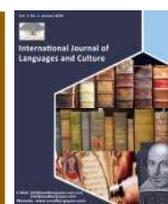




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## Measurement Scales and Tropes - Bridging Science and the Humanities

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### Abstract

Following my previous paper, common features are noted in the definitions of a sign and a trope. Four types of signs are modelled in relation to Vico's four Master Tropes. The limitations of Jakobson's discussion of language using only two tropes are recognized alongside the benefits of his implied extension of these two signs into larger structures beyond the level of single words. Fiske's use of the four Bourbaki mathematical structures offers a formal parallel between the language of scientific measurement scales and that of textual analysis in the humanities. It is proposed that Hayden White's work can be extended into the semiotic level, using proto-grammar as the equivalent organizing principle. Plausible correspondences are observed between four common grammatical cases and the structural rules proposed for the Master Tropes. Judea Pearl's theory of correlation and causality is considered in relation to the development of signs.

**Keywords:** *Master tropes, Bourbaki structures, Semiotic grammar, Case theory, C.S. Peirce, Structuralist theory*

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## 1. Introduction

Until recently, semiotics was more concerned with the humanities than the sciences, but now it is developing on both sides of the divide. The existence of a common logical structure of analysis at the semiotic level would bear on one of the major concerns of biosemiotics, which is to overcome the Cartesian split between the two fields (Wheeler and Westling, 2015).

One of the most obvious differences between the two fields is that the sciences employ mathematics, in the form of measurements or statistics, whereas the humanities mostly do not. Of course, the border is fuzzy and there are islands of mathematical analysis within the humanities, such as economic history, and a long tradition of mathematics in the form of proportion which extends into the arts of painting and music. But mathematics is not simply a question of numbers and geometry, it also includes mathematical structures, which were recognized by the Bourbaki Group, and became influential in the structuralist movement from the 1950s. Since then, there has been a post-structuralist phase which has in turn faded, but that does not mean that there is nothing left to learn from the earlier period. And the history of semiotics goes back much further and still provides much material to study.

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In my previous paper it was argued that the Bourbaki structures underlying Fiske's theory of the socio-cultural variations of communication provide a neglected resource for social semiotics. A cubic model of the sign was developed there to propose a way of mapping the varieties of the sign across the sociocultural environments discussed by Fiske and in Cultural Theory. Hayden White's theory, briefly mentioned in the previous paper, observed correspondences between fourfold systems of analysis used in the humanities, the most basic level of which was Vico's set of four Master Tropes.

I now want to investigate the possibility that the formal relations implicit in the tropes can be plausibly translated to analysing the varieties of signs, and here we come to a crucial observation. The upper levels of White's fourfold systems: ideology, epistemology and emplotment, all refer to large textual structures, whereas tropes are traditionally understood at the level of single words. In relation to the larger issue of comparing the analytical techniques of the sciences with those of the humanities, it is natural to inquire about what if anything corresponds to the mathematical structures in the field of textual analysis in the humanities.

Jakobson used metaphor and metonymy as the basis for distinguishing *Langue* from *Parole*; White used the more complete set of four tropes in correspondence with higher textual levels.

And the four tropes have been used creatively to analyse processes in business management and administration, where they are clearly understood as applicable at levels higher than the individual word (Sköldberg, 2002; Green *et al.*, 2009 and 2011). However the transition between the semiotic and higher levels has not been theorized. I suggest that the missing link and the parallel to the mathematical structures, can be found by borrowing from linguistics and proposing a *proto-grammar*.

### ***1.1. The Crossover: Mathematical Structures and the Master Tropes***

It was fashionable to say that semiotics was the inheritor of rhetoric (Abbott, 2006), and this is my starting point on the humanistic side, specifically the four 'Master Tropes' associated with Vico, and important developments by Burke (1969), White (1973a and 1978), D'Angelo (1992), Kellner (1981) and Marshall (2010).

Coming from the social sciences there is one source for a radical introduction of mathematical structures into cultural analysis, by Fiske (1991, 1997 and 2004), and its predecessor in Stevens' analysis (1946 and 1958) of the scales of measurement used across the sciences and statistics: which are also four in number.

The importance of Fiske's work for the present purpose is that it is both closely related to Cultural Theory, as discussed in my previous paper, and provides a mathematical background for the analogies proposed by Hayden White in the humanities.

### ***1.2. Tropes and Structuralist Theory—Two are Not Enough***

Jakobson's influential development of Saussurean linguistics focused on just two dimensions, the paradigmatic *Langue*, and the syntagmatic *Parole* and he linked them with the two tropes of metaphor and metonymy respectively. His approach has been criticized as reductionist for ignoring synecdoche and irony (Vickers, 1998: 442-450; Kellner, 1981: 27, D'Angelo, 1992: 205).

Vickers criticizes Jakobson's influential widening of metaphor and metonymy to be understood as linguistic processes, on two grounds. First, he points out that this reduction to only two key tropes damages any proper analysis of them and creates a false 'opposition' between them: the famous structuralist contrast of *Langue* and *Parole* taken from de Saussure. It is hard to disagree with this criticism. But in addition, Vickers says that Jakobson makes a major error by discussing these two tropes as acting in the field of the signified, when traditional rhetoric clearly thought of them as phenomena of deviation from a norm in the signifier. However, in the context of the present essay, it is useful to note that Jakobson's proposal does imply an extension of the concepts of these two tropes from individual words to the wider structure of *langue* and to the processes of discourse or *parole*.

It is useful at this point to consider the well-known contrast introduced by de Saussure between *langue*, the structure of a language as a system of signs, and *parole* or speech, which can be generalized as communication. Jakobson interpreted these two aspects as related to the tropes of metaphor and metonymy, respectively. The first based on choices of selection and replacement of words—a synchronic perspective—and the latter the syntagmatic combination of signs or words into a discourse in a diachronic perspective.

The point of this remark is to say that in our ‘tropical’ analysis we will need to focus not on individual signs but on their combinations. In the perspective of *langue* this implies an architecture of signs, such as Barthes used to model connotation and meta-language, while for *parole*, discourse as a *process* will be the key.

Barthes (1967: 89-94) also acknowledged that multiple signs could be covered by one connotation, and that processes of connotation and metalanguage could extend to more than one layer. They could even combine, so that a simple denotative statement (in the ‘real system’) could be the subject of a metalinguistic level which in turn could feed into a connotative level above it, and so on.

Barthes’ connotation and metalanguage are quite close to two of the Master tropes: synecdoche and irony, while he briefly described metaphoric *series* as ‘syntagmatized paradigms’, and a metonymy as ‘a syntagm which is frozen and absorbed into a system’ (*ibid*: 93). Synecdoche and irony are the two tropes that were left out when Jakobson connected metaphor and metonymy with the selective and syntagmatic dimensions of discourse (Jakobson, 1971).

Thus, it seems that there was already here the germ of the idea that the tropes could form the ‘repeating units’ of semiotic structures, much as in a chemical polymer, and if so, it implies a huge variety of possible ‘textual’ structures not limited only to linguistic forms.

In what follows it will be claimed (following Kellner, 1982; D’Angelo, 1992; Marshall, 2010), that the four master tropes also form a series of increasing complexity: metaphor – metonymy – synecdoche – irony, and that the series is homologous with the series of measurement scales used in the sciences: Nominal – Ordinal – Interval – Ratio.

It is also important to note that while the three Peircean sign types, icon, index and symbol have close relations with the tropes they are short by one, and in closing this gap we shall see another important benefit of focussing on semiotics structures in the way initiated by Barthes (1967).

