

“SHAKESPEARE SE JE MOTIL: ZAKAJ STA BIOLOGIJA IN KULTURA BOLJ INTIMNI KOT SMO MISLILI”

Oren Harman

Univerza Bar Ilan, Izrael,

Oren Harman je docent na dodiplomskem študiju zgodovine in filozofije znanosti na Univerzi Bar Ilan v Izraelu. Poučuje tudi na Fakulteti za vede o življenju in na Humanistični fakulteti Hebrejske univerze. Je avtor knjige *“The Man Who Invented the Chromosome: A Life of Cyril Darlington”* (Harvard University Press, 2004), in sourednik dela *“Rebels, Mavericks, and Heretics in Biology”* (Yale University Press, Spring 2008). Harman je znanstveni urednik ameriškega časopisa *“The New Republic”*.

“SHAKESPEARE GOT IT WRONG: WHY BIOLOGY AND CULTURE ARE MORE INTIMATE THAN WE THOUGHT”

Oren Harman

Bar Ilan University, Israel,

Oren Harman is an assistant professor in the Graduate Program in the History and Philosophy of Science at Bar Ilan University. He also teaches on the Life Sciences and Humanities faculties at the Hebrew University. He is the author of *“The Man Who Invented the Chromosome: A Life of Cyril Darlington”* (Harvard University Press, 2004), and the co-editor of *“Rebels, Mavericks, and Heretics in Biology”* (Yale University Press, Spring 2008). Harman is a contributing science editor for *“The New Republic”*.

Povzetek

V pričujočem prispevku bom dokazoval, da nam širjenje vzročnega polja med genotipom in fenotipom dovoljuje, da premislimo o vzorcu interakcij med kulturo in biologijo pri človeku, ki je drugačen od tistega, ki je prevladoval v predstavah prejšnjih generacijah. Niti z Newtonom navdahnjeni nativizem razsvetljenstva niti stratigrafični pristop klasične antropologije nista bila sposobna razložiti zapletenih medsebojnih vplivov med kulturnimi in biološkimi spremenljivkami v procesu oblikovanja človeka, v veliki meri zato, ker sta oba sprejela osnovno delitev med vrojenim in naučenim oz. - če si sposodim Shakespearov izraz - delitev na »Naravo in Vzgojo«. S to napačna dihotomijo je še vedno okužen velik del sodobne evlucijske psihologije.

Kljub temu postaja čedalje bolj jasno, da lahko to napačno razumevanje mirno pokopljemo. Za začetek bi rad opozoril na razvoj evlucijskih študij, ki nam dokazujejo, da niso vse darvinovske adaptacije zasnovane na genetskih variacijah, ker igrajo v evluciji pomembno vlogo tudi drugi dedni sistemi, ki niso nič manj pomembni od genetskih. Drugič, razvojna biologija nas ponovno opozarja, da moramo upoštevati medsebojno delovanje med

genetskimi podlagami in okoljskimi vplivi – bodisi molekularnimi, celičnimi, sistemskimi ali zunajtelesnimi. Zaradi impresivnega obsega plastičnosti na vseh nivojih, ki jih izražajo organizmi (od molekularnega do vedenjskega), smo začeli spoznavati, da je treba dopuščati možnosti procesov, v katerih fenotip dejansko lahko predhodi genotipu ter tako obrne našo običajno neodarvinistično perspektivo. To ne pomeni, da dobra stara genetska selekcija ni glavna sila evolucije, temveč da paralelni mehanizmi lahko razširijo področje evolucije in hkrati okrepijo njeno zmožnost, da sčasoma prispeva k uveljavljanju novosti.

Sledila bo kratka predstavitev razsvetljenskega pogleda na človeško naravo in pogleda, ki se je uveljavil v 19. in zgodnjem 20. stoletju v klasični antropologiji, nato bom ponudil definicijo kulture, ki bo omogočala razumevanje kulturno-biološke interakcije pri človeku. Kulturo bom predstavil, po Geertzu, kot sistem kontrolnih mehanizmov – »programov«- za upravljanje vedenja, ne pa kot kompleks konkretnih vedenjskih vzorcev. Preoblikovanje razumevanja kulture na takšen način povzroči, da preusmerimo našo pozornost od proučevanja univerzalnega človeškega obnašanja (in človeške narave) na mehanizme, ki kanalizirajo vso širino in nedeterminiranost človeških sposobnosti k dejanskim dosežkom in dejanjem. Takšen tok misli bo pripeljal do zaključka, da Robinson Crusoe ne more biti nič drugega kot izmišljotina.

