The Epigenetic Role of Ethical Cognitive Development

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Understanding that behavior in the animal kingdom has created advantages for reproduction and has triggered a movement toward providing an evolutionary explanation of the moral faculties and altruistic behaviors of humans. Within this movement and the field of ethics, a common paradigm posits the existence of genetically determined cognitive mechanisms tending toward the production of such behavior. Others have taken a broader view of evolutionary mechanisms, which allows a role for culture, still within naturalistic and evolutionary ethics.

This study argues that human ethical behavior as a whole, and altruism specifically, may have some roots in genetics, as Patricia Churchland describes, but overall, humans' cognitive developments of ethics are epigenetically developed due to the neuroplasticity of the brain. In this way, I argue that the roots of ethical structures are culturally mediated, rather than entirely genetically rooted, and that one such cultural mediation is the use of narrative as an ethical frame affecting the functional development of the brain.

The first section initially acknowledges Patricia Churchland's argument of the genetic role of producing empathy within mammals, but ultimately, this essay attempts to dispel the belief that ethics are genetically rooted. This study then discusses how culture affects the development of the brain, arguing for a functional understanding of brain development in contrast to a structural understanding. Finally, this essay argues that storytelling, being a symbol of culture, is one process by which

ethical information is directed from culture to brain development via narrative frames to cognitive schemas.

I. The Evolution of Ethics

An attempt was made to link humans' social behavior to Charles Darwin's theory of evolution, the term coined being the familiar "social Darwinism." However, this term did not originate with Darwin. Rather, it was Herbert Spencer who, after reading Darwin's *On the Origin of Species*, came to the understanding that one should subscribe to an evolutionary process in which those fittest should survive and flourish while the weaker of the species should be rigorously eliminated (Ruse and Wilson 313). While this idea of the survival of the fittest seems attractive to profit-motivated barons of industry and is a pervasive term in society at large, it is unlikely that human social behavior as a whole reflects this natural ethic which is "red in tooth and claw" (Ruse and Wilson 316). Instead, human social behavior seems to be moderated with a sense of altruism.

Patricia Churchland has provided an idea that promotes the genetic roots to humans' altruistic behavior, and those roots lie in the genetic promotion of the production of oxytocin found in mammals and birds. In mammalian bodies, oxytocin has a role in sperm ejection, egg release from the ovaries, lactation, and contraction of the uterus during childbirth. However, as Churchland puts it, the "genetic trick was to expand the territory of the ancient hormone oxytocin from the body to the brain" (46). In the brain, oxytocin triggers the discharge of cannabinoids which promote positive feelings for the host. This discharge of chemicals occurs during child rearing between mother and child through suckling and cuddling but also during coitus amongst mates, promoting monogamy. It even extends further out from the familial towards larger social groups via production from sharing food with another.

However, Churchland implies that moral culture came to exist as an epiphenomenon to this neurochemical adaptation or "genetic trick" as she puts it. This assumption is congruent with the adaptationist program that Stephen Jay Gould and Richard Lewontin argue against in their "Spandrels of San Marco" argument. The adaptationist program is described as

understanding evolution as "the near omnipotence of natural selection in forging organic design and fashioning the best among possible worlds" (Gould and Lewontin 584).

Gould and Lewontin compare the adaptationist program to that of understanding the construction of spandrels at St. Mark's Cathedral. A spandrel is the triangular portion created by the intersection of two rounded arches at right angles, and in the case of St. Mark's Cathedral, is ornamented with religious designs. As Gould and Lewontin describe: "The design is so elaborate, harmonious, and purposeful that we are tempted to view it as the starting point of any analysis, as the cause in some sense of the surrounding architecture. But this would invert the proper path of analysis" (582). Rather than seeing an adaptation as purely causal, where one might view the spandrels to be the cause for the construction of the architecture, adaptation can occur on a blank canvas. Ethical culture becomes the spandrel in this metaphor, and the problem with this line of reasoning becomes clearer in Gould's and Lewontin's next example.

Gould and Lewontin move on to explore carnivory in the Aztec culture. Based on Michael Harner's anthropological proposition that Aztec human sacrifice, and the feeding of said sacrificed to high-ranking members of society, arose as a solution to food shortage, E. O. Wilson argues that Aztec ritualistic human sacrifice illustrates a genetic predisposition for human carnivory (Gould and Lewontin 583). As Gould and Lewontin describe this: "Harner and Wilson ask us to view an elaborate social system and a complex set of explicit justifications involving myth, symbol, and tradition as mere epiphenomena generated by the Aztecs as an unconscious rationalization masking the "real" reason for it all: need for protein" (583-84).

