

## *Meaning at the Edge of Chaos*

### *Linking literary theory with genetic complexity*

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The *journey through life* is a conceptual metaphor that serves our ability to understand the intangible, elusive and often mysterious unfolding of our lives. While we can conceptualize a *journey* as a voyage, a series of tests or a path of progression, the abstract idea we call *life* is often illuminated by borrowing the qualities and attributes of a *journey*. We commonly say that someone has *lost their way* or must *choose their path*... ascribing the themes of a *journey* to life itself. Other metaphors are widespread in everyday communication and seem to unconsciously or automatically shape our understanding of abstract ideas like life, death and love. Theories are buildings: they can be shaky, built on solid foundations and sturdy. Ideas are food: you can chew on, digest or let them simmer in the back of your mind. While a metaphor can be seen as a simple tool used in everyday language they can also serve as a rich starting point to explore how we think about, experience and are ultimately shaped by the countless abstractions that pervade and bring meaning to existence.

In this essay I will consider the foundational metaphor of *reading or textual interpretation* that relates to ideas in complexity theory and molecular biology. This metaphor will facilitate an inquiry into the related theoretical shifts in literary theory and genetics. In general this is the shift from discrete linear causality to the recognition of complex and participatory systems in both fields. I will focus on the question of genetic determinism as it relates to textual interpretation and meaning. What are the implications of conceptualizing DNA as a *text*? What insights can be drawn from the metaphor connecting literary theory to genetics? The metaphor connecting language systems to complexity is not new. In biological hermeneutics and biosemiotics, the main analogies have been toward linguistic theory and language complexity. While these ideas are deeply related and perhaps underlying, I will try to focus this exploration on the realm of interpretation and meaning-making from the level of literary theory. Before digging into these questions, I will first lay out a discussion of the theoretical shifts in literary theory that gained momentum in the mid- to late 20<sup>th</sup> century through the postmodern ideas of Michael Foucault and Roland Barthes.

Language, simply put, is a system used to convey meaning. The power law pattern of word frequency and common usage—known as Zipf's Law<sup>[1]</sup>—shows that language is a complex system exhibiting a robust dynamic which can deliver relatively stable meaning. The stability of meaning however, depends on how a text is interpreted. Interpretation as Philip Franses and Brian Goodwin point out can be compared to the physics of light: "...wave (high information sharing, low form) and particle (highly formed, low information exchange) are two interchangeable aspects of reality." In other words, a text can be interpreted with "a dictionary type overview of a list of words encoding precise information" or as a "complex text that is articulating a whole idea uniquely."<sup>[2]</sup> The dynamic between these two extremes can result in a multitude of different ways to derive meaning from a text. In fact, the range of meanings and ambiguity that can emerge in the space between these extremes accounts for stacks of papers and discussions in the field of literary theory. In classical literary analysis, the space open to ambiguity was filled by turning to the intentions of the author. In this respect, the author of a given text was seen as *the* authority, whose intention alone created and determined the meaning of the text.

#### **The Death of the Author**

In 1967, French philosopher Roland Barthes published the essay, *The Death of the Author*, in which he called into question the authority of the author in the reading, interpretation and meaning of a text. The author's intended meaning became secondary to the meaning as construed by the reader. Through his radical call to

give birth to the reader, Barthes stirred up an extensive discussion of the importance of the author in interpretation that has remained central in literary theory until today. This rich dialogue has brought forth many of the same conceptual questions and ideas raised by the connection between complexity science and genetics: the death of the author can be seen as the birth of complexity thinking in literary theory. If the author does not create the totality of meaning, where does coherence in meaning come from? Barthes' radical claims both ruptured the historical authority of the author and opened up new ways to approach literature and texts with less linear or authorial determinism and greater freedom, free-play and attention to relationships in interpretation:

"We now know that a text is not a line of words releasing a single 'theological meaning' (the 'message' of the Author-God) but a multi-dimensional space in which a variety of writings, none of them original, blend and crash."<sup>[3]</sup>

"Once the Author is removed, the claim to decipher a text becomes quite futile. To give a text an author is to impose a limit on that text, to furnish it with a final signified, to close the writing."<sup>[3]</sup>

"In the multiplicity of writing, everything is to be *disentangled*, nothing, *deciphered*; the structure can be followed, 'run' (like the thread of a stalking) at every point and at every level, but there is nothing beneath: the space of writing is to be ranged over, not pierced."<sup>[3]</sup>

"The reader is the space on which all the quotations that make up a writing are inscribed without any of them being lost; a text's unity lies not in its origin but in its destination."<sup>[3]</sup>

While meaning, from Barthes' perspective, was placed solely in the hands of the reader—and the role of the author discounted—the space for interpretation became tremendously ambiguous and was limited only by the sheer number of readers that encounter a given text. If the author cannot deliver *the* meaning of the text, then the possibilities of interpretation are prolific. Meaning in this sense is infinite. As Jacques Derrida wrote, "the absence of the transcendental signified extends the domain and the interplay of signification *ad infinitum*."<sup>[4]</sup> Here, Michael Foucault builds on the argument by questioning the significance of the author's disappearance and the role of the author in the proliferation of meaning.

