EVOLUTION, PSYCHOLOGY, AND CULTURE[1]

Bogdan BOGHIȚOI

ABSTRACT: My goal is to clarify the type of relations one could hope can be established between psychology and the social sciences in general, on one side, and evolutionary biology, on the other. Thus, the paper analyzes one of the most remarkable contemporary attempts to forge such ties, namely that of John Tooby and Leda Cosmides, who explore the interface between the two domains and try to articulate a research methodology aimed at their better integration. Unfortunately, as I shall try to show, the position Tooby and Cosmides advance is undermined by adaptationist assumptions they don't manage to successfully defend. In doing so, my paper picks up the threads of the current adaptationism debate and seeks to draw some of the consequences it has for psychological research. Subsequently, I will attempt to generalize the chief results of my analysis, by emphasizing a few aspects of evolutionary theory I think are key for understanding its relation with human culture. On this grounds, I will argue for a position that makes social sciences autonomous in respect to evolutionary thinking, yet preserves solid ties with evolutionary thought, securing integration with the rest of science.

KEYWORDS: intertheoretic relations, evolutionary psychology, social sciences, John Tooby, Leda Cosmides, adaptationism

Of one of the chief epistemological concerns of our time is the status of social disciplines within the wider context of science. It is a critical problem for the both sides of what has become a notoriously chronic divide. On one hand, it is a source of vexation for natural science, whose constitutive aim is to incorporate ever new territories into its domain, but encounters difficulties and even intellectual resistance when it tries to tackle whatever is touched by culture. On the other hand it is a problem for social sciences, which still have to clarify their relations with other fields of study and asses the place reserved for them in the wider edifice of human knowledge. This constitutes a persistent source of frustration for social scientists, who often see the scientific status of their disciplines questioned on various counts of disunity. Quite often, failures of social research were blamed

[1] This work was supported by the strategic grant POSDRU/89/1.5/S/62259, Project "Applied social, human and political sciences. Postdostoral training and postdoctoral fellowships in social, human and political sciences," cofinanced by the European Social Fund within the Sectorial Operational Program Human Resources Development 2007 – 2013.

by on the lack of ties with the rest of science, which deprives them of the solid grounds and the powerful principles of organization the conceptual apparatus employed the latter can provide.[2] Thus, rooting research in the principles of some discipline on the other side of divide was often seen as a way to secure for science the realm of human mind and behavior.

One of the major strategies of the last decades to bridge this gap was was to treat the human mind and behavior as shaped by natural selection, and thus attempt to ground the theories about them in one of the cornerstones of modern scientific thinking – evolutionary theory. There are notorious in this respect the efforts of sociobiology, ever since its approach entered the forefront of the intellectual debate in the mid '70s. But the appeal to Darwinian principles is much more widespread. It pops out constantly not only in endeavors such as evolutionary psychology, which although are often shy to claim their sociobiological heritage, represent clearly some of its spin-offs. Today, it is hard to find a topic in cognitive science where evolution has not been evoked and authors that have not produced, at least occasionally, their share of more or less sound Darwinian considerations. As a consequence, the clarification of the general implications of evolutionarily principles on social sciences has become a hot foundational topic in the last few decades.

No doubt, humans, with their propensities and capacities, are evolved beings. But to what extent can we exploit this idea to bridge the gap between social and natural sciences? My response comprises two parts. On one hand I will asses the hopes placed, quite commonly, on evolutionary thinking, which was more than once deemed capable to ground or guide our investigations into the mechanisms of the mind and culture. Here my argument will involve a polemic, that will run for the most part of the paper, with what is probably one of the most articulated and influential attempts to forge a set of principles and a methodology for psychology out of evolutionary considerations – namely, with the metatheoretical reflections of John Tooby and Leda Cosmides. In spite of the negative conclusions, my goal is not to isolate social sciences in an ivory tower. I am willing to accept that mental functioning and cultural phenomena are with no exception biological phenomena, and can be dealt with as a province of biology where evolutionary theory still applies. But this does not preclude the province acquiring autonomy, and abiding laws and mechanisms to be established through

[2] This is precisely the reproach voiced by the two authors I will concentrate on. See Leda Cosmides and John Tooby, "Cognitive adaptations for social exchange," *The adapted mind: Evolutionary psychology and the generation of culture*, eds. Jerome H. Barkow, Leda Cosmides, and John Tooby (New York: Oxford University Press, 1992),163-228.

a set of a self-sufficent investigations, to which the the wider science can only take notice and structure its inquiries accordingly. In this respect, at the end on the paper I shall try to build further on the results of my critique of the programme and Cosmides, and show how the social sciences integrate with evolutionary thinking.

