

Productive perils: on metaphor as a theory-building device

Research Article

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Abstract: Metaphors constitute a relevant method for both building and making sense of theories. Semiotics is not exempt from their influence, and an important range of semiotic theories depends on metaphors to be meaningful. In this paper, we wish to examine the place of theory-constitutive metaphors considering the interaction view and the extent to which some areas of semiotics, particularly, the semiotics of culture and biosemiotics, are enriched by having metaphors dominate the way we think about them. The intention of the paper is not to document the different metaphors that have built semiotic theory, but rather to observe through a number of examples that semiotic research contains theory-building metaphors and that these are productive means of developing semiotic thinking further, with the caveat that theory change can be unexpected based on how we build metaphors for our theories.

Keywords: *metaphor • theory building • semiotics • models • biosemiotics*

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1. Introduction

In the construction of a theory, metaphors are both apt cartographers and road builders. They demarcate a territory, plant a flag and open paths for us to explore and walk through. Depending on metaphors for making sense of theoretical approaches is a time-honoured tradition in providing explanations of how certain elements within them *may actually* work. Broadly speaking, metaphors are productive means of getting ideas across, framing problematic concepts and providing models for analysis. There is, however, a potential trade-off when situating a theory within the metaphor used to describe it, with metaphors *becoming* the theory.

In this paper, we examine the role of metaphors as theory-modelling agents, how these can be understood considering the impact they have on the theories they operate in and what particular role these play in semiotic theories. As semiotic theories present different areas of coverage, effectivity and background, we do not intend to present a case-by-case analysis of metaphors in semiotic theory, but rather in general lines – as related to biosemiotics and its intersection with the semiotics of culture – through a brief number of examples. Models and modelling, being two central concepts to the development of the semiotic theory, will be taken into account as part of a meta-theoretical view of semiotics. Their centrality will help us isolate specific aspects of semiotic theories as a means of exploring how metaphor and model are connected in building theoretical approaches.

2. Scientific metaphor

In order to understand the value of metaphor in scientific writing, it is only natural that we begin by having a working understanding of what a metaphor does. Black's [1] groundbreaking article on the metaphor opens up the discussion on metaphor viewed as substitution, comparison and interaction, the first two being less adequate – in his opinion – to describe the role of metaphor in philosophical writing. The interaction view of metaphor takes a metaphorical sentence to have a principal and a subsidiary subject, which are 'best regarded as "systems of things", rather than "things"' ([1], p. 291), working through the implications derived from the subsidiary subject and filtered

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in their application to the principal subject. This view is generally agreed upon by Boyd [2] and Kuhn [3], at least in some general lines. They seem to agree that ‘metaphor plays an essential role in establishing links between scientific language and the world’ ([3], p. 539), but metaphors are prone to change over time. It seems to be the case that for a metaphor to be either useful or valid in scientific writing, it has to bring out something about the subject that may not be given by the subject itself. Indeed, metaphor is a common occurrence in scientific practice [4], as it allows for a sort of association of the properties of one of the subjects on the other, as would be expected from a description of the interaction view.¹ The issue with metaphors in science is, at least, two-fold, raising the questions of how it makes concepts readily available for their understanding through external figures, and how it causes change (or progress) in science.

2.1. Understanding from outside

The first question we have mentioned amounts to the general riddle about metaphor as applied to scientific descriptions and explanations. Armed with the interaction view, we can give a rough account of what a metaphor does, setting an antecedent to the cognitive theory of metaphor. But does the latter provide us with a more useful account of metaphor as applied to scientific descriptions and explanations? Sticking to the simpler account may do enough work for us, even if we are left with a black box situation in explaining how the interaction between concepts actually happens.² What matters to us is not the fine-grained understanding of how metaphor works altogether, but rather, what its role is in the scientific practice of theory building. As such, the main point of contention lies in whether metaphor works as a linguistic device or as a cognitive one, and whether there is a difference in its presentation when it comes to explanations and descriptions. We will only focus on scientific descriptions and explanations that do not pertain to their educational presentation, but the way in which concepts are embedded in science and the way they become public makes this separation tenuous at best.³ If metaphorical representations of abstract notions in science do the work of making the theory *accessible*, the concern is whether the properties of the subsidiary subject of the metaphor have any bearing on what the abstraction actually does. Brown [4], accepting that chemistry is a thoroughly metaphorical affair at its foundations, sees metaphor as doing interpretative and re-interpretative work and as a creator of new models for the presentation of data (p. 215). Added to this is the idea that scientific concepts are understood by humans *through* their bodily experiences, a point that Núñez and Lakoff ([7], pp. 377–379) drive home, in their development of notions such as the natural place of mathematics in human experience, its conceptual nature and the variability it is subjected to in time. In general lines then, it is safe to say that, if anything, the metaphor is productive in terms of understanding and developing scientific concepts.