This example best illuminates the fallibility of Churchland's oxytocin program. Churchland works under the assumption that the expansion of oxytocin from body to brain caused an expansion in an individual's relations with others of the species. This expansion of relations then results in a need for a code of conduct which, according to her, is neurochemically mediated, making human ethics and culture an epiphenomenon to this expansion. However, while it appears to be correlative

between oxytocin production and the cohabitation of a species, it cannot be stated that this adaptation was the cause for this phenomenon. In this way, just as Gould and Lewontin describe, the adaptationist view may be inverted, and ethics cannot be reduced solely through a "genetic trick."

Churchland aside, many evolutionary psychologists believe that not only humans' sense of altruism but also their ethical nature has its roots in genetics. This is due to two propositions held by the biological sciences: first, that the social behavior of animals as a whole is firmly under the control of genes, and secondly, that humans are animals. The first of these two propositions has been exhaustively tested and affirmed from fruit flies to frogs. As for the second proposition, the human species is a sibling species to the chimpanzee, having split from the common ancestor six million years ago (Ruse and Wilson 314).

From these two propositions, a logical conclusion is that altruism, being a social behavior found amongst humans, must be rooted in genes. However, the human species contains no special sequence of genes that promotes ethical behaviors, only empathetic behaviors. This concept runs counter to the notion of social Darwinism explained earlier. Instead, nature seems to have affected our social behavior by what is referred to as "epigenetic rules" (Ruse and Wilson 315). Epigenetic means the influence on the construction of ethical architecture happens outside of the genes.

Epigenetic rules are dispositions such as fears and avoidance of incest which contain certain biological virtues. In a similar way, altruism contains biological virtue in two ways. The first being that it is in an individual's self-interest to cooperate with others of the same species rather than to fight for resources. The second way is that the altruist, in the act of self-sacrifice, still acts for the well-being of another in a way that preserves a similar genetic profile which reflects the evolutionary idea of promoting reproduction. In this case, the well-being of another allows one the opportunity for future reproduction (Ruse and Wilson 314).

II. Culturally Mediated Brain Development

Ruse and Wilson's "The Evolution of Ethics" problematized the role of genes in the phenomenon of ethics in

human social behavior, favoring an epigenetic process for the emergence of altruism. However, this essay now moves away from Ruse and Wilson's line of thinking, specifically their idea that nature has instilled within humans the belief of a "disinterested moral code" (315). Rather, this section argues that culture in general affects the development of the human brain but not in a structural way. Instead, a functional theory of brain development is explored. This section will serve as background needed to present the case that ethics, and altruism specifically, are culturally mediated rather than a set of natural codes instilled in the human psyche.

Culture in this sense means, "the entire interactive symbolic environment in which humans live and communicate" (Donald 23). Experts believe symbolic culture to be a product of the evolution of special cognitive abilities such as language (Donald 19). In this way, the evolutionary psychologist carries a somewhat solipsistic view that the evolution of the brain precedes independently of, and in consequence, affects the evolution of culture. However, the influence from the brain to culture can flow in the opposite direction: some cultural changes can remodel the operational structure of the brain.

Evolutionary psychologists hold the view that genes affect domain-specific cognitive development, which in turn affects behavior. These cognitive modules are the products of the Pleistocene environment (Ward 238-9). Humans are therefore seen as "stuck with the fixed cognitive repertoire they evolved during the late middle and lower Paleolithic period" (Donald 25). At this point, the role genes have played in the evolution of brain development needs acknowledgment. However, this section shows that in most recent development since the Pleistocene, culture has been an epigenetic factor resulting in the evolution of brain development.

Evolutionary psychologists hold onto a structuralist perspective of the brain with the idea of domain-specific cognitive modules that constitute the cognitive structure of the brain. Therefore, cognitive structures in the brain are developed to carry out a specific task (Ward 237). In conjunction with what was previously stated, this means human brain structure remains the same as their Pleistocene ancestors, and that humans should all

inherently share universal human traits. However, this structuralist perspective does not hold up under scrutiny, exemplified by those with the congenital absence of eyes being found to have brain structure normally attached to vision now become "on the market," and those brain regions become involved in a natural selection for new adaptive functions (Donald 23-4). Rather than being domain-specific, the brain exhibits qualities of being domain-dominant through neuroplasticity (Ward 243).