Setting up the stage

Cosmides and Tooby reject a type of approach in the study of man, they label "the standard model of social sciences." As they present it, this model is characterized by the reliance on cultural and group practices, learned through socialization. From such a standpoint, "the features of a particular culture are the result of emergent group-level processes, whose determinants arise at the group level and whose outcome is not given specific shape or content by human biology, human nature, or any inherited psychological design. These emergent processes, operating at the sociocultural level, are the ultimate generator of the significant organization, both mental and social, that is found in human affairs."[3] Tooby and Cosmides accuse this stance of leading to stagnation, by discouraging the investigation of the "epistemological links" with the rest of science, and asserting a false idea of autonomy for their discilplines, blinding them to the role of evolution in structuring cognition.[4]

The above description seems hardly applicable to the mainstream scholars, as it was manifestly intended, to be called "standard model." We would be hard pressed to find even amongst the fiercest social constructionists one that would deny, for instance, the contribution of our organs of vision, as they happen to be shaped, to our color discriminating behavior just because the color-concepts are highly culture-dependent. Of course, scholars are not immune to preposterous presuppositions, which might sometimes inadvertently creep into their theories. But in order for the description to be adequate, the bulk of the scientists should accept at least tacitly, if not explicitly, the tenets Tooby and Cosmides decry. Yet no serious scientists would attempt to hypothesize for instance that humans might discriminate, if appropriately molded by their respective culture, into the UV spectrum, like bees. The set of presuppositions they entertain seems different for most of them, and that shows in what they consider to be meaningful inquiry. Somehow they tacitly, and, if questioned, explicitly assent to the idea that our peculiar biological being provides us with determinate capacities, and structure their research accordingly. That is why we don't see many studies into how

[3] Cosmides and Tooby, "Cognitive adaptations", 32.

[4] Cosmides and Tooby, "Cognitive adaptations", 23.

humans see in the UV spectrum. It is this body of shared tacit assumptions and methods that gives the content of scientific paradigms, more than polemical philosophical stands about what are otherwise core tennets of modern science – namely that our body conditions the mind. Of course, there are wide variations and bitter disputes about whereto nurture might extend and where nature reigns supreme, but only few would adhere to the extreme position that denies the latter all role, and that only when the authors are philosophizing and not effectively doing science. There is also no denial that quite a few would try to show that the contribution of nature has been overestimated and many or important traits we historically considered part of our biological dispositions are actually cultural artifacts. But that should not make us think that a corresponding number of scientists deny our biological makeup all role. Modern materialism at the core of normal science rejects the idea that our physical makeup is irrelevant to the mind and the ensuing behavior and, anyway, peculiar research programmes aimed at demonstrating the cultural origins of a peculiar behavioral disposition do not need to assume that all such behavior are sheer cultural products, but only some.

Whatever its historical implausibility, I am not interested in further analysing this denial of the role of human nature precisely because such a position has big troubles coping with ideas at the core of modern materialistic understanding of the world. Whether the adversary Tooby and Cosmides fight against is a straw man or not is secondary to me. I intend to keep my inquiry epistemological. From the standpoint of ideas, the view Tooby and Cosmides decry is actually a compound of two possible positions, not sufficiently distinguished. First, there is the radical denial of any role of our bodily nature in shaping the mind I have mentioned in the paragraph above. The second idea is that the study of socio-cultural factors can be carried out autonomously with respect to evolutionary biology. In this sense, one does not need to consider how, for instance, vision evolved in order to clarify how it is employed in socio-cultural contexts. That would not mean that "the inherited psychological design" is denied any causal role here, as the first position effectively holds. It means just that the question of what is evolved trait and how it evolved is inessential for for psychological or sociological inquiries, though of course we can retrace the evolutionary history of our innate capacities. Little by little, I shall show how this possibility can be given specific content.

As a successor for the "standard" approach, Tooby and Cosmides propose an "Integrated Causal Model" for social sciences, which no longer offers free hand to socio-cultural factors. According to their approach, the human mind is composed of a number information-processing mechanisms, put together through natural

selection that have the mission to solve the challenges thrown at our ancestors by the Pleistocene environmental conditions. In order to gain an insight into the inner workings of the mind, scientists should start by investigating what adaptive ends the mind serves, that is its functions, and then reverse engineer it, by establishing what structure enables it to perform those functions. This approach promotes a model of the mind which sees the psyche as a collection of punctual solutions or, more concretely, domain specific modules, put together by natural selection to meet peculiar challenges.

