

# **Is Nativism In Psychology Reconcilable With The Parity Thesis in Biology?**

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## **ABSTRACT**

The Modern Synthesis of Darwinism and genetics regards non-genetic factors as merely constraints on the genetic variations that result in the characteristics of organisms. Even though the environment (including social interactions and culture) is as necessary as genes in terms of selection and inheritance, it does not contain the information that controls the development of the traits. S. Oyama's account of the Parity Thesis, however, states that one cannot conceivably distinguish in a meaningful way between nature-based (i.e., gene-based) and nurture-based (i.e., environment-based) characteristics in development because the information necessary for the resulting characteristics is contained at both levels. Oyama and others argue that the Parity Thesis has far-reaching implications for developmental psychology, in that both nativist and interactionist developmental accounts of motor, cognitive, affective, social, and linguistic capacities that presuppose a substantial nature/nurture dichotomy are inadequate. After considering these arguments, we conclude that either Oyama's version of the Parity Thesis does not differ from the version advocated by liberal interactionists, or it renders precarious any analysis involving abilities present at birth (despite her claim to the contrary). More importantly, developmental psychologists need not discard the distinction between innate characteristics present at birth and those acquired by learning, even if they abandon genocentrism. Furthermore, we suggest a way nativists can disentangle the concept of maturation from a genocentric view of biological nature. More specifically, we suggest they can invoke the maturational segment of the developmental process (which involves genetic, epigenetic and environmental causes) that results in the biological "machinery" (e.g. language acquisition device) which is necessary for learning as a subsequent segment of the developmental process.

## 1. The Modern Synthesis, the Parity Thesis and Interactionism

The advocates of the so-called Modern Synthesis of Darwinism and genetics regard non-genetic factors as merely constraints on genetic expression and the variations which result in the characteristics of organisms. The environment, or everything external to the molecules that supposedly carry the genetic information (i.e., external to the germ), which extends from the cell, to somatic processes, all the way to social interactions and culture, is as necessary as genes in terms of selection and inheritance, but it does not contain information that controls the development of the traits. Thus, even though there might be disagreement as to the exact nature and role of the environment, the course of development is predominantly a result of the information contained in genes (DNA). This information can be changed at the level of DNA molecules and passed on to offspring. DNA controls the synthesis of proteins and their activity in developmental and morphogenetic processes. The role of the environment in these processes is secondary.

R. Dawkins (1989), a zealous advocate of the Modern Synthesis, insists on the indispensability of information-language to characterize gene-centric (i.e., DNA-centric) views, and on the causal asymmetry between genes and the environment where only genes are causally effective.

A more refined position (Maynard Smith, 1998) allows that developmental and morphogenetic processes can be affected, even severely, by non-genetic constraints. Neo-Darwinism does not prohibit this, as the basic premise of the Modern Synthesis that only those changes inherited by the DNA can be passed on to offspring is not challenged.

One could argue that the environment might be as important as genetic information, given that what the gene codes for is enabled by and perhaps determined by the structure of the environment. However, D. Dennett argues (1995) against this view, noting that the causal asymmetry is preserved, because genes contain explicit information and the environment contains implicit “matching” information. In effect, environment is a passive condition that enables genetic information to be realized (as a resulting trait). One could add that an inheritance is due to a variation at the molecular level, which produces a new trait *under the right conditions* in the environment (i.e., when the genetic information is found in the “right” environment).

Although our aim is not to give an exhaustive list of the challenges of the gene-centric view and its variations, it is important to note their breadth and depth. Many criticisms cannot be convincingly dismissed by a mere regurgitation of, or the application of superficial changes to, the postulates of the Modern Synthesis.

One such criticism challenges the germ-centrism of the Modern Synthesis, stating that the role of proteins in development and morphogenesis has to be reconsidered significantly in light of the studies of protein structures and interaction with DNA and RNA molecules. The notorious problem of protein folding has been attacked successfully by those who argue that the proteins play an active role in the process (Godfrey-Smith 2000). Others point out that in some species somatic embryogenesis does not establish a germ line that provides for the continuity of DNA information. As a matter of fact, other cells participate *on par* with those carrying DNA in the formation of gametes (Buss 1987).

