Academic Journal of Modern Philology

Aleksander Szwedek
professor emeritus, independent scholar
szwedekaleksander@gmail.com
ORCID: 0000-0003-2391-1942

ISSN 2299–7164
Vol. 27 (2025)
329–343

Innateness Hypothesis: Prenatal Image Schemas and Language

"…biologically, a schema is a part of the nervous system."
Neisser (1976: 54)

Abstract

The paper demonstrates that it is the image schemas that are universal elements in the foetus's nervous system, disproving Chomsky's Innateness Hypothesis with the fabricated universal grammar, structure and rules, in the prenatal period (in the foetus). The claim is based on the definition of the image schema as *a mental structure consisting of a relational schema and at least one* OBJECT *schema (*MOTION *of* OBJECT*), a conceptually independent entity representing physical objects.* Its fundamental property is density experienceable by touch, which as part of the nervous system evolves from the 7th week of pregnancy. The foetus-womb interactions evolve into prenatal schemas (MOTION of, BLOCKAGE of, *etc.*) forming a cognitive network. The interactions among schemas develop into interrelationships such as Cause-Effect. The universal prenatal image schemas, and the rudiments of reasoning (Cause-Effect) continue naturally after birth developing differently in different cultures. Finally, it is no coincident that the universal OBJECT-RELATION image schema corresponds to the universal NOUN-VERB structure, giving a solid support for earlier reports that in early childhood, nouns are acquired before verbs.

Keywords: the innateness hypothesis, the image schema, the sense of touch, prenatal image schemas, reasoning

1 Introduction

1.1. *The Structure of the Paper*

The idea of an intrinsic nature of some characteristics of an organism is an ancient one. The main theme of the paper is the experiential grounding of image schemas in the prenatal period leading to the formulation

doi: 10.34616/ajmp.2025.27.20

of a new innateness hypothesis. To achieve that goal, I discuss the importance of touch in the prenatal period, and the conceptual independence of the OBJECT schema, the fundamental and unique element of all image schemas. It is my intention to take the readers, step by step, through what has led me to the final conclusion that the prenatal image schemas are a strong argument for postulating the innateness hypothesis, different from all other proposals, and constituting a firm basis for further acquisition of knowledge. Among the most important issues involving image schema were their identification and definition. The paper emphasizes the unique character of the OBJECT image schema, that is, its conceptual independence, different from all other, relational, schemas. Another issue, inextricably connected with the OBJECT image schema is its experiential grounding, with particular focus on density, which is experienceable only with touch. The paper begins with a presentation of the layout (1.1.), followed by a brief reflection on empiricism and rationalism (1.2.), and a short description of the idea of the Innateness Hypothesis in linguistics (1.3.). Section 2 discusses controversies about the identification and definition of image schemas. Section 3 is devoted to the analysis of the OBJECT image schema, the fundamental and unique element of all image schemas (3.1.). It also draws upon Langacker's essential distinction between 'things' and 'relations', and experiential properties of objects (3.2.), with emphasis on the unique nature of the sense of touch (3.3.). Section 4 returns to the issue of the image schema, formulating the definition of the OBJECT schema (4.1.) and the image schema in general, illustrated by an example (4.3.). Finally, section 5 includes recapitulation of earlier arguments emphasising the foundational nature of image schemas in the prenatal period (5.1), examples of the prenatal schemas (5.2.) and a digression on the possible development of rudimentary prenatal reasoning (5.3.), followed by Conclusions (6).

1.2. *A Note on Empiricism and Rationalism*

"The idea that some characteristics of an organism are explained by its intrinsic nature, whilst others reflect the influence of the environment is an ancient one" (*The Stanford Encyclopedia of Philosophy* 2022) (SEPh). Plato maintained that the human soul, existing before it enters the body, has some knowledge, which disappears at birth. Essential in his approach is the recollection of pre-existing knowledge, which makes learning possible. In opposition, Aristotle rejected the idea of recollection, explaining human learning by appealing to sensory perception. Rationalism and empiricism emerged as distinct philosophical schools of thought in the early 17th century, with Descartes and Spinoza representing rationalism, while Bacon, considered to be the father of modern empiricism, Locke and Hume adhered to empiricism.

