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HUMANITIES AND HEALTH

## The jibarization of logos: how medical reductionism can kill<sup>☆</sup>



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**Abstract** In recent decades, a disciplinary and sub disciplinary proliferation has been triggered both in the medical fields and science in general. This trend may be partially explained by two diachronic, dialectically interconnected facts: the deepening of the technical, social and international division of labor in the globalized capitalist world, and the triumph of the reductionist program, mainly developed by the logical empiricism of the Vienna Circle. This paper aims to deepen the debate on the intricate links between medicine, biology, philosophy, reductionism, and complex thought, by using two examples: a current clinical case report and the situation experienced by a famous American scientist, Stephen Jay Gould, about his first cancer, an abdominal mesothelioma. We have witnessed how the two above-mentioned historical facts have been operating as a super-structure like a pair of “tweezers”, dismembering and compressing at the same moment the object of knowledge, the theories that allow their study, and the subject that receives the knowledge. This *jibarization of knowledge* is a real problem for public health, from the moment that it impacts, omnipresent, in the actual hegemonic medical model, leading to potentially dangerous attitudes in the various components of health systems.

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### PALABRAS CLAVE

Programa  
reduccionista;  
Pensamiento  
complejo;

**La jibarización del logos: sobre cómo el reduccionismo médico puede matar**

**Resumen** En las últimas décadas, se ha desencadenado una verdadera proliferación disciplinar y sub-disciplinar, tanto en el ámbito médico como en la ciencia en general. Esta tendencia podría ser parcialmente explicada por dos hechos diacrónicos e interconectados

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Filosofía de la biología;  
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Iatropatogenia;  
Salud pública

dialécticamente: 1) la profundización de la división técnica, social e internacional del trabajo del mundo capitalista globalizado, y 2) el triunfo del Programa reduccionista (PR), desarrollado principalmente por el empirismo lógico del Círculo de Viena. El presente trabajo tiene por objetivo ahondar el debate sobre los intrincados vínculos entre la medicina, la biología, la filosofía, el reduccionismo y el pensamiento complejo, a partir de la utilización de dos ejemplos: un informe de caso de la medicina actual y la situación experimentada por un afamado científico norteamericano, Stephen Jay Gould, a propósito de su primer cáncer, un mesotelioma abdominal. Hemos observado cómo los dos hechos históricos antes mencionados han venido operando como una súper-estructura de "pinza", descuartizando y comprimiendo al mismo tiempo al objeto a conocer, a las teorías que permiten su estudio y al propio sujeto que recibe el conocimiento. Esta *jibarización del logos* constituye un verdadero problema para la salud pública, desde el momento en que impacta, omnipresente, en el modelo médico hegemónico actual, propiciando actitudes potencialmente peligrosas para los diversos integrantes de los sistemas de salud.

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## 1. Introduction

In recent decades, both in medicine and science in general, the degree of compartmentalization in discipline sub disciplines has reached very high levels.<sup>1-3</sup> This pattern could be partially explained by at least two events a priori, diachronic but dialectically intertwined, which can be seen from a historiographical perspective of science as externalist and internalist, respectively: the increasingly exacerbated technical, social and international division of labor in the capitalist world, grounded in the foundational work of Adam Smith,<sup>4</sup> i.e. *Inquiry into the nature and causes of the Wealth of Nations* (known as *Wealth of Nations*<sup>5</sup>) and which materialized to a greater extent, due to the arrive of Henry Ford's industrial serial production system in series;<sup>6</sup> and the influence of the reductionist program (RP), constituted as such due to the efforts, mainly by members of the Vienna Circle, back in the 30s and subsequent years.<sup>3,7,8</sup>

In particular, this compartmentalization of medical knowledge is one of the essential characteristics of what Eduardo L. Menéndez referred to as the hegemonic medical model (MMH).<sup>1</sup> MMH is defined by the set of practices, knowledge and theories generated by the development of what is known as scientific medicine and biomedicine.<sup>1</sup>

This work aims to deepen the debate about the intricate - and never exhaustively analyzed - links between medicine, biology, philosophy, reductionism and complex thought, based on the use of two examples: a current clinical case and the situation experienced by a famous American scientist, Stephen Jay Gould, about his first cancer, an abdominal mesothelioma. Furthermore, it looks to underpin the invaluable contribution made by Viniestra-Velazquez.<sup>9,10</sup> However, it must be recognized that the ultimate aim of this text is to try to influence the professional ethics of the pediatrician. The goal is to challenge it, with the aim of promoting a critical and introspective review of its medical practices, highlighting the dangers that reductionism thinking brings to public health.

## 2. Discipline and sub discipline division: *ad infinitum fragmentation?*

When Adam Smith<sup>4</sup> analyzed the division of labor, fell bluntly in a reductive and misleading logic, using the analogy between "small and simple" and "large and complex" to infer, from individual premises, social conclusions.<sup>5</sup> Without going any further, the very notion of division of labor, introduced by him, is a category that Smith used to describe two very different processes. On the one hand, he uses the term to refer to the deepening of productive units (a craftsman or a workshop), which step by step begin to specialize in a few or even a single product. However, he also uses the notion of division of labor to refer the fragmentation of the production process in multiple operations that are carried out by different workers in the same workshop or within a factory. Then, using the same category to refer the separation between various manufacturing processes and the division of tasks within a manufacture.<sup>5</sup> The real problem appears when Adam Smith seeks to equate the two notions of division of labor, driving the leading nature of the first (i.e. the *social* division of labor) from the description of the second (i.e. the *technical* division of labor;<sup>11</sup> for a thorough debate on this, see Kicillof<sup>5</sup>).

