



Language: The “Ultimate Artifact” to Build, Develop, and Update Worldviews

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Abstract

What role does language play in the process of building worldviews? To address this question, in the first section of this paper we will clarify what we mean by worldviews and how they differ, in our perspective, from cosmovisions. In a nutshell, we define worldviews as the biological interpretations agents create of the world around them and cosmovision the more general cultural-based reflections on it (which, of course, include also agents’ worldviews). After presenting our definition for worldview, we will also present the multi-shaped viewpoint that frames our analysis, adopting three concepts that can help us explain *how* agents construct and develop their worldviews: saliences, pregnances, and abduction. While the notions of saliences and pregnances will explain how agents recognize anomalies in their worldview, the concept of abduction will help us discuss how they can learn to approach, explain, and use these anomalies to get new skills and abilities. This other point will lead us to discuss the role of language in this process, which will be describe as an artifact that permits the agent to use abduction to “normalize” and exploit anomalies, being now the ultimate artifact (for human agents) to build, develop, and update their worldviews.

Keywords Language · Worldview · Cosmvision · Abduction · Catastrophe theory · Saliences · Pregnances · Language emergence · Language acquisition · Language as the ultimate artifact

1 Introduction

This paper is the product of the combination of different background theories and theoretical points of view. As a forewarning to the reader, we should point out that this paper discusses in an interdisciplinary fashion concepts that pertain to philosophy (in particular philosophy of science, logic, and epistemology), semiotics, cognitive science, and evolutionary psychology. In this multi-shaped framework, language can, of course, be approached and described in many ways. Here we chose to focus on its cognitive role in the humans’ process of perceptual and conceptual acquisition of a point of view (which we define as building their

worldview). Basically, we see it as an artifact that allows humans to adopt and learn certain skills that makes them become aware of/adapt/react to their surrounding environment. *How* can we use it this way is the main question we aim to address. We so exploit theories from the pragmatist tradition in philosophy and semiotics with the additional contribution of the so-called semio-physics proposed by R. Thom’s theory of catastrophes. Also, the studies related to the analysis of language in terms of distributed cognition and extended mind resulted useful to depict natural language as the “ultimate artifact” to build, develop, and update worldviews.

In particular, the first section of this paper will clarify what we mean by worldviews and how they differ, in our perspective, from cosmovisions. In a nutshell, we define worldviews as the biological interpretations agents create of the world around them and cosmovision more general cultural-based reflections on it (which, of course, include also agents’ personal worldviews). After presenting our definition for worldview, we will also present the multi-shaped viewpoint that frames our analysis, adopting three concepts that can help us explain *how* agents construct and develop

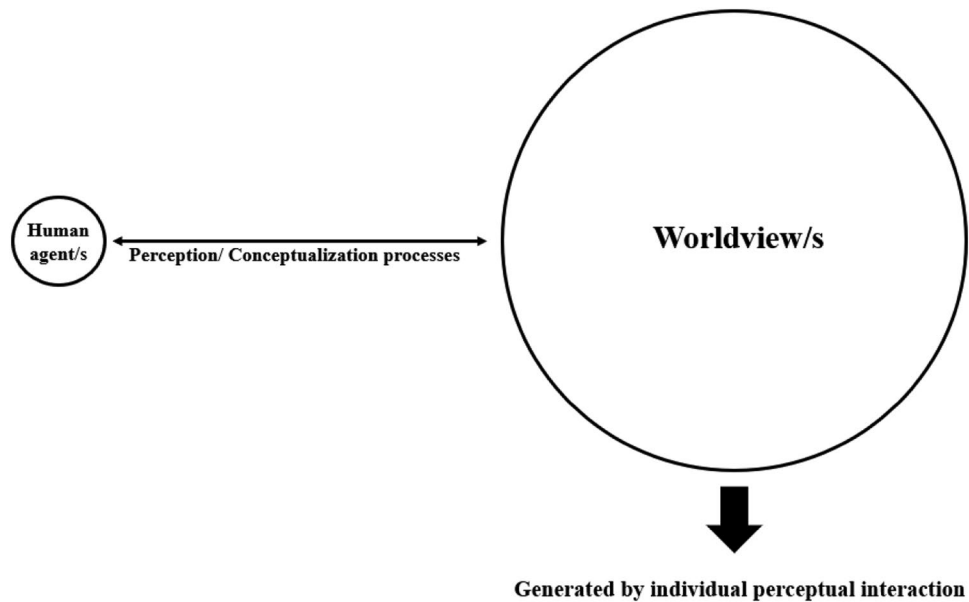
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Fig. 1 Worldviews are grounded on the perceptual/conceptual interpretations of the agent/s



their worldviews: saliences, pregnances, and abduction. While the notions of saliences and pregnances will explain how agents recognize anomalies in their worldview, the concept of abduction will help us discuss how they can learn to approach, explain, and use these anomalies to get new skills and abilities. This other point will lead us to discuss the role of language in this process, which will be describe as an artifact that permits the agent to use abduction to “normalize” and exploit anomalies, being now the *ultimate* artifact (for human agents) to build, develop, and update their worldviews.