Empiricists reject the Innate Knowledge thesis. They hold that "[i]nsofar as we have knowledge in a subject, our knowledge is *gained*, not only triggered, by our experiences, be they sensorial or reflective. Experience is, thus, our only source of ideas" (*SEPh)*.

The dispute between rationalism and empiricism continues, but in the last few decades has adopted a new character. Due to Chomsky's proposal of Innateness Hypothesis, the emphasis is on the development of language, and in linguistic circles there is "a clear consensus that linguistic research can help us to discover aspects of language-relevant biological endowment and, for some linguists too, there is the notion that supposed biological/psychological constraints on what might be learned should have a shaping influence on the form of linguistic theory" (Campbell 1988: 1).

1.3. *Inateness in Linguistics*

The idea of inateness of some language structures, known as the Innateness Hypothesis, was introduced by Chomsky in 1962. Essentially, it claims that humans are born with at least some knowledge of linguistic structure, and acquiring language is simply filling the frame with details in the process of exposure to the environment.

The Innateness Hypothesis developed into minimalist theory, which very firmly claimed the inateness of universal grammar, structures and rules. The minimalist type of derivation is perhaps best demonstrated on Tajsner's (2008) sentence:

The báby disappeared.

Since sentence stress (NSR) usually falls in some final position, the structure is incorrect. To mend it, he derives the sentence from the deep structure:

$[_{TP}$*The baby disappeared {the baby}]* (49).

He then puts the stress on the "baby" in final position (NSR):

The baby disappeared the báby.

and deletes the less stressed, initial "baby," which results in

disappeared the báby.

Finally, he moves the final, now stressed "baby" to the initial position, getting the desired structure:

The báby disappeared.

It never crossed his mind to check the Prague School works on the "thematic structure of the sentence", neither did he consider the different contexts in which his example and *The baby disappéared* occur.

It seems that one global rule, "move *α*," would suffice to account for the derivation. Thus, "move" "the baby" into the final position (insertion), "move" NSR upon it (insertion), "move out" the initial "baby" (deletion), and move "the baby" from the final to the initial position (fronting) – all this in the foetus.

What is more, he writes: "The ultimate order is a result of a PF [phonetic form]… *stylistic* fronting…" (264; author's emphasis). Thus, the changes are merely phonetic? stylistic?!

The universal grammar has been widely criticized for three reasons:

- the lack of empirical evidence,
- non-universality of the grammar,
- the slower language acquisition than would be expected with the grammar in the foetus.

The first reason is obvious. There is not a single piece of empirical evidence. For the second Sigurðsson wrote that "…typological research suggests that not having any case marking at all is by far the most common "case system" (found in 100 of the 261 languages in Iggesen 2008)" (2012: 193). Finally, without grammar, language acquisition is slower than it should be with the grammar at birth.

I wish to finish this part by citing Seuren's merciless words: "Chomsky's book *The Minimalist Program* is a sad example of spurious science, as it fails to satisfy basic scientific criteria, such as respect for data, unambiguous formulations, falsifiability, and also, on a different level, simple good manners" (2004: 193).

The key question, how the grammar, structures and rules got in the nervous system of the foetus, has not even been asked. To such a question, the only minimalists's answer I can imagine, could be – "It just was/got there!" by a kind of a "Deus ex machina"! With the conclusion that the universal grammar in the foetus is absent, the hypothesis submitted in the present paper makes use of the more natural and

verifiable development of image schemas: stimulus-response, saved and developed in the nervous system from the earliest stage. It might supposedly have a potential of being foundation of language.

2. The Image Schema

2.1. *The Importance of Image Schemas*

The link between the theory of image schemas and innateness may not, at first glance, be apparent. However, image schemas play an important role in the argumentation in favour of the innateness hypothesis. As stated above, the weak point in the innateness hypothesis has so far been the lack of empirical evidence. The present paper suggests that it is recognizable in the prenatal image schemas, which so far have been almost entirely ignored.