As discussed below, this is a good case, with little or no success, of intertheoretical reduction, since Smith intends to take the individual factory as a smaller scale, but accurate reproduction of social production as a whole.<sup>5</sup> According to him, when the technical division of labor is sufficiently fragmented in numerous simple operations, which are developed by different workers, an increase in the production of labor is inevitably generated for three reasons. First, the specialization of the worker in a single repetitive task gives him greater dexterity. Second, there is a saving in the "downtime" carried by the passage from one task to another (often in different physical places). Finally, spending the entire workday doing a single task, the creativity of the workers will be stimulated and this would allow

innovation in techniques and technologies.<sup>5</sup> These statements, together with the rest of the contributions contained in *Wealth of Nations*<sup>4</sup> became the theoretical principles governing the industrial model of production, and then the industrial production system in series<sup>6</sup> which then engenders the bourgeois production series educational system, drawn somehow to the present.<sup>12,13</sup> Apart from arguing if these reasons were indeed, in their finished form, those proposed by Smith, it is unavoidable to note how the advance of technique and technology, characteristic of this model, has strongly impacted medicine, propitiating or guiding hyper-specialization as an arms race.<sup>1,2,14</sup>

Usually, medical institutions have been analyzed and described by an internalist historiographical vision (i.e. through the "medical" look). A fact that has limited the comprehensive understanding of the features and functions of the social and historical "medical model".<sup>1</sup> What it is now considered as medicine (or biomedicine) was institutionalized in some European countries in the late eighteenth and early nineteenth century and in the countries of the Americas, including the United States, in the second half of XIX.<sup>1</sup> Therefore, the MMH begins to take shape during the so-called first Industrial Revolution, following the formation of the working class, the new industrial city and, later, the colonial expansion in the imperialist period<sup>1</sup> like the work of Adam Smith.

Some authors argue that the development of specialties would not be determined by a population demand nor by the same process of biomedical research, but by the increased professionalisation of Medicine.<sup>1</sup> This process of specialization, which was triggered significantly in the 50s, is consumed by appropriating a concept that although it already existed in prior medical knowledge, it was promoted until it became hegemonic: the mechanicism. Biomedicine understood the body as a sum of parts, entering the subjectivity of doctors in training metaphors that identify the human body with a machine.<sup>1,15</sup> At the beginning of the 20th century, medical specialization would lead to the dismemberment of the body to extremes unimaginable even for biomedicine itself. Thus, for medical specializations, the body would be reduced to, simpler, isolated parts where each will have the name of the speciality which will take care of (e.g. orthopedist specialist in head and neck). While this pattern was strongly criticized by sectors in biomedicine itself, mainly by attempts put forward on behalf of psychosomatic medicine, it has been maintained to a greater or lesser extent and in the field, resulting in the current MMH.<sup>1</sup>

That is why it is attributed some causal relationship –although not only– to the advent of fragmentation in discipline and sub disciplines observed, very characteristically in medicine, and which has followed *mutatis mutandis* the inherent logic of capitalism. It would seem that if this trend were to continue, physicians in a very short time would have nothing to envy to particularistic physicists, overlapping their areas of action.

In August 1929, in Vienna, Otto Neurath, Hans Hahn, and Rudolf Carnap signed their original manifesto entitled: "*The scientific conception of the world: the Vienna Circle*".<sup>16</sup> While it is a highly pretentious text, full of metaphors and little rigorous language (contradictorily to the key role that they give to the correct use of scientific or linguistic terms), it is certain that at that time, they were not able to foresee

the enormous implications of the sincere scientific, epistemological and ideological positions<sup>a</sup>, contained in what is now known as the Manifesto of the Vienna Circle, would have for the future of science and Western society. This was their greatest desire, it must be said, and they made it explicit in some passages of the text, as here transcribed: "*We experience how the spirit of the scientific conception of the world penetrates more and more into the forms of public life and private, education, and architecture, which in turn helps drive the organization of the economy and social life according to rational principles. The scientific conception of the world serves life, and life hosts it*".<sup>16</sup>

In the manifesto, they dictate death sentence to all metaphysics, and thus philosophy and any attempt of ontology (referring to the existence of entities, or what exists). We had to unify the sciences, all of them. For this, they had to choose a fundamental science that subsumed the others: physics. After the unsuccessful attempt of semantic reduction (i.e. reduce all scientific language to a single neutral observational terminology),<sup>17</sup> the tool or strategy chosen for unification was intertheoretical reduction.<sup>3,18</sup> According to this type of theoretical (or epistemological) reduction, it is possible to replace one theory A with another B with greater explanatory power. Then, in this case, there would be an intertheoretical reduction of A into B.<sup>8</sup> On the other hand, science had to be neutral, stripped of all ideology and "from the ashes of historical language"<sup>16</sup> (sic). It must be empirical and positive. Curiously, it would be through the denial of any ontological analysis, because they were, according to them, a vacuous and infertile terrain, typical of philosophy (pseudo-problems) and through the powerful use of intertheoretical reduction as strategic tool that would pave the way, implicitly and dialectically, to the second type of reduction of interest here: the ontological reduction.

