Poroi

An Interdisciplinary Journal of Rhetorical Analysis and Invention

ISSN 2151-2957

Volume 15
Issue 1 *Special Issue on Resilience Rhetorics*

DOI: 10.13008/2151-2957.1299
Article 9

January 2020

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Project On Rhetoric Of Inquiry
POROI
http://ir.uiowa.edu/poroi

POROI 15,1 (January 2020)

Abstract: “Function” is a vitally important concept in the scientific community. Scientists use it to describe and address a wide variety of research problems. In publications, however, scientists within and across disciplines interpret function differently. For example, intense debate surrounds what percentage of the human genome should be deemed "functional” rather than “junk DNA.” In this essay, we analyze the use of function in the research of *de novo* gene birth, a budding scientific field that studies how novel genes can emerge in non-genic sequences. Our research team, composed of a rhetorical scholar, philosopher, structural biologist and systems biologist, crafts a taxonomy of how “function” is variously constituted in *de novo* gene birth publications, including as expressions, capacities, interactions, physiological implications and evolutionary implications. We argue function is shaped by the diverse onto-epistemological perspectives of scientists and is both a recalcitrant and resilient concept of scientific practice. Informed by Gilles Deleuze and Felix Guattari’s writings on a scientific mode of thinking, functions are time-space scales of objects under investigation that make possible references to scientific measurements.

Keywords: Function, Evolution, Gene, Resilience, Recalcitrance, Scientific Practice, Rhetoric of Science

> The Human Genome Project is currently considered the world's largest collaborative biological project. It clarified the order of chemical bases in the human genome and created maps to show the locations of genes for major sections of human chromosomes. In 2003, after the Human Genome Project was complete, biologists continued to collaborate to create an encyclopedia of human DNA elements. As of 2019, this work is still ongoing. Scientists working on encyclopedia, "ENCODE," are composing a comprehensive list of "functional elements in the human genome" by integrating a variety of biochemical and computational techniques (Project overview, n.d., para. 1).

In 2012, the ENCODE project released a substantial set of results, which included the announcement that 80% of the human genome was biochemically functional. However, shortly thereafter, evolutionary biologists who were not a part of the ENCODE project contested this number (Graur *et al.*, 2013). Scientists from a range of disciplines proposed different percentages that varied from 5% to 90% (Laubichler, Stadler, Prohasha, & Nowick, 2015). These discrepancies within the scientific community did not concern the data. More data would not lead to agreement. The problem was with the concepts forming the research question: How much of the human genome is functional? In this question there are at least three concepts worthy of rhetorical attention.

The first is human. Who or what counts as human? What are the boundaries of the human species? How much genetic variation is there across humans? And whose DNA can represent the human? Contemporary rhetorical scholars regularly engage questions concerning humanity and human nature (McCann-Mortimer, Augoustinos, & LeCouteur, 2004; Wilson & Lewiecki-Wilson, 2001; Young, 2015).

The second concept is genome. How do different scientific fields understand the gene? What can a gene mean? How has the definition of gene evolved? Scholars studying the rhetoric of science, medicine and technology engage these questions by illuminating the political dimension of genetic discourses (Condit, 2008; Heppe, 2013; Zerbe, 2019).

However, it is this last concept in the question "how much of the human genome is functional?" that ignited the ENCODE debate, and it is the concept that has received the least rhetorical attention. Function is a vitally important and consequential concept for the scientific community. It is among the most significant biological concepts because it describes how processes of life work. What counts as a function, however, is not agreed upon across or within scientific fields. Does a chemical transformation count as functional? Or does that chemical transformation have to influence population dynamics over successive generations? The ENCODE debate is one instantiation of this ongoing philosophical disagreement that demonstrates different interpretations of function among scientists.

Philosophers of science have written extensively on the concept of function since the early 1960s, particularly regarding the theoretical relationship between function and teleology in evolutionary processes (Mossio, Saborido, & Bergareche, 2009; Nagel, 1961; Roux, 2014). However, while the theoretical context of function "is frequently discussed, less attention is paid to the role of measurement, i.e., the assignment of numbers to attributes of the natural world," what Manfred Laubichler, Peter Stadler, Sonja Prohasha, and Katja Nowick (2015) describe as "measurement context" (para. 15). The majority of philosophical writings concerns what function should mean and the legitimacy of a given definition, but they eschew questions concerning what meanings are in circulation and how those meanings come to be in circulation through measurement procedures—distinctly rhetorical questions.