Ever since it was first described by Johnson (1987), the image schema has raised many controversies with identification, and particularly, with developing a definition, which was finally formulated by Szwedek (2022; see section 4.2 below).

2.2. *The Image Schema Identification*

So far, the identification of image schemas has been intuitive and based only on experiments and arguments from the postnatal period. Despite the great interest that image schemas have aroused in scholarly discussion emphasising their importance in cognitive processes, what has been lacking is a definition of 'image schema' *sensu stricto*. In 2005, Hampe presented a comprehensive list of commonly recognized schemas based on proposals of a number of scholars (Johnson 1987, Lakoff 1987, Cienki 1997, Clausner and Croft 1999, Mandler 1992, Turner 1991, Gibbs *et al*. 1994, Dodge and Lakoff 2005). Hampe added that "[t]he image schema list has never constituted a closed set" (*cf*. Johnson's (1987: 126) statement about the number of schemas) The most commonly recognized image schemas are shown below in Hampe's comprehensive list (2005: 2–3).

(1) a. CONTAINMENT/CONTAINER, PATH/SOURCE-PATH-GOAL, LINK, PART-WHOLE, CENTER-PERIPHERY, BALANCE.
b. the FORCE schemas: ENABLEMENT, BLOCKAGE, COUNTERFORCE, ATTRACTION, COMPULSION, RESTRAINT, REMOVAL, DIVERSION.

(2) a. CONTACT, SCALE, NEAR-FAR, SURFACE, FULL-EMPTY, PROCESS, CYCLE, ITERATION, MERGING, MATCHING, SPLITTING, OBJECT, COLLECTION, [MASS-COUNT], [SUPERIMPOSITION].
b. UP-DOWN, FRONT-BACK.

(3) a. INANIMATE MOTION, ANIMATE MOTION, SELF MOTION, CAUSED MOTION (Mandler, 1992: 593–596), LOCOMOTION (Dodge and Lakoff 2005).
b. EXPANSION (Turner, 1991: 171), STRAIGHT (Cienki 1998), RESISTANCE (Gibbs *et al*. 1994: 235), LEFT-RIGHT (Clausner and Croft 1999: 15).

(Hampe 2005: 2–3)

Referring to Hampe's intuitive list, Oakley fittingly asked "What counts as an exhaustive image-schematic account of a familiar activity? Is there consensus on the exact number of image schemas? What are the constraints on postulating image schemas?" (2007: 229). To which he pessimistically replied, that "[a]t present, I see no widespread agreement on these matters, especially regarding the exact number of image schemas or even regarding the question whether some of the items appearing on Johnson's authoritative list, such as ENABLEMENT, are *bona fide* image schemas" (2007: 222).

The most radical statement about the possibility of formulating a definition of image schemas came from Clausner and Croft, who concluded, in no uncertain terms, that "[o]ne can define image schematic domains only by enumeration" (1999: 21). This opinionated statement is quite astonishing. Common sense indicates that one cannot identify any member of a category without some criteria.

In 2005, Grady proposed some guidelines for a definition of the image schema which, as he wrote, should be determined by ruling out "certain schemas that are too general to be associated with any particular type of perceptual experience, or too rich to count as fundamental dimensions of perceptual representation" (2005: 35). I imagine that the concepts to be eliminated first are such abstract notions as THOUGHT, DEATH, and TIME which Clausner and Croft (1999: 14) call nonimagistic domains, that is such which lack images (Lakoff and Turner 1989: 94*ff*). The only entity, I think, that is "general enough," but 'associated with a particular type of perceptual experience', is the OBJECT schema.

3. The OBJECT Image Schema

3.1. The Unique Nature of the OBJECT Image Schema

The OBJECT image schema has, so far, received little attention[1]. The only explanation I find is Wittgenstein's adage that one is "unable to notice something because it is always before one's eyes" (1953: 30). After all, we live in the world of objects, and we only need to give objects specific names. Saying **This is an object, and specifically this is a lamp* makes no sense, so we simply say *This is a lamp*.