### 1.3. *The Tropes in Close-Up*

A trope is a move which replaces one referent with another, while a sign, in Peirce’s definition, is something which stands for a referent in determining an interpretant to respond to it as if it were the referent (Chandler, 2002: 29). So, the question arises: Is there a useful way of viewing each of the major tropes as a variety of sign with different structures? And specifically, referring to my previous paper, can the three degenerate signs and the genuine sign form the basis of such a typology?

Lyne (1980: 163) cites Peirce as saying that rhetoric is ‘the general secret of rendering signs effective’ and follows this by saying that Peirce clearly intended to use ‘rhetoric’ in its traditional sense. In that case we can reasonably attribute some of this ‘secret’ power to the work of the tropes.

In *Rhetorical Poetics* (Rice and Schofer, 1983:19), we read the following definition:

A trope is a semantic transposition from a sign *in praesentia* to a sign or signs *in absentia*, and

- (1) Based on the perception of a relationship between one or more semantic features of each signified;
- (2) Marked by the semantic incompatibility of microtext and macrotext;
- (3) Motivated by a referential relationship of resemblance (metaphor) or causality (metonymy) or inclusion (synecdoche) or opposition (irony).

While in Chandler’s description:

*A trope such as metaphor can be regarded as a new sign formed from the signifier of one sign and the signified of another. The signifier thus stands for a different signified* (Chandler, 2002: 125).

Chandler’s statement relies on Saussure’s binary analysis of signs, but by connecting metonymy with the flow of ‘parole’, Jakobson makes clear that metonymy is a process acting in the field of the referent, while the metaphoric process of substitution happens in *langue*, the domain of the *system* of signifiers (Jakobson, 1971: 75). Jakobson goes on, referring superficially to Peirce, to claim that the sign has ‘two interpretants’, interpreting it by two references: ‘one to the code and the other to the context’ (p.75), but it is not at all clear how this is consistent with Peirce’s model of the sign.

Vickers is using Saussurean terminology, which often conflates as the signified what Peirce separated into the interpretant and the referent, whereas we need a proper triadic framework if we are to find models for the four master

tropes. And the next thing to take into account is that tropes are thoroughly relational. As Ricoeur made clear in analyzing metaphor (1978), the trope does not work by simply replacing one referent or signified by another, but by connecting the two and holding them together: ‘remoteness is preserved within proximity’ (1978: 148). The similarity which metaphor depends on is thus created in its use.

The other tropes are not so heavily dependent on imagination and reconstructing meaning, but the general principle that Ricoeur insists on seems valid for all tropes: in order to be recognized as tropes they must retain both the original and the new meanings in contact. A trope, by definition is a change of direction, something unexpected, something that *happens*, as Hoffmeyer points out (2015).

Centuries earlier, Ward (1759,1: 398), generalized this by saying that ‘every trope makes reference to two things.’

The similarity which metaphor depends on is created in its use. If I say a man is a pig, it is not (usually) because his physical appearance or behaviour are demonstrably typical of these animals, but because my intention is to create that image of him: to create an interpretant which brings the man and the animal together while also recognising that they are not identical. The more disturbing because we recognize that a pig cannot be judged morally for its typical characteristics.

For this example, the two referents in Figure 1 below would be ‘man’ and ‘pig’.

Despite Vickers’ criticism, a clear parallel exists between the first two tropes and the varieties of signs classified by Peirce as icon and index. Both metaphor and icon are rooted in the principle of similarity, while metonymy and the Peircean index are usually described as depending on relations of contiguity (Peirce, 1958), and/or causality.

Another general point arises in Kellner’s article *The Inflatable Trope* (1981), where he notes that the four tropes form a developmental series:

*‘One of the most striking and least examined aspects of the four-trope series-the “master tropes” of Vico and Kenneth Burke is their inherent movement through a fixed course: from metaphor, the preliminary naming operation, to metonymy, the process of reductive manipulation and formalization, to the integrative, macrocosm/microcosm relationships of synecdoche, to the final awareness within the series all of its processes have been relativizing turns, the whole process ironic. On this view, the tropes become “moments” of the tropology itself, which is not seen so much as a set of forms or categories, as a system, indeed the system, by which mind comes to grasp the world conceptually in language. The order in which the tropes present themselves in this system is strictly and logically entailed.’* (Kellner, 16-17).

And the sequence is also a cycle, it:

*‘Prescribes a pattern of recurrences directed in their courses and recurses by an analogy to the linguistic movement from metaphor, through metonymy and synecdoche, to irony and a re-beginning.’* (Kellner, p.19).

White (1978: 1-25) identifies the progression of stages governed by tropes in the work of Piaget on child thinking (sensorimotor, representational, operational, logical), Freud’s on the dream work (Condensation, displacement, representation, secondary revision), and Marx on the evolution of forms of value (from simple, extended, generalized, to the ‘absurd’ money form). He considers the possibility that each of these writers may simply have imposed, rather than discovered their four stages, but concludes that this does not matter, because the mere existence of analogies between such different works is itself a validation. And, in the end, the four stages governed by tropes are developmental stages of consciousness, even if they are not empirically present in these different subject matters.

D’Angelo (1992) asks why there should be just four tropes, and replies that:

*‘Four-foldedness is one of the most universal of symbols. It often appears as the representation of the growth of consciousness.’*

D’Angelo develops an analogical theory drawing on White’s comparisons, while paying attention to Freudian psychology and Piaget’s account of human cognitive development. He describes the tropes as being abstract models saying:

*The master tropes represent idealized stages of the composing process in its movement from an undifferentiated whole, to increasing differentiation, to hierarchic integration, and reflexivity. Tropically, the composing process moves from a metaphorical identification of a unit of experience, to a metonymic displacement of its parts, to a synecdochic integration of part/whole and genus/species relationships, to an ironic detachment and reflectivity of the entire process. (95-96).*

And ends by commenting that:

*The whole process is organic. The origin of the whole precedes the parts which are differentiated and integrated again into the whole. Analogously, the tropes represent an organic whole from which individual tropes are derived.* (p. 97). Freud's stages of the dream work, like Piaget's cognitive stages, he says: '*mediate between perception and conceptualization*'. (p. 97).

D'Angelo also cites a four-stage model of mathematical discovery (Wallace, 1926)—*preparation, Incubation, illumination, and verification* – suggesting in the end that the four stages originate in human perceptual information processing.

White (1973b) concludes that what Vico has succeeded in doing is to 're-discover the projective or generational aspect of language, the extent to which it not only "represents" the world of things but also constitutes the modality of relationships among things by the very act of assuming a posture before them.' (p.48). And Vico in his *New Science* (paras 400-410, 443-446) explicitly identified the four master tropes as a sequence, 'a four-stage cycle through which all civilizations passed' (Vico, p.48).

In comparison, White points to the impoverished nature of the simple binary contrast that the structuralists focused on, between metaphor as the synchronic and selective axis of language, and metonymy as is its diachronic and combinatory axis (Lévi-Strauss, 1962: 205-244 and Jakobson, 1960: 350-377).

It seems clear from these examples that four tropes produce a richer basis for analysis; they introduce the idea of a sequence, which is also present in the mathematical structures; and are already used by some scholars as if they applied to larger stretches of text than single words.