By prioritizing proper meaning over practical use, the philosophical debates have not resolved interpretive confusion among scientists. This is particularly apparent in emerging fields where scientists from a range of disciplines participate in knowledge production using diverse techniques and technologies to attain their measurements. The diversity in both training and practice create different conceptualizations of function. Similar to McGreavy's (2019) argument about cycles, different uses of function create "competing claims" about "whose knowledge counts." This not only hinders efforts to make sense of large amounts of data in the life sciences that can be used to address health and disease, but it also has gatekeeping implications (Doolittle, 2018). Disagreement about function impacts individual researchers because genomic sequences deemed "functional" are more worthy of publication, become a part of reference databases, enhance grant proposals, and support tenure and promotion.

Given these reasons, there is growing recognition that function cannot be treated as a general theoretical concept across the life sciences (Doolittle, Brunet, Linquist, & Gregory, 2014; Laubichler *et al.*, 2015). Function adapts to disciplinary environments, and research publications evidence this polymorphic quality. The field of *de novo* gene birth offers a particularly relevant example for understanding function's diversity since it is an emerging field of evolutionary biology with manifold uses of function that are not often clarified.

Scientists in the field of *de novo* gene birth study how novel genes can emerge in non-genic sequences (Van Oss & Carvunis, 2019). This is distinct from other well-studied areas of evolutionary biology where biologists investigate how novel genes derive from ancestral ones, such as through mutations in their genomic sequences. Scientists researching *de novo* gene birth come from a variety of disciplines, including but not limited to biochemistry, genomics, genetics, systems biology, developmental biology, evolutionary biology and protein biology. The background that scientists bring to the study of *de novo* gene birth, including education, methodological approaches, and disciplinary practices, imbues them with differing norms for what counts as functional. Additionally, the emergence of novel functional genes can be associated with the emergence of novel molecular or even organismal functions (Ding, Zhou, & Wang, 2012), and as technology develops scientists can measure different biological properties and thus have new understandings of the word function (Kellis *et al.*, 2014).

Our interdisciplinary research team addresses problems with function by analyzing discourse in the field of *de novo* gene birth. Specifically, we attend to issues of measurement context to enhance science communication. Function, we propose, refers to the time-space scales of objects under investigation. In this way, function is a concept that prescribes limits to forms and orients scientists to onto-epistemological planes of reference, the measurement context (Deleuze & Guattari, 1991).

We utilize the interpretive diversity of our interdisciplinary research team to discern the time-space scale patterns within the published discourse of *de novo* gene birth. We are four women, trained in four different disciplines—rhetoric, philosophy, structural biology and systems biology—and three different nationalities—US, Mexican, French. Our diverse training offers nuanced understandings of the available uses of function as both theoretical and measurement context.

We argue current measurement practices in *de novo* gene birth indicate at least five time-space scales of function that constitute this field's plane of reference: expression, capacity, interaction, physiological implications, and evolutionary implications. Scientists who reference time-space scales enhance the durability and portability of their measurements across and within their fields (St. Amant & Graham, 2019). Durability and portability are qualities of a recalcitrant reality where nature endures in a way that can be referenced by others. However, the time and space scales of function that make reference possible change based on evolving scientific practices and tools. Thus, functions are epistemologically recalcitrant when scientific practice maintains a plane of reference, but as scientific paradigms are ruptured functions are resiliently reborn (Stormer & McGreavy, 2017).

We understand resilience as an entity's ability to adapt to changing environmental conditions, as developed in ecology (McGreavy, 2016). In this way, function adapts to changing research environments and practices. This contrasts a notion of resilience that is popular in public discourse where an object can persist unchanged despite changing environmental conditions. Returning to the ENCODE debate, a scientist who advocates for a singular notion of function is assuming that the concept of function does not adapt to a changing scientific landscape and that it can persist unchanged. A scientist who assumes there is only one proper use of function would be protecting a particular disciplinary notion of function.

We proceed by discussing the most popular conceptualizations of function in the philosophy of science and their limitations; we continue by explaining our analytic approach to *de novo* gene discourse and the resulting functions that emerge from our analytical apparatus; and we conclude by addressing the contributions of an interdisciplinary rhetorical approach to the discourse of function. This essay amplifies the importance of understanding rhetorical discourse as a product of time and space. Scientific practice, and practice more broadly, creates time-space "objects" to be referenced, an epistemological recalcitrance that is contingent upon ontological resilience.

