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Conceptualization of the Gene in Richard Dawkins’ *The Selfish Gene*

Abstract

This paper investigates the conceptualization of the gene in the book *The Selfish Gene* by Richard Dawkins from the point of view of the Conceptual Metaphor Theory and the Conceptual Blending Theory. It is argued that there are two senses of the gene: gene₁ is a physically existing section of the DNA, gene₂ is information about protein synthesis. It is the second sense of the concept of the gene that undergoes metaphORIZATION. The analysis reveals that Dawkins’ gene is a conceptual blend which becomes extensively elaborated. Through elaboration the gene becomes personified on the one hand and deified on the other. The study shows the richness of Dawkins’ personification: the gene is conceptualized as building and controlling organisms, cooperating and competing with other genes, even showing personality traits. Deification of the gene is focused on highlighting its stipulated immortality and power to create organisms, humans included. The gene blend is at the same time used as an input space in the integration network producing the meme blend. It is also established that the personification of the gene plays the theory-constitutive role in the sense of Boyd (1993).

Keywords: personification, blending, selfish gene, metaphor in science.

Introduction

Since its publication in 1976, *The Selfish Gene* with its implications for social and cultural value systems has attracted public attention with reactions ranging from enthusiasm to indignation. The book also initiated a debate among evolutionary biologists on the unit of evolution and the level(s) of natural selection. The focus of this paper, however, is a Cognitive Semantics analysis of Dawkins’ conceptualization of the key construct of his theory, the gene. As a careful reading reveals, personification is the hallmark of Dawkins’

style and his personification of the gene, standing out even in the title of the book, is extremely rich and complex. The objective of this study is to investigate this complexity using the methodology offered by the theories of conceptual metaphor (cf. Lakoff & Johnson 1980, 1999; Kövecses 2002) and Conceptual Blending (cf. Fauconnier & Turner 1998, 2002). It will be demonstrated that the personification of the gene is a result of what Fauconnier and Turner (2002) call “running of the blend” or blend elaboration. It is also argued that in Dawkins’ theory, personification is a theory-constitutive metaphor in the sense of Boyd (1993). Thus, this study contributes to research into the role of metaphor in scientific discourse as well.

The structure of the paper is as follows: first, the integration network behind Dawkins’ concept of the gene is revealed; next, the rich elaborations of the gene blend are discussed, and finally, possible implications for the role of personification in Dawkins’ theory are considered.

1. Gene, the agent. A blending analysis of the selfish gene

Personification in evolutionary biology is not rare. For example, Charles Darwin, the father of evolutionism and Dawkins’ authority, used personification extensively to write about natural selection in his work *On the Origin of Species* though never to such an extent or with such complexity as Dawkins. A comprehensive analysis of personification and related metaphors in Darwin’s conceptualization of natural selection can be found in Drogosz (2011, 2012a, 2012b). Unlike Darwin, however, Dawkins makes the personification of the gene the backbone of his theory and treats it as a very powerful heuristic and rhetorical device. Although a careful reading of *The Selfish Gene* reveals many metaphorical conceptualizations of the gene (e.g. an analogy is made between DNA and an architect’s plans, with genes corresponding to letters or whole pages; chromosomes are likened to a deck of cards with genes corresponding to individual cards), personification is without a doubt both the most dominant and the richest conceptualization of the gene. This part of the analysis investigates the multiple blend that constitutes, as we believe, a springboard for further elaborations.

Dawkins defines the gene in several ways. Some definitions are “technical” in the sense that they rely on biological facts. For example, the gene is to be understood as “any portion of chromosomal material that potentially lasts for enough generations to serve as a unit of natural selection” [28]¹ or “a sequence of nucleotide letters lying between a START and an END symbol, and coding for one protein chain” [28]. However, far more often his definitions derive from metaphorical treatment of the gene. Thus, the gene is defined as “a unit that survives through a large number of successive individual bodies” [25], “a unit of self-interest” [33], “a replicator so long-lived that it is near immortal” [35], “the free, untrammelled, and self-seeking agent of life” [38]. These definitions rely on a number of metaphors and conceptual blends which will be investigated in this study.