One of the few who appreciated the uniqueness of the OBJECT schema was Santibáñez who affirmed that "[t]he available literature is rather contradictory as to the status and characteristics of the OBJECT image schema. This skeletal cognitive model is not described in detail in the seminal works by Johnson (1987) and Lakoff (1987), although the former includes it in his inventory of image-schemas" (Santibáñez 2002: 185). Regrettably, Santibáñez limits his discussion to general, though illuminating and important remarks when he writes that "[…] the OBJECT construct may be safely identified as a *basic image-schema* [author's emphasis], *i.e.* one that provides a blueprint for the orderly activation of additional cognitive material […] The OBJECT image-schema is *experientially grounded* [author's emphasis] in our physical and social interaction with our own bodies and with other discrete entities in the world" (2002: 186).

1 For example, Lakoff (1987) does not mention it at all. The importance of objects was acknowledged by Jäkel (1995), Reddy (1979), Schneider (1997), Santibáñez (2002), and Szwedek (2000, and particularly 2018).

Needless to say, the disregard of the OBJECT entailed disregard of its properties, particularly its basic, and so obvious that hardly noticeable[2] quality, that is, density.

As a point of interest, I may add that as early as in 1690, Locke described "solidity" (hardness) in terms of resistance, and a few centuries later, Kotarbiński described "inertness" (equivalent of density) in terms of "offering resistance" (1929 [1990]: 75).

This general introduction to the unique nature of the OBJECT image schema would be incomplete without a brief mention of Langacker's fundamental distinction of all predications into "things" and "relations". Langacker (1987) stated that all predications designate either conceptually independent "things,"[3] or conceptually dependent "relations": "processes" represented by verbs, and "atemporal relations" represented by adjectives, adverbs and prepositions.

The idea of conceptual independence of objects is not new. Following Aristotle, Kotarbiński defined a "body" (a physical object) as something that exists in its own right, that "has need of no other thing in order to exist" (1990 [1929]: 75; tr. author). As Langacker put it: "Relations are conceptually dependent, *i.e.* one cannot conceptualize interconnections without conceptualizing the entities they interconnect" (1987: 215). Interestingly, Chomsky's (1965) selectional restrictions diagrams can also be interpreted in terms of conceptual independence. Nouns are conceptually independent as they have their own characterization through semantic features such as, for example, [+ Common; + Count; + Animate; + Human), while the characterization of verbs requires the presence of nouns with their features. In other words, they are conceptually dependent relations between nouns (Chomsky 1965: 114ff). However, it is proper to add that Chomsky's semantic features look more like ontological properties; after all, it is objects, not nouns, that can be ± animate or ± human.

3.2. *Perceptual Experience of Objects*

There is no need to argue that experiential grounding of image schemas is one of the central issues of investigation, having its clear expression in embodiment. The common conviction has been that the most important sense in our experience is vision. True as it is for the postnatal period, vision is not the most primeval of the senses. To the best of my knowledge, it was only Szwedek (2000) who put forth the claim that the most primeval and fundamental among features of physical objects is density, and the only sense with which we can experience density is touch. Though vision predominates, it cannot, for example, give us the experience of the degree of density of objects, which brings us to the problem of schematicity. Image schemas show various degrees of it, from very concrete, such as "claw hammer," to more abstract "hammer," still more abstract "tools" and finally, at the very top of the hierarchy, the OBJECT itself. While "claw hammer," "hammer," and "tools" can be assigned various concrete features (shape, colour, size, *etc.*), the only concrete feature of the OBJECT schema is density, as Fig. 1 shows (Szwedek 2022: 146; based on Langacker's (1987: 135) hierarchy: THINGS>TOOLS>HAMMER>CLAW HAMMER).

2 *Cf.* Wittgenstein's adage comes to mind again, here.

3 I use the term OBJECT, first introduced by Szwedek in 2000, since "thing" has for decades been associated with the Great Chain of Being metaphor occupying the lowest level, with "reification" as the corresponding process of metaphorization. The term OBJECT includes all entities within the Great Chain of Being: humans, animals, plants and inorganic things.

