

# Leonardo Polo's Integrative Dynamic as a Philosophical Framework for Understanding Neuroscience

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**ABSTRACT:** Neuroscience requires theoretical frameworks to conceptualize and interpret the results of research, especially given the current trend that calls for functional integration in order to understand the brain. Leonardo Polo's philosophy may be an appropriate interpretive framework in this regard, since both the dynamics of his thought about human beings and current advances in neuroscience work in terms of integration. I thus trace Polo's understanding of human life and the anthropological scheme of his philosophy, in order to verify that it unfolds within the paradigm of integration. To ensure this, I will first discuss the way the term integration will be understood in this paper.

**KEYWORDS:** neuroscience, Leonardo Polo, integration, system, interdisciplinary, philosophy of science.



## INTRODUCTION

Neuroscience studies the brain at different levels (Blanco 2014, 135). *Grosso modo*, the following levels may be distinguished: first, the inferior molecular level, corresponding to the study of biochemical processes. Secondly, the cellular level studies the neuron as a unit. Next comes the overall system, built up from groups of neurons related to one another in a structural and/or functional manner. This is fundamentally how relational processes between neurons and information transmission are studied. Only then can we move into the properly psychological upper levels, where the diverse cognitive processes are studied: perception, decision-making, etc. Lastly, there is the level of behavior, which aims to understand why the human being acts in a determinate way and how we act upon reality.

All these levels are obviously interrelated, since they all refer to the same subject. Moreover, we are aware of this correlation inasmuch as we know of the mutual interactions among them (*cf.* Falk et al. 2013), even between those apparently farther away from one another, where behavior is in a bidirectional relation with molecular processes (e.g., all cognitive processes have a certain associated molecular activity (*cf.* Clark Noudoost 2014)). Still, we do not yet know how they relate to each other and how they move from one level to the next (Firestein 2012, 256).

When seeking to understand behavior, neuroscience finds itself faced with the problem of method, which in this case is analytical and thus requires deductions. Since the space of human behavior is so vast, neuroscience centers itself on particular aspects, e.g. human communication, among others. But even though this phenomenon is still far too large, it does isolate a determinate task focused on human communication, thereby obtaining certain results. Then it has to traverse the reverse path, adding many data. The problem is that, depending on how these data are connected, different results can be obtained; as a result, differing conceptions about the human being may arise. However, this is not a question of lacking data, but rather of clarity in one's presuppositions (Firestein 2012, 256; Markram 2013). This issue means it is necessary to have a prior conceptual framework in order to develop an interpretation (*cf.* Markram 2014; Sporns 2014); Polo's philosophy allows for just that. The convenience of Polo's philosophy to overcome the limits of science has been made evident in other publications. These limitations emerge when

sciences works without consideration to the integration of the person (*cf.* Vargas & Lecanda 2014).

What should we ask of a philosophical system in order that we may acknowledge it as a suitable structure for understanding within a scientific discipline? Would just any philosophical system be equally fit for employment as an interpretative framework? Here, certain conditions may be required, and therefore not just any philosophical framework can be successfully employed. In the first place, there should be a *logical correspondence* between the dynamics of brain function (to the degree to which we understand it), and the dynamics of the philosophical system under consideration. My hypothesis is that ‘integration’ is a feature that both neuroscience and Polo's philosophy have in common.

Neuroscience began with the understanding of cerebral activity in a *localized fashion*, that is to say, an understanding in which each area of the brain carries out a specific function. This approach later evolved into *modular* functioning, where a “module” is a collection of networks that perform a specific function (*cf.* Blanco 2014). Currently, neuroscience is transitioning towards a model based on *integration*, in which the activity of the whole brain is required to exercise any particular function (*cf.* Pessoa 2013). Mentioning the works of Sporns and Pessoa should suffice as references to see that integration is an interpretative key with a promising future in neuroscience. Nevertheless, *an example is shown below*.

Neuroscientific analytic/modular vision assumes that human acts are individual and independent. Once acts are done, they can be put together. This vision assigns each function to a different brain module. One module would be a cerebral net, so each independent net (module) has its own function. This allows them to separate what is seen, for instance a bird, from where it is seen, the place in his trajectory; or separate the function of hearing from the function of seeing; or feeling from making decisions. This traditional modular/analytical vision can be found in how EEG<sup>1</sup> is interpreted, and also in the way human vision is understood (Atkinson & Braddick 1989; Ungerleider & Haxby 1994). However, analytical/modular vision fails to explain the results of new research in neuroscience. Analytical comprehen-

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<sup>1</sup> EEG: ElectroEncephaloGraphy. *Cf.* Rugg, & Coles 1995.

sion of EEG points out to a temporal and local sequence of signal transmission. First, a subcortical sequence; second, a cortical sequence in the occipital area; and at the end, a prefrontal sequence in the cortex. This vision matches time, place, and function. Roughly, the temporal sequence would be as follows: in the first 130ms the signal reaches the subcortical region, then the latter occipital one, and finally the signal reaches the prefrontal cortical region. At about 200ms, the signal goes forward to the prefrontal cortex and joins the task being performed at that precise time. At about 300ms, emotional and attentional modulations show up. At about 400ms, the person notices the inconsistency of certain situations. About 600ms inconsistencies are resolved. In the other hand, recent research has revealed social modulations at 170ms (Cereceda et al. 2010); emotional modulations at 100, 200, 300, 400, 600 and 800ms (*cf.* Pessoa 2013; Cereceda et al. 2010; Greening et al. 2014); perceptive phenomena at 80, 100 and 200ms (*cf.* Melloni et al. 2007); and categorizations, such as distinguishing between an animal or an object, happens at 70ms (*cf.* Vroomen & Formisano 2014). Also, multi-sensorial signals are better processed than mono signals (*cf.* Bischoff et al. 2014). Multi-sensorial signals have been detected at 100ms (*cf.* Kaganovich & Schumaker 2014). We can take this as a quick example of the limitations of analytic/modular vision. The same process of deconstruction happens in human vision. There is a long list of facts that show the insufficiency of the modular vision which distinguishes brain areas devoted to detect, as in the example shown before, what is seen, from other ones devoted to detect where the object is seen (Ibos & Freedman 2015; Corbetta & Shulman 2002, Ling et al. 2015, Herzog & Clarke 2014).