2 Worldviews from an Eco-Cognitive and Semio-physical Perspective

What role does language play in the process of building worldviews? To address this question, we first need to discuss what worldviews are, from which theories we will study them, and what role language plays in these background theories.

Thus, in this section, we will first clarify what we mean by worldviews and how they differ, in our perspective, from cosmovisions. We will also present the multi-shaped viewpoint that frames our analysis, which is both eco-cognitive and semio-physical. In detail: we will highlight our framework’s eco-cognitive aspects in the first subsection while focusing on the semio-physical ones in the next. In the third subsection we will discuss how agents may not only develop their worldview through hereditary (hardwired) processes, but they can also learn to update their points of view through the building of different types of hypothetical—abductive, to be exact—activities. This introductory section will so

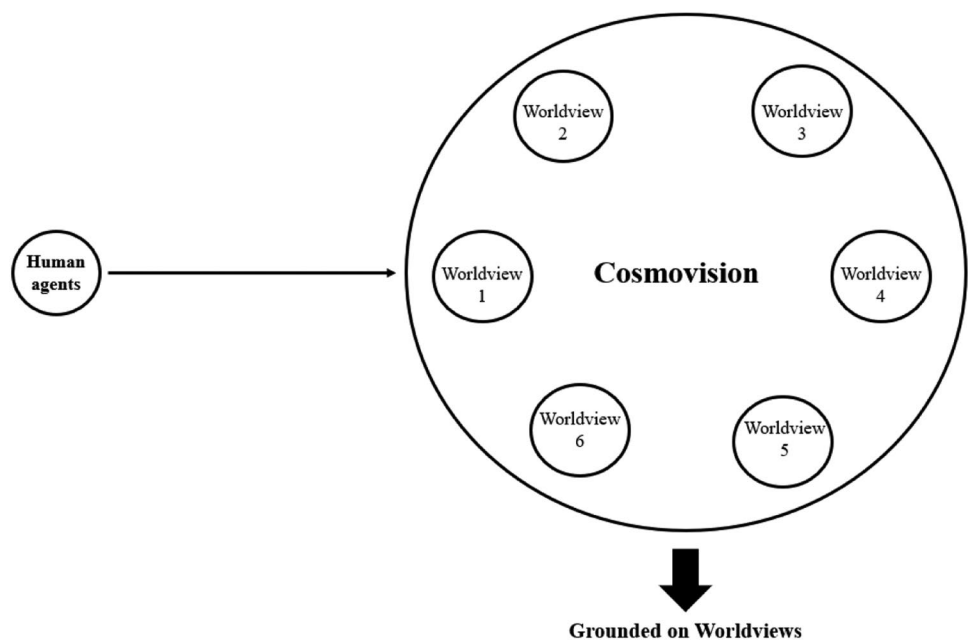
provide theoretical ground to our argument, which we will further explain later on in the paper, that natural language is the ultimate artifact to encapsulate worldviews.

2.1 Worldviews and Cosmovisions: An Eco-Cognitive Analysis

Eco-cognitive epistemology aims at analyzing how agents occupy, adapt to, and modify their environment, exploiting its features, and creating useful artifacts. For this reason, part of this epistemological study involves the comprehension of how the agents’ perspective allows them to understand their environment. In this, the term “cosmovision” becomes quite useful, since we use it to refer to the unified version of two kinds of interpretations the agents create of the world: biological and socio-cultural. While socio-cultural interpretations derive from group efforts, to which the agents both participate and are subjected to, the biological interpretation is individual. Indeed, this biological interpretation is based on the perception and conceptualization that individual agents have of their environment. We call it “worldview.”

So, the notion of worldview is intrinsically related to our eco-cognitive perspective, since a worldview is the first step that allows agents to comprehend their environment. To be more precise, in our definition the creation of a worldview is the process by which objects acquire contextual meaning for the agents. This process, as already stated, relies on both the agents’ perception and conceptualization [as illustrated in Fig. 1]. We refer to perception as the immediate (as unfiltered) information capturing, shaped by the different kinds of agent’s sense organs when affected by the immediate environment (which, of course, includes also operational qualities as *affordances*, (Gibson 1979)). Perception permits

Fig. 2 Cosmovision, grounded on group efforts, derives from the general cultural-based interpretations the agents. Cosmovisions and worldviews are interrelated and support each other in ways that help agents conceptualize what they perceive and, at the same time, those perceptions affect what the agents conceptualize



the agents to map the world (Kull 2010, p. 43), which is to say that it allows agents to create a semiotic model of it (Sebeok 2001) centered on their perspectives (Kull 2010).¹ Conceptualization, instead, defines the agents’ automatic and not-sentential enactment of inferential processes that give them sense of the world and its rules. For example, agents first learn about gravity—without a conscious and intellectual take on it—because they interact with it as a constraint for their bodies and as a feature of other objects. So agents “conceptualize” gravity (without actually creating concepts about it) by acknowledging some rules in the world around them (using primitive and not sentential types of inductive and abductive reasoning, as we will argue).