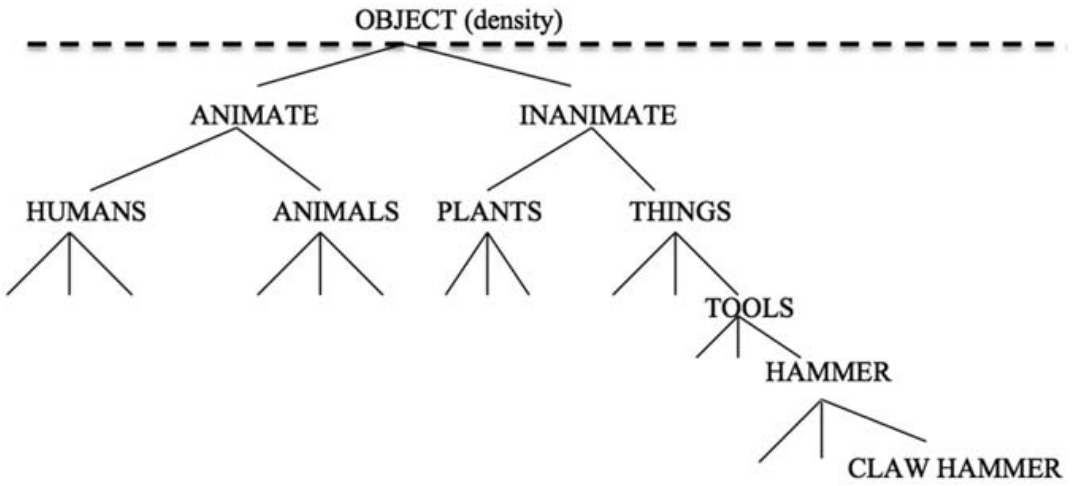

Figure 1. A hierarchy of objects

Notice, that the OBJECT schema meets Grady's (2005:35) criteria: it is the most "general" entity, but not too general to be disqualified as abstract (or non-imagistic), and at the same time it is "associated with perceptual experience" of density through touch.

In 2019, Hutmacher observed that "[f]or decades, vision was considered the most important sense" (Hutmacher 2019: Abstract). His diagram shows that "there were more studies on visual memory than studies on the memory of all other sensory modalities combined" (2019: Introduction).

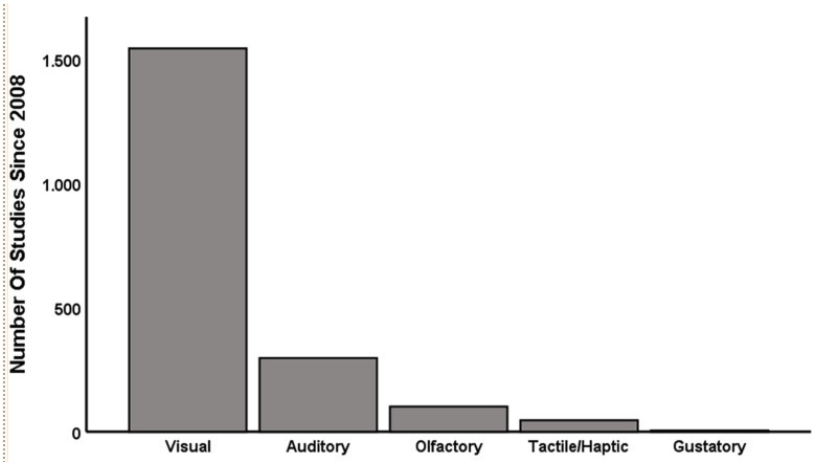

Figure 2. The number of studies on the different sensory modalities published since the beginning of 2008

The problem is that all these studies have been carried out on infants in the postnatal period, while the prenatal origin of image schemas has been practically ignored. Characteristic is Mandler's observation that there is "a wide range of studies of preverbal infants developing an extensive conceptual