### **Author in Context and Conversation**

In *What Is an Author?* Foucault argues that proclaiming the "death of the author," is not an ends, but a means to go further and "...locate the space left empty by the author's disappearance, follow the distribution of gaps and breaches, and watch for the opening that this disappearance uncovers."<sup>[5]</sup> Foucault cautions that the desire to discount the author comes only from the misperception of the author as "the genial creator of a work in which he deposits, with infinite wealth and generosity, an inexhaustible world of significations. We are used to thinking of the author as so different from all other men, and so transcendent with regard to all languages that, as soon as he speaks, meaning begins to proliferate."<sup>[5]</sup> In reality, argues Foucault, the author can no longer be seen as an isolated individual but rather, as part of a larger system of beliefs that a reader can use, among other factors, to restrict and limit the meaning of a text. The author is not the cause of the text, does not "precede the works;" but is rather, "a functional principle by which, in our culture, one limits, excludes and chooses" the possible meanings of the text.<sup>[5]</sup> Meaning, as construed by the reader, is thus relational, creative and emergent: the space for interpretation is historically situated, culturally embedded, contingent, locally constructed and deeply contextualized. Meaning emerges as the reader negotiates information flows that include the historicized author, the stable text and the shifting personal narrative that he or she brings to the text. Meaning is impermanent, not author determined, and can transform within our ever changing contexts and webs of reference.

Here we consider two fundamental shifts in literary theory: First, with Barthes from a singular author determined meaning—linear determination, to an infinite and prolific reader determined meaning—limitless variability. And second, with Foucault, the contextualization of the author giving rise to a contingent, shifting and embedded meaning that puts limits on otherwise prolific interpretations—meaning that emerges from the intelligent reader at the edge of chaos. This method of interpretation depends on a kind of complex system of language playing off both the culturally embedded author and reader. The reader creates meaning by

drawing upon multiple codes from wider contexts—both the text itself and socio-cultural norms. As I move on, I will consider the claims of Roland Barthes and Michel Foucault as a way to illuminate the themes and concepts of complexity emerging in genetics and molecular biology.

### The Death of the DNA Author

In genetics, a similar question has become apparent about the authority of DNA in the morphology and ontogeny of organisms. Furthermore, the basic concept of genotype to phenotype direct causality has been called into question. It is often said that DNA, or the genetic code, is “like a text,” “read” by RNA to produce the particular amino acids and proteins used as the building blocks of the organism. The DNA has been seen as a “blueprint for life;” determining, like the “genial author” of classical interpretation, the form and phenotype of the organism based on inheritance alone. Coming back to the shift toward complexity in literary theory, we can apply the metaphor to the rise of complexity in the interpretation of genetic text. A gene has been seen as “a piece of DNA whose function is to produce a protein,”<sup>[6]</sup> but according to findings in genetics, the authority of the gene may be just as disputed as the author of a text under the scrutiny of a postmodern literary theorist. According to Evelyn Fox Keller and David Harel, we can no longer think of DNA “as the master molecule that embodies the secret of life, that encodes and orchestrates the dance of life, but rather the far more interesting molecule that we have come to know as DNA today.”<sup>[6]</sup>

There are many biological reasons for abandoning this view of DNA. Keller and Harel cite alternative splicing as an important reason to begin to acknowledge the complexity of inheritance. The general process of DNA protein coding involves the transcription of a single unit of DNA, a gene, into a complementary precursor mRNA. The pre-mRNA is composed of protein coding exons and introns, which are removed in the process of splicing. The exons of the precursor mRNA can be reconnected in various sequences to form mature mRNA and thus code for distinct proteins. According to Keller and Harel, this process in which one sequence of DNA can code for multiple, even thousands of different proteins has “come to challenge the very idea of a discrete and particulate unit of inheritance.”<sup>[6]</sup>

Further findings challenge a “master molecule” view of DNA and the gene are widespread. Helen Pearson points out that only one to two percent of an entire inherited genome actually codes for the protein building blocks that correspond with phenotype.<sup>[7]</sup> While definite functions for some of the remaining percentage of DNA has been worked out as non-coding—regulating, promoting, inhibiting, silencing or as overlapping transcripts—much of what we inherit remains in the category of “junk DNA;” the preliminary term for DNA sequences without a definite function. Furthermore, with the growing focus on epigenetics, scientists are finding that some inheritance information is passed from parent to offspring completely independent of DNA sequencing. Particularly complicating things in molecular biology are findings that inheritance information is transmitted not only through DNA but also through non-coding RNA.<sup>[7]</sup> Similar to the effect of the *Death of the Author* in literary theory, the “death of DNA” as a direct code for expression seems to open up space for prolific variability. How, given what seems to be a shift towards chaos, do organisms form with such stability, robustness and coherent pattern?