Nato se bom lotil razgradnje delitve Narava/Vzgoja. Po morfoloških primerih iz narave (himalajski zajec, aguti (*Dasyprocta* sp.), cvet madronščice) bom predstavil klasične primere iz človeške izkušnje (jezikovna opremljenost, glasbena percepcija, fobije). Uporabil bom bežen premislek o živčnem in imunskem sistemu ter moralnih sposobnosti za to, da bom pojasnil, da je današnje spraševanje o tem, ali neko lastnost določa narava ali vzgoja, enako vprašanju: »Ali zvok tolkal ustvarjajo bobni ali bobnarji?«

Zanimivo vprašanje ostaja: Kateri biološki mehanizmi lahko razložijo omenjene primere in ali obstaja evlucijski model, v katerega jih lahko vključimo. Jasno, da bo odmik od neodarvinistične osredotočenosti na dednost k razvojni usmerjenosti in naraščajočem poudarku na teoriji form v evoluciji (vključno z razvojnostjo, epigenetiko, plastičnostjo, samoorganizacijo) koristen pri razlagi morfoloških in fizioloških primerov (razlike med Aguti variacijami, npr. izhajajo iz epigenetske določenosti in *ne* iz različnih DNA).

Bolj specifično in v povezavi z obnašanjem, bom predstavil moderno inkarnacijo Baldwinovega efekta (1896) - Waddingtonovo »genetsko asimilacijo« kot dober primer za razlago mnogih zanimivosti v evoluciji kompleksnega obnašanja in mišljenja pri ljudeh. Waddingtonov eksperiment na muhah je pokazal, kako lahko darwinovski mehanizmi ustvarjajo navidezno lamarkistično evolucijo. Ko pride do sprememb v okolju, razkrijejo sprožene okoljske spremembe že obstoječe genetske variacije, ki so potem lahko privzete z naravno selekcijo. Danes že vemo, da kratkoročna evolucija ni nujno zasnovana na mutaciji, ampak se lahko opira na epigenetske spremembe. Zanimivo s stališča evolucije je, da so nekatera epigenetska stanja dedna. Dedne epigenetske variacije lahko ustvarjajo premostitev, dokler jih genetske ne dohitijo. Tako epigenetsko dedovanje poveča verjetnost genetske asimilacije, ker vzdržuje novo razvojno smer, dokler je ni mogoče vzpostaviti bolj trajno z geni.

Ali je to v kakšni zvezi z evolucijo človeštva?

Medtem ko se vsi strinjamo, da se je sposobnost učenja razvila genetsko, pa mehanizmi asimilacije vračajo učenje na mesto dejavnika evolucijske spremembe, ne pa na mesto zgolj produkta evolucije. Bistvo je v tem, da ni mogoče ločiti razvoja in dednosti (pomislite, na primer, na učenje in prenašanje naprej nove pesmi ali besede ali obnašanja (razvoj in prenašanje gresta skupaj): Zaradi tega ni mogoče ločiti razvoja in evolucije – Davkinsova delitev med »podvojevalniki« in »vozili genov« se poruši. Spremembe, ki se sprožijo med razvojem, v glavnem z učenjem, igrajo veliko vlogo v vedenjski in kulturni evoluciji.

Zadnji premislek nas bo vodil k ideji, da je Kultura most med človeškimi notranjimi sposobnostmi in med tem, kar končno postane. Postati človek pomeni predvsem postati posameznik – to pa postanemo s sredstvi kulture, v kateri živimo in jo razvijamo. Moških in žensk, torej ne moremo in ne smemo definirati z njihovimi prirojenimi lastnostmi in sposobnostmi (razsvetljenstvo, evolucijska psihologija), niti samo z njunim vedenjem (behaviorizem in njegove sodobne različice). Namesto tega je potrebno upoštevati, da načini, po katerih se generične možnosti spreminjajo v specifične manifestacije, predstavljajo mnogo bogatejše izzive za študij človeštva in njegove narave, pri tem pa se je potrebno istočasno izogibati nepotrebnim poenostavljenim, očitno napačnim in škodljivim tradicijam biološkega determinizma.

Summary

In this paper, I will want to argue that the widening causal window between genotype and phenotype allows us to contemplate a different pattern of interaction between culture and biology in man than has guided the thinking of previous generations. Neither the Newtonian-inspired nativism of the Enlightenment, nor the stratigraphic approach of classical anthropology were able to capture the intricate interplay between cultural and biological variables in the making of man, to a large degree because they both adopted the basic division between the innate and the learned, or, in Shakespeare's borrowed term, 'Nature and Nurture'. The false dichotomy continues to plague much of modern evolutionary psychology.