2.2. Changing from both sides

The previous point leads to the recognition that metaphors can be central to how scientific theories are developed. These ‘theory-constitutive metaphors’, in the language used by Boyd ([2], p. 485) become the engine for the development of specific theories (such as the computational theory of mind⁴), and as such, the way in which they develop is intertwined with the way we understand the concepts used for the development of the theory itself. If metaphors can foster change in the development of specific concepts, and at least some areas of scientific endeavour are open-ended and variable, then outside change can bring about change to scientific concepts by virtue of how the subsidiary subject of a scientific metaphor is perceived in a different manner.

If the scientific endeavour relies – to some degree – on these metaphors, theory-constitutive or not, then it should not be controversial to accept that scientific understanding and development depend on a cognitive and linguistic context, at least to some extent. In other words, metaphors can centre a theoretical view and change it across time, being thus productive in their own right.

Referring to the productivity of metaphors in scientific discourse then, we do not need to commit to a strong view of how metaphors drive change (or to a particular view of reference), but rather we can accept at least a partial process of how changes in a context can help reinterpret data via metaphors. This process can be characterised

1 As a caveat, Brown [4] refers to Lakoff and Johnson, instead of Black, to provide a background for metaphors.

2 We may be persuaded to think that the interaction view of metaphor holds little currency in current research on metaphor ([5], p. 26), but the sufficiency of explanations as applied to science and its relation to the cognitive theory of metaphor allow for a sketch of the position we wish to hold. In general lines, the only compromise is the theoretical language used, as the idea that metaphor, even in science, is not merely linguistic is something that we accept and that is implied in the interaction view.

3 English [6] gives an account of how scientific descriptions and explanations depend on metaphor and formalisation as related to the learning of such concepts.

4 Other examples can be found in medicine [8] and nursing science [9].

as the replacement of certain analogous references to the described phenomena, a thoroughly socialised form of making sense of scientific concepts and highlighting what is interesting about them depending in their context. As metaphors often offer a view of the culture within scientific practice, with its norms and values being patently expressed through them [10], the logic of metaphor in theory-building practices is dependent on a number of ongoing cultural processes and their interrelations to scientific practices as well as the nature of the metaphor itself, contingent on how we frame it, but there seems to be little consensus on how metaphors lead to a change in knowledge ([11], pp. 295–296).

In the following sections, we temporarily shift our focus to the concept of modelling in the context of our current discussion and return to some of the more pressing issues on metaphor in the construction of semiotic theories.

3. Models and modelling

While, conceptually, models and metaphors do not cover the same category, there is an important overlap in what they may do and how they may express themselves in science. We may also be willing to accept at least *some* metaphors as models. But in order to develop this idea further, we need to be clear about what we mean by models and modelling. To be specific, the concepts of models and modelling, while clearly related, do not amount to the same, at least not in the technical language used here. When we use the concept of model, we will limit ourselves to the more narrow conceptions of semiotics (as this is a paper concerned primarily with the activity of semiotics), but this does not preclude the applicability of concepts in a wider dialogue within the discussion of models in philosophy of science.