### DNA in Context and Conversation

The message coming out of genetic research is that DNA works as a complex system in which, as Brian Goodwin describes, “the variability that arises spontaneously from gene recombinations, duplications and interactions via transcription factors must be put together in a single dynamic unfolding with constraints arising from both network dynamics and morphogenesis.”<sup>[8]</sup> Marginalizing DNA as the all determining author of life is analogous to Barthes’ attempt to marginalize the authority of the author of a text. As Barthes points out authorship “closes off the text” in a similar way that a rigid view of DNA put limits on diversity that are hardly tenable given the vast diversity of life forms. However, we see with Barthes that the “death of the author” gives rise to a prolific variability in interpretation. Similarly, if DNA does not provide a fixed code for expression, what are the limits, or as Foucault says, the “functional principle by which...one limits, excludes and chooses”<sup>[5]</sup> so that coherent, stable and patterned form emerges?

Genetic regulatory networks and morphogenetic fields, as Goodwin points out, are two examples of how genetic information and inheritance works as a complex, relational and dynamic process. Stuart Kauffman describes genomic regulatory networks:

“The magic of ontogeny lies in the fact that genes and their RNA and protein products form a complex network, switching one another on and off in a wondrously precise manner... genomic systems lie in the ordered regime near the phase transition to chaos. Were such systems deeply into the frozen ordered regime, they would be too rigid to coordinate the complex sequence of genetic activities necessary for development. Were they too far into the gaseous chaotic regime, they would not be orderly enough. Networks in the regime near the edge of chaos—this compromise between order and surprise—appear best able to coordinate complex activities and best able to evolve as well.”<sup>[9]</sup>

What emerges, with a genetic network viewpoint, is a highly contextualized “reading” of genetic information that is subject to the contingencies of an organism’s evolutionary history and local environment. The implication of this view is that organisms and their cells have a kind of embodied knowledge or natural intelligence that plays into the interpretation of genetic information. As molecular biologist Jesper Hoffmeyer considers, the “need for the active participation of cellular structures in realizing the digital codification of the DNA—into its analog and protein form—shows us that a sort of *tacit knowledge* is present in the egg cell.” This tacit knowledge, he continues, is “inherent within the cellular organization and must be presupposed by, rather than materially built into, the DNA description.”<sup>[10]</sup> Similarly as seen with the postmodern shift in literary theory, the intelligence of the reader was recognized and their particular interpretation elevated and valued. The relegation of the author as Foucault noted, promoted degrees of freedom for the reader to interpret the text by the particular context and relationships around it.<sup>[5]</sup>

Context as described by Ben-Jacob et al., means that “external latent information”—DNA or the text itself—“is placed within a framework in which its relevance (meaning), is derived according to the organism’s” —or reader’s—“external and internal conditions and internally stored information.”<sup>[11]</sup> As Brian Goodwin writes, “...organisms make meaning of their genetic texts by expressing them in form (morphology and behaviour) appropriate to their habit and history...The text that organisms read is their genetic text, which has many different ‘interpretations,’ each one sensitive to context.”<sup>[12]</sup> The argument here is that DNA alone does not determine form, just as in postmodern literary theory the author alone does not determine meaning. Organisms, like the reader, are granted a level of agency or intelligence in interpreting and making meaning of a text. Meaning emerges from the complex interplay of different information flows: the author’s text and DNA are enmeshed in the context of history. They are open to interpretation by the reader and organism, who both begin with a certain set of historicized information *and* are enmeshed in their respective cultural contexts and environments.

Goodwin further articulates the complexity of context through his description of morphogenetic fields. “Developing organisms are described by morphogenetic fields which are the organized spacio-temporal context within which changing molecular composition (controlled by a genetic program) exerts its influence.”<sup>[8]</sup> Again we see that the complexity of inheritance operates at the edge of chaos. On the one hand there is structure provided by the inheritance of DNA, a relatively stable genetic code. On the other hand is the potential for limitless and prolific interpretations of an organism’s genetic text. This is tempered by the morphogenetic fields and genetic regulatory networks from which coherent and stable patterns emerge. Similarly, the ambiguity of literary interpretation opened up by *The Death of the Author*, is regulated by the fact that all readers are deeply enmeshed in their own cultural context and are, as the organism, constantly negotiating a vast complexity of information flows within a field of references. The network metaphor bridges to literary theory as Wolfgang Iser points out, “each text is an intertextual network, interpreted by the reader through the lenses of values, norms and relations to other texts.”<sup>[13]</sup>