Conceptions of Function in the Philosophy of Science

Function has been present in the study of biology since the emergence of the field and before the study of evolution (Allen & Neal, 2019). However, the meaning of function is not consistent across the life sciences. Philosophers interested in biology and biologists interested in philosophy continue to debate what function should mean, with the primary goal of justifying proper definitions.

Two philosophical conceptions of function gained notoriety in the late 20th century for their broad application; these have been described as "causal role" and "selected effect," defined below. When the ENCODE consortium released their data to report how much of the human genome was biochemically functional, philosophers of biology used these two conceptions of function to explain why there were such varying interpretations.

Scientists working on the ENCODE project, who suggested 80% of human DNA was biochemically functional, derived their definition of function from a causal role perspective. The causal role function "emphasizes *what* an entity does" (Laubichler *et al.*, 2015, para. 1). Causal role stresses predictable behavior. It describes what an entity can do, based on what it is observed to do, and concerns causes of behavior.

However, those who critiqued ENCODE's conclusions supported a selected effect perspective of function. This understanding prioritizes the reason a biological object was selected in the evolutionary process, sometimes described as the "purpose" of the object. Biologists who conceptualize function as selected effect estimate much smaller percentages of human genome functionality than the ENCODE consortium, less than 10%. From this perspective, the function of the biological object "is the effect for which it was selected by natural selection or by which it is maintained" (Laubichler *et al.*, 2015, para. 1). Selected effect is backward looking, describing not what an entity does but "why" an entity behaves as it does as a result of environmental conditions (Laubichler *et al.*, 2015, para. 1). The term presumes the studied item or trait has an inherent purpose and proper function that nature selected. This sense of purpose makes selected effect prone to teleological interpretations, whether or not it is intended.

These basic descriptions of selected effect and causal role oversimplify much of the nuance that philosophers discuss in their justifications for proper meanings of function. There have also been various other conceptions proposed (Griffiths, 1993; Mossio *et al.*, 2009). However, these philosophical conceptions have had little to no practical impact on scientists' writing practices.

When scientists publish empirical data they rarely make their philosophical commitments regarding function explicit (Allen & Bekoff, 1995). Philosophical commitments are not durable in the same way as empirical data; according to Gilles Deleuze and Felix Guattari (1991), they endure differently. Philosophical conceptions of function are not empirically testable; they are explanatory (Allen & Bekoff, 1995). The portability of knowledge claims is contingent upon the social, intellectual, and environmental conditioning of other scientists interpreting the research.

Science Functions as Limits

The durability of philosophical claims is different from the durability of scientific claims and this affects their portability. This section will overview issues of durability and portability with regard to function, specifically the ways scientists are able to reference time and space scales to create similar working conditions. According to Deleuze and Guattari (1991), there is a distinction between function as a philosophical concept and function as an empirically testable reference. Understanding this distinction can help scholars think about the difference between a theoretical context and measurement context (Laubichler *et al*., 2015). We summarize the writings of Deleuze and Guattari on the differences between philosophy and science as distinct modes of thought and how a scientific mode of thought creates limits on time to enable measurement. Limits constitute Deleuze and Guattari's notion of function as a scientific tool for creating references. This notion of function informs our understanding of *de novo* gene functions as time-space scales, to be discussed in the next section.

Philosophy, which addresses theoretical context, and science, which addresses measurement contexts, are distinct modes of thinking. A person is not exclusively a philosopher or a scientist, instead each person thinks philosophically and scientifically (Deleuze & Guattari, 1991). Philosophical thinking has infinite movements; it attempts to retain infinity in its concepts. *Telos*, for example, is a concept that transcends time and space infinitely. It exists on a plane of immanence where time is infinite. Scientific thinking, on the other hand, tries to slow infinity down, to cut it up into a system of coordinates that can be used for reference. Science does this by creating functions, which are mathematical in their most basic sense. For Deleuze and Guattari (1991) a function is a limit that regulates infinity.

Time is qualitatively infinite; it is the duration of all forms and shapes that will ever exist. However, a scientific mode of thought turns quality into quantity; it attempts to create epistemological recalcitrance. Clocks and calendars, for example, regulate time. The second, the minute, and the hour are all limits that create boundaries and coordinates; these limits are the functions, according to Deleuze and Guattari (1991), which make measurements in time possible. Even as we measure very fast speeds, like the speed of light, this is still a slowing down of time because time is otherwise infinite. Time does not actually slow down or have limits, but scientific functions impose limits.

