkarni, H. Levine. (2017). "Phenotypic Plasticity and Cell Fate Decisions in Cancer: Insights from Dynamical Systems Theory", *Cancers*, Jun 22;9(7). pii: E70. doi: 10.3390/cancers9070070.
- Kampmark, Dr. Binoj. (2017). *Warring in the Oncology Ward*, February 24, <http://www.globalresearch.ca/warring-in-the-oncology-ward/5576458>
- Kant, Immanuel. (1987). *Critique of Judgment* (1790), Translated, with an Introduction, by Werner S. Pluhar, Indianapolis/Cambridge, Hackett Publishing Company.
- Khrousaki, Konstantin. (2010). All-embracing (triune) medicine of the individual health: a biocosmological perspective », *Journal of Future Studies*, 14/4, p. 65–84.
- Koseska, Aneta. Philippe Bastiaens. (2017). "Cell signalling as a cognitive process", *EMBO J.*, Mar 1; 36(5):568–582. doi: 10.15252/embj.201695383. Epub 2017 Jan 30.

- Kropotkin, P. (1893). “On the Teaching of Physiography”, *The Geographical Journal*, Vol. 2, No. 4 (Oct.), pp. 350–359.
- Latest global cancer data...*, 12 September 2018, International Agency for Research on Cancer, World Health Organization, Press release No. 263.
- Kottke, Tim; Kevin G. Shim, Vanesa Alonso-Camino, Shane Zaidi, Rosa Maria Diaz, Jose Pulido, Jill Thompson, Karishma J. Rajani, Laura Evgin, Elizabeth Ilett, Hardev Pandha, Kevin Harrington, Peter Selby, Alan Melcher, Richard Vile. (2016). “Immunogenicity of self tumor associated proteins is enhanced through protein truncation”, *Molecular Therapy Oncolytics*, vol.3, 16030. eCollection 2016.
- Levine, Bruce L.; James Miskin, Keith Wonnakott, Cristopher Keir. (2017). Global Manufacturing of CAR T Cell Therapy, *Molecular Therapy Oncolytics*, pp. 92–101.
- Lindstrom, Simeon. (2016). *Intentional Living: How To Not Die With Regrets By Living A Life That Matters*, Create Space Independent Publishing Platform.
- Mansell, Warren, and Timothy A. Carey. (2015). “A perceptual control revolution?”, *The Psychologist*, vol. 28, no. 11, pp. 896–899.
- Mansell, W., & Marken, R. S. (2015). The origins and future of control theory in psychology. *Review of General Psychology*, 19(4), 425–430, <http://dx.doi.org/10.1037/gpr0000057> .
- Margolis, Joseph. (1992). “Praxis and Meaning: Marx's Species-Being and Aristotle's Political Animal”, *Marx and Aristotle: Nineteenth-century German Social Theory and Classical Antiquity*, Edited by George E. McCarthy, Savage (Maryland), Rowman & Littlefield Publishers, Inc., pp. 329–355.
- Marx, Karl. (1857). *Grundrisse: Introduction*, <https://www.marxists.org/archive/marx/works/1857/grundrisse/ch01.htm>
- Maturana, H. (1970). *Biology of cognition*. BCL Report Nr. 9.0. Urbana, Ill.: University of Illinois.
- Maturana, H. R. (2002). “Autopoiesis, structural coupling and cognition: A history of these and other notions in the biology of cognition”, *Cybernetics & Human Knowing*, 9 (3–4), pp. 5–34.
- McKone, Anita. (2013). *Fearless and Fearful Psychology*, <https://anitamckone.wordpress.com/articles-2/fearless-and-fearful-psychology>
- Meier, David; Tinh-Hai Collet, Isabella Locatelli, Jacques Cornuz, Bengt Kayser, David L. Simel, Claudio Sartori. (2017). “Does This Patient Have Acute Mountain Sickness?: The Rational Clinical Examination Systematic Review”, *JAMA – The Journal of the American Medical Association*, 318(18):1810, November.
- Miller W.B. Jr., Torday J.S. (2017). “A systematic approach to cancer: evolution beyond selection”, *Clinical and Translational Medicine*, Dec; 6(1):2. doi: 10.1186/s40169-016-0131-4. Epub 2017 Jan 3.
- Muñoz-Espín, Daniel et. al. (2018). A versatile drug delivery system targeting senescent cells. *EMBO Molecular Medicine*, e9355 DOI: [10.15252/emmm.201809355](https://doi.org/10.15252/emmm.201809355)