### **The Death of the Author, The Birth of Complexity**

The metaphor approach to this essay began as a way to relate some aspects of postmodern literary theory to theoretical shifts in molecular biology. By playing each theoretical shift off the other, perhaps some new insights were gained not only within each field, but also with regard to the meaning of such analogous shifts in two fundamentally different disciplines. Beyond concrete insights, what are the perceptual implications and

significance of the general shift away from linear causality toward complexity, outside the laboratories of molecular biologists and ivory towers of literary theorist? Again, the two fundamental shifts we are looking at are first, the birth of agency in both the reader and organism or cell, and second, the recognition of an intricate web of references that limit, regulate and from which emerge coherent meaning and form. Within this web, the author or DNA is relegated to only one aspect of the complex negotiation between the text itself and the prior intelligence, history, assumptions and cultural/environmental context carried by the reader/organism. The key idea is that interpretation of both a literary text and DNA is comparable to a complex system wherein meaning/form emerges through relationships, a constant balance is held between stability and flexibility, meaning/form is sensitively dependent on all conditions of culture/environment and the inherent creativity of the reader/organism is acknowledged.

The implications of these shifts in terms of how we view the other than human world around us and the human organism itself are profound. Just as the meaning of a text can no longer be reduced to the intention of the author, the organism cannot be reduced and fragmented to its DNA and genetic materials alone. The birth of the reader brings a view of wholeness to a text. As Barthe wrote, "a text's unity lies not in its origin but in its destination,"<sup>[3]</sup> and the same seems to follow for organisms. Here the useful metaphor comparing two distinct systems—literary and genetic—begins to melt into one reality. Organisms are not *like* or *analogous to* readers, rather, organisms *are* readers and are as such, the destination of wholeness—emerging as a whole by means of their own creative language and free-play of interpretation. Organisms are "the book" of Foucault's theory. They "are never clear-cut: beyond the title, the first lines and the last full stop, beyond its internal configuration and its autonomous form, it is caught up in a system of references to other books, other texts, other sentences: it is a node within a network... The book is not simply the object that one holds in one's hands...It's unity is variable and relative."<sup>[14]</sup> Such is the dynamic of the life of readers—non-human and human alike—making meaning by interpreting the language of the world around and within us.

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### References

1. Zipf's Law says that the frequency of any word in a language is inversely proportional to its rank in frequency. The most frequently used words in an English text, "the," will occur twice as many times as the second most frequently used word, "and." This pattern continues as a power log proportional distribution as frequency rank decreases.
2. Franses, P, et al. (2008) *The Language of Living Processes*. Schumacher College, 12 March 2008.
3. Barthes, R. (1967) 'The Death of the Author' Translated by Richard Howard in *Aspen*, Fall-Winter; 1-4.
4. Derrida, J. (1978) 'Structure, Sign and Play in the Discourses of the Human Sciences' Translated by Alan Bass in *Writing and Difference*, London: Routledge; p 279.
5. Foucault, M..(1984) 'What is an Author?' Translated by Josue V. Harari in *The Foucault Reader* edited by Paul Rabinow, London: Penguin Books; p 118-119.
6. Fox Keller, E, Harel, D (2007) 'Beyond the Gene' in *PLoS ONE* 2(11)
7. Pearson, H. (2006) 'What is a Gene?' *Nature* 441, May; p 399-400.
8. Goodwin, B. (2000) 'The Life of Form. Emergent patterns of morphological transformation.' in *Life Sciences* 323; p. 17; 20.
9. Kauffman, S. (1995). *At Home in the Universe: The Search for the Laws of Self Organization and Complexity*. New York: Oxford University Press
10. Hoffmeyer, J. (2008) *Biosemitotics: An Examination into the Signs of Life and the Life of Signs*. Translated by Jesper Hoffmeyer and Donald Favareau. Chicago: University of Scranton Press; p. 82.
11. Ben-Jacob, E. et al., 'Seeking the foundations of cognition in bacteria: From Schrodinger's negative entropy to latent information.' in *Physica A* 359; p 511.
12. Goodwin, B. (2007) *Nature's Due: Healing our Fragmented Culture*. Edinburgh: Floris Books; p. 99, 101.

13. Iser, W. (1978) *The Act of Reading: A Theory of Aesthetic Response*. Baltimore: Johns Hopkins; University Press.
  14. Foucault, M. (1974) *The Archeology of Knowledge*. London: Tavistock, 1974; p. 23
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