As we can see neuroscience is clamming for a new vision to understand the phenomenon. This vision could be found in the concept of integrated functionality. Integration would happen at the very beginning of the process, and precisely because of it the signal would go forward. Integration would not be a product as in the analytic vision, but the way the activity itself happens. A deeper explanation can be found in Pessoa (2013), Anderson (2014) and Sporns (2014).

The goal of this article is not to show that neuroscience needs the concept of integrated functionality which is already shown in the insufficiency of the modular vision. The goal of the present research is to verify the hypothesis that Polo's thinking on the human being and his/her actions happen in the dynamic of integration. If this hypothesis is true and we can assume the sufficiency of the criteria of

logical correspondence in order to accredit one specific philosophy to a determined framework of neuroscience interpretation, then the goal of the article would be achieved and Polo's philosophy could be deemed suitable to understand neuroscience. The consequences of applying the logical correspondence criteria would be the work of a different research. Some of them have been pointed out in other publications (*cf.* Orón 2015).

I will now focus on clarifying what is understood by integration, and whether we can actually find this notion in Leonardo Polo's philosophy. If so, we can conclude that Polo's philosophy is an adequate conceptual framework for designing and understanding progress in neuroscience in a unified fashion.

### 1. THE NOTION OF 'INTEGRATION'

*To integrate* entails a maturation in which different aspects and relations differentiate and optimize to the same extent that they place themselves in a relation with one another. In other words, integration is the dynamic that explains how growth or human maturity happens; even more: integration is the dynamic that describes the evolution and functioning of open systems.

Integration, as we shall see throughout this paper, is a key feature of Polian thought, as we can see indicated in the phrase: "What characterizes the truth of man is his dynamic integrity" (Polo 1997, 198). Throughout sections 2 and 3 it will be explained how Polo's philosophy can be understood, at least in the issues mentioned above, from the key of integration.

What is at stake here are two different conceptions about the structure of reality. In philosophy and neuroscience this double view can be identified in the table below:

<i>Neuroscience</i>	<i>Philosophy</i>
Modular	Analytic
Integration	Systemic

This table shows the both in neuroscience and philosophy the same two currents of thought happens. The term "modular" in neuro-

science would correspond to the term "analytic" in philosophy. Similarly the term "integration" in neuroscience would correspond to the term "systemic" in philosophy.

What distinguishes both views is not the existence, or lack thereof, of a unification of processes, since both views contemplate such unification. For example, if we study emotion and cognition, both the modular/analytic and the integrative/systemic views recognize that these phenomena can be unified. The difference is that, in the analytic view, this unification takes the form of a sum and, therefore, it occurs at the end. In contrast, if the systemic view is taken, unification can come about through a necessary integration that happens at the outset. Continuing with the previous example of emotion and cognition, we find that:

-The modular/analytic interpretation would hold that each is formed separately, upon which unification may or may not follow.

-The integrative/systemic view would hold that both exist through the relation between each other that exists from the very beginning; if no integration is present between them, however, neither would exist.

This is the reason why the term unification is understood differently from the analytical and the systemic viewpoints. In the former, unification presupposes the dissolution of identities, and previous phases are lost when they are summarized in the unified ones. Therefore, unification is something that happens at the end of the process. It also has an optional character, because of the fact that the entities to be added are previously defined. So that, their adding up does not contribute anything to them. On the other hand, in the systemic view, unification does not entail the dissolution of identities. Rather, it requires identifying them in such a way that nothing is lost in the process, since everything is preserved throughout the growth process. The unification occurs from the very beginning, because everything happens thanks to the relationship and its growth. This is how we define integration at the beginning of this section. I present this alternative vision of unification in the following table:

<i>Unification</i>	
<i>Analytic</i>	<i>Systemic</i>
In the end	From the beginning
Optional	Necessary

Moreover, when the term "unification" is understood as something that happens at the end, it seemed to suggest that the growth stops. But, in the other hand, if unification is understood from the integration process, then there is no end to growth, but the possibility of a further increase. As growth is always possible, Polo considers that introducing unification is always a premature issue in anthropology (Polo 1998, 161).

Integration is that dynamic of growth that is proper to elements that are related (origin) to what is integrated (a growth stage susceptible of further growth).

The relation belongs to the order of what is already given, i.e. of what is natural, and not optional. It is not optional, in the sense that it is something that you received without your participation. It is not eligible. It is available in the sense that you can do thing with it, but it is not eligible the fact to be in relation.

Integration belongs to the order of what is provoked, of what is perfected, and is optional. It is optional, in the sense that if you do not have the willing to reach it, you will not reach it. It is possible, if you strive for it. It is not available in the sense that it is not one thing that you can choose between several options. It is a state that will appear with your effort. In some sense, you have to create it.

