Biosemiotics

Description

Biosemiotics is an area of research that studies living matter in terms of its communication networks, i.e. the transfer of *signs*. Biosemioticians think that the exchange of signs applies to whole organisms communicating with one another (as when humans or other animals communicate), but also the exchange signs at the microscopic and chemical level, including the way cells process DNA. Signs require interpretation, and it is here that biosemiotics brushes up agains theories in hermeneutics.

Anton MarkoÅ¡ is in a group at Charles University in Prague exploring biology from the point of view of semiotics and hermeneutics. His interesting book *Readers of the Book of Life* explores relevant writings by Martin Heidegger and Hans-Georg Gadamer. Itâ??s worth looking first at what they think of as a conventional view in biology of DNA processes.

The DNA recipe book

Biologist Richard Dawkins in *The Blind Watchmaker* explains how genes steer the development of an animal embryo. Genes are the *recipe* for the organismâ??s development.

> â??Embryonic development is a process. It is an orderly sequence of events, like the procedure for making a cake, except that there are millions more steps in the process and different steps are going on simultaneously in many different parts of the â??dishâ??. Most of the steps involve cell multiplication, generating prodigious numbers of cells, some of which die, others of which join up with each other to form organs, tissues and other many-celled structures. â?¦ In any one place in the developing body, at any one time during development, only a minority of the genes will be switched on. In different parts of the embryo, and at different times during development, other sets of genes will be turned on. Precisely which genes are switched on in any one cell at any one time depends on chemical conditions in that cell. This, in turn, depends upon past conditions in that part of the embryoâ?• (296).

Hermeneutic biology

The recipe metaphor is as plausible as any, and has currency amongst biologists, but it is under challenge from various quarters, including from semiotics and hermeneutical philosophy.

The recipe metaphor is lacking according to MarkoÅ¡: â??The main objective of hermeneutic biology should be to get rid of the genocentric view that takes the genome as a recipe for building the body. MarkoÅ¡ also extends Heideggerâ??s view of who and what is entitled to come under the category of Dasein â?? the being who is â??in-the-world.â?•

Whereas Heidegger implies that the beings he is concerned about are those that participate in spoken and written language, MarkoÅ¡ follows the biosemioticianâ??s line that includes all of life and all living creatures as language practitioners. He says, â??all living beings relate themselves to the world through â??languageness.'â?•

I couldnâ??t find â??languagenessâ?• in the OED, but the term seems to generalise language to any kind of exchange. It could also indicate access to a primary kind of language that precedes what is spoken and written â?? a protolanguage. Itâ??s important for MarkoÅ¡ to extend language to the unspoken as he wants to describe what happens inside cells in terms of language. He thinks of a cell is an interpreter or *reader* of DNA.

> â??the string of DNA is a genuine text that is read and interpreted by the cell. The cell will behave according to how it interprets the text: the interpretation is based on previous understanding, momentary contexts, and/or layout for the future. This metaphor is again in opposition to the metaphor of the genetic script as a program or an algorithm. A text written in natural language is not an algorithm: it requires a reader, not hardware.â?•

Here he echoes a standard hermeneutical description of how a human reader engages with (i.e. interprets) a text. One of the threads he develops in support of his argument notes the presence of *redundancy* in the text that is the genome. Much of the DNA sequence in a genome is superfluous, or it just holds the strand together, or switches on or off as the context changes, or serves as backup if other strands fail due to mutation.

Puppies

Thatâ??s a lot like spoken language, in which there are many substitutes for a word. He illustrates with the word â??dog.â?• The word carries different meanings (or uses) depending on context.

â??Dogâ?• can refer to the animal in general, the male animal, an insult, a creature that is crude, difficult or insistent, and â??dogâ?• has many grammatical forms and substitutes (doggy, dogged, mongrel, hound, pooch, puppy) which offer different meanings depending on context.

Words in spoken and written language shift and change and require interpretation, as does the whole passage, book, or corpus in which the words occur.

So too, the words of a DNA strand require interpretation in terms of their place within the bigger context of the organism, population, and environment.

MarkoÅ¡ also invokes the Heideggerian concept of tuning to describe how a cell operates. The interpretation of the cellâ??s DNA â??is dependent on the quality of the text itself and the â??tuningâ?? of the cell (the above-mentioned coordinates, physiology, morphology, and history) and is indeed to be viewed as a hermeneutic task.â?•

Amidst a discussion invoking terms such as *nonlocal morphogenetic fields, concentration gradients*, an *extracellular matrix, cytoskeleton*, and *nucleoskeleton* he asserts: â??DNA is thus far from being the algorithm prescribing how the body will look and how it will behave. It is a genuine text to be read by an informed (or better initiated) reader.â?•

The time scale of such interpretative operations varies: â??Changes in the interpretation of any of this multilayered information accumulated over billions of years can also be considered mutations and may even result in misinterpretations ending in aberrant development, or tumors, but from time to time also to a new morphological variant.â?•

Agents or models

MarkoÅ¡â??s argument treats the cell as an interpretive agent. This attribution of the capacity to interpret beyond the limits of the world of *human* agency engaged in spoken language provides a provocative departure not only from genetics but also from mainstream hermeneutical study.

Itâ??s useful to think that interpretation works all the way through the organism, from the thinking human in society down to the cells of which a person is composed, and spans across all living things. This is part of the message of biosemiotics, that the exchange of signs, verbal and otherwise pass through the entirety of living systems.

But MarkoÅ¡â??s recruitment of hermeneutics in this cause raises a couple of issues for me.

- What a cell does with its DNA doesnâ??t sound like what a reader does when they interpret a text. For example, thereâ??s the question of whether it makes sense to assert that a cell has any part in the kind of reflection that explores and explains philosophy, art and culture, and not only interprets but thinks about interpretation.
- Thereâ??s also a question about the authority MarkoÅ¡ accords to biological models. Hermeneutics would more likely treat the existence, structure and function of the cell as a model, i.e. an extremely useful construct invented by human beings. It is the genetic model that is to be read and interpreted, and the best means we have for engaging in that kind of analysis is human language.

By my reading of the tenets of hermeneutics, to presume the existence and primary status of the cell goes too far in according authority to the existence in nature of elements that exist independently of our theorising about them, i.e. independent of our human reasoning and understanding. Hermeneutical scholarship seeks to show that scientific discourse, experimentation, theorising, model building, evidence gathering and many other research practices involve processes of interpretation in all their aspects. Thatâ??s not the same as saying that the objects identified through our interpretive practices are themselves interpreters.

Notes

- The quotes from MarkoÅ¡ are mainly from the sections: Proteins Emancipated; The Text and Its Reader. Some quotes donâ??t have page numbers as they are taken from Kindle editions.
- Bodies are not buildings and genes are not blueprints (working drawings). Dawkins explains that a blueprint is a scaled down version of a building, before criticising the idea that genes provide blueprints for living organisms. I donâ??t think he wrote about icons, but in semiotic terms he thinks of the blueprint as an *iconic* sign. (See Reading the book of nature.) In the case of a blueprint he says thereâ??s a one-to-one mapping between the drawing and the building. He argues that the relationship between a genome and the appearance or form of the organism, its morphology, is much less direct than that. A genome (i.e. gene sequence) is not like a drawing. Itâ??s more like a *recipe*. The genome is a recipe that instructs the cook how to bake a cake. (As any architect knows, Dawkins could have retained the building metaphor by talking about *specifications* rather than *recipes*.)
- The first picture is an egg that missed the baking bowl. The second is a stray dog outside a cafe in SighiÈ?oara, Romania.

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Date Created
July 16, 2016
Author
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