The ontological reduction can be seen as the link between the different domains of reality, in which the items of a given domain are ultimately items of a more basic domain.<sup>17</sup> This kind of ontological reductionism is often used, openly or circumspectly, as a justification for inter-theoretical reductionism: if one X domain of reality can be reduced ontologically to another Y, it is to be hoped that the theory describing X can be reduced to the theory describing the domain Y.<sup>17</sup> For example, if a cell is nothing more than a set of inert matter functionally organized, ultimately, it would be sufficient with Particle Physics to explain it, after travelling an inter-theoretical reductive path going from Cell Biology to Molecular Biology, Biochemistry, Chemistry and, finally, Physics.

This pairing, in which the two reductionisms are dialectically related, forms what is known as the Reductionist Program (RP). In the specific case of the life sciences, it can be synthesized by the following formula: (a) explain the phenomenon of life from the laws of physics (intertheoretical reduction) + (b) consider that life is nothing more than organized inanimate matter (ontological reduction) = (c) RP.<sup>7,8</sup>

<sup>a</sup> While it is true that many of the members of the Vienna Circle came from non-capitalist traditions, it is indisputable that this manifesto fitted perfect in the world system already set up by capitalism.

Here is the second major reason for the upward spiral of the proliferation of disciplines and sub disciplines observed in latter times, in life sciences,<sup>3</sup> and particularly in the medical sciences.<sup>1,2,14</sup> It certainly may seem contradictory to attribute this, although not partially, to a program aimed at – and still aimed? – to the unification of Science.<sup>3</sup> But in a paradoxical way, we believe that the difficulties encountered by this enterprise from its physicalistic ontological commitment (i.e. life is nothing more than organized inanimate matter), what potentiated -through professionalization, an analytic decomposition and reductionism - the compartmentalization of life in tight boxes, increasingly smaller and distanced from the living: specialties. This “jibarization”<sup>b</sup> of logos (or knowledge), so characteristic of the modern world, was essential if the boxes could be explained ultimately by physical (i.e. intertheoretical reduction). However, also, this trend has paved the way for ontological sterilization of life or, as Hans Jonas would say, to the consummation of an “ontology of death”.<sup>20</sup>

### 3. But, what is reductionism?

*“How does Physics and Chemistry can explain events in space and time that occur within the spatial boundary of a living organism? The manifest inability of Physics and current Chemistry to explain such events is not enough to doubt that these sciences can not do so [...] we should not be discouraged by the difficulty of interpreting life through the ordinary laws of physics.”*

Erwin Schrödinger ([1944] 1984) What is life?<sup>21</sup>

As already mentioned, this journal has published two lucid papers on reductionism, its origins, nuances, and direct implications for the control of consciences and bodies.<sup>9,10,22-24</sup> This work is limited to dealing with those aspects that accompany the message that is desired to be transmitted.

One can consider that there is an old - or primitive - form of reductionism: essentialism. While it can not be said that this particular form of perceiving - and understanding - the world, which is certainly pluralistic and heterogeneous, represented by essentialist reductionism, originated in classical Greece, since it actually precedes it, it can be said that it was the first Greek philosophers who gave it a more rigorous theoretical form. The ancients, in their different currents or schools of thought, worked after the theoretical and practical search of the essential units of nature; a true ontology or “theory of being” a science of essences.<sup>25</sup>

For Democritus (ca. 460-370 BC.), for example, the fundamental units of all matter were atoms (precisely atom means indivisible). For Plato (ca. 427-347 BC.), the essence was associated with his notion of an idea stating that these were the eternal and immutable “forms” of the material and sensitive entities. There was, for example, a

perfect, true, and immutable (or incorruptible) “idea” of a horse (its essence or “model”). However, there was also a “real” horse, flesh, blood and bone, tangible, corruptible, as a crude representation of the first. It was Aristotle (ca. 384-322 BC.) who stepped beyond. While he admits, in tune with Socrates and Plato, that essence is what defines being, unlike his teacher (Plato) he understood essence as a form indissolubly linked to matter, constituting together the being, to which he called substance. This earthly leap in the search for the essences, catapulted in him and his followers the investigation of the real and tangible world, allowing the first proto empirical works. Aristotle developed research on animal dissection, proto embryology, and took the first steps to form an essentialist classification of natural species (proto systematics).<sup>25</sup>

Beyond the nuances and differences existing among the ancient philosophers, the reductive intention was placed in the search for an essential order or unity in nature; That is, a quest for the “unity in diversity” of the natural world. You could say, then, that here appears the first systematic effort to do what we know today as philosophical and scientific reductionism,<sup>9,10</sup> prefiguring a real “essentialist heritage” as a legacy for medieval and modern science that persists today.<sup>26-28</sup>