## 2. The Tropes and Degenerate Signs

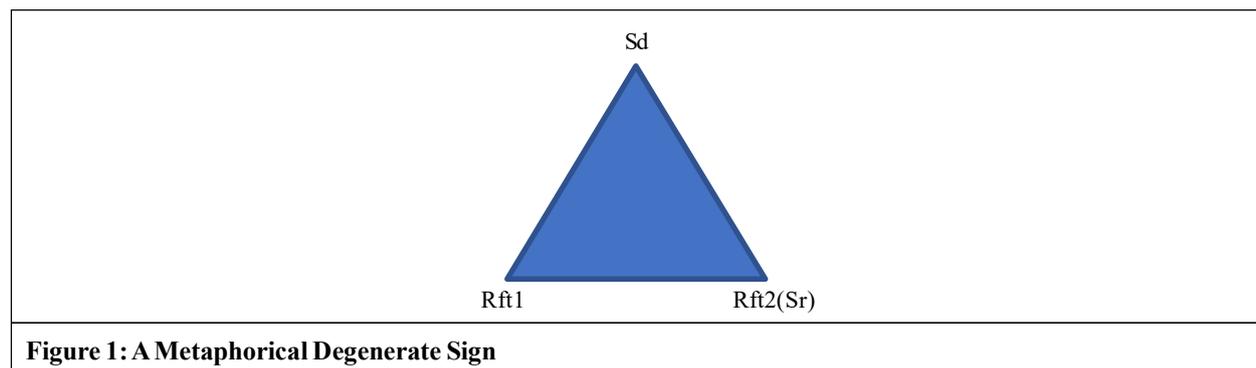
Having asserted that a close relation between the concepts of 'sign' and 'trope' and that the structuralist focus on only two of Vico's four tropes is too restricting, let us now consider how signs and tropes may be linked in a structural classification.

### 2.1. Metaphor

As already summarized, metaphor institutes a new predication while maintaining it in tension with the standard 'normal' meaning of the word or phrase, and this is based on a perceived or created relation of similarity: an iconic relation in Peircean terms (Ricoeur, 1978: 223; Burke, 1969: 503-504) also describes metaphor as seeing one thing in terms of something else and describes it as the trope of 'perspective'. It is clearly the most radical of the tropes and often relies for its impact on working against established convention (Lausberg, 1988: Para 561, P. 253).

I propose that the degenerate sign type that relates to metaphor is one in which the Signifier is suppressed leading to a binary sign model based on the contrast of the Referent (Rft) to the Interpretant, which I will refer to as the Signified (Sd), thus: Sd/Rft. This is like saying that the referent can be read directly for the meaning it holds, as in the concept of the 'Book of nature'. Henri Bortoft has provided an interesting critique from a phenomenological point of view, invoking Goethe's concept of science (Bortoft, 1998).

The following simple Figure 1 gives an idea of how the metaphor incorporates both the 'normal' and the new referents which together determine one signified. The degeneracy of this sign results from the signifier (Sr) being elided into the referents.



**Figure 1: A Metaphorical Degenerate Sign**

## 2.2. Metonymy

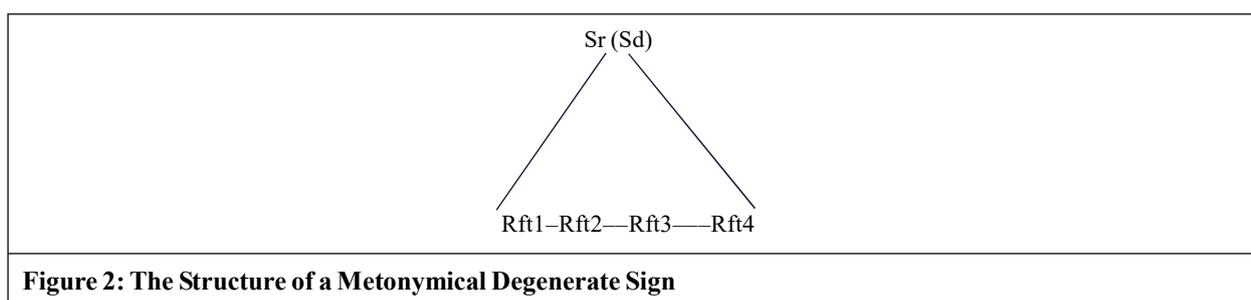
In Ricoeur’s discussion cited above he notes that while metaphor depends on a re-predication of meaning, metonymy is a simple relation between words (*ibid*: 145). The standard description of metonymy is a trope which depends on replacing one referent with another that is in real connection with it, either by proximity in time or space, or in a relation of causality. It can also be seen as a shortcut or a reductive move (Burke, 1969), and this is evident when we consider chains of causality. To say that Russia invaded Ukraine is a shortcut for saying that the Russian Duma together with Putin gave orders to the army commanders, who transmitted these orders down a long chain of command, to field commanders who gave orders for their units to cross the border in a certain number of places. All these details are obvious and irrelevant to a news story, so a long chain of interactions is collapsed into a simple term, not even leaving an input and output of the chain, but the reader knows these details and doesn’t imagine one country somehow transporting itself into another as in a metaphorical sense. An interesting alternative description of metonymy in this vein has been given by Menezes de Oliveira e Paiva (2010: 17), as being a change of scale in which the trope is viewed as a fractal.

Chandler (2002: 131), notes that Peirce *et al.* (1992) stated contiguity to be an indexical feature, and continues:

*Metonymy can be seen as a textual (or—as in thoughts and dreams—quasi-textual) projection of Peirce’s indexical mode. Metonyms lack the evidential potential of Peirce’s mode unless the medium is indexical—as in photography and film. However, it is on the basis of perceived indexicality that metonyms may be treated as ‘directly connected to’ reality in contrast to mere iconicity or symbolism.*

A similar reduction is commonly used when we say for instance that de Lesseps *built* the Suez Canal. The relation of causality is also one of hierarchical control; a machine is essentially a producer of work that can be controlled by a master, and this is what millions of human energy producers were reduced to in the slave trade. This aspect of social ranking will be discussed later. In traditional rhetoric metonymy included the following relationship pairings, one of which could substitute the other: object/producer or owner; cause/effect; container/contained, in which the ‘container may be a place or a time; abstract/concrete (Lausberg, 1988: p.257-259). In describing metonymy as a process of reduction, Burke, like Jakobson links it to scientific discourse, with its tendency to reduce complex phenomena to simpler component, a strategy that worked well in the physical sciences as long as the phenomenology of perception was regarded as irrelevant but doesn’t work well in social or biological sciences. Burke compares this with what he calls ‘poetic realism’ (*ibid*: 506-507) pointing out that an actor needs to master certain physiological fingerprints of emotions in order to express them to an audience, but he is not thus reducing the emotion to, for example, one gesture as its essential core.

In metonymy, I suggest the following Figure 2:



In this case the action of the trope is through causality and contiguity and is therefore confined to the referent, which is here opened up into a sequence that functions as a scale. The metonymic signifier here executes a change of scale to make communication more relevant to the task intended, similarly to Menezes’ suggestion. The interpretant (Sd) is the part of the sign that has here been elided. In addition to Jakobson’s well-known association of metonymy to realistic and scientific discourse, we can see here how the scientific illusion of transparency and objectivity is created by suppressing the reference to consciousness represented by the interpretant (Sd).

## 2.3. Synecdoche

The simple definition of synecdoche is that it is the trope which substitutes part for whole or whole for part. Unfortunately, it is often still described as a variety of metonymy (Wheeler, 2016: Figure 1, p. 163: Chandler, 2002), which completely misses the point that it involves a more complex structuring than the simple linear ordering of metonymy.

An interesting description is provided by Lausberg (1988: para 572) where he says that it is a metonymy with quantitative instead of qualitative relations between its terms—a point we shall see is relevant when we consider the scales of scientific measurement. He gives three types of synecdoches, based on relations of: part/whole; genus/species and singular/plural (Lausberg, 1988: p. 260-261).

In Kenneth Burke's analysis, Synecdoche is the trope not of reduction, but of *representation*, a term with obvious semiotic relevance.