Nevertheless, it is becoming increasingly clear that this beaten horse can be safely laid to rest. To begin with, developments in evolutionary studies are teaching us that not all Darwinian adaptations are based on genetic variation, since other, no less important, inheritance systems besides the genetic one play meaningful roles in evolution. Secondly, developmental biology is re-educating us with respect to the interplay between genetic substrates and environmental cues – whether molecular, cellular, systemic, or out-of-the-body. What we are learning is that the impressive amounts of plasticity at all levels exhibited by organisms (from the molecular to the behavioral) may allow for processes in which phenotype actually precedes genotype, reversing our usual Neo-Darwinian perspective. This is not to say that good-old-fashioned genetic selection is not a major driving force in evolution, but rather that parallel mechanisms may broaden the scope and strengthen the power of evolution to bring about novelty over time.

Following a short presentation of the Enlightenment view of human nature and the one espoused by 19th and early 20th century classical anthropology, I will offer a definition of culture which facilitates the understanding of culture-biology interactions in man. Culture will be presented, following Geertz, as a set of control mechanisms – 'programs' – for governing behavior, rather than a complex of concrete behavior patterns. The re-formulation of culture in this way has the effect of training our

focus not on universals of human behavior (and hence, human nature), but rather on the mechanisms by which the breadth and non-determinativeness of man's capabilities are canalized to his actual achievements and actions. This line of thought will lead to the conclusion that Robinson Crusoe is but a fiction.

Next, I will turn to a deconstruction of the Nature/Nurture divide. Morphological examples from nature (Himalayan rabbits, Aguti mice, Linaria flowers), will be followed by classical examples from human experience (language acquisition, musical perception, phobias). A fleetingly brief consideration of the neural system, the immune system and of moral capabilities will be used to bring home the point that to ask today whether nature or nurture is determinative of a given trait is like asking: 'do drums or drummers produce percussion sounds?'

The interesting question remains: Which biological mechanisms can explain the phenomena mentioned above, and whether there is an evolutionary model than can incorporate them. Clearly, the shift from the neo-Darwinian focus on heredity to the current development-driven, and increasing focus on a theory of form in evolution (including evolvability, epigenetics, plasticity, self-organization) will be helpful in explaining the morphological and physiological examples (the differences between the Linaria and Aguti variants, for example, are due to epigenetic imprints, not to different DNA).

More specifically, however, and with reference to behavior, I will present the modern incarnation of the Baldwin Effect (1896), Waddington's 'genetic assimilation', as a good candidate for explaining much of what is interesting in the evolution of complex behavior and cognition in humans. Waddington's experiments on flies showed how Darwinian mechanisms can produce apparently Lamarckian evolution. When faced with an environmental challenge, induced developmental changes unmask already existing genetic variation, which can then be captured by natural selection. Today we know that short term evolution needn't depend on mutation, but can lean instead on epigenetic change. The interesting thing from the point of view of evolution is that some induced epigenetic states are inherited. Heritable epigenetic variants can do a 'holding job' until the genes catch up. So epigenetic inheritance augments the probability of genetic assimilation because it maintains a new developmental pathway until it can be established more permanently by genes.

But how does this relate to the evolution of mankind?

While every one agrees that the capacity to learn has evolved genetically, the mechanism of assimilation renders learning an agent of evolutionary change, rather than merely its product. The point is that one cannot separate development and heredity (think, for example, of learning and transmitting a new song or word or idea or behavior (development and transmission go together): For this reason, one cannot separate development from evolution – Dawkins' division between 'Replicators' and 'Vehicles' breaks down. The changes induced during development, mainly through learning, play a big role in behavioral and cultural evolution.

This final consideration will lead to the notion that Culture is the bridge between man's intrinsic capacities and what he ultimately becomes. To become human means, above all else, to become an individual – and this we do by means of the cultures in which we live and develop. Man and Woman, then, should not and cannot be defined by their innate traits and abilities (Enlightenment, evolutionary psychology), nor simply by their behavior alone (Behaviorism and its current offshoots). Rather, the manner in which generic potentials are transformed into specific manifestations presents a much richer canvass for the study of humankind and its nature, while at the same time eschewing the unnecessarily simplistic, and patently wrong and harmful, traditions of biological determinism.