Drastic evidence for the virtual obsolescence of gene- or germ-centrism is structural inheritance in *ciliate protozoa*, where molecules of DNA and RNA play no significant role (Frankel 1989). Here, a morphogenetic cellular field controls both inheritance and morphogenesis. Similarly, some nongenetic structures are inherited by epigenetic mechanisms (Sterelny and Griffiths). As the cells might differ in terms of phenotype while having identical genotype in such cases, the mechanism of DNA replication is an insufficient explanation of either development or inheritance.

Conceptually speaking, the metaphor of information has become central to the Modern Synthesis. Dawkins went so far to claim it “is not a metaphor, it is a plain truth” (Dawkins 1986, p. 111). Yet many feel that it narrows understanding of development and heritability and prevent an adoption of some more subtle points concerning the role of proteins and other key elements.

Although these and other challenges have resulted in the dissatisfaction of many biologists and philosophers of biology with the Modern Synthesis, it is hard to avoid using it as at least a starting point or even as a working hypothesis for biological studies and explanations of evolutionary and genetic processes and their interrelation. Thus, this framework remains an indispensable heuristic tool (Michod 1981), even defining, albeit implicitly, the working premises of many studies attempting to undermine it.

The Developmental Systems Theory predicated on the Parity Thesis attempts to offer a comprehensive alternative to the Modern Synthesis by drawing on diverse challenges to it, some of which we have just outlined, and by offering a novel conceptual framework.

A dominant formulation of the Parity Thesis (Oyama 2000a, 2000b, 2001) states that one cannot *in principle* distinguish between the nature-based (i.e., gene-based) and nurture-based (i.e., environment-based) characteristics in development because the information necessary for the resulting characteristics is contained both at the level of the environment and at the level of the genes. Thus, the genes (i.e., the DNA molecules) are only part of the developmental process, and the nature/nurture dichotomy collapses as “nature” represents a *developing phenotype*, not an independent causal determinant. The phenotype is only part of the developmental construction. Hence, genetic information is never transmitted from a master molecule in the isolated germ but is always (re)-constructed in development, and the biologist’s task is to decipher the *ontogeny* of such information. In other words, evolution is “a change in the distribution and constitution of developmental (organism-environment) systems” (Oyama 2000a, p. 77), not simply a change in gene frequencies as the genocentrism of the Modern Synthesis would have it.

S. Oyama, the most vocal advocate of the Parity Thesis, emphasizes that phenotypes are always developmentally constructed. This does not allow one to partition genes and environment as two necessary but independent components of development (as well as morphogenesis) that can be analyzed as such (where the precedence of the genes could be established in some cases). In her words, “the parity thesis does not lead to conventional ‘interactionism’ that accepts traditional categories of nature and nurture, biology and culture even if both are ‘important’, and ‘interact’” (Oyama, 2000b, p 342). Thus, the consequence of her characterization of the distinction between acquired and innate biological characteristics is intended to make a much stronger point than even a very liberal version of interactionism, which, unlike conventional interactionism, treats

nature and nurture *on par*.<sup>1</sup> She writes that “*there is no intelligible distinction between inherited (biological, genetically based) and acquired (environmentally mediated) characteristics ...* Once the distinction between inherited and the acquired has been eliminated, not only as extremes, but even as a continuum, evolution cannot be said to depend on the distinction.” (Oyama 2000a, p. 138; emphasis added)

One worry about the Parity Thesis is its denial that we can identify different causes responsible for a particular process (Kitcher, 2000). If we collapse the two as different kinds of causes, it seems that we will not be able to discriminate between them or determine their particular role in the developmental process. Oyama maintains, however, that the Parity Thesis only implies that the *classification* of causes into gene-based and environment-based is not viable: “Our emphasis on causal interdependence doesn’t mean that everything is so connected to everything else that analysis is impossible, or that in order to study anything, you must study everything” (Oyama, 2000b, p. 344). She thinks that the Parity Thesis enables far more refined discriminations among developmental causes by denying the nature/nurture categories since it unavoidably leads to the collapsing of distinctions among causes into those that are gene-based and those that are environment-based.