The conceptualization phase is also what make the agents recognize the difference between interacting with inanimate and animate objects. This type of learning is a trial-and-mistake process, which not only makes the agents act and react to contextual events, it but also makes them infer other agents’ interpretations of the same environment. This implication may seem counterintuitive at first, but it derives from the fact that, if other animate objects interact with the same environment, our first instinct is to imply that they can interact with it in the same way as we do (and that we are animate objects in their perspectives). This implication is the ground for what Hildebrandt (2015) calls “Double Mutual Anticipation,” which is a notion that describe how agents act on the

prediction of others’ behavior, mirroring also their predictions, and relative behavior.

So this double and mutual anticipation becomes how agents infer similarities between theirs and others’ worldviews. From this interaction, which is mediated by the agents’ perception and conceptualization, a cosmovision emerges as a group effort on the ground of everyone’s worldview [as illustrated in Fig. 2]. Cosmovisions emerge, for example, when agents realize that they are component signs of the worldviews of others. In other words, when it becomes apparent that their point of view, their perspective, is not the only one that exists. More than that, as we already stated, agents recognize others as something similar to them since they interact with other things in a recognizable way. Then, the shared cosmovision of agents comes from the intersubjective behavior interpretation and their double mutual anticipation.

Now that we made clear the distinction between worldview and cosmovision² we can say that, in a way, we agree with William James’ (1991) pragmatist perspective, since he calls agents’ cosmovisions what derives from cultural factors and different conceptualized information (the latter is, in our terms, agents’ worldviews). From this perspective, personal experience is composed, borrowing the words from Peirce (1931-1958, pp. 5.41–56), another pragmatist,

¹ We can call it a “semiotic model” because we appeal, as we will later better explain, to a pragmatist and cognitive view regarding the concept of “sign”.

² We could also distinguish two kinds of cosmovision: general and personal: ideally we could refer to personal cosmovision as agents’ subjective participation to a general cosmovision. In sum, each agent has a personal cosmovision that gives shape and, simultaneously, conforms to a more general cosmovision that acknowledges the ones of others’ in a socio-cultural encompassing framework.

of a continuum process “in which knowledge is generated to attend to certain perceptual moments”. At this point we could ask: what kind of knowledge is generated?

To address this question, we could adopt a holistic perspective, since it could help us understand how the agent interact with the environment from his worldview and personal cosmovision (which are inevitably interconnected). In (Putnam 2001), for example, we can find this useful holistic theory:

1. Knowledge of particulars (facts) presupposes knowledge of theories.
2. Knowledge of theories presupposes knowledge of (particular) facts.
3. Knowledge of facts presupposes knowledge of values.
4. Knowledge of values presupposes knowledge of facts.
5. Knowledge of facts presupposes knowledge of interpretations.
6. Knowledge of interpretations presupposes knowledge of facts (Putnam 2001, pp. 136–137).

In other words, facts are interpreted, evaluated, theorized, forming the personal cosmovision of the agents, and all these processes could not happen if agents would not perceive facts, which comes with the construction of their worldview [as shown in Fig. 2].

So, what role does language play in the construction of worldview as we presented them? To answer this question we need to incorporate our eco-cognitive perspective in a semio-physical framework. In the next subsection we proceed to do so, by employing some elaborate concepts belonging to the catastrophe theory ideated by René Thom (1988, p. 3): saliences and pregnances.

2.2 Worldviews are Shaped Up by Saliences and Pregnances

So far the concepts of worldview and cosmovision helped us present the basic premises of our framework, which aims at explicating how agents interact with and adapt to their environment. In this subsection, we will expand our take by including semio-physical elements, which will introduce the problem of the emergence of language as an artifact (as we will discuss, the *ultimate artifact*) to build worldviews. Here the two parts of the word “semio-physical” stand for two focuses of research that our framework allows. The first concerns signs, which, in the pragmatist tradition inaugurated by Peirce are “feelings, images, conceptions, and other representations” that affect the agents and make them produce inferential activities (Peirce 1931-1958, 5.283). These activities, in turn, are sign-driven and sign-based, since they produce feelings, images, conception and other representations (so, other signs). The second part of the notion,

physical, refers to two things: first, the importance of the physical matter of the world the agents are embedded in (even if semiotically perceived); and second, how agents interact with it, which involves not only sentential and internal responses to the environment, but embodied, distributed, and extended reactions that tamper and exploit internal and external resources.