Time can be cut up with limits in all sorts of ways. Normalized systems of time can be regulated differently. A solar calendar is different from a lunar calendar is different from a lunisolar calendar; religious calendars are different from fiscal calendars. Each calendar depends on different delimitations of time, relationships that could be attended to differently. Scientific instruments and computational programs create their own limits on time. Once limits are adopted, measurements can proceed, and the measurements are used to create logical propositions in science.

A function that is assigned to a time-space relationship creates objects. Those objects—variables—can then be put into relationship with other functions to create propositions, a spatial relationship in time. The proposition refers to a system of coordinates established by time limits. Functions make it so that all speeds are subject to the same limits, and so that qualitatively different things can take on a quantitative identity that makes measurements possible. From measurements, scientific propositions can be crafted by creating a relationship between a previously established function and a new variable. For example, if we say y is a function of x, our understanding of y is dependent on previously established limits of x. Both y and x are limits established by a community to create propositions. Functions are therefore both limits and propositions supporting a system of reference.

Reference is what is required for durable and portable communication between scientists. By adopting similar functions, scientists can refer to similar patterns of time-space, what Deleuze and Guattari (1991) call the plane of reference. It may be useful to think of planes as fields, such as the field of *de novo* gene birth. The plane of reference is the field's system of limitations, a functional system of coordinates, which "carries out a preselection that matches forms to the limit" (Deleuze & Guattari, 1991, p. 121). As scientists create new functions, based on new tools, instruments, and practices, the plane of reference ruptures and breaks, and planes—fields—are resiliently remade. Communication is itself limited by functional agreement, by the same functions being used to constitute the plane of reference. However, scientists from different fields, and even scientists within the same fields, cannot completely stabilize the plane of reference because practices, tools, and the qualitative entities under investigation are never exactly the same, they are always entangled in different worldly relations (Barad, 2007).

Scientists from different fields are not necessarily concerned that they work on different planes of reference; "The highly specialized nature of organized science produces regions of discourse that can be isolated from one another even if carried out in close geographical proximity" (Lyne, 1995, p. 263). A quantum physicist does not need to work on the same plane of reference as a biochemist. While some functions will be similar, others will be unique to the field. However, different planes of reference become more problematic when scientists from different fields attempt to create epistemological recalcitrance together.

Since the late 20th century, there has been an increase in interdisciplinary work to collaborate on large-scale projects, such as genome sequencing and environmental health. These collaborations are bringing together scientists with different skill sets, practices, analytical instruments and computational tools, and with them, different functions to constitute their planes of reference, which are the measurement contexts.

A measurement context is distinct in each disciplinary approach to biology. The ENCODE consortium clarified their understanding of this after receiving different disciplinary responses to their announcement about human genome functionality: each branch of biology, they explained, "relies primarily on different lines of evidence indicative of function" (Kellis *et al*., 2014). Clarifying these different lines of evidence or limits, as Deleuze and Guattari (1991) would call them, enables a more recalcitrant plane of reference and measurement context to enhance both disciplinary and interdisciplinary work. In this way, functions may demonstrate recalcitrance or they may resiliently adapt to the changing working conditions of scientists. We turn now to a specific case study of discerning measurement contexts by attending to the discursive practices of scientists in the field of *de novo* gene birth.

Functions of *De Novo* Gene Birth

The field of *de novo* gene birth serves as an interesting case for studying measurement contexts of function for three reasons. First, it's a newer area of study in the sciences, developing in the late 20th century, just as resilience discourse was garnering academic attention (Holling, 1973). Unlike fields that are multiple centuries old and have more or less garnered consensus around their use of function, such as the field of Functional Morphology, there is no consensus about what is functional in *de novo* gene birth. Second, since it is a recent field, scientists are approaching their work from a range of disciplinary perspectives (e.g. biochemistry, systems biology, evolutionary biology), so it serves as an excellent case in assessing the range of functionality used in the sciences. And third, it is the study of novel gene birth and directly engaged questions of emergence, the transition from one type of element (not a gene) to another type of element (a new gene), which not only complicates the definition of gene in scientific discourse, but also creates possibilities for new understandings of functions.