Higher functions of cognition are even more neuroplastic, leaving them further susceptible to individual variation. This adaptability is beneficial to the species as a whole, allowing for extreme malleability to a multitude of different environments. But this also leaves cognitive adaptation more susceptible to cultural influence in that "culture determines so much about the way we structure our system of skills, including some seminal skills that play a direct operational role in cognition" (Donald 24). This functional theory uses the terms "capture and redeployment" to explain the adaptive process (Donald 24). These terms are used to describe how presently unused, or no longer adaptive, neural structures can be reused for more adaptive needs. Capture and redeployment theory is both functional and physical in that it is "mediated by basic neural-developmental processes such as synaptogenesis, displacement, and Hebbian learning (the strengthening of specific synapses by experience)" (Donald 23).

The skill of human literacy represents a clear example of the need for adaptation to operate functionally rather than structurally. For a properly operational society, children must develop the use of complex literary skills to function presently, and in the future, within the society. But literacy is a taxing, complicated process for the brain to develop and use:

> Symbolic literacy simply cannot exist without installing, in thousands of developing children an elaborate complex of lexicons, use rules, automated component subskills (such as decoding letters and symbols, finding words, and forming letters), and a number of memory management and attentional algorithms, each of which must be entrenched in its own neural network. (Donald 24)

Literacy, having only been traced back approximately 5,000 years,

is a relatively new process to the human species and is far from species universal. However, its dramatic spread across the species has been so rapid that the human brain could not generate a genetically derived adaptation for it. Rather, the capture and redeployment of older brain structures for the function of literacy, described above, proves more likely (Donald 25). In this way, clearly the cognitive development of the brain is as much a product of our culture as the development of culture is the product of the brain.

III. Cognitive Narratology of Altruism

Structural and functional cognitive development of the brain have been differentiated using the development of literacy in culture and the brain, favoring a functional theory of development, as an example. The first part of this section continues along these lines, specifically concerning cognitive schema development in the brain. With a functional understanding of schema development, literature, in the context of its narrative frame as a symbol of culture, is involved in an epigenetic adaptational development of human ethics.

While Jean Piaget initially coined the term for psychological use, it was Frederic Bartlett who popularized the use of the term "schema." Bartlett used this term in his work in educational psychology to describe a cognitive pattern that developed in the brain to be instantiated through behavior under similar conditions. Currently, his ideas of schema theory can be divided into two general camps: structuralist and functional theories of schema development. As previously explained, structuralist theories of cognitive development of the brain are not sufficient in describing the role of neuroplasticity in brain adaptation. However, for a case to be made for the role of narrative in ethical schema, an argument against the structuralist theory of schema development, and in favor of a functional theory, must be made.

Structuralist schema theories are founded upon two principles: first, that schemata are the building blocks of cognition, and second, that all information processing depends upon the prior availability of these building blocks in long-term memory (Iran-Nejad and Winsler 8). This conception implies that learning cannot occur without both an incoming string of

input information and a relevant pre-existing schema. Schemas, under the structuralist idea, are the retrieval and instantiation of generic long-term memory in particular cortexes (Iran-Nejad and Winsler 15). However, a problem arises from this conception: fact learning. According to these ideas, if there is not an appropriate schematic slot in long-term memory, then the schema-inconsistent information is simply ignored.

Functional schema theories, on the other hand, are much more dynamic; Asghar Iran-Nejad and Adam Winsler use an illustration of the functioning of a hand. The hand uses the same muscles to grasp, write, paint, etc. and does not contain a blueprint for any of these actions. In a similar way, the authors question why we should view the brain as being domain-specific (Iran-Nejad and Winsler 30). Rather, schema formation and instantiation are not reliant upon schematic building blocks, but rather can dynamically use the brain as a whole to store, restore, adjust, retrieve, and instantiate schemas.