Burke goes further and adds 'sign for the thing signified' (p. 507) and extends this to say that in looking at a tree for example, sensory perception abstracts certain qualities such as size, shape and colour to represent the tree. In semiotic terms this would seem to be to create via these perceptual signs an interpretant which is a reduced form of the referent tree. This sign could also be viewed as a degenerate form in which the referent has been elided into the signifier so that the sign is now the dyad Sd/Sr. In the case of the metonymy the replacement of one referent by another in contextual contact with it puts the emphasis on a different dyad: Sr/Rft. I have discussed the question of degenerate signs in my previous paper (Douglas, 2024).

Burke's view, as we have seen, is that the four tropes form a sequence of increasing complexity, in which each succeeding member includes the possibilities of the simpler ones, and he notes that in the case of synecdoche, only substituting part for whole also implies a reduction as in metonymy from quality to quantity or number, whereas the reverse shift does not cause a reduction. This is a better analytical description of the relation between these two tropes than to describe synecdoche as a mere variety of the simpler metonymy.

Following the Peircean sequence of sign types, we reach the third and final one with the Symbol, which Peirce describes in different ways, but most consistently as being governed by convention and being established as a *habit*, as befits its nature as a Thirdness.

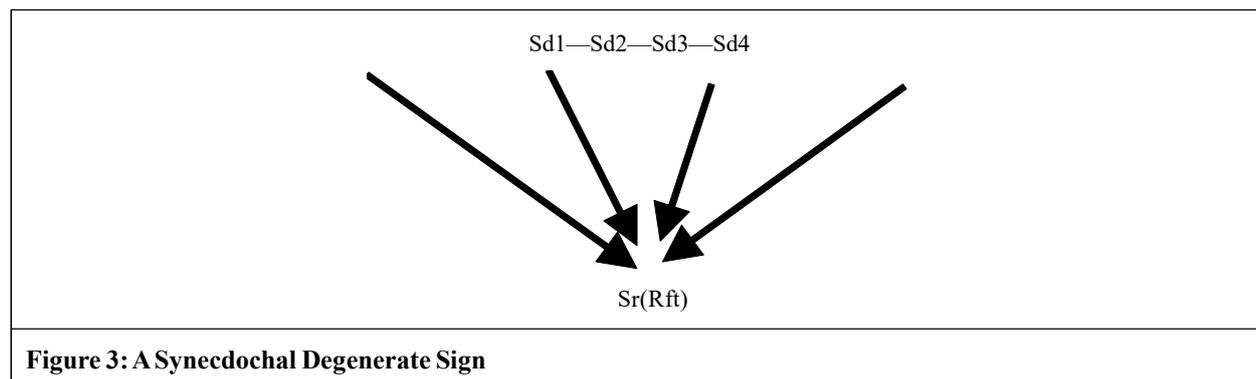
In the simple diagram below, I have represented Barthes' concept of connotation, while allowing multiple 'higher level' meanings to impact on a single signifier. This model also implies the possibility of a multi-level hierarchy extending upwards and potentially sideways to connect to other signifiers. The key word is integration as pointed out by D'Angelo (1992), and it could be said that the sign becomes a 'mini-text' in itself. Or as Burke suggested, a microcosm (Burke, 1969: 508).

In this case the part of the sign that has been suppressed is the referent, which now functions purely as a signifier, but not as in the case of metaphor with respect to an external referent but as a vehicle for various ideological meanings.

But the structure is versatile Hoffmeyer (2015: 247-248), describes the process of interpretation of an image (of a strawberry as it happens), leading to the exclamation "yum-yum" as a series of signs whose interpretants build up successively while drawing in and integrating threads from memories and other processes. There is also an element of causality involved, which is made more explicit in another example in Hoffmeyer's paper (*ibid*: 244-245) involving the action of adrenaline on the liver. Thus, it is clear that the synecdochal variety can include the simpler metonymic one.

This description by Kellner makes very clear that Synecdoche is an appropriate correlate of Organicism:

*'The symbol stands in a microcosm/macrocosm relationship to some aspect of its surroundings and serves as a sort of syntactic regulator by which the elements (conceivable as mere elementary figures, or as lexical and grammatical units) are brought into a rule-governed, integrative comprehension. Paul de Man has noted: "The symbol is the product of the organic growth of form; in the world of the symbol, life and form are identical:*



**Figure 3: A Synecdochal Degenerate Sign**

[citing Coleridge] 'such as the life is, such is the form.' Its structure is that of the synecdoche, for the symbol is always part of the totality that it represents." (Kellner, 1969).

In Figure 3 the four terms Sd1 – Sd2 – Sd 3 - Sd 4 need to be separated more so that each one sits at the top of one of the arrows.

As already noted, Synecdoche also carries the simple idea of a part-whole relation, and its other characteristic, which is often described as container substituting the contained is interesting because it thus changes an uncountable quantity into a countable one, through establishing units that can be counted. The Interval scale is the first one which introduces units, and in Fiske's Equivalence Matching relation we see the emergence of the idea of keeping track of debts through the counting of units of work done, money or goods owed to maintain equity.

In Synecdoche, the basis is the part-whole relation, which is clearly apparent in the Interval scale, where equal increments exist between successive points on the scale while there is no zero.

It is often said that synecdoche is another form of metonymy, but it would be more exact to see it as a combination of metonymy and metaphor, since a part-whole relation necessarily involves both similarity and contact. A better formula might be:

*Synecdoche = Metaphor x Metonymy*

And synecdoche, where a part is made to stand for a whole to represent a larger thing by virtue of the common property which they both contain, a tree for a wood for example, or an MP for an electorate. Here we have numbers but no zero.

#### 2.4. Irony

We have assigned the first three tropes to different types of sign relations, what do we do with the fourth trope, Irony? And at this point we may also bring in the Saussurian description of the sign as arbitrary, and ask if Peirce's symbol, based on convention is also arbitrary, in the sense of being completely detached from motivation and iconic or indexical relations. Does Barthes' metalanguage actually imply a fourth type of sign ruled by Irony?

Irony, the trope based on negation, which is obviously related to the literary style of Satire. It is not so easy to link this to the other systems, but the essential character of this negation is the emergence of a new level, by taking the intensity (motivation in Saussurean terms) out of the previous ones. Thus, in contextualism, and political liberalism, the approach is pragmatic instead of morally certain. The world is viewed as a context in which events take place, and motivations need to be discovered and understood rather than dogmatically followed. This is the view of the sociologist and the character of a modern multi-cultural society. Likewise, value has become de-personalised and de-historicised, it simply becomes a universal means of negotiation and trade.

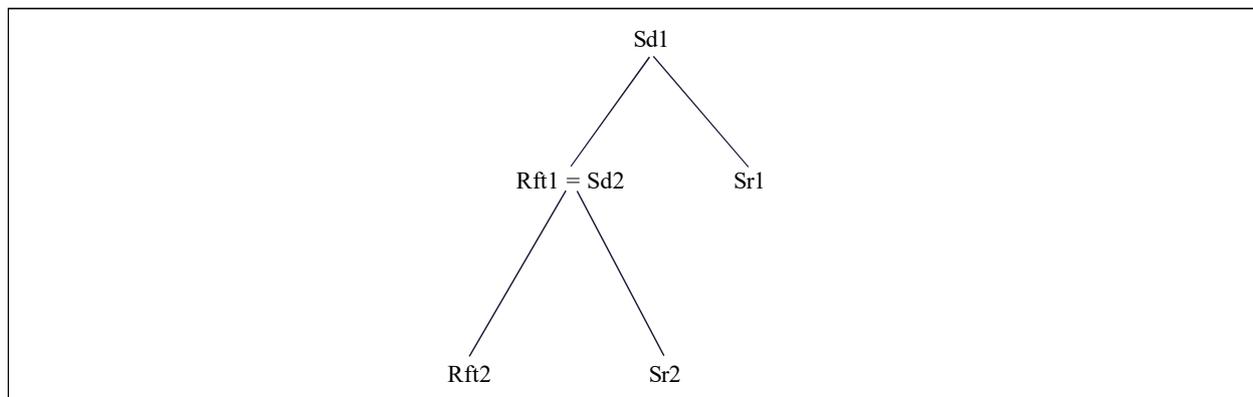
In *Vico and the Transformation of Rhetoric in Early Modern Europe* – Marshall (2010), on p.213 gives this description:

*'Irony is actually related to the first development of semiosis as such. Irony is Metalinguistic. It asserts the possibility of meaning where no such possibility was initially perceived. [.....] Vico's account of the tropes reveals his revision of the art of persuasion. It is a sublimation that denotes simultaneously a condensation and a release of energy. Indeed, it is not inappropriate to parse Vico's poetic logic in an Aristotelian vernacular, and say that Metaphor, Metonymy, Synecdoche and Irony are the four Vichian "categories". The contents of the Institutiones Oratoriae—and by extension the rhetorical tradition is reproduced—but the long form is replaced by a condensed, sublimated rhetoric focused on the origins of the problems of cognitive operations that are essential to human community.*

*The genus, species, totum and partes of the IO are the constituents of Synecdoche. Causa, and its various modes (as auctor, materia, forma, finis) and effecta, are the diachronic poles of Metonymy, together with antecedencia and consequentia. Similia and dissimilia, congruentia and repugnancia are the axes of continuity that constitute Metaphor. The three types of opposition contraria, privantia and contradictoria are the conditions of possibility for Irony, together with Comitantia.*

p.214: *'Vico however, does not simply replicate the classification of the tropes into four master types. He deploys that classification as an account of the cognitive sensitivities that found conceptuality as such'.*

Kenneth Burke identifies Irony as the trope of dialectic (Burke, 1969: 511-517). At this stage the teleological view of development as pre-determined towards a certain goal is replaced by a multi-perspectival view. Complex situations are seen from the multiple perspectives of different players in a human drama, to create a ‘perspective of perspectives’, none of which is uniquely right while all contribute. The trope of Irony is self-reflective and thus represents a jump to a new level.



**Figure 4: A Metalinguistic or Dialogical Sign**

Barthes’ described metalanguage in Saussurian terms, employing just Signified and Signifier, as a second degree signification in which the whole sign as a combination of Sr and Sd at the first denotative level becomes the Signified meaning accompanied by a new Signifier at the meta-level (Barthes, 1967: 90-93), so to express this in Peircean terms, we would place the first level Interpretant (a more developed sign, as Peirce says), as the Referent at the meta-level, accompanied by a new Signifier and a new Interpretant. As in the other diagrams, I have used Sd to represent the Interpretant (Figure 4).

## 2.5. Summary Comments

Based on the idea of degenerate signs discussed by Bucynska-Garewicz (1979), the following four types have been suggested in correlation with the Master Tropes described by Vico.

1. A metaphoric degenerate sign which suppresses the signifier (Sr) and fuses it with the referent (Rft), leaving a binary structure which explicitly joins the interpretant (Sd here) to the Rft.
2. A metonymic sign which elides the Sd to create the binary structure of Srs which represent Rfts without the intervention of consciousness, in the tradition of Cartesian science.
3. A synecdochal sign, which can be a triadic structure like Peirce’s Symbol, but which may also suppress the Rft which becomes just a signifier, so that the Sr dominates the Rft is contrast to the opposite relation in type 1. This sign can then build up multi-level connections in the manner of the connotative sign described by Barthes (1967).
4. Finally, the sign reaches another level, like the meta-linguistic form that Barthes also described. Here all motivation remains at the lowest level as the sign becomes more abstract.

The structuralist assertion that metaphor and metonymy are forms that can be found in the behaviour of semiotic relationships can seem little more than a handy way of thinking of *langue* and *parole*. However, when a set of four fundamental tropes and the hierarchical relationship between them are recognized, it seems time to ask more fundamental questions about how this comes about. And it is perhaps ironic that the very structuralist movement itself rests on the mathematical structures identified by the Bourbaki mathematicians, yet one of its consequences has only been followed up by a small group of literary critics, not by linguists. And from the sociological side, Fiske has proposed a theory of social communication, which must necessarily involve signs, without in my view tackling the relations sufficiently systematically, as we shall see below.

The discussion above holds to a static view of ‘the’ sign, whereas Peirce certainly viewed semiosis as a continuing process of development, and a fuller description would be served by taking into account the concept of ‘semiotic scaffolding’ proposed by Hoffmeyer, to deal with the complex networks of interaction that occur in signification (Hoffmeyer, 2015).

### 3. Tropes and the Mathematical Structures in Stevens' Scales

We have seen how the four Master Tropes can be related to four types of signs and noted how the static and punctual tropes need to be viewed dynamically and as extensible into larger structures, whether linearly as in metonymy or architecturally for synecdoche.

We now turn to the logic of mathematical structures, to see if the mathematical properties of each of the scales can be detected in the tropes and the sequence of degenerate and complete signs.

It might seem far-fetched to think there could be any correspondence between the classifications of signs and of measurement scales. I hope to show that not only are there common themes, but that they can be found at the most basic formal level of mathematical structures, and that both sets of four, tropes and scales are defined by a hierarchy of types.

There is also a general reason to suggest that there should be such a correspondence, because both signs and measurement require means of representing the objects with which they are concerned. It should be no surprise that representations of the objects belonging to any hitherto unrecognized field of study can be expected to develop and become richer with time and use. The interesting question becomes "do these developments pass through stages?"

Fiske classified social interactions in ways that are quite similar to my analysis of social environments in Cultural Theory, as discussed in the previous paper (Douglas, 2024).

Each of Fiske's four structures were developed from a simpler analysis by Stevens (1946 and 1958) on the basic types of measurement scales used in data analysis and statistics.

1. The Nominal Scale is qualitative, simply a list of names which may be as simple as arbitrary letters of the alphabet, and mathematically it is characterized by relations of equivalence, which implies only three properties: Reflexivity, Symmetry and Transitivity (Fiske, Structures, p.211). This obviously applies to similarity relations because each element  $x$  is similar to itself (reflexivity); if  $x$  is similar to  $y$  then  $y$  is similar to  $x$  (symmetry); and if  $x$  is similar to  $y$  and  $y$  is similar to  $z$ , then  $x$  is also similar to  $z$  (transitivity), it is classed as an Equivalence Relation. Similarity recalls metaphor, leaving open who determines that a similarity exists.
2. In an Authority Ranking (AR) according to Fiske and in Stevens' Ordinal scale, every element retains the properties of the previous type and also has a unique place in the linear ordering (connectivity), which is *anti*-symmetric because if  $x > y$ , then  $y$  cannot be greater than  $x$ .

When we consider metonymy, an interesting question arises, which also applies to each of the tropes. A scale connects multiple elements bound by common properties, a trope is used only to relate two terms, so how could a trope be expanded, and would it still be a trope? If we take as an example the common metonymic device of replacing a person or group of people by the name of the building or institution in which they work, we could imagine a sequence of causation being reported such as: Downing Street has told St. James Park to inform the White House that .... etc. What is interesting here is that the relation of causality which exists here is not being expressed through metonymy, instead each term or step in the chain has its own metonymy based on substituting an address or a building for a group of people or office of state. The causal type of metonymy is left out and the contiguity relations are not plausibly connected in a chain. It thus seems that metonymy by contact does not extend in the way that mechanical causality does. And of course, Peirce defined Secondness, the root of Indices, in terms of force not simple contact.

Another feature is that the sequence creates what would normally be described as a code, the rule being "replace each actor by the name of its physical location". This an interesting question to return to because each term in a code is necessarily part of a structure in which it has a value, also a feature of Saussure's analysis of signs.