system during the first year of life" (2012: 21). Although Hampe asserted that, "[a]nother major theme […] pertains to image-schema formation itself" (2005: 7), only a few scholars mentioned the idea of innateness (for example, Mandler, 2005, Dodge and Lakoff, 2005), but eventually, the discussion focused on the postnatal period. To the best of my knowledge, only Neisser (1976), Szwedek (2002, 2018, 2022) and Rohrer (2005) were aware of the importance of research of the prenatal period. Neisser's assertion was definitely the firmest. He wrote that biologically "a schema is a part of the nervous system" (1976: 54). Rohrer added that "[a]lthough image schemas may ultimately require the consolidation of postnatal sensorimotor experience, their origins stretch back into prenatal experience" (2005: 176). Szwedek made it more specific, writing that "some sort of primitive schemas develop in the prenatal period, as a result of interaction between two bodies, the foetus and the mother's womb, for example, OBJECT, CONTAINER, CONTACT, MOTION, FORCE, RESISTANCE, COUNTERFORCE, CYCLE, *etc.*" (2022: 145; ftn. 4).

Crucial in our further discussion are the following assumptions: I. density is the most essential property of objects; II. it can be experienced only by touch; III. of all senses, touch is the most unique and primeval.

3.3. *The Sense of Touch*

All physical objects, gases, liquids and solids have a perceptible degree of density experienceable by touch. In contrast to the general opinion about the importance of vision, in a number of studies, Szwedek argued for the unique and primeval character of touch in human experience (for example 2000, 2018), adducing the following arguments (slightly modified from Szwedek 2018: 10):

a) Touch is the earliest sense to develop. Kornas-Biela wrote that "the functional activity of the sense of touch (in the lips-nose area) is observed as early as the 5th week of pregnancy" (7th week in Chamberlain n.d.: 1), and it is "the most developed of senses at birth" (Kornas-Biela 2011: 159). "[T]he visual focus and tracking begin around the 32nd week" (Chamberlain n.d.: 3). Since the sense of touch begins to develop at the same time as the nervous system (ca. 7th week), it is impossible that it would not simply be part of that system. This would mean that, image schemas generated by touch would also be parts of the nervous system (*cf.* Neisser's quote above);

b) Touch is the only sense with which we can experience density, the fundamental property of all physical objects;

c) Touch, including the vital sense of taste, is the only whole-body sense reaching "full body sensitivity by the 32nd week" (Chamberlain n.d.: 1).

The unique and primeval nature of touch in human experience of physical objects can best be summarized in the following words: "we can close our eyes and not see, we can plug our ears and not hear, we can close the nose and not smell, but we cannot stop touching things – the air, the ground/floor, our clothes, *etc.* Therefore, paraphrasing Wittgenstein's adage again, we hardly notice touching because it is always part of our bodily experience.

The arguments presented above allowed Szwedek to formulate definitions of the OBJECT schema and the image schema in general.

4 Definitions of the OBJECT Schema and the Image Schema

4.1. *A Definition of the object Schema*

As was argued above (section 3), objects have two fundamental properties in contrast to relations: I. they are conceptually independent, and II. their fundamental property is density experienceable only by touch. Both of these features are integral parts of the definition of the object image schema, which was defined as *a conceptually independent mental representation of a physical object, whose fundamental property is density experienceable by touch, with ensuing boundedness, shape, size,* etc. (Szwedek 2019: 18).

4.2. *A Definition of the Image Schema*

For decades linguists have questioned or even outright denied the possibility of defining the image schema which, on the one hand, would be anchored in perceptual experience, and, on the other hand, would be highly abstract (*cf*. Grady 2005: 35; section 2.2. above).

However, taking into account the fundamental properties of the OBJECT image schema, its conceptually independence and its density, Szwedek formulated a definition of the IMAGE SCHEMA as "a mental structure with at least one OBJECT image schema, which is a conceptually independent entity representing a physical object whose fundamental property is density experienceable by touch, with ensuing boundedness, shape, size, *etc.*" (2019: 27).

4.3. *An Example*

BLOCKAGE seems to be an interesting image schema, particularly in the context of CONTAINMENT when, for example, the foetus's kick is blocked by the walls of the womb.

Johnson's initial definition of BLOCKAGE was formulated in terms of encountering "obstacles that block or resist our forces" (1987: 45). He further remarks that "[…] a force vector [encounters] a barrier and then [takes] any number of possible directions" (1987: 45). First, BLOCKAGE is preceded by MOTION of Effected Entity, which uses FORCE, and coming into CONTACT with the wall is BLOCKED (Cause) by another object (stationary, or in motion) and COUTERFORCED, taking "any number of possible directions" (DIVERSION). Thus, BLOCKAGE and its immediate context form a cognitive network.