<i>Relation</i>	<i>Integration</i>
What is given	What is provoked
What is natural	What is perfected
Not optional	Optional

It is essential to start by supporting relation. Things do not exist

and then relate. Everything exists in relationship. Through these relationships, things are what they are. By this is meant that the order of the relationship is a given, natural and not available. It is the way things are. Instead integration involves the active participation of the elements and must be provoked. That means that integration is available and because of it growth and perfection of the same elements in relation occur.

This reveals that the term *integration* has certain characteristic features:

1. It preserves novelty and continuity simultaneously. Within an integration, something appears that was not there previously: thus the novelty. At the same time, there is continuity, for what was previously there grows without losing its original identity.

2. It maintains both unity and diversity simultaneously. What is integrated is more united than before, an increasingly ordered and coherent activity has appeared, and the input of the different parts has become greater due to the growth it involves. However, at the same time, a greater diversity is also entailed, for a greater singularization appears, since there has been a growth in differentiation.

3. It is a dynamic that is always open: one that does not have a concrete goal, but rather a dynamic of increasing perfection. If there were a concrete goal, it would be determined and would not be open. On the other hand, the lack of a concrete goal does not mean that just any form of growth is useful, for growth entails the perfection of what is received, and what the received is something not determined by the integration.

4. In the maturation process nothing is lost, everything is improved. Everything goes on, but not in the same fashion, for it is present in a different way: it has been perfected. The contrary would result in a summarizing process in which the initial conditions are lost, since they are contained in an abridged way.

To identify this in Polo the following questions are relevant:

- a) *What* is the reality of human life?
- b) *Who* is the human being?

There are more questions that could be asked to consider whether Polo's thinking has an essential component of integration. These

questions are particularly relevant because they often receive an analytical response. From the point of view of analytical response the human being is independent of what he/she does. In this case, the human being is independently defined who afterwards acts or relates to others. It will be making a static definition of being human. But if Polo's answer does not extract the human being from his life and relationships, then his presentation is dynamic and we can study if this dynamism is integrative.

Each of these questions can be answered from an analytic/modular or a systemic/integrated perspective, as can be seen in the following table (which I will presently discuss in more depth):

	<i>Analytic / Modular</i>	<i>Systemic / Integrated</i>
<i>What is the reality of human life?</i>	Sum of parts	Open, free system
<i>Who is the human being</i>	Subject	Person

If the salient features of integration, just as I have described them here, can be recognized in the answers to these questions, we can then say that integration is a key feature for reading Polo's philosophy and, if this is confirmed, that his philosophy would be a valid conceptual framework for neuroscience.

## 2. WHAT IS THE REALITY OF HUMAN LIFE?

Polo claims that a human being can be understood as a *system*, but one with very specific features: *openness* and *freedom* (Polo 2007a, 261).

The term *system* can be understood as a series of identifiable realities in which, due to the kind of relations existing between them, “when one (of its elements) is modified, all others are modified” (Polo 2007a, 67). This is key for the dynamic of integration, for the relations between the elements connect each one to all the others; thus, influencing one means influencing the rest. This entails that we cannot accept the selective growth of one part over another, a thesis held

by the modular view. In the case of a system, we either speak of a holistic growth, or else there is no growth at all: this is just what the word *integration* implies.

The qualifying term '*systemic*' describes living realities better than the term '*analytic*' does. There are, however, different kinds of systems: closed systems, open systems, and free systems. Close systems occur in nature when after defining all the elements predictions can be made about their evolution. Their behavior can be predicted if the initial situation is defined, together with their properties and their initial conditions, such as an electrical circuit. This is a system because changing one item changes everything. But it is close system because predictions can be made. In the other hand, the system can be open if predictions have limitations. This is the situation of living beings in general. When we refer to human reality, we must specify that we are talking about an open and free system, which exists, moreover, in a particular fashion.

The notion of '*openness*' (*abierto*) means something that is exposed, that is, manifestative. In the case of human beings, we can say that they express themselves through their intimacy. The expression 'through' or 'from their intimacy' guarantees the unity of human actions and, therefore, that all of them are related and integrated in the same person. Human being intimacy also refers to their interiority. Besides, since the feature of openness is never lost, its growth can be unrestricted: "a feature of an open system is that the relations between its elements are ever more intense and integrated" (Polo 2007a, 123).

The concept of '*freedom*' (*libre*) indicates that the direction of growth is not predetermined and thus there can be growth in both a positive or negative sense. Positive growth is an integrating growth; negative growth is disintegrating: "A free system, an open system, if it disintegrates or dissipates, is disoriented and acts in a random and capricious way" (Polo 2007a, 124). Integration places conditions on growth, because nothing is lost and everything improves. Yet that does not involve setting a goal, for this can be achieved in several ways. Disintegrating growth can be recognized in pathology.<sup>2</sup>

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<sup>2</sup> Neuroscience also associates pathologies to desintegration in what is called "disconnection syndromes" (Sepulcre, Sabuncu, & Johnson, 2012).

This systemic, open, and free reality is recognized in the brain via the following characteristics of brain structure (*cf.* Polo 1985, 15-51):

- *The concept of a formal surplus (sobrante formal)*, which guarantees the preservation of openness. Formal surplus is the natural form of the organ. And yet, the formal surplus of the brain is not exhausted by each act it performs. Formal surplus is related to the concept of brain plasticity, for that plasticity allows performance to be different, and is maintained throughout the human being's life though in different ways. It also relies at the beginning on an undetermined possibility of potential connections.