The method Tooby and Cosmides prescribe involves a few steps.[5] First, researchers are asked to determine, in so far as possible, what recurrent problems our ancestors faced and the informational resources they could employ to solve them. "Such features and relationships constitute the only environmental information available to whatever cognitive program evolved to solve the adaptive problem. The structure of the cognitive program must be such that it can guide behavior along adaptive paths given only the information available to it in these Pleistocene conditions."[6] This offers a set of constrains that any hypothesis about the structure of the above programs must comply with. We are thus provided with a heuristics that helps us generate hypothesis about the specific algorithms animating psychological mechanisms that must exist in order to address the problems environment threw at our ancestors. Finally, the proposed hypotheses about such the computational structure of such programs should be tested against patterns of current behavior.

In so doing, the method of evolutionary psychology brings with it a few conceptual tools it hopes it could extend the use to the mental domain. Thus, it employs a concept of function life sciences use and relates it in a specific way to what cognitive scientists name 'functional description' of a psychological mechanism. According to evolutionary biology the application of the concept of function must be reserved to the processes promoting fitness.[7] To gain in rigor, we should leave aside lay uses of the term, like those making it designate something contributing to the attainment of one's goals or to making a valid inference, for instance. Instead, we should take up the notion of function employed by

---

[5] John Tooby and Leda Cosmides, "Evolutionary Psychology and the Generation of Culture, Part I. Theoretical Considerations," *Ethology and Sociobiology* 10 (1989): 40-41.

[6] Tooby and Cosmides, "Evolutionary Psychology I," 41.

[7] Tooby and Cosmides, "Evolutionary Psychology I"; John Tooby and Leda Cosmides "The Psychological Foundations of Culture," in *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*, 19-136; Leda Cosmides and John Tooby "Mapping the Evolved Functional Organization of Mind and Brain," in *The Cognitive Neurosciences*, ed. Michael S. Gazzaniga (Cambridge: MIT Press, 1995),1185-1197.

evolutionary biology, where "it refers solely to how systematically caused its own propagation in ancestral environments."[8]

It is the identification of biological functions that helps individuate the psychological structures to be further analyzed in order to establish how they work. The only proper object for scientific study when it comes to functional architecture are the ones validated by this biological standard for functionality.[9] After all, "adaptive organization is the only kind of functional organization that is there to be found,"[10] as the evolutionary processes are the sole capable of coming up with complex structures. Thus "modem evolutionary biology constitutes, in effect, a foundational 'organism design theory' whose principles can be used to fit together research findings into coherent models of specific cognitive and neural mechanisms."[11]

As I already stated, I am not going to deny that nature informs our psychology and culture. For someone who accepts Darwinism, it is quite trivially true that evolution structures cognitive mechanisms and ultimately cultural behavior. What I shall attempt to show next is something different, namely that the outlook and subsequently, the method proposed by Tooby and Cosmides are a bad guide to human nature and ultimately misrepresent evolutionary theory.

Function and functionalism

I would like to start my argument by emphasizing a conceptual distinction. It is that between the term 'function,' as it is used in evolutionary biology, and what is properly called 'functional role' (sometimes too informally called 'function' of a opinion, intention and so on). They should be clearly set apart, as the notion of 'functional role' has a much broader scope. The functional role is defined with reference strictly to the causes and effects of the states fulfilling that role. But such a state, defined by its functional role, might have recurrent maladaptive effects or effects that are irrelevant to fitness. Think here of certain representations in a population, like the belief that killing witches can eradicate epidemics, expecting a concurrent clan not to attack when it is actually preparing for war, or of whatever opinion was deleterious to us or our Pleistocene ancestors.[12] Such states have a

[8] Tooby and Cosmides, "Mapping," 1187.

[9] Tooby and Cosmides, "Mapping," 1187.

[10] Tooby and Cosmides, "Mapping," 1188.

[11] Tooby and Cosmides, "Mapping," 1186.

[12] We can be pretty sure our ancestors had such beliefs. After all, all organisms have mental states that impact negatively on survival, from the fish that mistakes the bait for an insect, to

clear functional role, that is such states are caused by certain events and elicit certain behaviors. But they might have no adaptive function.