So, now that we presented in which sense our framework has semio-physical features, we can introduce two relevant notions that make them pop out as relevant for our purposes, which follows from the catastrophe theory of the mathematician René Thom (1988): saliences and pregnances. These concepts gain a special conceptual intensity if seen from a naturalistic point of view, and become appropriate to the aim of presenting a unified vision of physico-biological events (such as human language), stressing their deep eco-cognitive relevance. To draw a honest picture of how the concepts of salience and pregnancy work, we should point out that they too should be understood in a holistic perspective. Indeed, the idea of *pregnance* depends on the idea of *salience* and vice versa, so we can start by describing their relation to illustrate their role in our framework.

Living being, in order to survive, need to recognize sensorial discontinuities in the environment. If a point on a branch stands out from the rest because something moves, a quick recognition of this movement can determine the survival of the agent who sees it and identifies it as, for example, another branch shaken by the wind or the slithering of a snake. These sensorial discontinuities are *salient forms* (another obvious example, but for the auditive case, is the emergence of a sound amidst quietness).³ In the words of Thom, calling for the simplest case, they determine the features of “the punctual discontinuity geometrically represented by a point dividing the real straight line \mathbf{R} into two half lines” (Thom 1988, p. 3). Discontinuities *out there* in the external surroundings are fundamentally *translated* into other pretty much enhanced discontinuities in the individual sensorial state, as a sort of “reverberation” or “stun” of the physical surrounding *within* an organic agent. The term pregnancy (which is rooted in Wertheimer’s Gestaltic idea of *Prägnanz*) can be exploited to study both physical and biological phenomena implicated in the recognition of a salient form. Pregnances can be accounted for as non-localized substances emitted and received by salient forms: when a salient form “seizes” a pregnancy, it is inundated by it and presents modifications in its inner state which can, in turn, deliver outward expression in its form. Of course, this means that not every salient form is able to “seize” a pregnancy, but every pregnancy comes into shape from a salient form. To

³ To be precise, saliences are not just anomalies but also perceptions that affect or attract sensorial apparatuses.

further clarify the two concepts of salience and pregnancy the following example can be of some use.

1. Worker honeybees intercommunicate with one another thanks to signs (through the well-known performance of a dance)—that is the pregnancy—that refer to the site where they have discovered food so as to render acquainted the other conspecifics—the invested salience—about the site. In this second case the pregnancy is communicated and so mediated—through undulatory sounds and light signals and delivers a neurobiological impact at the target organism, that is, as it were, a “psychic” impact.

Usually, in the case of salient forms, their effect on the organism’s sensory apparatus “remains transient and short lived” Thom (1988, p. 2), so they do not provoke important long-term outcomes on its way of behaving. Thom contends that when salient forms convey “biological significance” (like for example in the case of the *form of the prey* for the starving predator) the reaction is a lot greater and includes the liberating of hormones, emotional arousal and a behavior (or an immune reaction in the case of the infection) addressed to the possible attraction or repulsion of the form. Salient forms of this sort are named *pregnant*.⁴

Of course, the *cultural* obtaining of a sensitivity to salient and pregnant forms happens not only at the instinctual (hardwired) level, but also because of the presence and availability of appropriate artifactual surroundings, working as *pregnancy mediators*, where plastic teaching and learning is conceivable. These artificial environments make a lot of cognitive instruments accessible to humans, that thus make the living agents that obtain them ready to *pregnantly* manipulate signs (which therefore acquire particular “meanings”). So, as we have already said, the sensitivity to pregnancies is hereditarily derived but, can also be effectively learnt through the building of different types of hypothetical—as we will see in the next section, abductive—activities, as the fruit of what has been called “extragenetic information” (Odling-Smee et al. (2003)).

We have now at our disposal the concepts of worldview and cosmovision together with a clarification of the semio-physical mechanisms related to saliences and pregnancies, where the role of any type of sign, as also, so, of *linguistic*

ones—dominates. The following section will deal with the relationships between abduction and worldviews, to the aim of preparing the remaining conceptual ingredients that will allow us to introduce the emergence of language (Sect. 2) as the ultimate artifact to build worldviews (section 2.2).

2.3 Abduction and Changing of Worldviews

At this point we should consider how the two holistic frameworks—worldview-cosmovision’s and salience-pregnance’s ones—work together in the process of building, developing, and updating worldviews (and cosmovisions).