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<sup>1</sup> Conventional interactionists maintain that the genetic program results in the biological centres necessary for psychological development, albeit more minimally than the biological devices presupposed by nativists (see e.g. Elman 1996; Karmiloff-Smith 1992). Liberal interactionism eliminates the genetic programming altogether and invokes the environment/biology interaction throughout the process. This is a novel general (parity) thesis which, unlike conventional interactionism, does not explicate what exact, if any (developmentally produced) biological devices are needed for psychological development. It is not simply a weaker interactionist account: we will, in effect, argue that it is plausible to reconcile a nativist claim about the substantial biological devices necessary for psychological development with liberal interactionism as a general parity thesis, if the former is divorced from genocentrism. However, nativism, even when divorced from genocentrism, cannot be reconciled with conventional interactionism because of the disagreement as to the kind of biological devices needed for the realization of psychological abilities, not to mention the interactionists’ commitment to genocentrism.

## 2. Nativism in Psychology and the Parity Thesis

Oyama and others (see e.g. Griffiths and Stotz, 2000) argue that the Parity Thesis has far-reaching implications for developmental psychology in that any developmental account of motor, cognitive, affective, social, and linguistic capacities that presupposes the nature/nurture dichotomy is inadequate. Nativism (as well as conventional interactionism) implicitly and/or explicitly subscribes to the neo-preformationist understanding of development. According to this understanding, a genetic program is responsible for innate features of the organism (i.e. the features given by nature) while the development of the more advanced cognitive, affective, social, and linguistic capacities unfolds through interaction between innate nature and culture. But if we abandon the idea of genetic programs and accept Oyama's suggestion that nature is always nurtured, this renders misleading the claim that "psychological development is due to interaction, while the body is programmed, or that some modules are in the genes while others must develop" (Oyama, 2000b, p. 341).

Now, even if the point concerning the collapse of the distinction between gene-based and environment-based traits is plausible in biology (i.e. if there is no master molecule or genetic programme), it is not immediately clear whether or how this threatens nativism in psychology. For example, even if nativists do not deny that most *mechanisms* which result in psychological traits, capacities, and behaviours of organisms are developmentally constructed, their core understanding that there is a limited and well-defined set of biological and psychological *capacities/predispositions* necessary for the development of these mechanisms could remain intact. Whether this is so depends *on*

*how exactly these psychological and biological capacities or predispositions are brought about* - whether they are a result of genetic programs, an outcome of epigenetic processes, etc. (and whether these biological processes collapse the distinction between nature and nurture, as Oyama's version of the Parity Thesis implies). But it also depends *on what exactly are these necessary capacities and presuppositions*, in other words, what kind of nativism one advocates.

In fact, nativists have substantially different views on the exact nature of the capacities or predispositions necessary for development. Historically, innateness has been ascribed to predispositions, traits, and behaviours, as well as to full-fledged knowledge. Thus, in the history of pathology we find a view that a particular state of the body (its constitution) predisposes it to acquire certain diseases; this is called the *diathesis*. Thus, while the disease is contracted or developed due to the environment, it is also contracted because of the weak constitution of the body inherited from the parents (R. S. Olby, 1993).

In the weakest forms of nativism regarding capacities of the mind, as in empiricism and behaviourism, we inherit mechanisms of learning-readiness that do not contribute content to the output of the learning process. What is learned depends entirely on the culture in which the learner grows, but if she is to learn successfully, she must inherit the right predisposition (the learning-readiness mechanism).

Mental and physical character traits have also been considered as inherited. One of the first to argue that through empirical research and strict measurement we can determine which traits are due to nature and which are learned was F. Galton, Charles Darwin's first cousin. Galton believed that nature, at birth, offers a potential for



development. While neither nature nor nurture is self-sufficient for development, “no carefulness of nurture can overcome the evil tendencies of an intrinsically bad *physique*, weak brain or brutal disposition” (Galton, 1875, p. 9-10, italics in the original).

In contemporary evolutionary psychology (see. e.g. Cosmides and Tooby, 2000) some instincts and behaviours, such as fear of snakes, incest avoidance, altruistic and mating behaviour and the like, are considered hard-wired and inherited. What kind of cognitive mechanism, if any, needs to be hard-wired in order to generate such behaviours remains to be seen (Cosmides and Tooby, 2000).