- Muraille, Eric. (2014). Generation of individual diversity: a too neglected fundamental property of adaptive immune system, *Frontiers in Immunology*, 13 May, <https://doi.org/10.3389/fimmu.2014.00208>.
- Ohsumi, Yoshinori. (2001). “Molecular dissection of autophagy: two ubiquitin-like systems.” *Nature Reviews Molecular Cell Biology*. 2 (3): 211–6. March, *PMID 11265251*. [doi:10.1038/35056522](https://doi.org/10.1038/35056522).
- Pearl, Judea and Dana Mackenzie. (2018). *The Book of Why: The New Science of Cause and Effect*, New York, Basic Books.
- Pebay-Peyroula, Eva; Hugues Nury, François Parcy, Rob W. H. Ruigrok, Christine Ziegler Leticia F. Cugliandolo (Eds.) (2014). *From Molecules to Living Organisms: an Interplay Between Biology and Physics*, Oxford, Oxford University Press.
- Pindar. (1990). *Pythian*, 3, 62-63, Odes. Pindar. Diane Arnson Svarlien.
- Plato. (1967). *Gorgias* in *Plato in Twelve Volumes*, Vol. 3 translated by W.R.M. Lamb. Cambridge, MA, Harvard University Press; London, William Heinemann Ltd.
- Plato (1969). *Republic*, in *Plato in Twelve Volumes*, Vols. 5 & 6 translated by Paul Shorey. Cambridge, MA, Harvard University Press; London, William Heinemann Ltd.
- Poincaré, Henri. (1909). «Lettre à Léon Walras», in Léon Walras «Économique et mécanique», *Bulletin de la Société Vaudoise de Sciences Naturelles*, Vol. 45, pp. 313–325 (pp. 12-13).
- Ruiz-Mirazo, K. and A. Moreno. (2004). Basic autonomy as a fundamental step in the synthesis of life. *Artificial Life*, 10, pp. 235–259.
- Ruiz-Mirazo, K., J. Pereto, and A. Moreno. (2004). “A universal definition of life: Autonomy and open-ended evolution”. *Origins of Life and Evolution of the Biosphere*, 34, 2004, pp. 323–346.
- Sabelli, Hector. (2001). “The Co-Creation Hypothesis”. In: Gillian Ragsdell, Jennifer Wilby (eds), *Understanding Complexity*. Springer, Boston, Ma, pp. 19–29.
- Spasov, Spas. (1998). “Biological Teleology in Contemporary Science”, 20th World Congress of Philosophy, Boston, Ma. <http://www.bu.edu/wcp/Papers/Scie/ScieSpas.htm>.
- Tian, Xiao; Jorge Azpurua, Christopher Hine, Amita Vaydia, Max Myakishev-Rempel, Julia Ablava, Zhiyong Mao, Eviatar Nevo, Vera Gorbunova, Andrei Seluanov. (2013). “High-molecular-mass hyaluronan mediates the cancer resistance of the naked mole rat”, *Nature*, Letter 19 June.
- Vallis, Rhyll and Sohail Inayatullah. (2016). “Policy metaphors: From the tuberculosis crusade to the obesity apocalypse”, *Futures*, Vol. 84, Part B, November, pp. 133-144, <https://doi.org/10.1016/j.futures.2016.04.005>.
- Vltchek, Andre. (2017). *Middle Eastern surgeon speaks about the “Ecology of War”*, 01 May, <http://www.investigacion.net/en/middle-eastern-surgeon-speaks-about-the-ecology-of-war/>.
- von Glasersfeld, Ernst. (1990). “Teleology and the Concepts of Causation”. *Philosophica*, 46 (2), pp. 17–43.

- von Uexküll, Jakob.(1982). “The Theory of Meaning” (1940), *Semiotica*, 42-1, pp. 2-82.
- Wang, Mingzhang et al. (2017). “Quenching protein dynamics interferes with HIV capsid maturation”, *Nature Communications*, volume 8.
- Xuan, Kun; Bei Li, Hao Guo, Wei Sun, Xiaoxing Kou, Xiaoning He, Yongjie Zhang, Jin Sun, Anqi Liu, Li Liao, Shiyu Liu, Wenjia Liu, Chenghu Hu, Songtao Shi, Yan Jin. (2018). “Deciduous autologous tooth stem cells regenerate dental pulp after implantation into injured teeth”. *Science Translational Medicine*, 10 (455): eaaf3227 DOI: [10.1126/scitranslmed.aaf3227](https://doi.org/10.1126/scitranslmed.aaf3227)