- *The relation of the object with reality.* In one hand, we pass from the known object to reality through the former's intentional character and, on the other hand, we pass from reality to the object through a process of inhibition that highlights the formality of reality. Intentionality neither belongs to reality, nor can it be equivalent to the functioning of the brain. What is intentional refers to what is real. On the other hand, the notion of *inhibition* refers to the organic cognitive faculty. This faculty operates through inhibition. Inhibition as notion of theory of knowledge is not equivalent to the neural inhibition. Inhibition consists of a separation of the knowable form from reality in order to allow for it to be learned. Inhibition acts as a brake that filters, letting some things through and blocking certain other things. It is clear that a fire existing only on somebody's mind does not burn. Inhibition attenuates both the efficacious and the material to the benefit of the formal. Function does not refer to the function of the neuron, for the neuron by itself cannot explain what happens in the synapse. Let us say that the parts, neurons, are 'functionalized'. Functions have functional parts but these are not brain parts, but rather functionalizations of the supports. This makes the theory of knowledge incapable of being understood in a passive sense (as in the classic example of the mark that an object leaves in clay or as a response to reality), or as a creative act (I do not 'come up' with what is outside); rather, it is a process of integrating what is real into what is personal.

- *The brain as a de-totalizing unit* (Polo 1985, 29). The brain does not have a function, and that is why it is not totalizing; still, it acts like a unity, for without the participation of the whole brain, properly human processes would not be carried out. If the brain had a function, its activity would be nothing more than an unfolding of it: it

would impose its form on everything within reach. And it would always act in the same way, for it would have a goal determined by its function. The brain does not have a particular function, but all human functions are vehicles to the brain activity and they exist through that very same brain activity. The function of the brain is, rather, what the person may develop at any given moment. The condition required by the brain is unity of action (which does not imply that it can only do one thing at a time).

This systemic, open, and free reality can be recognized in other aspects of human life, e.g. in the following:

*Hierarchy* in Polo (1984, 321) is different from the usual account: he holds that hierarchy occurs through qualitative difference (the usual account, in contrast, attributes hierarchy to quantitative differences). In the common view, the superior element has more of the same capacities that the inferior element has (e.g. if the sailor can perform certain operations, the captain can perform those and more). However, according to Polo, the superior element does not have more of the same, but rather *is* more deeply. The intellect, for example, cannot see: only vision can see, and yet the intellect can ‘see’ more than vision. Thus, according to Polo, the presence of the superior element does not annul the operation of the inferior element: this is contrary to the usual view, according to which, “where a captain rules, a sailor has no sway”. In Polo's account, though, being more is equivalent to being more act. This is fundamental in the integration process, because in it nothing is lost: everything keeps on going, but not in the same way as it was before; it has grown thanks to the perfection of the relation. The way Polo conceives of hierarchy assumes that unification is realized through integration, and not through a sum. If there were no hierarchy, we could proceed by adding parts and subparts.

*Government*, according to Polo (*cf.* 1997, ch. I) is a consequence of the existence of hierarchies in human realities. But government is not an imposition of those who are superior on their subordinates; such an imposition would be a despotic act, where one element imposes its form on another one. Government, rather, potentializes all its parts. Everybody wins with a government. Thus, within integration, nothing is lost and nothing imposes itself on anything else, instead, all parts are potentialized.

*Growth*, in Polo (1985, 23-25), is not the result of a simple multi-

plication. Growing does not mean adding more of the same, but rather differentiation through perfection. Polo gives the embryo as an example: the embryo's cells do not simply multiply; rather, they do so while differentiating themselves from one another, in such a way that growth entails a formal potentialization. Formal potency is what allows us to speak about growth. Every form of growth has a limit marked by its unity, which sets a limit to biological growth. But human growth does not behave in this way: it is actually unrestricted, thanks to the cognitive growth that takes over from biological growth. In the case of animals, their own natural unity sets a limit for their growth, but in human beings nature sets no limit, thanks to the personal reality of human beings. Certain living beings can overcome biological growth because they can attain cognitive faculties that are potentializations of neurons; these sensible cognitive operations, however, are final in their own way, as they can never go beyond their own nature.

This allows for animals and human beings to share certain similar practical behaviors, even if they are actually distinct, because for human beings, practical conduct is 'integrated' by intellectual knowledge.

### 3. WHO IS THE HUMAN SUBJECT?<sup>3</sup>

*Human beings are persons, and not just subjects.* According to Polo, the subject has its apex in the *ℙ*, which is found at the level of the human *essence*, of the *soul*, in *synderesis*. But human persons are much more than just subjects, or rather, it is because they are persons that they can be subjects. For Polo, access to the subject comes through personal being, while in Idealism we access the subject through its actions. This will lead to the term *subject* having different characterizations, depending on the philosophical framework in question.

The subject was amply treated by Idealist philosophers, but on this

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<sup>3</sup> Here we are closely following Polo (1984, 145-237).

<sup>4</sup> "La sínderesis es el ápice de la esencia del hombre. Designo ese ápice con la palabra yo. El yo no es idéntico con la persona humana, sino el ápice de la esencia del hombre en tanto que depende de la persona" (Polo 1998, 154).

path the most that can be known concerns that there is someone behind certain actions, but one cannot know who is actually behind these actions. For Descartes, ‘the I knows’; in Fichte, ‘the I wants’; in Schelling, ‘the I creates art’; in Hegel ‘the I is’ (*cf.* Düsing 2002); for Husserl, the psychological I is the abridged and eidetically purified I who performs the actions of all former I’s, and any other mental action (*cf.* Husserl, 1997). The I, the Idealist subject, ends up being an object, for it only knows about itself through its relation to objects. For Polo, on the other hand, the subject is the door to the expression of personal being.