This mathematical structure, known as a Linear Ordering, does not seem to map equally onto both the two major features of metonymy, based on causality and contiguity. This can be seen in relation to the transitivity property, which obviously applies to causality: If  $x$  causes  $y$  and  $y$  causes  $z$ , then  $x$  also causes  $z$ , whereas contiguity between  $x$ ,  $y$  and between  $y$ ,  $z$  does not require contiguity of  $x$ ,  $z$  although it does not exclude that possibility.

#### 3.1. Equivalence Matching (EM) and the Interval Scale

Equivalence Matching, where goods that are owed or exchanged are measured by how much of what one partner takes is *equivalent* to how much of what the other wants or deserves. But it can also be observed in other non-economic relations, for example in conversation, where turn-taking is balanced.

Turning to the proposed relationship between Synecdoche and the Interval Scale, the principles of the previous two structures are retained with the addition of new properties belonging to the so-called Ordered Abelian Group (Fiske, *Structures*: 215-216). We can illustrate the new Commutative relation in the Abelian Group by the following arithmetic equation, in which  $x$ ,  $y$  are elements which are parts of a whole  $W$ :

$$x/W + y/W = y/W + x/W$$

It seems to be much the same thing as the relation of addition, and there is clearly also a subtraction relation (the inverse) which allows one part to be subtracted from the whole, but only as long as they do not overlap. If the different parts do overlap, then it would seem that we are outside the range of the Synecdoche trope, or possibly there is a second synecdoche within a synecdoche.

However, if the ‘operation’ that governs the Abelian Group is the synecdochal one of ‘part-for-whole’ there is an obvious inverse operation of ‘whole-for-part’.

Another definition of this trope, which plays on container-for-contained and vice-versa, certainly requires more than partial overlap to be true. So, the trope seems to be more restrictive than the scale but still to obey the required Abelian Group conditions. Lastly, Abelian groups must also support a null element or Identity relationship, like a zero in arithmetic, so that adding this element to another part leaves the latter unchanged. Here we seem to find the Synecdoche more limited, as it is difficult to conceive of a zero-part meaning anything, and even less so when we come to consider negative numbers: how can there be a negative part of a whole?

There is another interesting parallel, however.

Synecdoche is described as a relation between container and contained, and if we take as an example packing sugar in 1 Kg bags, we can see that one feature introduced by the packaging is a shift from what linguists refer to as ‘uncountable’ to ‘countable’ quantifiers in which ‘ten kilos of sugar’ (uncountable), is replaced by ‘ten bags of sugar’ (plural because countable). So, it seems relevant that the Interval Scale introduces counting of units for the first time, following the simpler Ordinal Scale. Lausberg (para 572), says that Synecdoche is a metonymy involving quantitative relationship.

Fiske refers to this final type of social relation as Market Pricing (MP) which allows more than one Abelian Group to operate simultaneously, governed by a different ‘operation’ as well as addition—in this case it is multiplication. In Stevens’ typology this is the Ratio Scale, which now has an absolute zero point and allows values to be multiplied directly. The mathematical structure is known as the Archimedean Ordered Field.

Fiske’s account of EM and MP relies heavily on economic examples, which are easily related to Stevens’ scales. And this leads him to an interesting reflection, that the two simpler forms of CS and AR can be identified in various phyla of animals whereas EM is rare and MP unknown (Fiske, 1992: 716). Extending this idea, he points out that much of evolutionary theory is based on MP-type axioms.

Let us consider Irony as a shift from the previous stage of Synecdoche, as suggested by Burke, and use the example of the religious symbolism of the Christian communion. Here the bread and wine are symbols for the body and blood of Christ, which by the doctrine of trans-substantiation are supposed to actually carry the spirit with them. Now a satirist might wish to treat this ironically, asking whether he could improve the benefit with more communions. “How about me doing 10 in a day at different churches, or maybe I could hire a priest to give me 10 in a row on the same day?”. Clearly such a suggestion would be deeply offensive to believers, but it shows that what Irony does is to disconnect the sign from its context and its original meaning: in Saussurian terms it removes the motivations of the symbol. At the social level, Irony lifts the symbol out of its context among a community of believers, and turns it into an empty form that can be used in a new semiotic game, at a meta-level.

Kenneth Burke’s discussion of Burke (1969, 511-517) contrasts Irony with the relativity of the points of view of the characters in a drama. Irony, he says is a development in which each of the competing sub-perspectives can be viewed as completely right or wrong in the attempt to create ‘a perspective of perspectives’. He also treats Irony as a development of Synecdoche, giving as examples ironic observations that diseases perfect their cures, and cures extend the influence of the disease (p.512). Burke sees this shift as one in which the partial certainties of each player are replaced by the view that each of them is a valid contribution.

It is also interesting, since we are working towards a semiotic context for all this, that Burke ends his discussion, by saying that: ‘Irony, as approached either through drama or dialectic, moves us into the area of “law”, and “justice” (the “necessity” or “inevitability” of the *lex talionis*)...’. Thus, we have both Peirce’s Thirdness based on laws as necessary relations in true signs, and Saussure’s focus on conventions in signs.

Irony is based on a principle of negation according to Burke, and on opposition according to Rice and Schofer.

Quantification may be at the heart of Irony and also of Barthes’ meta-language. The clue to this type of interpretation is often transmitted by exaggerating a statement – so much so that no-one believes it is meant literally, and the receiver then intuits that the opposite meaning must be intended. Imaginatively speaking, the signifying process began at one level, and was stretched until its elastic limit was passed, causing it to revert to something quite mundane at the original level. This image implies that signification or semiosis may depend on analogue processes, from which a digital sign emerges. When the source of the stretching force causes the rubber band to snap, it stands holding one end of the band now detached from the rest of it, but still pointing towards its origin as a trace of what once existed. It still resembles the previous relationship, but once removed from that context, the piece of rubber it holds retains only an arbitrary conventional relation to it. In order to be interpreted it must be explained to any curious ‘reader’. However, an unfamiliar viewer may be motivated to create an abduction, conjecturing that the piece of rubber once belonged to a rubber band.

Another example from biosemiotics was provided by Bateson (Quoted by Wilden, 1972)—the nip that is not a bite. In this case the intensity is so low as not to be taken seriously and the intention of playfulness, rather than a warning or a threat, is received. It is as if a move is made and then once received is withdrawn, like a comment. The warning is still present but made as an observation of an implicit rule—“this is what you can expect if you persist”.

These kinds of signs include linguistic ones, and quantification enters here directly through verbal quantifiers and also through paralinguistic indicators of tone or atmosphere—are these words spoken neutrally or with anger, controlled or not? In another sense such expression of feeling is an ironic comment on the inadequacy of language itself and marks a return to the simpler level of analogue communication, but as a modifier at the higher level of digital signs. Satire often consists in reducing highly cultured statements or actions to their basic analogue and animal level.

Finally, can Irony be interpreted quantitatively?

We can point to anecdotes that seem to express Irony’s quality of negation, and Oscar Wilde’s famous quip about a cynic being someone who knows the price of everything and the value of nothing. But still, it is a vague suggestion.

Fiske only made the sketchiest attempt to link his four structures to semiotics referring to any semiotic writings in detail. In considering CS he suggested that it was likely related to kinesthetic communication, based on his comparison with Piaget’s sensori-motor stage of infant development, and went on to suggest that the AR system is encoded very often in spatial hierarchisation and therefore should be seen as an ‘iconic mode’. But this confuses a mode of expression with the content expressed, the use of distance of approach between people to express an indexical relation of ranking is not the same as an iconic meaning.