So, let us briefly recap by saying that so far we discussed agents get information and facts about the surrounding world. Of course, these facts are approached by processes of perceptual and conceptual interpretation (worldview building) and cultural setting (adapting to a general cosmovision): moreover, we also know that, in order to give meaning to the world, human agents need to pay attention to particular anomalies (saliences) and reflect them biologically in order to retransmit them (through pregnancies) and pass on information. We should also point out that facts are actually negotiated and re-negotiated by the agents upon changes in the environment or when new information arises. This process of negotiation happens because the inferential activities that give sense to the all-sign world are mostly *abductions*, which is a fallible but extremely useful inference that gives the chance to the agent to act upon provisional hypotheses Haack (1995). These hypotheses are ways to manage uncertainty, which not only is ever-present in the ordinary circumstances of action for the agent, but arise also when new saliences emerge. For example, when agents experience learning.

Indeed, we can use and reframe the case provided by Putnam (2006, pp. 33–37) of a music student that decides to learn how to actually “listen” to music or to train the “musical ear.” This cannot simply be learned by following some rules, but at the same time is essential to follow them later to play any instrument. In order to listen to the music, the student needs to learn how to recognize anomalies in what he is hearing, so s/he needs to separate saliences and find patterns that he can repeat. So s/he needs to understand how to transmit the pregnant form of the sounds that s/he need to identify in order to repeat them and pass them on to others with an instrument. When actually s/he is learning how to play an instrument, a violin, for example, the learning process can be improved by the enactment of fast and almost automatic abductions, that concentrate the attention of the student to different element of the music and proceed by trial-and-error to the selection and isolation of the right combination of hypothesis.

When the student begins to recognize some notes, so isolating the right saliences from the noise, s/he can improve

⁴ In his book, Thom (1988, section E of chapter 1, p. 8) also makes an explicit reference to the idea of a “pregnant category”, in the precise sense of category theory, and in fact, in the same section Thom defines, without mentioning it, a co-variant functor R (the physiological reactions): it has to be said that category theory is a very natural framework within which abductive processes can be formalized, as demonstrated by the results offered by Caterina and Gan-ge (2016).

his/her play by evaluating her/himself which notes s/he is generating (so, by enacting fast evaluation processes of her/his hypotheses). Since for many abductive problems there are—usually—many guessed hypotheses, the abducer needs reduce this space to one. This means that the abducer has to produce the best choice among the members of the available group. It is possible to identify this learning process as a case of *manipulative abduction*. Manipulative abduction happens when agents are “thinking through doing” and not only, in a pragmatic sense, about doing (cf. Magnani (2009, chapter one)). In this case the “doing” part includes adaptations and modifications established by action guides (directed by the teacher). On the one hand, we face an implicit fill-up process, which refers to the generation hypotheses and, on the other, the cut-down one, which works on the selection of the more appropriate hypothesis in the light of various constraints established by different contexts. Of course, it is essential to take into account that hypotheses in these abductive contexts are not related to the standard necessity to explain something: they are just characterized as action guides in a context of general uncertainty. From this point of view, it is possible to understand knowledge generation as the adaptation of the lived experience to the new one obtained by the continuum of perception.

During the learning experience, of course, the worldview of the student changes as s/he is improving her musical ear and capacity to play. The pregnant forms that s/he is learning to pass on with her/his instrument are now recognized as notes and s/he is able to read the pattern that s/he could just “hear” without “listening” (or understanding) before. The role of abduction in this process is fundamental and it happens not always at a sentential level, but through gestures, the manipulation of the instrument, and the essential relationship with the teacher, which is the person that needs to make her/his students understand how to select the right salient forms.

Thus, through abductive processes enacted by adopting certain behaviors and encapsulating particular sensorial data as relevant, the student modifies—negotiates—the facts that s/he already had experienced when s/he was hearing without listening to the music. The student point of view becomes so part of the general cosmovision shared by her/his teacher, since s/he is building a new worldview by the conceptualization of the salient forms that both s/he and her/his teacher are able to recognize. The facts and pieces of information that they now consider are different, in the sense that the student built a new worldview with the skill and data s/he learned and the teacher will now be able to refer to those data as “meaningful” for both of them.

Humans obviously are adaptive organisms, whose biological vital capacities are intertwined with the cultural ones, in the sense that the latter are constructed above the former. Of course, the reader has to note that in this case

we do not establish any relation between cultural development and biological evolution, but we are just referring to that will of adaptation—in general and not strict Darwinian sense—that permeates our cultural characteristics, as history of human civilizations clearly demonstrates. Cultural traditions are modified during the course of adaptive actions and, from this point of view, information and data, in the form of cultural traditions and ways of relationships building, sometimes operate as constraints and sometimes as triggers. This bivalence allow us to understand, for example, the triggering of an innovative music interpretation as indicating that a new music style is born, maybe in serious contrast with tradition, but it is still considered music, after all. An excellent example is the guitar scene in the 1985’s movie “Back to the Future” when Marty McFly finishes covering Chuck Berry’s Johnny B. Goode and says, “I guess you guys are not ready for that yet, but your kids are going to love it.”