5 Prenatal (Innate) Image Schemas

5.1. *A Brief Recapitulation of the Main Arguments*

Perhaps the firmest support came from Neisser, who affirmed that, biologically, "a schema is a part of the nervous system" (1976: 54). Commenting on sensory stimuli, Rohrer unequivocally declared that "[f]rom the perspective of neuroembryology […], sensory stimuli in general (with the obvious large exception of the visual) do not commence at birth" (2005: 176). There is little doubt, if any, that image

schemas based on the sense of touch develop in the prenatal period. This firm assertion is based on the following assumptions discussed above.

a. The OBJECT image schema is an integral part of all image schemas.
b. Conceptual independence (Langacker 1987) is one of its fundamental properties.
c. The other fundamental property of the OBJECT schema is density.
d. Density of objects is experienceable only by touch.
e. Touch is the sense which develops earliest of all senses as part of the nervous system, so it is impossible that it would not be an integral part of it.
f. In pregnancy, we have two interacting objects: the foetus and the mother's womb.
g. Interactions between these two objects are based on the sense of touch.

Such interactions result in the emergence of image schemas, clearly innate in nature.

5.2. *Some Examples of Prenatal Image Schemas*

Based on Hampe's (2005) set, the next section lists some prenatal image schemas, with a short comment on each[4].

MOTION is one of the omnipresent attributes in human life. It can be observed from the earliest stages of the foetus's growth, no doubt developing into an image schema.

The sensitivity of the OBJECT schema may arise as a result of the tactile interactions between the two bodies, the foetus and the mother's womb.

The CONTAINER schema comes from the 'awareness' of the relation between the foetus and both, the amniotic fluid and the walls of the womb.

LINK is possibly created by the bond between the two bodies through the umbilical cord, and turn into CONTACT when the foetus touches the walls of the womb, which may also result in the feeling of the SURFACE.

The sense of BALANCE begins to develop about 21 days after conception, and is completed about 4 months later. It mainly depends on gravity in connection with changing proportions of the foetus's body.

FORCE and BLOCKAGE are acquired when the foetus feels resistance of the walls of the womb.

COUNTERFORCE is at play when the foetus pushes the front of the womb[5] and the wall of the womb resists and pushes back.

DIVERSION may arise when the moving body touches the wall of the womb with some force and is redirected.

SCALE is the result of MATCHING different blocking forces in front and in the back of the womb.

CYCLE may emerge due to such actions as the cyclical breathing of the mother, the cyclical heart beats, and the cyclical movements of the mother's walk.

4 I disregard such schemas as ANIMATE and INANIMATE MOTION, as MOTION itself cannot be either animate or inanimate. Only the objects that are in MOTION can be ± animate. I also disregard subtypes of motion: SELF MOTION and CAUSED MOTION.

5 Recall the famous photo of the little foot protruding through the skin of the mother's belly.

By analogy, I can suggest that the repertoire of the prenatal schemas can be extended to other senses. Hearing (18^{th}–26^{th} weeks: Timmons 2018) can be the source of the SOUND image schema, combined with SCALE (loud-soft, pleasant-unpleasant; *cf.* Krzeszowski 2016 on the axiologically fundamental POSITIVE-NEGATIVE distinction). Vision, (16^{th}–32^{nd} weeks: de Bellefonds 2021), can give rise to the LIGHT schema (light-dark) combined with SCALE and CYCLE (night-day). Likewise, taste and smell (Psychology: Durham University: 2022) must have similar effect on the nervous system.