The first thing to be noted about the concept of the gene is that it has two senses: one sense (let us call it gene₁) relates to the gene as a physically existing section of DNA and it is not personified (at least not by Dawkins); the other sense (gene₂) relates to the fact that such a section of DNA is an established sequence of nucleotides that carries information about the synthesis of a particular kind of protein. This sense of the gene is subject to profound metaphorization. In what follows, the levels of this metaphorization are discussed.

1 All the quotations come from the 30th Anniversary edition of *The Selfish Gene*. The page number is given in brackets after each quotation.

The first level of metaphorization of gene₂ concerns its objectification, that is, conceptualizing an abstract concept in terms of physical objects (*cf.* Szwedek 2000, 2011). Building on the notion of ontological metaphor (Lakoff & Johnson 1980), Szwedek argues that objectification is a necessary step in a metaphorical construal of any concept, and at the same time the most common type of metaphor (2000: 143). In the case of the gene₂, abstract information coded in a pattern of nucleotides is granted the ontological status of a physical object: it is bounded and individuated; it is treated as a unit. Once gene₂ is conceptualized as a thing, the process of metaphorization can be continued in the sense that the experiential knowledge that we have of physical objects of various types can be mapped onto genetic information.

The feature ascribed to the gene that stands out throughout the book is its agency. In Dawkins' gene-centered view of evolution, it is the gene that is presented as the level on which natural selection operates (1), as opposed to the organism, as was assumed by Charles Darwin and many of his followers. What is more, because genes carry information on protein selection, they can be described as controlling the construction of animal bodies, which makes all organisms, people included, machines created by genes for their own benefit (2–5). Consequently, the gene-eye-view of evolution requires that the genetic information is consistently conceptualized as an agent.

- (1) I shall argue that the fundamental unit of selection, and therefore of self-interest, is not the species, nor the group, nor even, strictly, the individual. It is the **gene, the unit of heredity**. [11]
- (2) This brings me to the second important thing DNA does. It indirectly **supervises the manufacture** of a different kind of molecule—protein. [23]
- (3) **Genes do indirectly control the manufacture of bodies**, and the influence is strictly one way: acquired characteristics are not inherited. [23]
- (4) The evolutionary importance of the fact that **genes control embryonic development** is this: it means that genes are at least partly responsible for their own survival in the future, because their survival depends on the efficiency of the bodies in which they **live** and which they helped to build. [23–24]
- (5) The argument of this book is that we, and all other animals, are machines **created by our genes**. [2]

Conceptualizing the gene as an agent involves another ontological metaphor, personification, also attested by the examples above. Technically, to make his theory coherent, Dawkins only needed to project the feature “agency” from the domain of PERSON. However, as it will be demonstrated later in this paper, much more was mapped. An extended analysis of personification is presented in next section.

Let us now turn to the issue of the gene's animacy. Throughout the book, the gene is described as if it were a living organism (*e.g.* 4). There appear to be two sources of this conceptualization. One source is the domain PERSON which participates in building the construal of the gene as “the agent of life” to be discussed later. The other is the conventional metaphor EXISTENCE IS LIFE. By virtue of this metaphor the existence of inanimate objects or abstract concepts can be conceived of in terms of life. Excerpts (6–7) provide examples of this metaphor in common discourse:

- (6) ... the legacy of his writings and ideas **lives** on... (*Guardian*, 2 Jul 2005)
- (7) ... and the idea **lives** on forever (*Guardian*, 15 Oct 2001)

(8) ... **long-living** capital stocks (*Guardian*, 29 Jul 2011)

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Further, it must be emphasized that when Dawkins talks about the life of a gene, he does not mean gene₁, but gene₂, as in (9).

(9) Genes, like diamonds, are forever, but not quite in the same way as diamonds. It is an individual diamond crystal that lasts, as an unaltered pattern of atoms. DNA molecules don't have that kind of permanence. The **life** of any one physical DNA molecule is quite short—perhaps a matter of months, certainly not more than one lifetime. But a DNA molecule could theoretically **live** on in the form of *copies* of itself for a hundred million years [35, *italics original*]

At the same time, he makes use of the common understanding of information and patterns, according to which both information and patterns maintain their identity when copied. Therefore, it is not individual genes (*i.e.* genetic material) that “live” long, but genes (*i.e.* genetic information and the pattern of nucleotides) that “live” as copies of themselves.