This mismatch makes the perspective professed by Tooby and Cosmides and the conceptual apparatus it employs too restrictive for science, even for evolutionary biology. One reason is that the chief interests of cognitive scientists lies precisely in the cognitive role, in the sheer causes and effects of specific psychological structures, even of those that, when evaluated from an evolutionary standpoint, must be considered as having no adaptive virtues or even being maladaptive for our ancestors. Understanding how mind works is one thing, while understanding how well it works is quite another. The roles of clearly dysfunctional states of mind even constitute some of the chief points of interest for various branches of applied and clinical research. For instance the causes and effects of the different classes of psychotic thoughts, drug produced hallucinations or injury induced dysfunctional states, for which we would hard pressed to find adaptive virtues, have always been one of the chief interests of psychiatry. For instance the phenomenon of command hallucinations, urging people to harm themselves or those around them is hardly adaptive, even for Pleistocene conditions. Of course, some of the states we currently consider as mere pathological dysfunctions could turn to be adaptations. For instance, depression might have been a selected feature.[13] As a matter of fact, nosographically isolable deviations from the regular functioning of the mind, or to be precise, pathological states possessing a specifiable set of causes and effects are bound to appear and interfere with the workings of the mind, as designed by evolution. Malfunction is something that just happens, often in a from that does not vary from individual to individual.[14] Sticking to adaptive mental processes and states would discard many respectable and valuable areas of scientific research, like mental health, robbing them of essential parts of their conceptual apparatus.

More generally, taking adaptedness as a criteria for genuine biological kinds, physical or psychological, creates at least two difficulties. First it excludes biological phenomena like diseases and recurrent malfunctions from the realm of science. Thus perfectly respectable medical statements such as "Aneurysms increase the risk of hemorrhage" would suddenly be banned from scientific publications, because an aneurysm is a structure which is deeply maladaptive, and

---

modern humans falsely believing, like the Chinese alchemists did, that ingesting mercury salts prolongs life.

[13] P.W. Andrews and J.A. Thomson Jr, "The Bright Side of Being Blue: Depression as an Adaptation for Analyzing Complex Problems," *Psychological Review* 116 (2009): 620-654.

[14] Or even presumably between species, allowing for animal models of human mental diseases

therefore, it cannot be a genuine biological structure. Secondly this stance creates problems even within evolutionary thinking. After all, it is not only physicians that are interested in maladaptive structures. Failure to adapt and biological configurations that are ill-suited for survival are part and parcel of evolutionary theorizing, without which we cannot understand natural selection. Working with such structures is required in order to explain, for instance, why certain individuals or populations died out. Therefore being an a function-performing adaptation is not a necessary condition for being a scientifically respectable biological structure, physical or psychological.

Adaptionism and antiadaptionisms: picking up the threads

But the most discussed problem any form of adaptionism faces is that of unselected features which might creep into the design of living beings. There are many factors that have been mentioned as non-selected features. For instance, there is the issue of exaptations of and spandrels. Then, there is sheer chance, which might for instance produce of fail to produce a mutation at the origin of a phenotypic trait. Tooby and Cosmides are of course well aware of such phenomena, but often they fail address the counterarguments these phenomena generate.

The spandrel problem was notoriously pushed forward by Gould and Lewontin in their *The spandrels of San Marco and the Panglossian paradigm: a critique of the adaptationist programme*,[15] and often voiced specifically against evolutionary psychology in its later writings by Stephen J. Gould.[16] The term 'spandrel' is of an obvious architectural extraction. In its original usage, it designates a certain empty space created by adjoining an arch to the straight boundary of another architectural structure. This creates a feature unintended by the architect, who deliberately designed only the architectural structures bordering the spandrel. Traits the evolution has created for their adaptive value might have the same 'unintended,' or, to be precise, unselected features. Think for instance of the color of the bones, to take an often quoted example. They are white because of the peculiar mineral composition of the bones, which was undoubtedly selected by the evolution. But whiteness itself wasn't selected. Bone color contributes nothing to overall fitness, and as such is an unselected feature of

[15] S. J. Gould and R. C. Lewontin, "The Spandrels of San Marco and the Panglossian Paradigm: A Critique of the Adaptationist Programme," in *Proceedings of the Royal Society of London. Series B, Biological Sciences*, 205, 1161 (1979): 581-598.

[16] Stephen Jay Gould and Elizabeth S. Vrba, "Exaptation–A Missing Term in the Science of Form," *Paleobiology* 8, 1 (1982): 4-15.

the animal organism. Similarly, many features of our psyche could be such side effects, not selected by any adaptive process.

Of course, Tooby and Cosmides are not naive to such difficulties. They address both lines of attack. First they eagerly point at the differences that, allegedly, exist between features that are due to chance and those that are the outcome of natural selection. Thus, they hold that chance is incapable of creating the complexities of human architecture. They argue that "social scientists should be extremely uneasy about positing an improbably complex structure in the system with the capacity to serve nonbiological functional ends, unless that capacity is a by-product of functionality that evolved to serve adaptive ends. Selection builds adaptive functional organization; chance almost never builds complex functional organization."[17] That is, whiteness might be a spandrel caused by the composition of the bones, but we won't get anything more complex than that.