And according to Fiske, EM would correlate with pre-operational manipulation of objects in ‘indexical’ form, leaving MP to be represented in ‘abstract symbolic form’. He has only partly captured the hierarchy of sign relations of Peircean semiotics, and without referring to Peirce at all (*ibid.*: 203-205).

Although Peirce’s three types of signs also form a hierarchy ascending from icon to symbol, Fiske’s discussion leaves this in conflict with the ordering of his four models, by associating iconic representation to a more developed structure than indexical.

In his contribution to a later work, an overview of Relational Models Theory (Fiske, 2004: 60-98) he assigns CS to indexical communication on the basis that it is characterized by extensive physical contact between bodies, AR remains Iconic and MP symbolic. This means that EM has to be omitted, which he explains on the grounds that:

*‘There is nothing in the Peircean tripartite typology corresponding to the conformation of EM, because Peirce apparently did not recognize the representational properties of procedures, and his taxonomy was not concerned with constitutive processes. However, Piaget’s (1952) concept of concrete operations is helpful in understanding this conformation. Although it was intended as an ontogenetic stage theory, we can nonetheless apply Piaget’s concept without concerning ourselves with the problematic theory of cognitive stages. ... Piaget explores how children use concrete operations for judging equality or inequality. ... [so] it seems*

*reasonable to ask whether the primary adaptive function of these capacities is social. However, Piaget ... also applied his stage framework to moral development and social comprehension (1932, 1941-1951), but he did not explicitly discuss concrete operations for constructing socially balanced relationships. Nevertheless, ... one of the most pervasive concrete procedures for constituting EM is taking turns.'*

Returning to CS, one of the most important expressions of social solidarity is communal eating, which of course is a sensuous activity, involving physical contact, but we can also note that in a communal meal the participants express their solidarity and equality, while ingesting materials which are not part of their bodies. And CS environments are defined by the simple binary border between 'we' and everything else (Fiske, 1992: 715). The food which might be potentially an alien body is consumed without fear because of the relation of trust between the participants, which is different from sharing a meal that has been paid for in a restaurant. At the same time, if poisoning were to occur between false friends, it would activate the always present fear of pollution in small groups (Douglas, 1978).

It is clear that Fiske was not primarily concerned in examining possible semiotic correspondences to his Relational Models Theory, and it is hoped that the present paper contributes to that investigation.

#### 4. Codes, Cases and Varieties of Discourse

Although we have just seen some plausible connections between the sequence of tropes and the scales, some of it is quite circumstantial, and the link between Irony and the Ratio Scale seems weak.

However, we have been attempting to compare tropes, which usually operate on individual signs with scales which, by definition, are extended over many elements. Is there anything in semiotic theory which can deal with this?

Kellner (1981) has bridged the two approaches: the humanist one of White and the scientific—without mentioning Stevens or Fiske—by referring to Foucault's sequence of four *epistemes*, in his early book *The Archaeology of Knowledge*: the 16<sup>th</sup> Century episteme, followed by the Classical, the 19<sup>th</sup> Century episteme and the finally the Modern.

Finally, Kellner invokes Kant's analysis in the *Critique of Pure Reason*, claiming the presence of the same four elementary forms represented by Vico's tropes, and importantly also that they follow the same sequence of development.

White, in an essay (1973b), despite Foucault's insistence that his four epistemes were not a developmental sequence, claimed that they were exactly that, based on the natural progression inherent in the four master tropes. Thus, while in each epoch there was an attempt to guide scientific disciplines in line with a standard considered value-free and independent, in each case this standard itself conformed to an evolving framework set by the four tropes (White, 1973b: 45-49).

White argues that 'any science committed to making a complete list of all the *similarities* (...) is necessarily driven, by the logic of the list-making operation itself, to an apprehension of all the *differences* that might exist among things.' (p.46). Metaphor only exists because similarities need to be pointed out, or claimed, they are not immediately obvious because they are accompanied by differences. Thus, the list-making process inevitably reaches a tipping point, where it is the differences which are foregrounded, and the only basis of relationship falls to contiguity, spatial relationships, cause-effect and hence governed by the trope of metonymy. White is thus already relating the tropes to relationships that go beyond individual words to embrace different manners of classification.

White also talks about the importance of part-whole relations in the taxonomies typical of this period, thus confusing metonymy with synecdoche, but he does so to focus on the *mechanistic* nature of this type of thought, something which belongs with the second of Pepper's world hypotheses Pepper (1970).

The next shift then involves the discovery, as White says: that 'things (...) differ internally within themselves, during their life cycles, which is the basis for that temporalization of "the order of things" which Foucault ascribes to nineteenth century consciousness' (*ibid*: 47). Thus, White says that the process of examination of parts and wholes inevitably leads to disputes about which parts are most important, and which is the most distinctive feature of the whole to which they belong. This is resolved by addressing functional differentiation of parts within wholes, and the process of development that occurs in the life cycle of organisms, recognition that the whole is greater than the sum of its parts, an organic unity is 'the modality of relationships that is given in language by the trope of synecdoche' (p.47).

And Pepper's 'world hypothesis is thus the Organicist one (White, 1973).

Claiming that Foucault would also have characterized the 20<sup>th</sup> century episteme as ironic ‘if he understood correctly what he has been about’.

From both the humanities and the sciences, there has thus been a concern with both the micro- and the macro-levels of communication and discourse.

It is worth recalling the fourfold classifications mentioned in my previous article, Tinbergen’s ‘Whys’ and Haugaard’s types of political power (Douglas, 2024), where the themes expressed abstractly in the tropes are evident materially.

## 5. Tropes and Causality

In Judea Pearl’s *The Book of Why* (2019) he introduces the idea of a Ladder of Causation, which is worth comparing with the triadic systems discussed above.

Pearl’s concern in the book is to address the way that statisticians have for decades maintained a taboo on any use of the concept of causality, when it comes to interpreting data, correlation takes all, but correlation is only the first rung of his ladder. He describes this level as one based on seeing, not intervening on or interpreting data. And it is interesting that he compares these to three levels of cognition beginning with observation which most animals are capable of, passing through doing or intervening, using toolmaking as an example, and reaching its most advanced level where imagining and retrospection are possible, in humans (Pearl and Mackenzie, 2018: 27-36).

The first level is one where association is the key interest—“what makes these data similar or different?”. This is the world viewed simply and passively as based on correlations and conditional probabilities. Predictions can be made from repeated observations but there is no intervention by the observer on the data.

At Pearl’s second level the questions of interest are of the type “What will happen if we do X?”, we act or intervene in the system. The data are manipulated by the force of the observer. It’s not hard to recognize the presence of both indexicality and Secondness here.

The top level is one where counterfactuals—“what if X had happened?” questions—are considered, and Pearl links this to the concept of scientific laws, where the behaviour of a particular spring, for example, in response to varying tensions can be predicted from Hooke’s Law (*ibid*: 33-34). And Law is of course a foundation of Peirce’s Thirdness.

Deacon’s model of the emergence of signs based on studies of chimpanzees was described in my previous paper, it is worth repeating it here:

Deacon (1997: 85-87) has provided a closely analysed model of the development of signs in chimpanzees that allows a clearer conclusion to be reached about triads and tetrads.

He is careful to distinguish symbolic understanding from the ability to transfer learned associations from one stimulus to another or to a new context. And he notes that a crucial property of symbolic reference is that unlike indexical associations it is not extinguished if the expected association of stimuli ceases to be valid. Symbolic references (in the form of words) are stabilized by their relationships to other words, not to referents, which in the cases of angels or unicorns may not actually exist.