Even if, according to Kant, behind every thought there is a ‘thinking I’ –since every action requires an agent– we still cannot conclude to the existence of such an I, nor to its substantial being. Such an I is nothing more than a formal conclusion. Kant acknowledges that we can deepen our knowledge of this I through biology, but it will still always be an objectified I. The Idealist subject not only impedes knowing the human person, it also forces itself as subject to become an object.

Polo holds, however, that the human being is a *person*. Persons manifest through their essence, and only then will a subject emerge. The Idealist subject may on the whole be very active, but it is a closed being, because it is nothing more than its actions. Modernism knows that the subject must exist by logical necessity, and know what his/her actions show. But if I identify the subject’s actions with the subject, then the subject is being closed by its act. Instead the person is more than his actions. Polo characterizes the Idealist as the modern radical. The word ‘radical’ is used in this context as a way to stand out the essential character of the concepts of ‘being’ and ‘life’ of human beings. So, the modern radical is not false, but is incomplete (*cf.* Polo 2007b, 273). Polo speaks of three radicals: the radical of nature; the radical of the subject (or radical modern); and the radical of the person. A person is reached by transcendental anthropology. Knowing the human person through transcendental anthropology makes it possible for us, while viewing the subject, the I, to discern within him or her the mark of their personal transcendentals. Even more, these transcendentals allow the subject to know, love or grow in a unified fashion. Just as, according to Polo, the subject is dependent on personal being, the subject can really be a subject –not an object–, and can grow. Because of this dependency of the term “subject” on that of “person”, in referring to the human being, the latter is a more proper

denomination than that of subject.

In the following paragraphs we will see how Polo understands his transcendental anthropology. This will allow us to know the person as a person.

*The human being is complex and unitary.* Everything about the human person is dualized<sup>5</sup>, non-overlapping, and instead arranged hierarchically in such a way that the superior element pulls on the lower. There is no symmetry, however, in any duality. These dualities imprint a growth dynamic on the human being, because the higher duality does not exhaust itself on the inferior. The upper duality has a surplus character –in an unrestricted sense– for the topmost duality of all is found in the personal transcendental of personal love, which is divided into accepting and giving, the former being the superior dimension. The dualities discovered by Polo traverse the entirety of human reality (cf. Polo 1998, 176-201), and thus all human reality is marked by this dynamic of growth.

*The human being is manifestative, through his or her intimacy.* The openness of a human being proceeds from inside to out<sup>6</sup>. Intimacy has a transcendental character, and it defines the human act of being. Intimacy means each person; it is the concept that is expressed in the reality of the human person. It is from this personal reality that integration occurs, which is also a guarantee of unity. Polo says that what is human is forged through the integration of what is external with what is internal (cf. 1997, ch. I), so that we may speak of a growing intimacy. It is an intimacy prepared for interpersonal encounter: it is co-existent-with. Another important consequence of human beings manifesting themselves from their intimacy, is that the idea of a response as a mere reaction crumbles, because such a notion means

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<sup>5</sup> "El hombre no es una realidad simple sino, como se puede observar, sumamente compleja, por lo que, con frecuencia, su estudio no se sabe controlar o se afronta de una manera parcial. Dicha complejidad se entiende de acuerdo con el criterio de dualidad. Los aspectos duales del hombre son muy abundantes. Por ejemplo, acto de ser y esencia; cuerpo y alma; voluntad e inteligencia; interioridad y exterioridad; operación y objeto; hábito y operación; hábitos innatos y adquiridos; sociedad e individuo; hombre y mujer". (Polo 1998, 157-160).

<sup>6</sup> There is also an openness "towards the inside", but in this paper I am focusing on the openness "towards the outside".

we respond at the instance of what happens outside of ourselves. However, as beings that are manifestative from their own intimacy, human beings can act without owing anything to what is exterior or reinterpreting what is exterior from a superior paradigm. This, therefore, makes humans into bringers of the new, and confers upon them a disadaptive capacity which is required in order to be able to be an agent of integration.

*Human beings are understood as 'additionally' (además).* This expresses both their radical openness and their capacity to contribute newness. Being 'additionally' is also a safeguard of the possibility of the I being known, but not the person, for the person cannot be reduced to his or her nature. Nor can the essence and the personal act of being be identified, no matter how much the essence is perfected. 'The I' and the essence belong to the nature, but the person is more than his or her nature or essence. The person is always 'additionally'. Perfection will make them more coherent, but it will never make them equivalent. This allows not only for unrestricted growth: it also makes the human being the only possible agent for bringing about an integration. Such an integration requires an input of novelty, and in this respect, the human being cannot work within adaptive parameters. Adaptation brings adjustment, not true novelty. The character of 'additionally' entails that human beings are never exhausted in their expressions, and guarantees that their interventions will have a proper originality, a novelty. Due to the richness of their internal manifestation, human beings can see *opportunities* where animals see only necessities.<sup>7</sup> And still, he can see even more than opportunities: he is capable of discovering *alternatives* that were not found before, and thus an even greater novelty is possible. None of this would be possible at all if the human being weren't 'additionally', not subjected to immediacy.