3.1. Models

An ostensive (albeit limited) description of models includes theories, simplifications, depictions and physical representations as the most commonly featured examples, but in this case, we only intend to refer to models as theory-bearing and theory-depicting devices, not as physical representations. The overlap with theory-constitutive metaphors seems important enough, when we adjust our expectations to these specific forms, to demand an analysis of similarities between models and metaphors. To start with, the distinction we have to bear in mind lies on the levels of applicability. Modelling, as an activity, can be a primary or secondary internal process of perception, whereas a model is a framed function of this activity. Semiotic scholarship has internalised these two on the grounds of biosemiotic modelling, following the tradition recovered from Sebeok [14], in particular. Earlier on, Black ([12], p. 236) accepts a certain degree of overlap between metaphor and models in science, but when we talk about semiotic models in particular, we are referring to a gradient that applies across spheres of human activity. Modelling may be thought of as making sense of the world through specific constraints, be those physiological or psychological, but it may also have a meta-referential aspect in that it is also used in the context of creating specific models for specific phenomena. Part of this discussion in semiotics has to do with the concept of modelling systems and their hierarchy. The concept, originating from Lotman's [13] work, is taken to mean that at the basis of human cognition is the modelling of the world through perceptual structures (a *primary* modelling system). These, in turn, are complemented with organising structures such as language (a *secondary* modelling system), which – at the same time – can be used further to create specific models of the world, such as literature (a *tertiary* modelling system).⁵ Scientific models, under this view, would of necessity be limited to the tertiary level.

In characterising theories and their models outside of semiotics, however, the semiotic view only gives us a rough description of what a metaphor looks like in context, but its place in the theory-building process is left unanswered, even within the field itself. It seems that, considering the multifaceted and largely informal nature of semiotics as a whole, we cannot commit to a purely axiomatic view of how theories and models work. Instead, we can situate ourselves closer to a non-syntactic view on how scientific theories work, with the caveat that semiotics is not a well-defined body of knowledge. The divergence between areas that depend roughly on some formal and systematic conception of theory, as happens with some parts of biosemiotics, and the more-informal, ad-hoc conceptions of specific phenomena characterised as semiotic, as is the case with some parts of the semiotics of culture, makes it necessary to retain a rather general line on how we can actually treat scientific practices and theory building in this paper. The variegated nature of the field makes the issue of advocating a position (either semantic or pragmatic)

⁵ This particular rendition of the modelling systems theory is due to Sebeok's [14] critique of Lotman's [13] original view.

hard to articulate and beyond the intention of this paper, but it is an open question for meta-semiotic theory how we can characterise model building as the central feature of semiotic theorising.

With that out of the way, scientific models present us with a specific case within semiotics, but it would be a mistake not to also consider the overlap with metaphor as we have used it thus far.

3.2. Modelling

If modelling is a cognitive activity through which individuals make sense of the world, then the case for embodied metaphors in science, described by Núñez and Lakoff [7], seems compatible with a semiotic perspective that follows the modelling systems theory. Modelling, however, is not theory free, especially if we categorise the activity through modelling systems theory. Metaphor applied to science also falls in the same spectrum, expanding the overlap between concepts. Under this view, we can indeed accept metaphor as a modelling activity, resulting in both explanatory concepts and theory-constitutive models. This will be important as we set the groundwork for the meta-theoretical exercise of understanding metaphor as a theory-building device within semiotics. This interest is given because of the meta-theoretical nature of dealing with metaphor in semiotic theories.

3.3. Metaphor and hypoicons

Another important point to consider at this point has to do with the standing of metaphor in semiotic theory. As Peircean semiotics deals with the concept of metaphor through the classification system, there will be something to be said about how metaphors may map structural properties as used in communication. Peirce considers metaphors to be hypoicons, and hypoicons are by themselves iconic representamina. In the division of hypoicons, he identifies *images*, *diagrams* and *metaphors* as pertaining to the qualities they partake (EP 2:273). Interestingly, here Peirce sees diagrams as a relation of analogy and metaphors as parallelism. More explicitly, this division has to deal with the type of relation as seen by Peirce, with diagrams being dyadic and metaphors being triadic. That is, a diagram seems to act as a one-to-one correspondence, whereas a metaphor has to be *filtered*, so to speak. To us, this division presents an important challenge, as there is a blurred line between what metaphors and diagrams do in science, particularly when talking about theory-constitutive metaphors. Sonesson ([15], p. 94) identifies the dissonance in the application of the concept of metaphor within Lakoff's work, stating that, following a Peircean line, we are dealing with diagrams for the most part. This – in turn – opens up a problem for how we treat metaphor as a driver for theory modelling and building. Committing to the interactive view of metaphor may present a problem if we stick to discussing about the fine-grained distinction between types of icons. However, our intention is more humble in only attempting to convey the idea that what is usually called metaphor within the view of philosophy of science has some relevance in the constitution of and change to specific practices within semiotics.