It is interesting to note that it is relatively simple for us to recognize something new (a salient form) as familiar (and may be pregnant form) after the process of worldview updating is completed. This process applies in cases where novelty comes from our socio-cultural contexts but also when we get into different ones. The concept of abduction permits to understand the novelty with a surprising psychological state (which it is triggered by the pregnancy of the salient form). A novel (or salient) case presents itself as a surprise when the cognitive background does not incorporate it in the available knowledge: this situation triggers the production of new tentative hypotheses aiming at providing additional knowledge capable to account for the novelty/anomaly. In other words, abduction provides ways to cognitively act and also reasons to do so. From this perspective, during this process our worldview changes exactly thanks to these new ways of action that allow us to approach the surprising and unknown fact with a hypothesis which plays the role of an epistemological anchor. This “enactive” process of understanding is at the same time a learning process in which every new action is nevertheless conditioned by the cultural framework (or cosmovision) that interacts with the individuals behavior.

Now that we illustrated the three corners of our view, we have all the conceptual tools we need to discuss the role of natural language in the process of building, developing, and updating worldviews.

3 Language, Abduction, and Semiosis

In the Sect. 2.2 we have introduced the concepts of salience and pregnancy, which are derived from Thom’s catastrophe theory. As we already stated, both concepts are key ideas which can be fruitfully examined in the light of abductive cognition in order to explain how agents build, develop, and

update their worldviews. Pregnances influence a life form, and the related abductive/speculative reaction is immediately set off, modifying the meaning-making processes enacted in response to environmental triggers. Hence, we can say that a pregnant stimulus is—so to speak—*highly diagnostic* and a detonator to start abductive cognition, which in turn tune-up the worldviews of the subjects that recognize new clues in the environment. Also, of course, pregnances can be abductively enacted or made for the first time.

For example, when a bell ringing is reiterated frequently enough along with the presentation of a bit of meat to a dog, because of Pavlovian conditioning the nutritious pregnancy of meat spreads by contiguity to the salient auditive form, with the goal that the salient form, for this situation the sound of the bell, is invested by the nutritious pregnancy of the meat. As Thom puts it: “So we can look on a pregnancy as an invasive fluid spreading through the field of perceived salient forms, the salient form acting as a ‘fissure’ in reality through which seeps the infiltrating fluid of pregnancy” (Thom 1988, p. 7). When the reinforcement is built up, the bell—Thom states—alludes *symbolically* in a pretty much stable manner, to the meat. Obviously also the annihilation of pregnances through lack of reinforcement is conceivable, when a living being moves away for a long period from the source form or when the invested salient form is related with another pregnant structure still without reinforcement. In this perspective the “symbolic activity” is viewed as in a general sense connected to biological control systems in two different ways: (1) first of all it is an expansion of their efficiency (new great intellectual abductive possibilities—new pregnances—are supplemented); (2) an internal simulation regarding the relations between the food and its index, the bell, is actualized, so that the way to the formation of numerous types of abductive semiotic cognition (and/or intelligence) is opened.

Thom’s example related to Pavlovian processes can fruitfully open up the problem of the emergence of language: Thom says that “[...] the situation is not fundamentally different from that of language.” At the beginnings the stimulation is a mere association, but we can clearly see in it what Thom calls “[...] the first tremors in the plastic and competent dynamic of the psychism” of a link seen as casual. Now it ought to be evident that we can represent these semiotic cycles as hypotheses-based. For instance, Thom says that “[...] it is suspicious whether hereditary qualities alone would have the option to code a *visual* structure [...]. Whence the need of conjuring social transmission, connected with the social or family association of the network” (p. 10). In gregarious organisms signs—that must be also seen as alluding to the role of the “pregnance-reflecting” capacities of human language—are a conveyor of pregnances to the extent that they transmit pregnances from an agent to another, or to many others. In such a manner they favor the activities

of education (teaching and learning), working to establish the social and shared cosmovision required, for instance, to catch food and to avert predators.

Of course pregnances favor *diagnosticability* and in this way an organic agent can recover an emblematic reference to a “source” form, which can often become a trigger of a swift reaction. For example the pregnancy of fear in a flock of birds generates the action of taking flight. In sum, abducted pregnances play the role of mediators of salient signs and work in a triple way: feelings, acts, and concepts. They are the output of various cycles including signs. Obviously sign(al)s are dependent upon changes, since they are always, so to say, inadequate, with the chance of transforming a specific element beforehand obscure to their interpreters in a clearer message, at the same time favoring further modifications of the pregnant forms and even their withdrawal. In human creatures signs such as the ones involved in languages, natural and artificial, are pregnant for the recipient to the extent that they are promptly enriched with conceptual importance (forming their ever-changing worldviews) and live in a semiosis endowed with an appropriate stability in the chain of iconic, enactive, and symbolic communication.