5.3. *A Digression on the Innate Origin of Reasoning*

In the context of the present paper, it is plausible that reasoning may have the same innate nature as image schemas. I have in mind some rudimentary forms, which would constitute foundation of reasoning, developing simultaneously with the development of the nervous system. Apart from the internal structure of image schemas (*e.g.,* X MOTION [Y]), once they become part of the nervous system, they inevitably enter into numerous interactions with each other in a variety of configurations. As described above, BLOCKAGE is invariably associated with prior MOTION, as well as CONTACT, COUNTERFORCE, and possibly DIVERSION, the latter being associated with MOTION again. We may propose, in plain language, the following sequence within this event: *X MOVES towards Y, comes into CONTACT with Y, which CAUSES blockage of X, with the EFECT that X stops, possibly followed by counterforce, CAUSING, in EFFECT, X to MOVE backwards, or DIVERT.* The sequence looks like a series of "cause-effect" relationships. Since image schemas are part of the nervous system, it is natural to assume that relations among them must also be so. Of course, in no way, am I suggesting any adult form of reasoning at this stage. But I am convinced that the sequence of events, with the cause-effect core, as well as other interactions and relationships, become part of the nervous system constituting a firm background for what later develops into reasoning.

6. Conclusions

By way of conclusions, I want to highlight the differences between Chomsky's hypothesis and mine, and, at the same time answer the critique of the rationalists.

a) The two hypotheses agree that the prenatal nervous system is not empty. However, while Chomsky postulates the presence of some abstract, fabricated universal grammar (structures and rules) in the foetus (!?), I claim that the nervous system consists of a naturally formed network of image schemas, the smallest cognitive units.

b) The innumerable interactions between the foetus and the womb mean that, with the sense of touch in action, there is no "poverty of stimulus."

c) The absence of grammar explains why learning of language is slower, given the complex structure of language in innumerably various contexts.

d) The early reactions of the foetus to touch, clearly provide empirical evidence, making the rationalists' critic about "the lack of empirical evidence" invalid.

e) In addition, my hypothesis suggests that the interactions among image schemas may be the foundation for the future faculty of reasoning. Thus, the structure of image schemas

(object(s) + relation), and the rudiments of reasoning (Cause-Effect) continue naturally in the postnatal nervous system for further development.

f) The best evidence of innateness of the OBJECT and RELATION schemas is their absence in language.

We never say

This is an OBJECT and it's a bottle.

This is an OBJECT and it's a toycar.

I am in a relation with my notebook, that is I am writing.

I am in a relation with the wall, that is I ran into it, etc.

The reason is that both types of schemas are deeply embedded in the nervous system since very early in pregnancy.

g) It is no coincidence that the universal structure of image schemas, that is, OBJECT(s) plus RELATION, corresponds to the universal structure of noun and verb, with all their varieties of features: ± case, number, *etc*., and aspect, tense, *etc*. respectively. The present paper provides a solid support for Gentner's (1982), and Gentner and Boroditsky's (2001) disclosure that nouns are acquired before verb. They offered an analysis of language data, as well as a cognitive explanation. Gentner and Boroditsky call upon earlier experimental research (discussed in Gentner 1982) that showed that nouns predominate in early production and comprehension and children learn object reference readily. What, however, is most interesting is Gentner's (1982) explanation in terms of *natural partitioning* and *relational relativity*.

Referring to *natural partitioning*, Gentner (1982: 324) wrote that "there are in the experimental flow certain highly cohesive collections of percepts that are universally conceptualized as objects, and [...] these tend to be lexicalized as nouns across languages. Children learning language have already isolated these cohesive packages – the concrete objects and individuals – from their surroundings." Furthermore, on *relational relativity* she argued that "when we conceptualize the perceptual world, the assignment of relational terms is more variable crosslinguistically than that of nominal terms [...] Predicates show a more variable mapping from concepts to words" (Gentner 1982: 323–325).

h) Finally, I also believe that those prenatal image schemas and interactions among them are universal (MOTION, LINK/CONTACT, FORCE, BLOCKAGE, *etc.*) constituting the bedrock for postnatal development. It is rather unlikely that the structures of and relations among the prenatal image schemas differ from culture to culture. Thus, at birth, the infant would be equipped with a network of rudimentary image schemas and relations among them. What such frames would be filled with after birth, depends on the predispositions, environment, culture, and language, through interaction with reality: recognition, listening, and imitation.

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Received:
31.03.2025
Reviewed:
29.04.2025
Accepted:
15.05.2025