Stronger versions of nativism regarding mind emerged with the cognitive revolution of the 1950s and the subsequent rise of the computer metaphor for the mind. While nativists of the cognitive revolution continued the tradition of 17<sup>th</sup> century rationalists who argued for innate ideas and innate knowledge, later 20<sup>th</sup> century nativists conceptualized innate knowledge as domain-specific learning mechanisms, including the language acquisition device (Chomsky 1959, 1968; Pinker 1994), the theory of mind module (Baron-Cohen 1995), mind modules for physical reasoning (Spelke and Kinzler 2007; Tooby and Cosmides 2000), the recognition of faces (Tooby and Cosmides 2000), and the like. The main difference between *stronger versions of nativism* that posit domain-specific learning mechanisms and *weaker versions* that postulate innate dispositions for learning, lies in the fact that the former ascribes some innate content (knowledge) to the process of learning, while the latter denies such knowledge and postulates learning mechanisms devoid of content.

Let us focus on the stronger understanding of nativism. Can *it* be reconciled with the Parity Thesis? And what exactly does it mean that certain domain-specific knowledge

is innate or hard-wired in the context of a naturalist explanation (the one that most people now expect) of the origins and development of mind?

S. Pinker (1994) establishes that language capacity is localized in a particular part of the brain and moves on to illustrate how this particular network of neurons, localized in a particular brain area, can process certain linguistic rules.<sup>2</sup> Pinker next considers how neurons responsible for processing of certain linguistic rules form a neural network with the required pathways. He invokes a simplified version of the Modern Synthesis in order to explain the formation of the pathways: he notes that the molecules that guide, connect, and preserve neurons are proteins, and genes specify proteins. Within this framework, the “grammar genes” are stretches of DNA that code for proteins or trigger the transcription of proteins at certain spatial and temporal points in the brain. The proteins, in turn, guide, attract, or glue neurons into networks necessary to compute the solution to some grammatical problem.

It is clear that nativism and the Parity Thesis cannot be reconciled, as long as the former is predicated on genocentrism. In Oyama’s view, “[O]pposition between genes (or biology) and learning, or between genes (or biology) and culture, are endemic to many fields but are miserably inadequate for capturing the multitude of causal factors needed for any reasonable treatment of ontogeny and phylogeny” (Oyama, Griffiths, Gray, 2001, p2). But can Pinker and other modular theorists who subscribe to genocentrism continue to argue that the mind is a set of hard-wired modules if genocentrism is implausible? *Prima*

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<sup>2</sup> The neural network is supposed to carry the information in a way similar to the programmed Turing machine that processes information while doing addition. Pinker is speculating that some pathways in this neural network are responsible for processing particular grammar rules such as inflection or verb tense. When the child is born, many neural pathways in the centre for language are open (and thus the child can learn any language) but they are also constrained, in that they are devoted to processing linguistic rules universal to all languages. As the child is exposed to her mother tongue, some pathways are strengthened more than others.

*facie*, it seems that they can. Even if genes do not carry privileged information about protein transcription and proteins are a result of epigenetic and similar processes, nativists might still maintain that there are brain centres necessary for the development of language, theory of mind, and so on, and that the structure and function of these centres result from such epigenetic processes.<sup>3</sup> The “nature” can be equated with the biological structure, an “organ,” necessary for the development of language and various psychological capacities, even though it (the biological structure) is a result of biological processes which are not genetically determined.

However, as we will see shortly, the issue is somewhat more complicated. The main problem for nativists willing to give up genocentrism is that most of the brain centres to which they refer are not ready or even present at birth. To account for postnatal development of these centres, nativists usually invoke the concept of *maturation* that *presupposes* a genocentric view of development. It turns out that the concept of maturation forces nativists to embrace genocentrism, and that the reconciliation of the Parity Thesis and strong nativism hangs on this issue. We will turn to this central problem and the way in which nativists can address it in Section 3.