Perhaps more important though is the fact that the specific sense of metaphor used here can still be observed as pertaining to some iconic relations, so the theorist invested in Peircean terminology may find solace in knowing that the concepts are not beyond consolidation, but that lies beyond our intentions here.

4. The role of metaphor in the constitution of semiotic theories

Despite the hurdles presented by simply referring to the concept of metaphor, it seems quite clear that its place in at least some semiotic theories is of certain relevance. But even here, we need to set some limits to what counts as a relevant metaphor. Is a relation (as in sign relation) in its logical sense a metaphor? What about the idea of an encyclopaedia as the mental organisation of meaning? Intuitively, one is clearly more metaphorical than the other. This has to do with how long the distance is between a concept and its different senses. Relying on intuition to do the whole work of discovering what exactly counts as metaphor in theory building does not give us a full picture, but the ad-hoc nature of metaphors used in science implies that

- these are readily identifiable as foreign objects that, following the interaction view, condition our understanding of a concept;
- they appear to have a different sense altogether when taken in a different context;
- they are readily applicable to different contexts while being reliable in their sense.

The problem of metaphor identification is, however, far beyond the scope of this paper, and so we will limit ourselves to clear cases of ad-hoc, active metaphor.⁶

This being the case, a *relation* will not provide a good metaphorical concept when it comes to sign relations, being all the more abstract in how it is commonly expressed in logic and semiotics. While the status of metaphor in science may still be murky, it is important to note that our intended application has to deal with yet one more issue, namely, the status of semiotics as a scientific practice.

4.1. Is semiotics a science at all?

This is a fair question to make in this context, but it may miss the point of what we are actually trying to achieve. As is the case for science, philosophy depends on metaphor to both communicate and build meaning as a discipline. Semiotics lies at a strange crossroads, where philosophical, scientific (or perhaps mostly biological) and sociological paths meet, but it is articulated in a particular way that confers the field with a specific identity.⁷

While what a physicist does and what a semiotician does may not be on similar scales in terms of objects of study and the type of research done, the point is that semiotic theories are constituted by building up from previous theories, being informed about outside developments and integrating new context-related insights. Current semiotics, and in particular cognitive and biosemiotics, seek, if anything, a scientifically informed rendition of semiotic insight. In our particular view then, we can accept that semiotics engages with both scientific and philosophical practices and that our point about metaphor works in a similar way as it does in both science and philosophy. Therefore, while some may argue for and against placing semiotics in the same category as other sciences, the point is that its formal expression as a discipline is comparable to two other areas where metaphor does a good amount of work. In what follows, we will actually observe how metaphors can and do shape semiotic theories in this way.

Semiotic theories sometimes try to convey the act of modelling through models, a meta-description that seems to pertain to the idea that all living beings generate models of their environment (through semiosis) and that scientific descriptions are indeed part of the same situation [20]. These models need not be abstract, and they can certainly take a metaphoric form to describe their objects of study. In fact, despite the different divisions that come up among the branches of semiotics, we can identify some theoretical similarities that partly depend on a metaphorical expression of their tenets. Such seems to be the case of the concept of *semiosphere*, as we will see now.

4.2. The sphere metaphor

A substantive part of semiotic theory, coming from the Tartu–Moscow school, is Lotman’s [13] idea of the semiosphere. This is defined as the ‘semiotic space’ where texts (contextualised, cohesive strings of signs) are active and related to other elements within the same space ([21], p. 208). It is interesting to note that Lotman [13] tries to explain how the semiosphere is constituted of texts, but separate texts do not amount by themselves to a semiosphere, through the following analogy:

Just as, by sticking together individual steaks, we don’t obtain a calf, but by cutting up a calf, we may obtain steaks, — in summarizing separate semiotic acts, we don’t obtain a semiotic universe. On the contrary, only the existence of such a universe — the semiosphere — makes the specific signatory act real. (p. 208)

Now, the idea of a semiotic space from the concept of a *sphere* is quite indicative of a metaphorical constitution of the theory. The concept of the semiosphere can be traced back to the concept of the biosphere [21], making it a bit of an adaptation of a different concept and hinging on a previous metaphor. The idea of a sphere of signification is not, of course, to be taken literally, at least when it comes to the spherical constitution of the space. However, it is the allusion to space that truly matters in this context. Nöth ([22], p. 252) recounts how Lotman’s [13] idea of the physical expression of the semiosphere may have had a non-metaphorical character, but that this strong interpretation of the claim falls flat (and eventually disappears from Lotman’s work) because of the abstract and mental characters that also pertain to the concept. It seems that the spatial aspect of the metaphor (beyond the more mundane circular aspect) cannot be fully de-metaphorised, and the centrality of the concept to Lotman’s [13] semiotics makes it a good candidate for a theory-constitutive metaphor. As drawing attention to its spatial character

6 Discussions on the identification of metaphor span a large corpus and it would be disingenuous of us to try to convey a general theory. Some of these reflections can be found in Loewenberg [16], Kittay [17] and Steen [18], to name only a few.