While this essentialist heritage is deeply rooted in the conceptual and methodological forest of modern science since ancient Greece,<sup>26-28</sup> it was the mechanistic essentialism of René Descartes which deepened the roots of reductionist thinking<sup>c</sup>, resulting in the development of a new, vigorous and intricate rhizomes. It was this fantastic - and powerful - philosopher and researcher who incorporated the logical framework of analysis and synthesis into the academic world, reinforcing strongly with this, the heuristic capabilities of reductionism. Descartes argued that any scientific research has to start by decomposing the object or system of study in its simplest units (analysis) to reach that contained the property of greater simplicity, being enough with itself to be explained, and thus becoming independent of the environment. For Descartes, if we achieved to know the essential properties of the fundamental particle of a system, object or phenomenon, we could then perform the explanatory synthesis, since those properties are transmitted along all ontological levels of this said system. In his own words: “Every method consists in the order and disposition of things on which the penetration of the truth-seeking intelligence must focus. We will be faithful to it by gradually reducing the complex propositions to simpler ones, and starting from the simpler we are going through the same gradients raising the knowledge of the others” (taken from Descartes translators comments, p .174).<sup>29</sup> In summary, for this author, the dissection of the whole in its component parts makes it possible to discover the structure of the object investigated, achieving the decomposition of

<sup>b</sup> The Jibaro people, or more precisely *Shuar*, are native of the Amazon rainforest (ca. 80,000 individuals). They lived in part of the territory of what is now Ecuador and Peru. They are well known for the ancient tradition of reducing their defeated opponent’s head to get in this way, all his wisdom. Thus, the chief of the winning tribe performs the *tzantza* (or reduction of head) alone, and through a process of meditation and fasting<sup>19</sup>.

<sup>c</sup> It would be a mistake to consider René Descartes as a “reductionist” since he was rather a cultor of analysis and synthesis, an approach developed by him. What is difficult to deny is that precisely his thought conferred tools (positive heuristics), so that from “the whole is the sum of the parties”, the reductionist thought makes its cut by transforming the phrase into “the most elementary—part—does and explains the whole.”



a complex phenomenon into simpler elements. This allows delimiting the essential of that which is not, to reduce to the simple the complex. The whole is - only - the sum of the parts.

Sustained in this powerful logical-analytical principle and a strongly reductionist thinking is that the first investigations of classical Physics and Chemistry were developed, distinguishing, at first, the atoms as the essential particles, then passing to the subatomic particles, and thus explain the ultimate behaviour of matter.<sup>17,30</sup> However, Cartesian thought also plunged deep into the disciplinary birth of the social sciences, visibly influencing the works of Thomas Hobbes, Thomas Malthus, and Adam Smith, among many others. These renowned authors sought to find in an alleged selfish and competitive human essence, the explanatory basis of all social organization, giving rise to methodological individualism (i.e. results in the ontological and epistemological primacy of the individual over any higher level of organization) which governs up to nowadays, not only in the social and human sciences but also in the biological or health sciences, such as the medical sciences. From now on, the analytical research method, also known as Cartesian method<sup>d</sup>, in addition to aprioristic "reductive mandate" became the metaphysical method of thinking,<sup>19</sup> or what we call here, the shrinkage of logos.

Before going any further, it is necessary to clarify the two general types of reductionism that are most influential in present science, described here: the archaic (or essentialist, of Greek origin) and the modern (or physicalist, of Renaissance roots but developed mainly by the logical empiricism of the Vienna Circle). Although in both cases there is a firm intention to reduce the complexity of the systems or objects of study, the fact is that these types are mutually rejecting. While the former seeks transcendental or metaphysical essences, the following aims to eradicate them from the scientific construct after the discovery of the immanent characteristics of matter and the physical laws that explain it. Apart from this more theoretical distinction, in the academic practice, the two types coexist and are rooted in the scientists, without many of them notice.

Returning briefly, and to reinforce, the concept of RP and the two types of physicalist reductionism that compose it, the intertheoretical reduction can be understood as the *explanation of a theory or a set of experimental laws established in an area of research, through a general theory, though not always from a different domain*.<sup>31</sup> This type of reductionism is underpinned by a strong mandate: the unification of science. Physics is the science of choice as a fundamental.<sup>17,30</sup> For this reason, the intertheoretical reductionism it is considered as "eliminativist" because all the information contained in theory T' (reduced) is now contained in the laws of the theory T (reductive).<sup>30,31</sup> One of the examples used to illustrate this is the reduction of the theoretical statements of Galileo and Kepler's laws by Newton's laws.<sup>30</sup>

<sup>d</sup> It should also be mentioned, the central role of Cartesian dualism (i.e. distinction between *res cogitans* and *res extensa* or "thinking being and extended being, respectively"). But this would need a substantial prolongation of this text and also escapes its objectives. For an excellent critique of Cartesian dualism, see Jonas<sup>20</sup>.