In crafting this analysis as an interdisciplinary team, it was important for us to understand our different disciplinary perspectives, to use mixed methods, including a rhetorical approach and a content analysis, and to publish our results in both rhetoric and science journals (Keeling, Garza, Crenshaw, & Carvunis, 2019). Over the course of our three-year collaboration, the humanists learned about molecular evolution, while the scientists learned about rhetoric and philosophy. Based on our interdisciplinary readings and theoretical discussions, we crafted an initial taxonomy of the uses of function in the field of *de novo* gene birth. To assess the quality of the taxonomy, we conducted an analysis of 20 abstracts in the field of *de novo* gene birth that included the word 'function' at least once. For the content analysis, we drafted intercoder reliability rules for assessing context and tested our model. After analyzing a group of abstracts, we discussed our interpretations, came to a consensus, revised the taxonomy where necessary, and reread abstracts to reinterpret and revise the taxonomy.

We catalogued and interpreted each instance according to our evolving taxonomy individually, then discussed our reasoning as a group and came to a consensus regarding the time-space scales being referenced by the functions. We did not analyze instances of function where function was used to describe a bioprocess rather than the activity of a molecular object under investigation (DNA, RNA or protein objects). When an object of investigation was identified but no measurement context was given, we used the category "vague."

Vague indicates that sufficient evidence was not found to infer one or more time-space scales of function, or to derive a new one. This category exemplifies the way function is used within the field of *de novo* gene birth without clarifying measurement context. Lothar Wissler, Jurgen Gadau, Daniel Simola, Martin Helmkampf, & Erich Bornberg-Bauer (2013) demonstrate a vague use of function when they state that "Orphans are an enigmatic portion of the genome since their origin and *function* are mostly unknown" (emphasis ours). In this instance, function is not given a time-space scale that could be discerned through an experiment, tool or method within the abstract, and therefore not recognizable as a measurement context on the plane of reference. We can understand such instances as conveying philosophical conceptions of function without explicitly identified theoretical contexts. The reader is expected to have a similar understanding of function, even though their disciplinary training, techniques, and methodology may be different.

We identify five time-space scales of function that do evidence measurement context: expression, capacities, interactions, physiological implications, and evolutionary implications. Each refers to different relationships of time and space of the object under investigation. Functions co-exist since they are different ways of tracing coordinates on the plane of reference. Thus, some instances of function refer to two different measurement contexts, which will be evidenced below in our example for both expression and capacities.

Expression is the presence or amount of the object under investigation (RNA or protein object), or the presence or amount of its transcription or translation products (DNA object). Gene expression is a highly regulated process that varies across cell types and over the life cycle of the organism. Thus, expression refers not only to the object's presence but also its quantity, the timing of production and the sub-localization (i.e. specific organelles, cell types, tissues, organs) of the object within the organism. For example, in the study of songbirds, Morgan Wirthlin, Peter Lovell, Erich Jarvis, and Claudio Mello (2014) "performed a comparative analysis of 48 avian genomes to identify genomic features that are unique to songbirds, as well as an initial assessment of *function* by investigating their tissue distribution" (emphasis ours). Tissue distribution refers to a mapping of the specific tissues in which the gene products, in this case RNA, are detected. Function as expression is the limit placed on the object of investigation and has a relationship with detectability, a human's ability to measure it.

Whereas functions as expression have a relationship to presence, capacities are a relationship of composition. Capacities are intrinsic physical properties of the object under investigation: the necessity of the object's behavior given an environment. Capacities refer to any and all of the object's molecular properties. For a protein object this would include hydropathic index, charge, 3D structure, or conformational dynamics. In the same study on songbirds, Wirthlin *et al*. (2014) also performed "the initial assessment of *function* by investigating … predicted protein domain structure" (emphasis ours). If we analogize proteins as beads on a string, where each bead represents a different amino acid building block, the structure of a protein domain is the way the chemistry of those beads and their environment drives them to come together and form an overall shape or fold. Proteins with a similar fold tend to have similar interactions.

Interactions are physical contacts, direct or indirect, between the object under investigation and the other components of a system, including contacts that mediate chemical transformations. Whereas the time-space scale of capacities entails compositional relationships, interactions are relationships with other objects. Interactions are evidenced by Michal Brylinski (2013) when discussing mouse proteins: "A subsequent structure-based *function* annotation of small protein models exposes 178,745 putative protein-protein interactions with the remaining gene products in the mouse proteome, 1,100 potential binding sites for small organic molecules and 987 metal-binding signatures" (emphasis ours). This study investigates three types of interactions with protein objects: the binding of proteins to one another, to small molecules, and to metal ions. Functions that refer to time-space scales based on interactions may indicate participation in larger systems.