But first, it is important to clarify that the Parity Thesis as presented by Oyama seems to demand more than merely abandoning genocentrism. Nothing can save nativism in the face of the Parity Thesis, as advocated by Oyama, since it demands that the distinction between “nature” and the environment be treated as inapplicable to developmental causes in general. There cannot be a moderate abandoning of genocentrism to leave intact the distinction on which nativism in psychology is grounded.

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<sup>3</sup> A key claim for the importance of the epigenetic processes in inheritance and development is that they enable a stability of the formation of organs which the genes (DNA molecules) cannot provide. Modularity follows naturally from epigenetically produced stability.

Given that nature “is always a nurtured nature” (Oyama, 2000b p. 341) the nature-nurture discriminations can never, at any level, be clear-cut and studied independently from each other. And “the discriminations must stand on their own if they are to stand at all” (Oyama, 2000b p.339). In other words, we have to be able to study, at least in principle, the traits as purely nature-based or environment-based if the opposition between these two categories is to be justified and useful. The implication is that such clear-cut distinctions are possible only within a geocentric view of development, and that if we give up genocentrism, we should abolish such distinctions altogether. That “there is no intelligible distinction between inherited (biological, genetically based) and acquired (environmentally mediated) characteristics” seems to undercut the foundations of any sort of nativist analysis.

The consequence of this attitude with respect to developmental psychology is severe: it implies the rejection of the nativist emphasis of the existence of innate biological capacities as responsible for the development of advanced psychological capacities in the appropriate environment, at least in the case of the nativism advocated by Pinker. Thus, psychological capacities and traits cannot be defined in (non-dynamic) non-developmental terms that analyze these capacities – irrespective of their developmentally and environmentally constructed nature – in terms of biological predispositions.

Oyama admits, however, that “if one really is interested in abilities that are present at birth, for instance, one can certainly study them” (Oyama, 2000b, p.340). She adds that “the point is not that all notions of nature are meaningless, but that their meanings are often unclear” (Oyama, 2000b, p340). But how are we to read her

comments? One could argue that the Parity Thesis tolerates a weaker sense of the concept of the nature present at birth than the one on which Pinker's analysis is predicated.

The problem is that the underlying (albeit substantial) distinction between biological nature on the one hand, and the environment as necessary for the future realization of some psychological capacity that presupposes such biological nature, on the other hand, *is an indispensable ground for formulating any explanatorily meaningful questions regarding abilities present at birth, in the first place*. Even if one clarifies that "nature" (biological structures) present at birth is developmentally constructed.

Typically, developmental psychologists are interested in understanding how certain advanced psychological capacities occur in development. For instance, empathic understanding is considered to be a fairly late product of cognitive and affective development, and a question asked in the nativist spirit is which developmental processes and more basic capacities are its precursors. While many abilities, such as gaze following, joint attention, social referencing, and the like, are usually cited as necessary for normal development of empathic understanding, the ultimate question is whether at birth, a child needs to have a neurological basis enabling most primitive automatic empathic reactions if she is to develop advanced empathy later in life. If there is such a neurological basis, it is considered both innate and inherited (see Preston and de Waal 2002). But if we abandon the distinction between biological nature and environmental causes that jointly contribute to the emergence of an advanced psychological capacity like empathy, can we even ask questions about a neurological basis that must be present at birth?

If Oyama allows as meaningful the search for the neurological basis that is present at birth and responsible for later development of empathy, and given that such a search requires the basic distinction between nature and nurture, it is not clear how her position could differ from a liberal brand of interactionism (such as Kitcher's), according to which, *distinction between biological (natural) and environmental causes* of development matters, even though both could have equal relevance once the biological capacity is realized and even though the developmental processes involve both. Perhaps Oyama could provide a clarification that distinguishes her view from liberal interactionism, while retaining her rather radical conclusions about the nature/nurture distinction, but it is not immediately apparent what such a clarification could be.

If, however, Oyama's point is that, in following the Parity Thesis, the talk about the nurture-based and nature-based traits should be abolished in that the notion of nature should be clarified so that even the liberal interactionist meaning of the nature/nurture distinction is avoided, it is hard to see what the question concerning "the abilities present at birth" could possibly mean. Any clarification of the notion of "nature" in answering such a question seems predicated on a substantial nature/nurture (i.e., biological structure / development embedded in a suitable environment) distinction. The problem is, then, that either Oyama's thesis, without additional clarifications, implies that it is meaningless to study predisposition at birth or her view of the Parity Thesis adds little to the liberal interactionist reading of it, despite intense rhetorical attempts to convince us otherwise.