These observations can be made more transparent through application of Blending Theory terminology and graphics. By blending the mental space of protein synthesis and the role of DNA in this process (input space one), and the mental space of physical objects (input space two) we obtain the objectified unit of genetic information: gene₂ (blend one). This blend is at the same time an input space (input space three) that is integrated with the established metaphor EXISTENCE IS LIFE (input space four) from which the element “life” is connected with the element “existence” in the gene-object space. This connection is reinforced by mapping from the domain PERSON (input space 5), from which the element “agency” is projected as well. From the entire integration network the blend “living agentic gene” emerges.

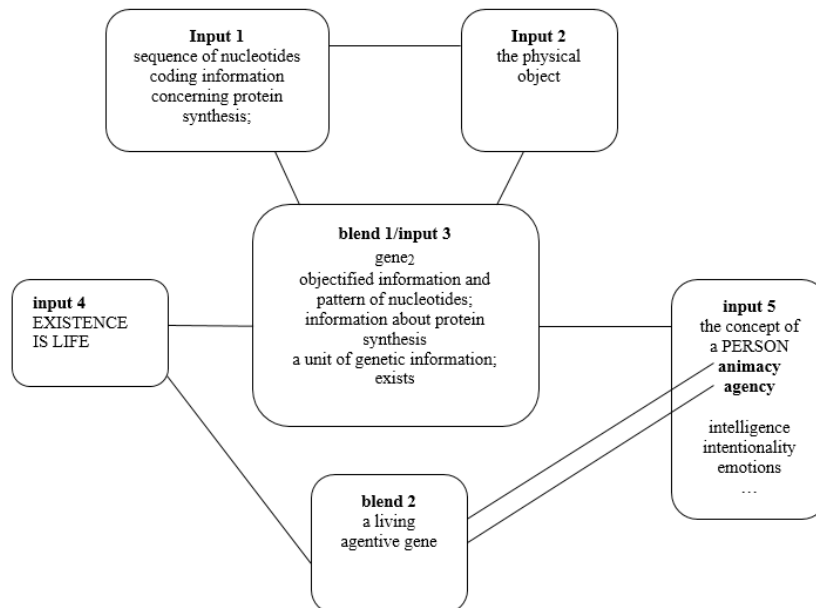


Figure 1. The blend “living agentic gene”

From the point of view of Dawkins' theory, the process of metaphorization of the gene could end here, as the gene blend is entirely sufficient to describe the role genes play in the process of evolution. Of course, it does not end here and this is precisely what makes this book unique. This paper argues that the rich personification of the gene found in *The Selfish Gene* is a result of advanced processes of elaboration operating in the blend. The next part of the study investigates these elaborations in detail.

2. The elaboration of the gene blend

The Blending Theory emphasizes the presence of the emergent structure that results from the integration of the entire network. According to Fauconnier and Turner (2003: 60), emergent structure is developed "on the basis of composition (blending can compose elements from the input spaces to provide relations that do not exist in the separate inputs), pattern completion (based on background models that are brought into the blend unconsciously), and elaboration (treating the blend as a simulation and 'running' it imaginatively)." It is the last operation – elaboration – that is of particular relevance to the analysis of Dawkins' description of the selfish gene.