This way of understanding relations between theories acts accordingly with the traditional metaphysical realism, philosophical posture most commonly adopted by scientists and the general community (whether they recognize it or not), which postulates the existence of a single fundamental ontology.<sup>32</sup> For traditional metaphysical realists, systems are there, waiting to be described and explained by different theories. For this position, there is only one objective description of such ontology: the only entities, properties and relationships that do exist are those that belong to the ontology of reducing or fundamental theory.<sup>32</sup> Then, those known as fundamental theories would be describing the reality as it is, while "phenomenological" theories arising from those "secondary" disciplines, could only describe events as they present to us. In this way, the deeply rooted metaphysical commitment is revealed with a last and fundamental ontology (ontological monism), which will correspond to the true and finished description of the world. Moreover, this was -and still is? - without further add-ons, the RP enterprise.<sup>7,8</sup>

As already mentioned, ontology refers to what exists. Moreover, if then, according to the ontological reductionist perspective, it is assumed that the entities corresponding to the higher levels of organization of matter are formed by entities of the lower levels, and using Dermatology as an example, one could ask: What is the skin?, Organized cell sets? And, what is a cell? Organized sets of particles? Sagaciously, Pigliucci and Kaplan<sup>33</sup> made an accurate criticism, challenging to save by the RP, when they said: "Therefore, a complete knowledge of the physical and chemical properties that characterize a protein will not tell us in a certain way what it is. By knowing what a protein really is, chemistry can tell us how it does what it does (...). The distinction between explaining how something does what it does and what it is something is central to the criticism of reductionism."<sup>33</sup> (sic). These authors argue that although a reductionist and valid explanation can be welded of how something does what it does, this is not, in any way, equivalent to explaining what something is.<sup>33</sup>

#### 4. Clinical case report<sup>e</sup>

The following case presented very closely, thus a series of details can be given that, far from seeking asepsis, accuracy, and scientific rigor, try to awaken in the reader the empathy necessary to achieve, towards the end of the text, the understanding of the dangers, no longer epistemological or even less ontological but pragmatic, that carries the RP in the daily life of people.

Two days after postpartum discharge from the hospital, a newborn entered the neonatology unit of the clinic where she was born, diagnosed with physiological jaundice. This episode was solved through the use of UV lamps and formula milk, as a supplement to breastfeeding for 48 hours. As the days passed, parents continued to notice that the

<sup>e</sup> Medical information will be expressed in the most correct possible way, but may not be entirely accurate in medical terms since the author is a biologist and medical information is not exactly the objective of this work.

girl's skin pigmentation remained yellow, so they decided to see the pediatrician they had chosen to follow the newborn. After repeating the laboratory tests and verifying jaundice, this professional indicated them that two months of life as the maximum term for the patient to normalize her levels of bilirubin in the blood. If normalization did not occur, parents should urgently consult with a pediatrics hepatology specialist. As the patient did not improve and liver cholestasis installed, the parents made the decision to consult the specialist. To do this, they had to travel 1500 km from their place of origin to the capital city, since there attended one of the doctors with more experience in liver diseases in children of the country. They would see the Honorary Chief of the Service of Gastroenterology and Child Hepatology of one of the best hospitals in Argentina, an international reference in the field of liver transplants in infants and children.

Already during the interview with the specialist, he consulted parents about the color of the girl's stool. They were yellow, clear, but never whitish. After thoroughly reviewing the infant (the general condition of the patient was satisfactory and showed no rigidity in the liver) and previous studies that the parents brought from their home city, the doctor sat at his desk and, with some concern, took his pen and the prescription book to proceed to make a request for laboratory analysis. The doctor began to list an extensive battery of studies. Because some prepaid medicine companies in Argentina limit the number of tests that can be ordered in the same order, the doctor stopped the list and counted the number of studies that he was requesting. He had exceeded. Cut the last one. Touches his forehead, he thinks and then writes morning plasma cortisol test.

Although the most likely presumptive diagnosis a biliary atresia (or obstructed bile duct), of a purely surgical solution (and in that sense almost all the studies requested), something did not fit him, and at the last moment the doctor decided to add an analysis of hydrocortisone, a steroid hormone produced by the adrenal gland that is released in response to stress and low blood levels of glucocorticoids.

That same day the blood sample was extracted from the patient, and all laboratory tests were performed urgently. Also, a hepatic Doppler ultrasound was performed, which yielded satisfactory results, although a marked decrease in the size of the gallbladder was observed. A few hours later, the personal telephone number of the specialist doctor rang. It was from the laboratory; the patient had critical blood cortisol values, and since this represented some danger, the hospital's central laboratory was required to inform the professional in charge. As expected, the values of the blood analysis corresponded with the installed hepatic cholestasis (i.e. bilirubin and very elevated transaminases), but the great discovery it was the result of cortisol in critical values [i.e. 1.6 mg/dl (reference values 5.0- 25.0  $\mu$ g / dl)]. Throughout his long career, the pediatric hepatologist treated only a few cases where low levels of blood cortisol explained, albeit partially, liver cholestasis as the one the patient had. It was a very rare case that should be co-evaluated by another speciality of medicine: pediatric endocrinology.

After conveying the news to the parents, the doctor suggested they do a consultation with a pediatric endocrinologist; from there, the follow-up of the patient was carried out by both professionals. Already with the endocrinologist, and immediately after very accurately measuring weight and height (the patient was at the 97th percentile on the weight and 75th in height), the specialist in metabolism and infant growth asked to repeat the cortisol test, since the original studies had not been carried out by extraction in the early hours of the morning, and that could affect the results. Also, he sought to examine the functioning of the hypothalamic-pituitary-adrenal axis searching a possible panhypopituitarism, which is usually associated with rare cases such as this. Nothing, the patient also had hypoglycemia, something often associated with hypocortisolism. All was normal except for the corroboration of extremely low blood levels of hydrocortisone.