Physiological implications are the object's involvement in biological processes. The object's involvement in a biological process is enabled by a set of its capacities, interactions and expression patterns, independent of cross-generational considerations. Dan Li, Zhihui Yan, Lina Lu, Huifeng Jiang, and Wen Wang (2014) provide an example of a *de novo*-originated gene, MDF1, participating in a biological process. They write, "MDF1 *functions* in two important molecular pathways, mating and fermentation, and mediates the crosstalk between reproduction and vegetative growth" (emphasis ours). Mating and fermentation, as well as reproduction and vegetative growth, are biological processes. These processes are named based on their surmised end goal. Thus, MDF1 has physiological implications because it supports the integration of reproduction with vegetative growth. Physiological implications, as functions, refer to the time-space scales of systemic relationships, distinct from populations across generations.

Evolutionary implications are the object's influence on population dynamics over successive generations, as enabled by its physiological implications and their interplay with environmental pressures. Frequently, evolutionary implications describe whether, how and how much the object impacts fitness. Jorge Ruiz-Orera *et al.* (2015) discuss the evolutionary implications of transcripts: "In general, these transcripts show little evidence of purifying selection, suggesting that many of them are not *functional*" (emphasis ours). The authors have analyzed the DNA sequences for these transcripts and did not find much evidence that populations of these sequences are being purged of deleterious mutations by natural selection. This suggests that changes to the sequences of these transcripts are not harmful and that the existence of these transcripts is not a requirement for successful reproduction.

Together, the field of *de novo* gene birth employs at least five functions. These time-space scales indicate different measurement contexts. Each is constituted by relationships that attempt to establish epistemological recalcitrance: expressions are relationships to presence; capacities are relationships to composition; interactions are relationships to other objects; physiological implications are relationships to systems; and evolutionary implications are relationships to populations across generations. This time-space scale taxonomy varies in its relational complexity, from expression to evolutionary implications. The taxonomy is a "spatial arrangement of action" within the field of *de novo* gene birth (Stormer, 2004, p. 262). It demonstrates the system of coordinates that constitute function's measurement contexts. These contexts are the "cartography of persuasion" (Stormer, 2004, p. 262); they are what make for convincing propositions in this specialized field.

Conclusion

Our rhetorical analysis of discursive practices in the field of *de novo* gene birth offers a recalcitrant and resilient understanding of functions as time-space scales. From the perspective of Deleuze and Guattari (1991), science takes the qualitative difference of nature and turns it into quantitative identity by cutting it up into functions. Functions are put in relationship with other functions to create a system of coordinates that then make propositions possible. While functions vary within and across disciplines, functions within a particular field may be similar to those in another field if they share the same scientific practices that shape their time-space scales. Scientific practices produce planes of reference that aim to achieve epistemological recalcitrance. To communicate, scientists must produce recalcitrant functions on a plane of reference, even while there are no guarantees for how long that plane can be maintained.

As limits placed on infinity, functions can be reconstructed again and again; this is the resilient quality of scientific practice. New measurement contexts will emerge with innovations to scientific practice and the evolution of the natural world. There seems to be, then, an interesting relationship between the recalcitrance and the resilience of biological functions.

The relationship between recalcitrance and resilience is similar to metaphor and catachresis, respectively. Recalcitrance, as a metaphorical movement, anchors an object of study within a context and gains additional perspective through its relationship to other vehicles. The anchor's transformation is recalcitrant, even as it has been affected by changing relationships. Resilience, on the other hand, moves like catachresis. It is the abuse of context, from the Greek *abusio*, misuse, regularly confused with metaphor (Fahnestock, 1999). It is a particularly useful trope when a proper relationship does not exist, such as when new practices rupture the plane of reference. The plane, composed of functions, must be re-coordinated in a way that is improper to previously conceived planes of reference. The catachrestic representation proposes "a structure for a combined space-time manifold, that literally [makes] no sense from the perspective of prior theories of space and time" (Krips, 1999, p. 53). Functions are both recalcitrant and resilient, moving at the pace of science.

A consequence of the scientific mode of thinking, however, is that once time is divided and measured, it lacks unity. Science cannot unify the plane of reference; that which is cut up is no longer whole, and so science is necessarily reductionist. Nonetheless, for many people, there is still a desire to tell a story about scientific measurements, even if that story will be incomplete and ongoing. This is the aspirational dimension of functions—the hopes and desires of what functions can do for the human condition. For some, functions are asked to confess that there is no purpose in life, for others, functions confess that there is. Philosophical elucidations over the concept of function often find their way into obfuscating measurement contexts for these aspirational reasons. As such, we wonder of philosophical concepts and scientific functions: which are more recalcitrant and which more resilient?

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