The "core" integration network discussed earlier reveals input spaces whose elements are projected to the blended space, that is the living agentive gene. One of the input spaces contains knowledge about human beings and this space remains active during the process of conceptual integration. From the language used to describe the gene, we can see that Dawkins projects increasingly more information from the domain of PERSON. The gene's agency is elaborated in terms of human activity. Thus, genes are said to build bodies of organisms analogically to people building the machines they need:

- (10) Now, natural selection favours replicators² that are good at **building** survival machines [24]
- (11) The **manufacture** of a body is a cooperative venture of such intricacy that it is almost impossible to disentangle the contribution of one gene from that of another. [24]
- (12) We were **built** as gene machines, created to pass on our genes. [199]

The cornerstone of Dawkins theory is the idea that genes are behind the construction individual organisms (consistently called gene's survival machines or vehicles). Reversing the traditional perspective in which individual organisms seek reproduction to perpetuate their species (in which case agency is non-metaphorical, at least in the case of higher animals) and genes are a tool to achieve it, Dawkins promotes genes to a role in which they are actively involved in the process of reproduction. Building bodies serves that purpose. However, genes not only build bodies, they can also influence these bodies, manipulate them for their own benefit to the point of exploitation, and generally exert control over the organisms that house them.

- (13) I suggest that fluke genes exert an **influence** on the shell-secreting cells of the snail, an **influence that benefits themselves** but is costly to the snail's genes. [242]

2 Along with the notion of the gene, Dawkins uses the terms "replicators," "DNA," "genetic material," "allele" or "cistron." While I realize that in biological sciences they are not synonyms, in this study I treat them as various linguistic realizations of the concept of the gene. This approach seems fully justified because, in the first place, the technical differences between these terms are not relevant in this analysis, and secondly, Dawkins himself uses them as if they were synonyms.

- (14) Natural selection favoured those ancestral caddis genes that **caused** their possessors to build effective houses. The genes **worked on** behaviour, presumably by **influencing** the embryonic development of the nervous system. [240]
- (15) ... the replicators have built a vast range of machines to **exploit them**. [21]

This control can even extend to the external world:

- (16) The target of its manipulation may be the same body or a different one. Natural selection favours those **genes that manipulate the world** to ensure their own propagation. [253]
- (17) ... the gene reaches out through the individual body wall and **manipulates objects in the world** outside, some of them inanimate, some of them other living beings, some of them a long way away. [265]

Another elaboration depicts genes as members of a community involved in different relationships with other representatives of their kind. On the one hand, genes cooperate in building bodies (18–21) and other genes are their companions on the journey across the generations (22), on the other hand, genes compete with their rivals, other genes, for survival, that is for the same slot on a chromosome (23–24):

- (18) The manufacture of a body is a **cooperative venture** of such intricacy that it is almost impossible to disentangle the contribution of one gene from that of another. [24]
- (19) Building a leg is a **multi-gene cooperative enterprise**. [37]
- (20) Our own genes **cooperate with one another**, not because they *are* our own but because they share the same outlet—sperm or egg—into the future. [245]
- (21) Nowadays this **cooperation between genes** goes on within cells. [258]
- (22) As the cistrans leave one body and enter the next, as they board sperm or egg for the journey into the next generation, they are likely to find that the little vessel contains **their close neighbours** of the previous voyage, old shipmates with whom they sailed on the long odyssey from the bodies of distant ancestors. [33]
- (23) When two genes, like the brown eye and the blue eye gene, are **rivals** for the same slot on a chromosome, they are called *alleles* of each other. For our purposes, the word allele is synonymous with **rival**. [26]
- (24) Genes are **competing** directly with their alleles for survival, since their alleles in the gene pool are **rivals** for their slot on the chromosomes of future generations. [36]

In order to win this struggle, some genes manipulate (25) or cheat (26), others rebel and run away (27):

- (25) A gene ‘for’ sexuality **manipulates** all the other genes for its own selfish ends. So does a gene for crossing-over. There are even genes—called mutators—that **manipulate** the rates of copying-errors in other genes. [44]
- (26) Here we are talking about single genes **cheating** against the other genes with which they share a body. [236]
- (27) Consider a **rebel stretch of human DNA** that is capable of snipping itself out of its chromosome, floating freely in the cell, perhaps multiplying itself up into many copies, and then splicing itself into another chromosome. [246]

From this struggle, the vision of a genetic battlefield emerges, a battlefield where the future existence of a gene is at stake and the efficiency of the body is the weapon.