7 A review of the standing of semiotics as science can be found in Salupere [19].

also brings out points on delimitation, boundaries and so on (all of which are central to Lotman's semiotic theory), the semiosphere as a concept cannot be extricated from the theory of this spatial character of signification in the way Lotman builds it.

A question that may arise in this sense is the exact value of adopting the metaphor of semiosphere. Its clear productivity aside, the usefulness of the concept seems to be dictated by a change in the way semiotic systems are thought of. The process of replacing one-on-one correspondences with an interrelated, dynamic system of multiple possibilities of signification within culture comes metaphorically informed, but it also develops into a technical concept that informs the thinking about semiotic systems as, perhaps, natural, interconnected and active. In this sense, the concept itself builds a different picture for semiotics.

Is there a way to go ahead and replace *semiosphere* with a periphrasis or an extensive description to achieve the same object? The contention is that, at the core of the theory, the metaphor is what holds the sense of the theory together. This, in turn, means that the way in which the concept plays out depends on its presentation to the degree that it makes sense to think of the semiosphere as a semiosphere and not as its abstract description. Instead of a shorthand for a set of theoretical constraints, the semiosphere defines both the interactive basis of its elements and its own limits. If the metaphor (which in this case hinges on a theoretical reference to a different concept altogether) is capable of creating a specific sense of what is expected of the theory, then the metaphor is successfully utilised as a frame of reference itself.

The spatial sense that can be garnered from the idea of the semiosphere is easy to see in the form of the metaphor working seamlessly. Remm ([23], p. 407) sees this space as 'objectified and applied as a neutral model at the level of cultural research', an interesting insight by itself, as it helps us understand that the role of the *spatial* sense of the concept of semiosphere plays a fundamental role in its application.

4.3. Language metaphors in biosemiotics

Linguistic metaphors in biology are a recurrent topic in biosemiotics [24, 25] and, at the same time, they pave the way for a more in-depth discussion on what can be applied from the semiotic theory to biological systems. Linguistic metaphors are tricky in that they provide a large range of potential applications, from talking animals to genetic codes. Since our intention is not to document these metaphors, but rather to see how they work in the context of semiotics, we can only outline some principles of what constitutes a language metaphor within biosemiotics along with selected examples. Importantly enough, Emmeche and Hoffmeyer ([24], p. 37), when talking about the 'language-as-life' metaphor, distinguish between the information-processing paradigm and the natural language paradigm, applicable to systemic descriptions of fundamental biological functions.

Behind such attempts lies the need to give a specific meaning to how we work with biological concepts altogether. Biosemiotic descriptions of biological phenomena, at least at this level, work as a new frame of reference, making linguistic metaphors pertain to a different order. In principle, biosemiotic descriptions attempt to subvert certain fixed notions of biology in order to replace them with a semantic dynamic [26, 27], but linguistic metaphors are not newcomers in this context. The difference that stands between these apparent poles rests on making the connections work in a different way.

Similar to the distinction made by Emmeche and Hoffmeyer [24], the focus of the metaphor changes how we perceive the object of study when what we study depends on the said metaphors in order to be intelligible. This process is more like changing to a different car model than switching gears, as it implies using familiar language in a different way. This seems to be the point made by Markoš and Faltýnek [25] when they differentiate between formal and natural languages as applied to descriptions of biological phenomena, implying that the sense of one does not correlate with the implications of the other. Interestingly, the adoption of such metaphors, according to Boyd ([2], p. 482), usually works as 'a sort of *catachresis* — that is, they are used to introduce theoretical terminology where none previously existed', though their aptness is, again, partly derived from contextual needs. New conceptual technology leads to, if anything, theory change.