### 3. Moving on the debate: maturation, development and non-genocentric nativism

Nativism has been a persistent force in the 20<sup>th</sup> century developmental psychology and cognitive science primarily because of the explanatory need to differentiate between capacities and/or knowledge that result from learning and those that emerge fairly early in development and are *unlikely to be learned*. Thus, traditionally, nativists have asked what kind of biological and psychological capacities are necessary for the development of psychological mechanisms. Conceptually, this seems a valid question, and if Oyama insists (and she sometimes seems to) that we cannot talk about the bottom-line capacities/constraints necessary for development, which would strike at the heart of nativism, she needs further conceptual and empirical arguments to substantiate this claim.

Let us return to the question of the relation between nativism and the alternatives to genocentrism. As pointed out, it seems possible for the advocates of strong nativism of Pinker's type to abandon genocentrism, embrace the epigenetic and alike mechanisms of the formation of neurological centres (and modules), and still ask the meaningful questions in the spirit of nativism concerning biological, as opposed to environmental, pre-conditions (i.e., biological structures) present at birth, necessary for the subsequent development of certain psychological capacities. The nativists will need to qualify, or rather refine, their notion of innateness, by pointing out that it captures primarily the causal significance of biological structures present at birth, even though such structures develop through the interaction with environmental factors. Liberal interactionism does not deprive the nativists' questions of meaning; rather, it provides a more detailed and perhaps more refined background.<sup>4</sup>

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<sup>4</sup> It is certainly not necessary for somebody who embraces the Parity Thesis as understood by liberal interactionism to accept the nativist view of substantial biological devices (such as language acquisition

Yet the path to the reconciliation of *the Parity Thesis as liberal interactionists understand it*, on the one hand, and *strong nativism*, on the other, may not be as smooth. There is a jarring aspect of nativism that, we think, critically blurs the relation between nativism, genocentrism, and the alternatives. Although we see it as critical, it has been explicitly recognized by neither Oyama nor the advocates of liberal interactionism.

Most capacities treated as innate are not exhibited by just-born infants. For instance, first words occur in the second year of life, and complex grammatical constructions do not occur before the child is three years old. Therefore, if there is an innate language acquisition device, as Pinker (1994) or Chomsky (1959) would have it, such a device is a result of prenatal *as well as postnatal development*. In addition, understanding others as intentional beings, which is sometimes identified as the main precursor of social cognition, does not emerge before the infant is nine months old (see e.g. Tomasello 1999). The theory of mind module, often posited as a necessary requirement for normal development of social cognition (see e.g. Baron-Cohen 1995), does not fully kick in before the third or fourth birthday. Such psychological abilities occur relatively late in development as a result of innate biological capacities enabled by biological structures that emerge well into the post-natal period.

In order to explain these psychological capacities as innate rather than learned, nativists usually invoke the concept of *maturation*. The idea is that the neurological and physiological structures necessary for the emergence of the above-mentioned abilities which require some postnatal time to develop are entirely directed or prescribed by inner, genetic programmes and, as such, are not a result of learning, experience, or any

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device). Thus, a liberal interactionist could choose to accept the existence of minimal biological devices as prerequisites for psychological development. But our main point is that there is nothing preventing her from embracing nativist kind of explanation either.



environmental causes. Pinker, for one, is committed to such a view and provides a detailed account (Pinker 1994).

*Thus, even though it seems prima facie, that nativists of Pinker's type can embrace non-genocentrism in the form of epigenetic or similar mechanisms (see p. ), and thus potentially reconcile their view with the Parity Thesis - at least as it understood by liberal interactionists – the problem is that they feel compelled to reinforce the concept of maturation by defaulting to genocentrism.* The question is whether maturation and genocentrism are inextricably linked.

We believe that nativists could explain postnatal development of neurological structures that they hold to be necessary for language learning, social cognition and alike, without invoking maturation married to genocentrism.