- (28) Fundamentally, all that we have a right to expect from our theory is a **battleground of replicators**, jostling, jockeying, fighting for a future in the genetic hereafter. The **weapons in the fight** are phenotypic effects, initially direct chemical effects in cells but eventually feathers and fangs and even more remote effects. [256]

The elaboration of the blend towards personification goes so far that Dawkins' genes are capable of displaying emotions and personality traits. The most important feature of the gene, standing out even in the title of the book, is its selfishness which drives its actions. Apart from that, genes are characterized as lucky, independent, free, and good at building bodies:

- (29) The few new ones [genes] that succeed do so partly because they are **lucky**, but mainly because they have what it takes, and that means **they are good at making survival machines**. [36]
 (30) However **independent and free** genes may be in their journey through the generations, they are very much *not* free and independent agents in their control of embryonic development. [37]

From the examples above a consistent picture of genes as "free, untrammelled, and self-seeking agents of life" [38] who cooperate to build organic bodies to protect themselves and to prolong their own existence or compete with other genes, emerges. The inevitable inference of this image is the gene's intentional, directional activity and consciousness. One gets the impression that Dawkins is ambivalent about this inference. On the one hand, he exploits it to the limits when he writes, for example

- (31) ... there are special circumstances in **which a gene can achieve its own selfish goals** best by fostering a limited form of altruism at the level of individual animals. [2]
 (32) If we allow ourselves the licence of talking about genes **as if they had conscious aims**, always reassuring ourselves that we could translate our sloppy language back into respectable terms if we wanted to, we can ask the question, what is a single selfish gene **trying to do**? It is **trying** to get more numerous in the gene pool. [87]
 (33) The **interests** of alga genes and *Chlorohydra* genes coincide. Both **are interested in doing everything in their power** to increase production of *Chlorohydra* eggs. [244–245]
 (34) In whichever of the two sorts of body it finds itself, we can expect a gene **to make the best use of the opportunities** offered by that sort of body. [145]

On the other hand, he seems sometimes uncomfortable with it. In these cases, he either explicitly denies gene consciousness and intentionality or uses quotation marks to detach himself from such inferences (35–40).

- (35) **The true 'purpose'** of DNA is to survive, no more and no less. [44]
 (36) In this, **the replicators are no more conscious or purposeful** than they ever were. [24]
 (37) **Genes have no foresight. They do not plan ahead.** Genes just *are*, some genes more so than others, and that is all there is to it. [24]
 (38) ... we must temporarily abandon our metaphor of the gene as a conscious agent, because in this context it becomes positively misleading. [...] Albino **genes do not really 'want'** to survive or to help other albino genes. [89]

- (39) The gene has no foresight. [183]
- (40) Therefore, whatever ‘**calculations**’ the parasite genes make about optimal policy, in any department of life, will converge on exactly, or nearly exactly, the same optimal **policy** as similar ‘**calculations**’ made by host genes. [245]

The examples above show how Dawkins elaborates the gene blend by rich projections from the mental space of PERSON. He uses this elaborated blend with gusto in his other books as well. However, as Fauconnier and Turner put it (2002: 48), “part of the power of blending is that there are always many different possible lines of elaboration, and elaboration can go on indefinitely.” In *The Selfish Gene* one more elaboration can be identified, this time pointing to the domain of divinity. In other words, the depiction of the gene exceeds by far that of a human being and activates the domain of GOD. Some of the expressions bring clear Biblical associations. For example, the genes are immortal or near immortal:

- (41) The genes are the **immortals**, or rather, they are defined as genetic entities that come close to deserving the title. [34]
- (42) What I am doing is emphasizing the potential **near-immortality** of a gene, in the form of copies, as its defining property. [35]

Working in mysterious ways (43), they created people and all living organisms, and they are the purpose of our existence (44):

- (43) **DNA works** in mysterious ways. [21]
- (44) They are in you and in me; **they created us**, body and mind; and their preservation is **the ultimate rationale for our existence**. [19]

The gene is even said to be “the prime mover of life” with unlimited powers:

- (45) The fundamental unit, **the prime mover of all life**, is the replicator. [264]
- (46) With only a little imagination we can see the gene as sitting at the centre of a radiating web of extended phenotypic power. [265]
- (47) The long reach of the gene knows no obvious boundaries. [266]
- (48) The only kind of entity that has to exist in order for life to arise, anywhere in the universe, is the immortal replicator. [266]

It must be added that the example in (48) is the last sentence of the book, which suggests that this is the image that Dawkins wants to remain in the reader’s mind.