One particular example of the usage of language metaphors in biosemiotics can be found in the treatment of organisms as texts [28], where the concept of text is bound to its Lotmanian notion and is applied in a technical sense, lending itself to a specific conception of organism based on the semiotic notion derived from language. Another example can be found in the notion of grammar as a structuring concept for some cellular activity that can be described as semiotic. Barbieri ([29], p. 87) makes use of the notion leading to the role of codes in his view, replicating some ideas common to other views within biosemiotics [30].

The chock-full information-and-communication set of metaphors applied to biology is easy to find in biosemiotic discourse, with a prime example in what would become code, biology moving from the application of Saussurean terminology to a code-centric view of biological phenomena [31], layering linguistic and informational metaphors in the long-term development of the theory. This, in turn, leads to a separation from the more traditional Peircean biosemiotics while still sharing some core ideas on the semanticity of biology. Yet, the change in descriptions also causes a division in what potential ideas can be explored through the application and naturalisation of metaphors in this case.⁸

Briefly put, then, language metaphors in biosemiotics constitute an attempt at formulating a background for processes that are seen to *follow* patterns of signification, as it could be argued is the main target of biosemiotics in general.

4.4. Signs as living beings

Turning the previous point on its head, we can use biological metaphors for semiotic phenomena. This view is particularly expressed by Santaella Braga [34] and Nöth [35]⁹ following an excerpt from Peirce stating that symbols are alive *stricto sensu* (CP 2.222). The commitment to a literal sense of symbols as being alive will evidently depend on what we think counts as being alive. Now, Nöth clarifies his position by seeing the relevance of *growth* as pertaining to both symbols and biological processes [37]. It seems clear that signs do not engage in metabolism, except perhaps metaphorically, so the idea behind the statement that signs are alive depends on focussing on growth, reproduction and replication, but even so, it would seem that it is the metaphor that is doing most of the work here,¹⁰ unless the hard interpretation of signs as being alive is what we aim for.

What this highlights, in any case, is a problem for the conceptual theory-building process while also being a testament to the possibilities of Peircean interpretation. Committing to the literal sense of a potential metaphor without setting a clear limit to how the literal sense of the metaphor is understood can result in theory divergence and change, but its application is rather hard to follow in that it requires an object that does not seem to be there. It seems that it is the metaphor here that is more productive as a means of inducing theoretical change. The literalisation, on the other hand, puts us at a full stop, at least for the time being.

There is something to be said about the reliability of metaphors, given the conundrum of literalisation we have just faced. The internalisation of metaphorical concepts within the theory does not come as a single explanation, but as an opening of terminology that will, in turn, be displaced by different ways to use the concepts afforded by the metaphor itself. The viability of a metaphor, however, is to be judged contextually. Given that literalising the sign-as-organism metaphor yields no relevant predictions (nor does it intend to give a predictive account of sign action), its value, validity and reliability are to be judged in terms of philosophical strength and place within other semiotic theories. As far as explanations go, even if we deem this particular approach wrongheaded, the point is that metaphors are *productive* and *motivated*, i.e. even when inchoate, these are shaped by other forms of understanding of the subject matter and produce an account that can be subjected to scrutiny by those involved in the discipline.

5. Linguistics applied to the non-linguistic world

Generally speaking, the semiotic theory deals largely in the application of linguistics to non-linguistic phenomena. We have seen the case of language metaphors in biosemiotics, but this is also the case in the areas traditional to the study of culture. The productivity of the approach is undeniable, but it is the status of the application that needs some discussing. Biosemiotics hinges on a semiotic understanding of certain biological processes to give rise to a general theory of semiotics, but while it could be argued that a semiotic metaphor is applied to biology, it does not seem to be the case that the semiotic abstractions used *in principle* have to stand as metaphors. There is a thin line separating what can be considered metaphoric, as we have already explored, and in this case, abstract principles govern the general development of the theory while also allowing new metaphors to be adapted.

⁸ But see also an earlier, more-positive view on this divergence in the paper by Barbieri [32]. On the place of information in biosemiotics, see Cannizzaro [33].

⁹ And exclusively documented by Houser [36].

¹⁰ A side note to this point is related to how Nöth repeats the idea of *mere* metaphor as quite possibly something that is not desirable [35, 37]. Our view on metaphor is more positive as a theory-building device.

