

Emily Wheater // In my last piece for *Synapsis*, I wrote about how pregnant women have been the objects of scientific scrutiny, particularly with regards to any behaviours or feelings that may influence the health of their offspring. The pregnant woman is considered plastic, an accessible target for intervention. This discussion is embedded within opposing forces of determinism and plasticity, where the pregnant woman is a site of the latter.

The field of epigenetics is likewise situated in the crossfire between determinism and plasticity. Epigenetics is often described in terms of being the 'plastic' answer to 'deterministic' genetics; to apprehend epigenetics in diametric opposition to genetics is to misapprehend it. Blogposts and newspaper articles include phrases such as 'DNA isn't destiny,' and 'you aren't controlled by your genetic makeup.' This is clearly indicative of a discontent with the perceived boundaries placed on us by our genetics. These boundaries – susceptibility to disease, of being human in the first place – certainly are considerable, but perhaps, through our epigenome, we may be able to push back against them.

The meaning of the term 'epigenetics' itself is somewhat changeable. Its original coining, by Conrad Waddington, was: "the branch of biology which studies the causal interactions between genes and their products, which bring the phenotype into being" [1]. As an embryologist, Waddington's conception was tied to the processes through which cell fate decisions during development are made, and how genetics interacts with the environment to produce phenotypes. Over the decades, the definition has shifted and is still contested [2]. Currently, 'epigenetics' tends to carry a molecular definition indicating the modifications that are made 'on top of' the underlying DNA, that do not involve modifying the DNA sequence itself. An epigenetic modification can therefore refer to: a change in the pattern of DNA methylation, a covalent modification of histones (proteins that are important in packaging of DNA inside the cell nucleus), or chromatin remodelling through the incorporation of different histone variants into a nucleosome (a unit of packaged DNA), and many more. The function of these modifications is thought to be the regulation of gene expression. That genes are 'expressed' in varying degrees and combinations is vital in establishing cellular identities. As well as this, the capacity to modulate gene expression is also important as a means of introducing adaptability. It is this that leads epigenetics so often to be considered a mechanism by which we can exert control.

It is hardly surprising then that epigenetics appeals to sentiments of 'self-improvement' and is spilling over into public discourse on wellness, diet, and stress. After all, if the epigenome is adaptable to the environmental input then you can adapt it yourself by controlling that

environment. Your destiny isn't in your DNA; your destiny is in your hands because you control your epigenome. This goes beyond the standard lifestyle choices such as exercise and diet—even how you think is to be enlisted in the campaign to wrest the power from your genome:

*“your genetic activity is largely determined by your thoughts, attitudes, and perceptions. Epigenetics is showing that your perceptions and thoughts control your biology, which places you in the driver’s seat”*

This sort of empowering message is very marketable. But who, primarily, is this being marketed to? According to a study of the public discourse of epigenetics, industries that are beginning to use the language of epigenetics, such as skincare, fertility, wellness and nutrition, are targeting these messages at women and—we are coming full circle here—pregnant women more specifically. The danger is that what can initially be marketed as 'empowering' can morph, and the promise of control that the modifiable epigenome may offer becomes just another measure by which a person can be said to lose control, and be blamed for it.

[1] Goldberg, A.D., Allis, C.D., Bernstein, E., 2007. Epigenetics: A Landscape Takes Shape. *Cell* 128, 635–638. doi:10.1016/j.cell.2007.02.006

[2] Greally, J.M., 2018. A user's guide to the ambiguous word “epigenetics.” *Nat. Rev. Mol. Cell Biol.* 19, 207–208. doi:10.1038/nrm.2017.135

[3] Dubois, M., Verine Louvel, S., Le Goff, A., Guaspare, C., Allard, P., 2019. Epigenetics in the public sphere: interdisciplinary perspectives. *Environ. Epigenetics* 5, 1–11. doi:10.1093/eep/dvz019