With more doubts than certainties, and without being entirely convinced, the endocrinologist decided to start a small dose of exogenous hydrocortisone to replace only what the adrenal gland of the patient was not producing. The most plausible explanation was found that there was a maturational delay in the gland, although it was rare that only it manifested itself in its ability to secrete cortisol, while all the other functions were normal. On the other hand, the pediatric hepatologist prescribed the use of ursodeoxycholic acid, to contribute to the detoxification of bilirubin in the blood and help the inflamed liver.

Both doctors asked the parents to reassess the patient after ten days of treatment. After this time, it was recorded a significant decrease in bilirubin (direct and indirect), but an increase in transaminases (GOT, GPT, alkaline phosphatase). Cortisol levels, thanks to medication, were normal. Although the treatment was effective, both professionals wanted to understand what was causing inflammation in the liver, since hypocortisolism per se seemed insufficient. They scheduled a new follow-up after 15 days, including a planned family trip. The result was very similar; bilirubin was down, but transaminases were very high. The endocrinologist asked the parents to remove the dose of hydrocortisone 24 h before blood extraction to assess the endogenous concentration. Values were critical again. Here, the hepatologist made the decision to practice a liver biopsy, the gold standard for detecting the causes of inflammation (as cirrhosis, tubulopathies, and gigantocellular hepatitis). Failure in achieving a definitive diagnosis was beginning to impatient the physician.

Fifteen days later, the family travelled again so the biopsy would be performed. The procedure is simple, very frequent and does not require hospitalization, but the patient must undergo general anesthesia and many hours of fasting. Before the anesthesia, it was applied a high dose of cortisol, so that she could recover from surgery without problems. Finally, the patient was cursing gigantocellular hepatitis caused possibly by maturational hypocortisolism. This was the diagnosis that left doctors quiet; especially the hepatologist. From here, and following the same treatment previously prescribed (ursodeoxycholic acid and hydrocortisone every 12 h in a weight-adjusted dose), the child was periodically followed up and quickly improved until she fully recovered. However, then, where does the issue of medical

reductionism come from? Moreover, why I argue that such reductionism can kill?

## 5. Why medical reductionism can kill

As it was his healthy habit in life, and in a short essay entitled: “The median<sup>f</sup> is not the message”,<sup>26</sup> Stephen Jay Gould shakes the comfortable carpet of the academic *status quo*, throwing powder to the face of essentialist reductionism which, in general, have researchers in life sciences. Punctually alerting on existing limits of the use of the “average systems” (i.e. descriptive statistics measures of central tendency of a sample: mean, median and mode) as the main interpretive, explanatory and predictive tool, in biological and health sciences.<sup>26–28</sup> However, this time, it does so through the story of one of the toughest personal experiences, in 1982 he was diagnosed with abdominal mesothelioma, a rare type of cancer linked to asbestos exposure.

After the surgery which he underwent that same year, once recovered, he took refuge in the Library of Medicine at Harvard to find all available medical information about his rare disease. The unpleasant surprise for him was that in all the works he consulted, the prognosis was a median survival of only eight months. After being overwhelmed for a few minutes, his mind began to work again, and, as a good evolutionary biologist that he was, he realized that he was falling victim to the “averaging fallacy”. In this context, the averaging fallacy is the erroneous and decontextualized use of a single central tendency, in this case, the median, as a reified abstraction for the prediction of the survival of human beings by medicine, leading to false conclusions, ethically improper and psychologically devastating for any ill patient.

The conventional interpretation that many doctors -and most people- would make of the phrase “the median mortality is eight months” is “very probably, the patient will die in eight months”. This reasoning is not only wrong but is rooted in the historical and philosophical background of the characteristic reductive ideas of “essentialist heritage.” Thus, distinct and well-defined essences to discretize nature are searched for, which, to the contrary, is presented to us as an irreducible continuum, finding in the average statistical systems a powerful abstraction with which fulfills this reductive mandate.<sup>26,27</sup> In this way, in biological and health sciences average systems are understood as harsh realities and the variation, which allows the calculation, as a set of transient and imperfect measurements of a hidden essence: platonic noise.<sup>26–28</sup>

Gould understood that some features would make him live longer than eight months predicted by his doctor. He was still young; the disease had been diagnosed early; he had access to better health services and, above all, a very hopeful attitude towards the possibility of staying alive. On the other hand, and this is where comes what concerns us, he

realized that the distribution of variation around the median of eight months was very deflected to the right. This means that about half of people with mesothelioma die within eight months (median value), but the other half could live much more than that those around the central value, since the variation of the left side of the median was very high. From the day he was diagnosed with his first cancer, Stephen Jay Gould (who died of lung cancer on May 20, 2002) not only defeated the lying average but enjoyed 20 more years of life, in which he produced most of his transcendental works.