*Personal transcendentals are not co-causes, but rather co-acts.* The causal mechanism leads to manifest what is already there but is not yet out. This is because the effect is always somehow pre-contained in its cause, and, therefore, in this case, the person would only be able to unfold and be whatever he or she would necessarily

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<sup>7</sup> Thus, a monkey may see a stick as a tool for grabbing something that is far away, but the human being can see in the stick possibilities that necessity does not present, e.g. the fabrication of a spear, or a bow.

be. If personal transcendentals were co-causes, no integration would be possible, because integration is not a deployment of the pre-content. No freedom would be possible, for a cause necessarily produces its effect: it is only a matter of time. But saying that personal transcendentals are co-acts indicates that they act, that they manifest in an orchestrated fashion, because all personal acts manifest through synderesis. Synderesis is defined as the apex of nature and human essence (*cf.* Polo 1998, 160). The word nature indicates the initial endowment received by humans at birth. The essence is nature enriched by the accumulated growth involving the actions of habits and virtues (*cf.* Polo 1998, 120 and 139). The essence is also the manifestation of the person (*cf.* Polo 2003). Because Synderesis is defined as the top of the essence, Synderesis can also be understood as the way the person uses its nature and manifests it (*cf.* Polo 1998, 7-40). This guarantees the unity of human action, and also ensures that any given human action is related to all other human actions. Thus, making an act of the will independent from the intellect, or vice versa, makes no sense. Synderesis guarantees the unity of action because it is the 'way out' for the personal act of being. Synderesis is the first act of the human being through his or her essence. Humans act in possession of the possibilities brought about by their essence, but they cannot possess the essence itself. What human essence brings is the possibility of unrestricted growth and perfection; if this were any other way; the I could not be unified. If I know synderesis through human nature, which is what the Idealists intended, the problem of the unification of actions would remain. I have already pointed out that Idealist philosophers highlight one or another action of the I, and that they can thus reach knowledge *about* the I, but they fail to reach the I itself. This problem continues in phenomenology, which knows the I is there, but does not know how to approach it. If I know synderesis through human person, the unification is possible because there is only one gate to 'way out'. This manifestative road of the act of being by way of its essence is given in all its acts; that is why its acts can be understood as degenerating the personal act of being if they are in disagreement with it. In this way, freedom and unity are guaranteed as co-acts, which is necessary for attaining an integration, insofar as the 'source' is not disaggregated. The 'source' is the human person, which uses its nature through synderesis. If it weren't so, human actions would be a disaggregation, a spilling over, for each operation would move in a different direction, making integration impossible.

*Personal transcendentals are necessarily co-acts.* The four personal transcendentals are co-existence-with, personal freedom, agent intellect (or personal knowing) and personal love. They call for each other and cannot be thought without each other. The fact that the four are jointly formulated guarantees that the dynamics of integration can be present. If one of them were missing, absurdity would ensue and an integration would be impossible. For example, personal freedom without personal love would have no way of knowing 'where to go'. We can think of each of them as highlighting an aspect of integration. In this sense, co-existence underlines relation; personal freedom guarantees the authenticity of action and its novelty; the agent intellect, authorship over our own acts; personal love, the way and the destiny of growth. To force these associations, however, might suggest that certain personal transcendentals are in the order of creation and others in the order of integration, which would be a false assumption. The four of them are present in both moments and, therefore, we can speak of a personal road to perfection.

*Co-existence-with (co-existente-con)* guarantees that one must begin, of necessity, with the relational state. The hypothesis of an isolated person is unthinkable, even if at base it is the Idealists' presupposition regarding the subject. The human person is, by necessity, a relational being co-existent-with others and with the world. For the human being, this feature is received. Polo will say that "nothing human is real without personal co-existence" (Polo 1998, 178). The dynamic of co-existence implies that the perfection of human beings is lived through a personal relation. There is no growth outside relation, but co-existence is also present in the order of integration, for "co-existence is always something that must be attained" (Polo 1998, 190). That is why we can say there is no individual or isolated happiness. Personal happiness outside co-existence is impossible. That is why happiness functions at the integration level.

*Freedom.* Freedom is much more than a measure of the quality of actions; it is actually a personal transcendental, and precisely because it is so, certain actions can be called free. Freedom explains the radical openness of the being that is 'additionally', and makes human beings into generators of alternatives. Freedom breaks apart causality. As I have already said, a cause necessarily produces its effect, but in the case of freedom, we cannot foresee what will happen. Freedom also makes it so the will can move for reasons not restricted to external factors. Polo will solve this by saying that the will is moved by

synderesis. Freedom as a personal reality safeguards integration at the level of what is available. Personal freedom is also a guarantee that human praxis contains *prohairesis*<sup>8</sup>, personal choices made from my personal being from whom I understand myself and the world (*cf.* Vigo 2008). Inasmuch as they are free, these actions have repercussions on persons: namely, through their actions human beings are perfected or ruined, but they never remain just as they were before.

*The agent intellect* guarantees that human beings live engrossed in the search for knowledge. We could say that humans live with their eyes open, and the human character of 'additionally' forbids them to stop. The agent intellect stamps upon them the dynamic of searching and allows for finding. The possessive character of human knowledge is thus safeguarded. Possessing not only guarantees the agency, but also enables the delivery to be genuine. And still, the agent intellect is qualified as transparent (*cf.* Polo 1988, 35), that is to say, it is not an illuminating act, but one that allows the human intellect to illuminate its own objects, thereby making the world intelligible. This transparency means that we can see through it, since it shows what its origin is.