Beyond the necessary terminology to make a certain approach *semiotic*, the focal point on meaning processes is coupled by an understanding of where those processes originate and take place, as well as how they can be described specifically. Metaphor is prevalent in these areas as a means of theorising beyond the frequent sign terminology, and this intersection becomes the more-productive instrument to yield change in the subject of semiotics. That is not to say that semiotics cannot be concerned with matters proper to its own description (as is the case of this paper), but rather that theory building in specific areas of semiotics does indeed make use of metaphors.¹¹ Modelling, as it happens in general semiotic theory, is consistent with the view that a metaphor can work within the theory to inject sense into it. The interaction view of metaphor seems consistent enough to allow us to discuss about the merits of a certain metaphor as a theory-building device, but in cases like the semiosphere, it seems to leave something to be desired because of the nuances of the metaphor and the historicity it is imbued with.¹² As for the plausibility of theory building through metaphor when the parameters of the theory are judged against the intent of testability, the problem faced in semiotics has more to do with the way in which the discipline is carried forward. As frameworks such as experimental semiotics claim new grounds [40], these metaphors will potentially find themselves re-signified by methodological change. Still, beyond the issues of application and testability, theory building is a conceptual exercise in that it provides us with language and perspective for referring to and describing phenomena. The status of semiotics – or any other interdisciplinary research project similar to it – is not limited to theory building, but rather, its conceptual strength is what drives research into different areas and opens new paths for exploration.

The articulation of semiotic theories is a street of multiple turns, intersections and even pedestrian crosses, and a large part of the theoretical activity within the discipline is unencumbered by consistency with alternative approaches, which leads to compatibility headaches when putting different theories working together (as it could be the case with Saussurean and Peircean semiotics beyond generalities). However, we should also recognise the potential that these metaphors can have in taking theories to new areas of development. The upshot of this can be seen in how, for instance, Sebeok's [14] examination of Lotmanian semiotics develops into a terminological change within the theory,¹³ which remains compatible with the theory at large. The case of biosemiotics is a special one in that the two-way feeding mechanism of theory building puts extra strain on how we perceive our theories of semiotics. If the task of biosemiotics is the naturalisation of semiotic phenomena and the investigation of the said phenomena in the biological world, and if we are right to consider these as foundational for other semiotic activity, including the realm of culture, how we present our biosemiotic theories should have an impact on how we develop our theories of culture. This is the case for Sebeok's [14] semiotic project and, despite the apparent disconnect between the branches of semiotics, there are both productive avenues and potential hurdles to explore and develop.

In how we understand metaphor in scientific activity, we also give some explanations as to how we understand metaphor altogether. This leaves a rather ample number of questions unanswered though, many of which deal with how we should treat metaphor in the ontology of our theories. Going back to Núñez and Lakoff, if mathematical objects can be successfully deflated from real objects to embodied concepts ([7], p. 366),¹⁴ does that pertain to our semiotic concepts as well? Can we be committed to Peircean realism about sign relations if we can embody concepts of the sign instead?¹⁵ What does that say about how we understand metaphors in science? In short, the problem of metaphor lies in how we understand the concepts we use and how we expect to apply them. The modelling activity of semiotics is fragmented across domains, and this is not a bad thing to have in a discipline with as many potential applications, but it also conditions the way we meta-theorise about the field.

In developing our theories further, we must proceed knowing that the metaphors we use—the models we place within our models—create specific values and lead to certain conclusions, even if our models themselves are not necessarily axiomatic. Theory-constitutive metaphors allow us to flesh out perspectives related to our object of study – which are not readily available – but these can take unexpected turns, as we may see with the example of the biological metaphor on signs and its literalisation. Metaphors in the wild grow and develop new faces, and new theories develop. Beyond the conceptual standing of metaphor, it is hard to deny that it has had an influential role in shaping semiotic theory, and by being clear on this position, meta-theoretical approaches to semiotics can gain an understanding of how semiotic theories develop in context.

11 Another more specific example can be found in the study of the game metaphor in semiotics [38].

12 Eco reminds us that “[e]ven the most ingenious metaphors are made from the detritus of other metaphors” ([39], p. 256).

13 I am referring more specifically to the concept of primary and secondary modelling systems.

14 While mathematical entities may exist, they do not think that our mathematical thinking is related to them ([42], p. 74).

15 A possible development of the question and the potential answer can be found in the paper by Stjernfelt [43].

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