Then we see how essentialist reductionism, probably more archaic, can be very dangerous, because, for example, leads to false conclusions with profound implications for the survival of terminally ill patients through a negative impact on the psycho-neuro-immuno-endocrine system. However, the impact of the RP on public health may still be more direct. To be more precise about it, we need to return to the case report presented above.

If the first consultation with pediatric hepatologist, the doctor had been carried away by the influence that the RP had in his education (MMH<sup>1</sup>), and even in the same structures that govern his being-and-be in the world inherent in Western capitalist societies, most likely he would have suggested performing a scintigraphy of biliary excretion, a trans hepatic cholangiography, a percutaneous liver biopsy (to determine the severity of cirrhosis) or, why not, exploratory surgery, to definitively get the diagnosis. Most of the symptoms were consistent with a relatively common condition, biliary atresia. Moreover, given the age of the patient, the region where she lived (it was tough to have frequent monitoring) and the prolonged period the girl suffered hepatic cholestasis, any of these medical practices could have been done without fear of committing an iatrogeny.

Now, if he had followed that route, the patient, who was only two months old, would have been subjected to one of these interventions through a process of general anaesthesia, with all that this implies regarding stress (i.e. activation of the hypothalamic-pituitary-adrenal axis<sup>35</sup>). This could have triggered dire consequences on the patient. As stated by the experienced pediatric hepatologist to the parents, after detecting the critically low levels of morning cortisol that the patient suffered: “If we practiced exploratory surgery or a liver biopsy, the girl most likely would have had serious difficulties recovering from the anesthesia.”

It is there when I lit all my alarms since the patient in question was my only beloved daughter. After I had recovered from the stupor, the first thing I thought was: “What would have happened if we had a reductionist doctor?” Like Stephen Jay Gould, I was now going through a very painful scenario where the dangerous power of reductionist thinking had the gun loaded and ready to fire. However, that first day of consultation with the liver specialist, we had attended a real fact of complex thought, integrative and thoughtful; when the doctor took his time to think and ordered an atypical study for the clinical manifestations that the baby had.

For complex thought, I mean the ability of people to interconnect different dimensions of reality. Given the emergence of facts, systems or multidimensional objects, interactive and/or with random components (almost all rare cases of medicine, such as my daughter), the subject is (or

<sup>f</sup> The *median* is very similar to the mean (or average) statistic, part of what I call the “average systems”. Represents, as the etymology indicates, an intermediate point in an ordered series of values.<sup>34</sup> It is a statistical widely used in cases where the distribution of the data is not normal.

should be) forced to develop a strategy of thought that is not reductive nor totalizing, but reflective.<sup>36</sup>

This concept confronts the disciplinary hyper-compartmentalization of knowledge, proposing a transdisciplinary and holistic approach, but without abandoning the notion of the constituent parts of the whole.<sup>36</sup>

My daughter could have died if she had fallen into the hands of a doctor with little or no capacity for complex thought (which is close in this case to what is commonly known as “clinical eye”), something expected of a hegemonic medical -and social- system crossed by everything that has been said. Where the patient, in the hands of a hyper-specialist, is transformed by analytical decomposition and reductive strategies (intertheoretical and ontological), only in, for example, an inflamed liver “product” of the “giant cells” (gigantocelular hepatitis) or by a blocked bile duct (biliary atresia), stripping it of all features that make it, first of all, a living being and, secondly, a human being.

## 6. Final remarks

*Homo liber nulla de re minus quam de morte cogitat; et ejus sapientia non mortis sed vitae meditatio est.*<sup>9</sup>

Baruch Spinoza ([1677] 2000) *Ethics*, P. IV. prop. 67<sup>37</sup>

In his brilliant book entitled “The phenomenon of life: toward a philosophical biology”,<sup>19</sup> Hans Jonas argues about how at the dawn of human history, the most indecipherable enigma was death, and humanity sought to respond to it through myth, worship and the religion. In his words, there was a “pan-vitalism” and a central problem: death. Just as the stone tools reflect the first technical capabilities of humanity, “in the tombs, which recognize death at the same time deny it, and the very first human reflection is embodied. From them has come metaphysics in the forms of myth and religion. Tries to solve the basic contradiction: *everything is life and that all life is mortal*<sup>19</sup> (*sic*; these italics are mine). According to Jonas, this fundamental contradiction gives rise to an “ontology of life”, in which a being is comprehended uniquely, and acquires the status of reality when alive. Although this understanding of being as a continuum of life goes even beyond death.<sup>19</sup>

On the contrary, modern thought, rooted to the Cartesian Renaissance is located in the reverse theoretical situation: what is natural and understandable is death; the problem is then to explain life. Today there is, according to Jonas, a “pan-mechanicism” and a central problem: life. As stated above, taking the tools of the natural sciences, particularly those of physics, modern science sought to master the knowledge of reality, an ontology whose only substrate is the pure mud of inert matter. There exists, then, a universe occupied by fields of inanimate particles and forces that do not seek any purpose, and whose processes are explained and understood according to the constant and universal laws of physics.<sup>19</sup> Therefore, the lifeless becomes knowable and, in turn, in the explanatory foundation of all: the ontolog-

ical physicalistic commitment. “The absence of life is the rule and life, is the enigmatic exception within the bosom of the physical being”<sup>19</sup> (*sic*). Thus, today we face a thought dominated by a true “ontology of death”.<sup>19</sup>