So, a new level of binding together of indexical relationships must emerge to create symbolic relationships (*ibid*: 85-87). And the key to this new level is that a word can be selected correctly for use if its relationship to other words is already understood—in other words an elementary appreciation of grammatical and syntactical rules is a requirement. Two nouns cannot be combined, nor can two words with similar referents, a verb must be related to a noun syntactically. This type of rule-based combination is a logical or categorical generalization, as opposed to one based on stimulus or context.

And the advantage it confers is simplification—the number of possible associations of word to referent grows astronomically with the number of items, but syntactical rules greatly reduce the load on memory.

Deacon’s model shows that words can now be ‘about’ indexical relations instead of just being indexical themselves (*ibid*. p.83), so the jump to another level takes place here in his model. However, a part-whole relation is more elaborate than the many indexical part-part relations that the whole may contain, without being at a more abstract level, and it is not present in Deacon’s model.

## 6. Quantitative and Qualitative

A fundamental question still remains from putting all these 4-fold systems into alignment: what is the relation between the unquantifiable tropes and the quantifiable scales and statistical causation?

A suggestion that comes to mind is the traditional difference between a metaphor and a simile: the first asserts a similarity by using one term in place of another whereas a simile raises the possibility, ‘x is like y’, thus encouraging thought and questioning.

Another is Lévi-Strauss’s distinction between the concrete thought of the *bricoleur* and the analytical thought of the engineer (Lévi-Strauss, 1962; Ben-Asher, 2022), and Bernstein’s contrast between Restricted and Elaborated codes, discussed in my previous paper (Douglas, 2024).

These speculations bring to a focus the question. “What is a trope, semiotically speaking, and where do they come from in linguistic evolutionary terms?”. Could it be that they are degenerate or developing *proto-grammatical* elements at the level of signs?

When we compare the two ‘languages’, linguistic and mathematical, and move above the level of individual elements (words or numbers) what are the organising principles? In the mathematics case they begin with the structures identified by the Bourbaki Group discussed above, and in the case of languages the obvious candidate is grammar.

Going back to the standard Peircean model of a triadic sign, another speculation is whether the three terms could be related, to cases, perhaps as follows:

Rft—accusative case; Signifier—Dative case, because it is an intermediary; Interpreter—Nominative case, which lies ‘behind’ the *Interpretant*.

Peirce himself suggested that the Index could be related to the Imperative mood, and the Symbol would be Indicative or Declarative (Peirce, 1958, Vol. 2:291). And in his discussion of the logical processes of Abduction, Deduction and Induction, he identified them as a sequence, related to the order of Firstness, Secondness and Thirdness. Abduction, or Hypothesis may be based on a perceived or imagined similarity or on the possible existence of a rule, while Deduction adds nothing new but is simply the application of a rule, and Induction creates a habit (Peirce, 1958, Vol 2: 619-644). Since habit is one of the key features of Thirdness the sequence is clear. Thus, Peirce has associated Firstness, Secondness and Thirdness to logical processes, and hinted that grammatical moods relate to two of the three tropes.

As mentioned above, Peirce stated that ‘rhetoric is what makes signs effective, and in a theory of rhetorical processes in the theory and methods of organization, Green *et al.* (2010) focus on the four master tropes. They say that rhetoric ‘contributes to the construction of facts’ and that they are ‘figures of thought’ ... inextricably linked with cognition’ (Green *et al.*, 2010: 47). Citing Burke, Vico and White, among others, they say that:

*‘Tropes are unavoidably implicated in the construction and comprehension of the world, because perception itself is embedded in linguistic conventions.’*

They then summarize their model, by associating the three tropes three tropes in order: metaphor, metonymy, synecdoche to Peirce’s three types of reasoning cited above, while adding a fourth—dialectic—to match irony (Green *et al.*, 2010: 49-51; Peirce).

They continue their discussion of how their model can be applied to the development of any new paradigm in managing an organisation through each of four stages.

I will now propose a pilot model of how the action of a trope can be understood as a proto-grammatical process, for the single case of nouns.

## 7. Tropes as a Change of Case for Nouns—a Conjecture

Tropes can exist in nouns, adjectives and verbs, and I will just propose a model for nouns as a preliminary step in an investigation that needs much more time and cannot be treated properly here.

Remembering that the origin of the word trope is a turning or a change of direction, and the direction needs to be indicated by the goals of the movement, from one goal to a different one. Let’s further assume that there are four fundamental cases that relate to nouns: Nominative, Accusative, Genitive and Dative.

If a trope is defined as an operation on a noun in the nominative case, I propose the following four transformations:

Nominative (1) – to Nominative (2) – Metaphorical transformation

Nominative – to Accusative – Metonymic transformation

Nominative to Genitive – Synecdochic transformation

Nominative to Dative – Ironic transformation.

To make this more concrete, let's take a simple sentence with a three-place verb: John gives his book to Mary. This could of course be written in a different voice, tense or aspect, but a trope is more radical in this conjuncture: it switches cases without explanation.

Perhaps the most challenging is the Dative transformation, which would retain the tense and other grammatical categories: John's book gives him to Mary.

We see the way that the event has been reconfigured from a different point of view, and in the process makes the comment of an ironic observer, and also exposes the social role of the gift, first discussed by Marcel Mauss.

We also see that with this template there are two transformations simultaneously, the Dative case has been switched to the Nominative as well. Do tropes always have this reversible character?. It's a question for more study, but Synecdoche is sometimes described as 'part-for-whole, or *vice versa*; likewise, metonymy as cause for effect or *vice versa* (Burke, 1969: 507-508).

The metaphoric transformation seems rather uncontroversial, a case position is filled by a different content, and this could equally well happen for the book or for Mary, and this no inherent directionality here. And yet another question appears: is a trope defined only by the final state, or by both the initial and final ones, as has been implied here by describing a trope as a change of direction?

To operate the accusative transformation on the same template, we would have to say Mary gives John's book to him—does this make any sense, is it a metonymy? Does this switch Cause and Effect? Or must we say: "Mary receives John's book from him"?

Finally, the Synecdochic transformation, the book belongs to John, so part-for-whole would replace the book with its owner or *vice versa*: John gives himself to Mary, would that be a synecdoche?. Or "The book's owner gives it to Mary". In the first case, the book has become enlarged into a symbol of John, in the second case John is reduced to existing as merely the owner of the book.

We can note here that the book has not been given a title, but if it were say the Complete Works of C S Peirce, that could itself be reduced in a synecdoche, by saying "John gives his Peirce to Mary".

In each case Aristotle's Four Causes seem to be standing in the shadows.

## 8. Conclusion

As a conclusion we can say that two things have been suggested here—first that Fiske's use of the four Bourbaki structures provides the mathematical key to the textual analogies proposed by Hayden White; and that these structures also provide a basis for the analysis of signs, both degenerate and fully developed.

Jakobson's association of the two tropes metonymy and metaphor with the fundamental dimensions of language is too limited, as several writers have pointed out, but Jakobson did implicitly offer an extension of the concepts of tropes beyond their traditional application in rhetoric to larger discursive and structures.

Moving on from this I have conjectured that a *proto*-grammar is a useful concept underlying the extension of the use of tropes into larger structures, and that for nouns it can be developed in the form of a theory of grammatical case. More work remains to be done on this sketch especially to examine the dimensions of verbs: Voice, Aspect, Tense and Mood. In biosemiotics there are no words in the normal sense, so it will be interesting to develop this conjecture in the case of non-linguistic signs.

The present work can be viewed as a piece of *bricolage*, following the three characteristics identified by Ben-Asher (2022):

*Three key components: being satisfied with the materials found in the field given the limitations and constraints imposed by reality, utilizing the resources at hand, and combining resources for new purposes.*

Thus, this paper has utilized resources at hand, found in the academic field, given the limitations imposed by academic reality, and combined these resources for new purposes.

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