*Personal love* shows the way to the perfection of the human being, attained through a life dynamic of giving and offering. Polo points out that there is an ordering, because nothing can be given if one does not accept oneself first. While give is more than to receive, accepting is more than giving, because in order to accept, we must give. Receiving is not eligible and is about the relationship. Instead, accepting implies welcoming what has been received. This means giving up considering me as a creator, and accepting me as a creature. Human persons find their existence as something given to themselves, but they can either welcome it or not. Welcoming our existence means recognizing ourselves as creatures and not creators, that is to say, through our welcome we recognize ourselves and our reality as being children. If we do not accept what is personally received, our offering cannot be a personal offering. In fact, there couldn't even be an offering, but only a manipulation of reality. If I understand me as a creator, I could manipulate everything because I do not owe anything to

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<sup>8</sup> This is a technical term. It is similar to choose, but it is not the same. See the following explanation in the text to notice the differences and to deep understanding see the article of the following note.

anyone, but if I understand me as a creature I will respect it. Accepting myself as received, welcoming myself as child, allows my offering to be respectful with others. There is a dynamic that starts with understanding myself as received, for I did not create myself, and which ends with self-acceptance. From acceptance, we become a gift, and this gift is offered to someone who in turn receives. But this is not a one-way street, because when others receive me and accept me, they have at the same time given me something, and thus their acceptance enriches me. This introduces an unrestricted growth, thanks to the maturation of relations. But this only happens through his or her essence, which is why “the created person is incapable of communicating a personal character to his own gift”, and thus can continue to be. Personal love guarantees not just unrestricted growth, but also that freedom is not lost. It is through personal love that freedom knows where to direct itself.

## CONCLUSIONS

After this quick summary of the systemic view that Leonardo Polo has of human life and its anthropology, I conclude that his philosophy is an appropriate conceptual framework for neuroscience.

Neuroscience, as with any other science, requires an extra-disciplinary framework to develop a prior conceptualization of what it seeks to study, the formulation of hypotheses, and the interpretation of the relevant data (*cf.* Polo 1995, 127). In order for a philosophical framework to be capable of performing such a function, it must previously justify itself. A justification comes from a mandatory *logical correspondence* between philosophy and the science in question. That is to say, if both disciplines show the same dynamic in their functioning, it can be said that there is a logical correspondence between them. This assumes, in our case, that Polo's philosophy has been accredited as a conceptual framework of this kind for neuroscience. In this way, neuroscience would acquire a tremendously useful tool. This enrichment can be seen at work in papers that show how a Polian understanding of human action, cognition, and emotion is of great use for neuroscience (*cf.* Orón 2015).

In this paper, I have needed to find a logical correspondence that acts as a kind of bridge that unites both disciplines. The shared dynamic between them would be found in the word *integration*. I have

pointed out that integration is a maturation in which different aspects and relations become differentiated and optimized inasmuch as they are brought, at the same time, into a relation with each other. Integration is not something that may or may not happen, but rather it is precisely the way in which things happen in open, free systems. In the process of growth, I have indicated two temporal moments. The first is relational, which belongs to the level of what is given, what is natural and not available or not eligible. The second moment is the one that is integrated, and which belongs to the order of the provoked, the perfected; it is eligible and does not close anything but rather opens new possibilities.

In the present article I have not explored the way in which neuroscience explains brain functioning through the lens of integration; I have simply referred to two important authors that hold this thesis. Focusing then on Polo, we have seen the way in which he too participates in the same dynamic. Concretely, I have reviewed his conceptualization of human reality as an open and free system, his understanding of the human brain, as well as certain notions like hierarchy, government, and growth. In the context of his anthropology I have discussed his conception of the human being as a person, instead of a subject, and the person's complex yet unitary nature. I have also reviewed the character of 'additionality', that manifestative being that comes from within, and the characterization of the personal transcendentals. In discussing all these elements I have shown, obviously without exhausting Polo's philosophy, that they can be understood in the integrative key presented here.

There is long way to go to discover the benefits of interdisciplinary dialogue. Nevertheless, the goal of this paper is to show that dialogue between science and philosophy is possible because neuroscience and Polo's thinking are in logical correspondence: Both of them share the dynamics of integration.

## BIBLIOGRAPHY

Anderson, M. L. *After Phrenology. Neural Reuse and the Interactive Brain*. London: MIT Press. 2014.

Atkinson, J., & Braddick, O. J. "Where" and "what" in visual search.

*Perception*, 18(2) (1989), 181-9.

Bischoff, M., Zentgraf, K., Pilgramm, S., Stark, R., Krüger, B., & Munzert, J. "Anticipating action effects recruits audiovisual movement representations in the ventral premotor cortex". *Brain and Cognition*, 92 (2014), 39-47.

Blanco, C., *Historia de la neurociencia. El conocimiento del cerebro y la mente desde una perspectiva interdisciplinar*, Madrid, Editorial Biblioteca Nueva, 2014.

Cereceda, S., Pizarro, I., Valdivia, V., Ceric, F., Hurtado, E., & Ibáñez, A. "Reconocimiento de emociones: Estudio neurocognitivo". *Praxis. Revista de Psicología*, 2(18) (2010), 29-64.

Clark, K. L., & Noudoost, B., "The role of prefrontal catecholamines in attention and working memory", *Frontiers in Neural Circuits*, 8 (2014).

Corbetta, M., & Shulman, G. L. "Control of goal-directed and stimulus-driven attention in the brain". *Nature Reviews. Neuroscience*, 3(3) (2002), 201-215.

Düsing, K., *La subjetividad en la filosofía clásica alemana de Kant a Hegel. Una panorámica a modo de programa*, Azaféa, *Rev. Filos.*, 4 (2002), 97-121.

Falk, E. B., Hyde, L. W., Mitchell, C., Faul, J., Gonzalez, R., Heitzeg, M. M., ... Schulenberg, J., "What is a representative brain? Neuroscience meets population science", *Proceedings of the National Academy of Sciences of the United States of America*, 110/44 (2013), 17615-22.