One of the fundamental claims of the blending theory is that an established blend can be recruited in the formation of another integration network. This is what happens in *The Selfish Gene*. In the gene blend, there is the idea that the gene is agentified information that “wants” to survive by making as many copies of itself as possible. When Dawkins projects this element from the domain of genetic information onto the domain of human culture, a new structure emerges, a unit of cultural transmission or imitation which he calls the meme. However, this concept has become so complex (becoming the core of the science known as memetics) that it deserves a separate study.

3. The role of personification in Dawkins' theory

Having discussed the integration network and its elaboration that underlie Dawkins' conceptualization and description of the gene, let us turn now to the role that emergent metaphorization of the gene has on the selfish-gene theory. Cognitive Semantics seems to be especially well-designed to address the question of the role of metaphor in language of science, because ever since its beginning it argued for the significance of metaphor in reasoning (*cf.* Lakoff & Johnson 1980).

The literature on the role of metaphor in science is extensive (*e.g.* Black 1962; Boyd 1993; Fojt 2009; Gajda 2008; Hesse [1963] 1970; Kuhn 1993; Soskice & Harré 1996; Zawisławska 2011), but this study focuses on the most fundamental distinction proposed by Boyd (1993), which is between theory-constitutive and exegetical (pedagogical) metaphor. As Boyd puts it, theory-constitutive metaphors "encourage discovery of new features of the primary and secondary subjects, and new understanding of theoretically relevant respects of similarity, or analogy, between them" (1993: 489). They also play a catachretic role in that "they provide a way to introduce terminology for features of the world whose existence seems probable, but many of whose fundamental properties have yet to be discovered" (1993: 490). Exegetical, or pedagogical, metaphors, on the other hand, "do not convey theoretical insights not otherwise expressible" but "play a role in the teaching or explication of theories which already admit of entirely adequate non-metaphorical (or, at any rate, less metaphorical) formulations" (485–486). Put in other words, the former are an inherent part of a theory and its logic, and cannot be replaced by other expressions, the latter are a way of explaining ideas that can be expressed in non-metaphorical language. In light of Boyd's distinction, it is argued that Dawkins' theorizing of the gene as a unit of evolution and agent of natural selection is a direct result of its objectification and personification and thus is a case of a theory-constitutive metaphor. For Dawkins, the richly elaborated personification of the gene constitutes the foundation of the theory and his descriptions of the gene could not be paraphrased without changing the theory itself. What is more, the ongoing debate among evolutionary biologists concerning the level at which natural selection operates (whether it is at the level of genes, individual organisms or species) also points to Dawkins' description not as a metaphorical explanation, but as an aspect of his scientific theory.

Conclusions

The aim of this paper was to look at Dawkins' conceptualization of the gene through the lens of the Blending Theory. It has been established that the concept of the selfish gene results from a "core" network which integrates input spaces of genetic information, the domain of a physical object, the domain of a human being and the metaphor *EXISTENCE IS LIFE* into the blended space "living agentive gene." This blend is further elaborated by extensive projections from the domain of a human being, which become manifested in descriptions of the gene. Thus, the gene is said to perform directed activity such as building shelters (*i.e.* bodies) or exerting influence on the external world, create communities with complex social patterns, and show personality traits, such as selfishness. This "running" of the blend in the direction of personification yields additional emergent structure, that is its supreme power, which is further elaborated in the direction of deification. Finally, the blend of the gene as information controlling organisms is extended to the domain of culture to create yet another concept, the meme.

The concept of the gene in Dawkins' theory heavily relies on its personification, which allows him to highlight its power to act as an agent of evolution. Consequently, it is concluded that the metaphor of personification plays the theory-constitutive role in the selfish-gene theory.

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