At this point we can readdress the problem of the emergence of human language and its role in worldview building, from an ontogenetic perspective, taking advantage of our semio-physical framework. To illustrate this last point, let us come back to Thom’s illustration of the Pavlovian dog. When the dog is instructed to give a special meaning to the sound sign as a pregnant form regarding food this modification is occurring in the worldview of the dog. On the contrary, the phonic and material status of the signal is unchanged but as a material physical event *becomes* pregnant for the dog thanks to the human intervention. In the worldview of the dog, a kind of “mind” arises, which is characterized by the possibility to responding to signs (and also to produce and express other signs, for example a sound finalized to ask for food). In this Pavlovian example a pregnancy is rooted in the remembering of a previous alimentary gratification and so it is the *abductive anticipation* of the gratification itself. It is clear that pregnances of such a type are composed by interrelated internal and external semiotic processes so that a particular component of the dog’s worldview corresponds to something existent in the world.

Thus, human language enters the scene of the semiotic worldview building (in an ontogenic sense) in very wonderful ways. Let us consider the case of affect awareness in case of human infants and their parents and caregivers. The first interplay is mainly iconic: they communicate with gestures, faces, forms, but also special cries. Later, of course, they begin to learn words: the adults know them and understand their meaning, the infant is just engaged in learning them entering what we can call a “linguistic semiosis,” which is already modifying their means of interaction, and so their

worldviews. The infants are inundated by a lot of words, only *possibly pregnant*, to be learnt, and the capacity to learn and understand them is usually related to the specificity of human development. The mother utters words and, at the same time, “deictically”, emanates an amount of her pregnancy to affect the referred object (for example using contact or pointing fingers), thus connecting the given object or event to the sound of the word. The infant’s worldview is inundated by this process and an internalization occurs in terms of neural fixation (about at eight or nine months the child can independently exploit the learnt words). In sum, the “meaning” of the word is finally firmly comprehended and internally assimilated (the worldview is updated to accommodate new meanings). Thom adds that an example of the morphological isomorphism between language and biological functions is represented by the verb as it is used in propositions like “The cat eats the mouse”. This sentence recreates at the linguistic level the biological change between the virtual investment of a subject by a pregnancy and the gratification similar to the one illustrated above in the Pavlovian experiment.

Of course, though, language in humans is also related to the need of communicating. It is, indeed, a *social need*: we pass a great part of our lives extracting the “meaning” embedded in pregnancies found in humans’ and artifacts’ words thanks to many sensory systems based on undulatory sounds, light, but also direct contact (imagine Braille cells). We also to add that it is mainly thanks to natural language that human can build very sophisticated worldviews: in this language is used as a tool that permits agents to manipulate one own’s and others’ worldview (and cosmovision). In the next subsection, we will argue that language is a cognitive artifact that, by permitting the agent to use abduction to “normalize” and exploit anomalies, fruitfully updates their worldviews.

3.1 Language as a Cognitive Tool

Agreeing with relatively recent studies in the area of distributed cognition (Wheeler 2004; Clark 2008), we can contend that vocal and written language are cognitive tools, since they foster and favore cognitive activities of the agents. Let us reconsider the problem of mother/child interplay presented to discuss the processes of language acquisition in the previous section. Once the mutual use of a “word” is abductively stabilized, it realizes the welcome linguistic awareness of the child (and at the same time the two individuals can solidly “communicate” in a shared cosmovision): the maternal cognitive deixis to an external object or event is stabilized too. The entire procedure is, step after step, the slow product of consecutive abductive operations on “linguistic (abductive) hypotheses” [in this case words belonging to a natural language] uttered by the two individuals, until a

conceivable and adequate result is attained. In this cycle, the external utterance of a sound/word of the infant is built up as a commitment to the outside world, which at the same time is related to an established and consistent worldview that permits active communication with the mother. Another connected result is also the sharing of affectivity as sometimes mediated by words which is at the premise of further social articulation of emotions based of natural language.

Thom contends that language can essentially and productively communicate *vital* bits of data about the principal biological oppositions (such as life–death, good–bad): it is from this viewpoint that we can obviously comprehend how human language—even in the case of the more complicated syntactical articulations—always and consistently conveys data (pregnances) about people, things, situations, that actively modify agents’ worldviews. Such characteristics are in any case related to fitness and survival of human agents, both individually and collectively. Societies are richly maintained and regulated by language and, it is also used to express agents’ worldviews for various reasons. To make an example, the creation of vocal language is certainly strongly related—of course this is not the only role of language—to the need of governing the members of a group sending directions regarding the execution of various tasks to the final aim of granting its stability. In this way, language is also a mediator from an individual worldview to shared cosmovisions. More than that, in the next subsection we will defend the thesis that, for our species, language is now the ultimate artifact to build, develop, and update worldview, since it can be used to convey internal and external changes of conceptual paradigm, and hypothesis-led arguments and reasoning.