Firestein, S. *Ignorance: How it Drives Science*. New York: Oxford University Press. 2012.

Greening, S. G., Lee, T., & Mather, M. "A dual process for the cognitive control of emotional significance: implications for emotion regulation and disorders of emotion". *Frontiers in Human Neuroscience*, 8, (2014). 2013-2014.

Herzog, M. H., & Clarke, A. M. "Why vision is not both hierarchical and feedforward". *Frontiers in Computational Neuroscience*, 8 (135) (2014).

Husserl, E., "Fenomenología", 1927, in *Enciclopedia Británica*.

Ibos, G., & Freedman, D. J. "Dynamic Integration of Task-Relevant

Visual Features in Posterior Parietal Cortex". *Neuron*, 83(6), (2015), 1468-1480.

Kaganovich, N., & Schumaker, J. "Audiovisual integration for speech during mid-childhood: Electrophysiological evidence". *Brain and Language*, 139, (2014), 36-48.

Ley, A., Vroomen, J., & Formisano, E. "How learning to abstract shapes neural sound representations". *Frontiers in Neuroscience*, 8, (2014). 132.

Ling, S., Pratte, M. S., & Tong, F. "Attention alters orientation processing in the human lateral geniculate nucleus". *Nat Neurosci*, (2015), *advance on*.

Markram, H. "Seven challenges for neuroscience". *Functional Neurology*, 28(3), (2013). 145-151.

Melloni, L., Molina, C., Pena, M., Torres, D., Singer, W., & Rodriguez, E. "Synchronization of neural activity across cortical areas correlates with conscious perception". *The Journal of Neuroscience: The Official Journal of the Society for Neuroscience*, 27(11), (2007). 2858-65.

Orón, J. V. "Consecuencias de la dinámica de la integración de Leonardo Polo sobre la acción humana, la cognición y los sentimientos". *Cuadernos de Pensamiento Español*, 57, (2015), 201-217.

Pessoa, L. *The cognitive-emotional brain. From interactions to integration*. London: MIT Press, 2013.

Polo, L., *Curso de teoría del conocimiento I*, Pamplona, EUNSA, 1984.

--- *Curso de teoría del conocimiento II*, Pamplona, EUNSA, 1985.

--- *Curso de teoría del conocimiento, III*, Pamplona, EUNSA, 1988.

--- *Introducción a la filosofía*, Pamplona, EUNSA, 1995.

--- *Ética. Hacia una versión moderna de temas clásicos*, Madrid, AEDOS-Unión Editorial, 1997.

--- *Antropología trascendental I. La persona humana*, Pamplona, EUNSA, 1998.

--- *Antropología trascendental II. La esencia de la persona humana*, Pamplona, EUNSA, 2003.

---(2007a) *¿Quién es el hombre? Un espíritu en el tiempo*, Madrid, Rialp, 2007.

---(2007b) *Persona y libertad*, Pamplona, EUNSA, 2007.

Rugg, M. D., & Coles, M. G. H. (Eds.). *Electrophysiology of mind. Event-Related Brain Potentials and Cognition*. Oxford: Oxford University Press. 1995.

Sepulcre, J., Sabuncu, M. R., & Johnson, K. A. "Network Assemblies in the Functional Brain". *Current Opinion in Neurology*, 25(4) (2012), 384-391.

Sporns, O. "Contributions and challenges for network models in cognitive neuroscience". *Nature Neuroscience*, 17(5) (2014), 652-60.

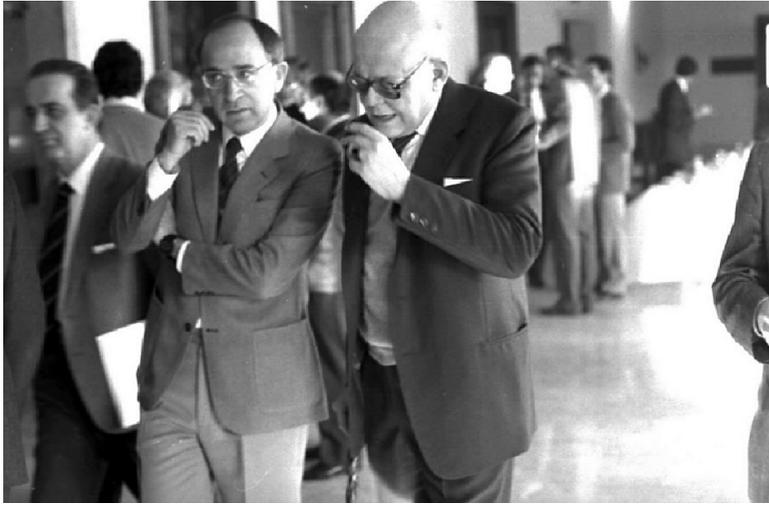
Ungerleider, L. G., & Haxby, J. V. "'What' and 'where' in the human brain". *Curr Opin Neurobiol.*, 4(2) (1994), 157-65.

Thelen, E., & Smith, L.B., *A dynamic Systems approach to the Development of Cognition and Action*. London: MIT Press, 1996.

Vargas, A.I., & Lecanda, J., "The Anthropological Crisis of Scientific Innovation", *Scientia et Fides*, 2(1) (2014) 9-30.

Vigo, A. G., Praxis como modo de ser del hombre. La concepción aristotélica de la acción racional, in G. Leyva (ed.), *Filosofía de la Acción. Un análisis histórico-sistemático de la acción y la racionalidad práctica en los clásicos de la filosofía*, Madrid, Editorial Síntesis, 2008, 53-85.





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