However, now let’s see how this impacts the health system and public health, or what we describe as the hegemonic medical model.<sup>1</sup> The main structural features of MMH are its biologism via intertheoretical and ontological reduction, methodological individualism (medicine focused on the individual), and its absence of historicity, sociability, its mercantilism and pragmatic effectiveness. Is it worth remarking that biologism articulates all the other mentioned characteristics of MMH, allowing the exclusion of social and economic conditions of the causal explanation of the development of diseases. Thus, biologism allows Medicine to delineate a natural history of the disease, in which the social history of the conditions are excluded or converted into “medical-ecological” variables.<sup>1</sup>

Only if we accept this as a starting point, it is relatively easy to understand how, in many cases, doctors can convey information about the survival time of their terminally ill patients, merely communicating the values of central tendency (or “average systems”) published in the aseptic, depersonalized and neat research papers. Or make hasty decisions regarding practices or life-threatening invasive interventions in patients who do not require them, as well as countless iatrogenic consequences not described here that reductionist thinking may have -and indeed has- on public health in general and children in particular. Conducting a brief counterfactual exercise, we might think that Stephen Jay Gould, one of the most prominent evolutionary biologists could have died after eight months of his diagnosis of abdominal mesothelioma, due to a deeply harmful impact that those news provoked in his psycho-neuro-immune-endocrine system, surrendering to the disease. Much more difficult I find thinking what would have happened if the specialist in pediatric hepatology did not use the two hemispheres in his brain when making the first order of studies for my daughter. The paradigmatic role of the allopathic medical system in the health and survival of human populations is indisputable. However, how many deaths could be attributed to this hegemonic health care system, emanating from the intricate relationship between the capitalist division of labor and the metaphysical method of modern thinking or shrunken knowledge? We will never know, but we can begin to stop them.

This work should not be understood in any way as an *a priori* critique of the specialties, although it is a critique of the disciplinary of disciplines, the separatist compartmentalization of knowledge and the totalizing shrinkage of knowledge. It neither should be interpreted as a praise of intuition in medicine that propitiates the abandonment of protocols and solidly acquired knowledge. Although this capability is inseparable from the natural functioning of the mind and represents a fundamental aspect of complex thought, it remains just that: another point of an epistemological and ontological scheme diametrically different to what the RP conferred to the MMH. However, complex thought requires a new kind of intelligence, distanced from the one imposed by the neo-positivist orthodoxy, not apart from intuition or emotion or sagacity or foresight or care or self-awareness and the sense of opportunity. It requires an

<sup>9</sup> A free man thinks of nothing less than of death, and his wisdom is a meditation not of death but of life.



intelligence that does not give to abstraction (abs-traction = forced extraction) the central role in explaining phenomena because in this way a phenomenon will be decomposed of its intercommunications and points of contact with other phenomena which with it forms a whole-of-consciousness. If in addition to what was brought from its environment (i.e. the patient), is applied to calculation and mathematical formalization (i.e. statistics), you get to the paradoxical situation in which the only reality are the equations that apply to the real, but not the real to which they apply.

Human knowledge has reached very high levels, often even difficult to assimilate by society, following the logic of RP. For example, in health achievements that have significantly increased life expectancy are undeniable, especially in developed countries. However, this enterprise is now showing its weaknesses and undressing the dangers when faced with the inherent characteristics of living things.<sup>3,8,19</sup> We believe that, in the case of the life sciences, it is time to stop, think<sup>2</sup> and lead to new non-reductive strategies<sup>3</sup>. We should raise our voice and appeal to an ethical commitment that foster complex thought<sup>36</sup> and a progressive abandonment of reductive strategies.

In the words of Edgar Morin, the main objective of complex thought is "to give an account of the articulations between disciplinary domains broken by disgregating thinking [...]; it isolates what separates, and hides everything that relates, interacts, interferes".<sup>36</sup> Complex thought aspires to multidimensional knowledge and recognizes, from its origins, that complete knowledge is impossible.<sup>36</sup> Unified science -or omniscience- is unrealistic and unnecessary. As Theodor Adorno said: "The totality is the non-truth." However, for this we must recognize -and internalize- to our practices a principle of uncertainty, rejecting or at least questioning the modern devotion to science that constitutes a true "Trojan horse" the notion of certainty. Instead, complex thought is motivated by the constant tension between the claim of an unfragmented non-reductionist knowledge and recognition of the unfinished and incompleteness of all knowledge.<sup>36</sup> The day my daughters doctors discharged her after a substantial improvement documented in her laboratory tests and the realization that she was already producing the endogenous levels of cortisol needed to recover from any other stressful process, the pediatric endocrinologist told us that we will never know why the baby had what she had; what we do know, is that she does not have it any longer."

Since it brings specific health hazards to people, we believe that fostering a detachment from RP constitutes today an ethical duty. Although undeclared, this enterprise has as its ultimate goal, the reproduction of a capitalist world-system exclusive and responsible for the gross accumulation by global corporate elites, and the consequent exfoliation of natural and social resources that we are suffering.<sup>9,10,24,38,39</sup>

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