3.2 Language as the Ultimate Artifact to Build Worldviews

Once emerged, human language grows itself generating a powerful tool that can fulfill plenty of cognitive tasks (Clark 1997, p. 218): recent cognitive theories concerning natural language should now be mentioned also to illustrate its functions in the light of the interplay between worldviews and cosmovisions. Clark, for example, sees the brain as a “pattern completing device” and language as an external asset/instrument which is—thanks to a process of coevolution—clearly fitted to the human brain, promoting its cognitive talents (Wheeler 2004). As a pattern completing device, language, in a way, tune up agents’ worldviews to accept the changes and anomalies of the environment: this way, agents’ reflection on their context is continuously updated. Moreover, language is culturally transferred from one generation to the next just exposing individuals to examples of it, that afterward are reasonably generalized in their shared cosmovision.

Precisely like mallets and computers are fitted to the human brain and to the structure, shape, and limitations of human hands, language is a mediator of communication and information and it “[...] alters the nature of the computational tasks involved in various kinds of problem solving” that concern human beings (and their brains) (Clark 1997, p. 193): language *scaffolds* cognition for the brain (Clowes and Morse (2005)). Language is for Clark a cognitive tool that promotes thought and perception through: (1) memory increase, (2) simplification of the environment, (3) coordination of actions thanks to control of attention and resource allotment, (4) capacity to free human beings from complicated situation-based learning activities, (5) facilitation of planning ahead when it is difficult to exploit the internal memory alone, (6) successful management of data and of representations. All these aspects are fundamental when we build and develop complex and conceptually stratified worldviews (and cosmovision, nonetheless).

The use of natural language reprograms the computational endowments of the brains to allow “continuous” physical entities,⁵ such as neural networks, to perform logic-like and discrete serial processing (Wheeler 2004, p. 696), without a considerable alteration of the basic brain’s processing functions. More internal capacities are favored, such as internal self-directed discourse, thanks to murmuring, or when we rehearse a few guidelines to ourselves. Clark observes that “[...] exposure to, or rehearsal [of spoken and written language, through visual, auditory, and haptic sensorial systems] [...] always activates or otherwise exploits many other kinds of internal representational or cognitive resources” that are able “to provide a new kind of cognitive niche whose features and properties *complement*, but do not need to replicate the basic modes of operation and representation of the biological brain” (Clark 2006, pp. 370–371).

Furthermore, language exonerates individual agents from being trapped in a specific situation and necessarily depending on it, and provides signs that can be perceived and grasped to the aim of reasoning simplification, for example solving tough problems outside, in a sheet of paper, thanks to “written” words and symbols: overall, language anchors flexible and contextual ways of thinking.⁶ Logan further comments that a word plays the role of an attractor for all the percepts related to the concept it represents, so providing access and grasping appropriate memories (Logan (2006)).

In this perspective we can also understand how thoughts made by words (for example taciturnly speaking to ourselves) constitute the fundamental cognitive ability that is at the basis of that human animals’ specific capacity to think

“about” their own thoughts (that is second-order thinking); indeed Clark thinks, and we partially agree with him, that it is only and exactly the capacity to generate thoughts *in words* that makes the thoughts stable entities susceptible to be valued and managed. However, we concur with Wheeler who censures this conviction: language would not be the “only” way for realizing this second-order process, actually it seems that many non-language based animals could likewise, on a fundamental level, present this ability employing other inner states (for instance model-based—visual, emotional, etc.—representations).

4 Conclusions

The initial part of this article has been devoted to the clarification of the concept of worldview taking advantage of the concept of cosmovision its their relationship with the role of abduction and knowledge, so laying the groundwork of new eco-cognitive and semio-physical perspective. The role of natural language in its capacity to build, develop, and update worldviews is subsequently examined thanks to a series of theoretically steps that, taking advantage of Thom’s catastrophe theory, range from the exploitation of the concepts of salience and pregnance, and of abduction. Salience and pregnance furnish a theoretical tool able to simply and satisfyingly describe the problem of the emergence of language and its naturalness as an ordinary semio-physical process. Finally, in the spirit of catastrophe theory and of the perspectives related to the theory of extended mind and of distributed cognition, the final important problems of the function of abduction in the acquisition of language and the character of language as an “ultimate artifact” to build, develop, and update worldviews are investigated.

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⁵ On the interplay between continuous and discrete, and the role of alphabet and computation, cf. (Longo (2009); Magnani (2018a, b)).

⁶ Further details are illustrated in (Harris (1989); Menary (2007)).

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