This functional theory of schema formation, that allows for learning of novel information from cultural symbols, supports the argument that ethics is culturally mediated, and that narrative is one cultural symbol by which it is mediated. Narrative in this case means a spoken or written sequence of events, i.e., a story. When readers engage in a story, they do not see the text as having narrative features, rather they experience it as narrative which allows for the recognition of narrative frames imposed on the story (Fludernik 926). Narrative frames are "schematic, commonsense knowledge that overlaps with both fictional and nonfictional … types of discourse" (Grishakova 189). In other words, frames are intuitively grasped depositories of knowledge and patterns of schemes of behavior.

Notably, fiction, alongside nonfiction, is considered to contain frames of knowledge. If the brain operated under structural schema theories, fiction would hold no epistemological value as its fictional frames would be considered schema-inconsistent information. However, this is not the case, and as Marina Grishakova describes: "fiction may be considered an experimental cognitive laboratory, where updating of the mind's 'software' occurs and finds a hypothetical resolution, and which is, no doubt, less painful and expenditure-demanding than

in real life" (190). In this way, the construction of narrative seems to contain an evolutionary value for humans to be able to acquire practical information without having to experience directly the hardships faced in a fictional narrative.

To adapt to society, culture must impose upon functional brain developments for literacy, but social schemas must also be instilled in the brain. For social species, this is essential for the group to work properly together. As such, culture must include these symbols which would promote the development of ethical schemas in the brain. As previously argued, these ethical schemas are not genetically rooted, and they cannot be previously constructed schematic building blocks. Instead, it seems that they are culturally mediated and operate functionally, similar to literacy development; in this case, their source of development is not the use of language itself but instead the narrative frames within literature.

An example of this concept of narrative frame to cognitive schema exists in one of *Aesop's Fables*, "The Lion and the Mouse." Although this story is about animals, it still contains ethical frames that can be experienced by the human reader. This contrasts Thomas Nagel's famous piece, "What Is It Like to Be a Bat?" in which Nagel problematizes humans' ability to acquire subjective knowledge from non-human sources. The problem that arises in this fable is that one should be more immediately drawn to connecting with the hunter rather than the animals of the story because the reader is most similar to the hunter. If this phenomenon were to occur, the ethical value of the story would be radically different than the one intended. This problem is bypassed through the anthropomorphizing of the animal characters, the lion and the mouse (Grishakova 192). The anthropomorphizing technique falls under the idea in narratology known as blending: the use of metaphor and narrative to create new meaningful effects (Fludernik 926).

In "The Lion and the Mouse," a lion catches a mouse scurrying across it, and after the mouse pleads to the lion, the lion, in a gesture of kindness, does not eat the mouse, but instead releases him. Later, the same lion becomes ensnared in a hunter's trap, and when the mouse hears the roars for help, it comes to the lion's aid and chews the ropes binding the lion (James 71). In

contrast to Plato's belief that stories lack epistemological value, Aesop believed stories contained ethical information, and he neatly summarized the narrative ethical frame at the end of the story. This structure, while not necessary for schema development, primes the reader by clearly stating the ethical frame of the story to be internalized for schema development. In the case of "The Lion and the Mouse," Aesop finishes the story by stating, "Kindness is seldom thrown away, and that there is no creature so much below another but that he may have it in his power to return a good office" (James 71).

This fable clearly shows narrative as a cultural symbol which affects ethical adaptation of human brain development using narrative frames to affect cognitive schemas. The story is told in a way that relates the narrative to the reader, and in this case, the ethical message, a clear example of a narrative frame of the story, is explicitly stated for the reader to consciously internalize for the purpose of creating a cognitive adaptation of altruism to better operate within a society. In comparison to the earlier discussion of Churchland's mode for ethical construction as dependent upon oxytocin promoting empathetic behavior, this fable teaches reciprocity, not empathy. This demonstrates the nuance of human ethics and why they cannot be reduced to an oxytocin-dependent paradigm for ethical cognitive construction.

Ethics, and altruism specifically, are a necessary adaptation for the social human species to operate in society. Without this adaptation, operations within a society would break down because parts would be unable to work together in situations that require selflessness and other ethical characteristics, but the cognitive architecture of human ethics are not genetically encoded within the species, nor are they hardwired into the human brain's architecture. Rather, ethical construction is much more dynamic: it is an epigenetic, culturally mediated process, deriving from symbols in culture. This paper specifically has argued that one of these cultural symbols for ethical formation lies within the ethical frames of narratives which then affect functional schema development.

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