Nativists believe that it is implausible that the view that learning explains the emergence of biological devices such as language acquisition device is implausible. Actually, developmental psychologists (or, more generally, cognitive scientists interested in psychological development) usually equate the notion of *learning* with the notions of the *early experience* of the infant, and with the *development* of neurological centres (if they treat them as shaped by environmental factors). Given this conflation, nativists feel compelled to introduce the maturation period which minimizes (or, in effect, eliminates) the role of environmental causes in the biological formation of neurological centres (devices), in order to distinguish it from learning as the developmental process that starts once the maturational period is over. Thus, in order to avoid learning as an (implausible) environmental cause of the capacities and devices, they embrace genocentrism to account for maturation as an innate endogenously directed process. For them, learning begins

once the necessary biological structure has matured and can enable the biological capacities as a pre-condition for psychological development, rather than at birth with the exposure of the child to the outside environment. That is, presumably, why learning happens suddenly and more or less uniformly among the individuals of the species.

Admittedly, this maturation/learning distinction may be unnecessarily strong. Nativists can hold that the learning process is simply a result of certain suitable environmental influences (triggers) exerted on the matured neurological centres, while at the same time accepting that the neurological centres necessary for learning have been shaped by environmental influences (along with the genetic ones) as long as these are different from learning. Given the nature of the processes at stake, a nativist might be better off talking about a) *the maturational segment of the developmental process*, where the biological processes interact with the environment to produce fully developed neurological centres (thereby eliminating crude genocentrism), and b) *learning*, as the segment of the developmental process that starts once the maturational development has reached the threshold.

Thus, the environmental causes make a significant contribution to the (maturational) developmental process – a point emphasized by the advocates of the Parity Thesis. It is, however, meaningful (and necessary) to ask what kind of neural centres an infant needs and to consider what kind of maturational (developmental, i.e., biologically and environmentally caused) process must take place for the infant to be capable of learning. Also, the maturational developmental process is analyzable in terms of tangible distinctions between biological, albeit not purely genetic, causes on the one hand, and

environmental causes, on the other. And even though biological processes are always causally entangled with the environment, the nativist can treat the threshold reached by such a process in static rather than dynamic terms, as a biological “machinery” or structure required for *learning processes* to take place.

Thus, for example, nativists could say that everyday activities and routines in which a caregiver regulates child’s eating, sleeping, levels of arousal, and the like, are environmentally as well as biologically based processes, necessary for the development of brain centres responsible for language learning or social cognition. Such environmental causes are as indispensable for the development of the brain structures after the child is born, as are the inner genetic and epigenetic processes in the prenatal period. Even so, the brain structures necessary for learning are not a result of the learning process, which is virtually nonexistent before the development of these centres is finalized.

Oyama is right to argue that, in some sense, traditional distinctions between nature and nurture or innate and acquired have to be abandoned. But developmental psychologists need not give up these distinctions altogether if they are careful in distinguishing between environmental causes and genetic or epigenetic causes that work together to build the neurological and physiological structures necessary for language learning, social learning, or any other kind of learning. In other words, the distinction between biological prerequisites, the learning processes (that take place only if these biological prerequisites are in place), and the advanced linguistic, cognitive, affective, and social capacities that presuppose both, can be made even if we give up genocentrism. Pinker does not need to appeal to a rather simplistic notion of language

genes and the concept of maturation married to it. *He can instead argue that a language acquisition device is not an outcome of language learning, but rather a biological prerequisite for normal language acquisition, even though it is developmentally constructed as such, both in the pre- and post-natal period (being a result of genetic, epigenetic, and environmental causes).* His argument, presumably, would not lose any of its nativist appeal. However, whether Pinker and Chomsky are correct in their explanation of language acquisition by means of a language acquisition device can only be decided by further empirical research.

In short, if it turns out that genocentricism is an unsatisfying, nativists can adjust their view of what constitutes innate physiological and psychological structures so that it makes biological sense. In the end, the nativist position in psychology does not stand or fall with genocentricism in biology, nor does the Parity Thesis necessarily dispose of the distinctions that constitute the substance of nativism. Ultimately, other conceptual and empirical criteria should decide its fate.

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