But the argument is faulty. Of course, all complexity is the outcome of an evolutionary process. This is one of the chief theoretical conquests of Darwinism, but invoking this basic truth is of no real help here. This is because it doesn't mean that all complex arrangements were *selected*. We should make a clear distinction between what was *selected* and what *evolved*. Thus, any accumulation of features – be they, selected features, spandrels or mere accidents – would create a complex structure, that of course has an evolutionary history behind, but which might not be selected as such.

Think for instance of a human face, hand or of many other anatomical features. It is unlikely that their outer shape was selected, though some of their features of course were. For instance a certain configuration of the eyebrows is necessary for preventing sweat to trickle into the eyes. But a large part of the facial traits is the consequence of the internal skeletal, muscular or sensory structures. This means that a large number of features were not selected as such, because they are mere spandrels springing from the internal structures. We should also add to the mix whatever trait resulted from random genetic effects. Some of them are not universal, like peculiar traits that run in families due to random genetic accidents in their history. But many could have spread in an entire population through to genetic drift. Of course, science is far from sorting out which is which. Nevertheless, the occurrence of each type of process is a common event in the evolutionary history, so most likely we will have all in the mix.

This piling up of features resulting from genetic accidents, of spandrels and selected features is capable of creating complex structures. Faces and hands have a

[17] Tooby and Cosmides, "The Psychological Foundations," 110.

complex shape, that usually requires years in art school for someone to be able to reproduce in clay or draw. Thus, the argument out of complexity is not conclusive.

One might object that there is a difference between piling up various items and a coherent structure, whose internal proprieties provide it a role in the life of a species. But faces are not amorphous, in the sense that their structure is psychologically, and implicitly biologically relevant. For instance, their internal arrangement is decisive for them being recognized. The human brain even possesses well-defined structures for such a task, that for obvious reasons came to be called "the fusiform face area."[18] Thus, faces get to have an important role important consequences in the life of humans, from triggering specialized recognition mechanisms to eliciting more subtle, culturally charged reactions.

Let us remark here that the argument turns not on the possibility of randomly creating complex functional systems in the biological world. After all, given enough time such unlikely events are bound to happen. It is rather about what is a steady process in the course of evolution and what is the improbable exception. But that won't help at all the argument of Tooby and Cosmides either. First, such combinations that have gained a biological function turn out regularly. The example of the human face is not an unique in the history of evolution and similar cases pop up on many other phylogenetic branches, which shows it to be a regular phenomenon, not a chance event occurring in of one line of evolution or, at best, in a handful of them. For instance the entire body shape, sculpted by the same categories of factors, acquires a role in parent recognition for many species. Of course, there are species who have developed explicit cues for that task, such as the herring gull, which evolved a special red patch on the bill, so that it could be recognized by its chicks.[19] But the display of such selected manifest recognition cues is hardly the rule in the animal kingdom. The living world is split into two numerically consistent groups with regard to recognition strategies. Many animals do not employ such visible outer signs. For some, even any randomly shaped middle-size object would actually do. Lorentz showed that, for the youngsters of many species, the cues are provided through filial imprinting at an early age, and are not specially selected visible structures.[20] Thus, chicks will imprint any conspicuous moving object of the right size they are in contact at a critical age, regardless of the shape. They could come to take as their mother members of other

[18] J. Sergent, S. Ohta, and B. MacDonald, "Functional Neuroanatomy of Face and Object Processing. A Positron Emission Tomography Study," *Brain* 115 (1992): 15–36.

[19] N. Tinbergen and A.C. Perdeck, "On the Stimulus Situation Releasing the Begging Response in the Newly Hatched Herring Gull Chick (*Larus argentatus argentatus* Pont)," *Behaviour* 3 (1950): 1-38.

[20] Konrad Lorenz, "The Companion in the Bird's World," *Auk* 54 (1937): 245–273.

species or even inanimate objects, such as researcher's boots and even a celluloid ball. This demonstrates that for such species there is no specially evolved outer structure on which recognition would depend. Whatever form they happen to encounter at a critical age might be adopted. In the wild such a role must be assumed buy the accretion of features, of which many are unselected, that forms the outer bodily shape of their parents .

Therefore, such biological structures might come to play a biological role in many other lineages. The examples could continue indefinitely. The bodily shape of a carnivore might make pray or competing predators flee. Its scent – which is the result of a mix of selected pheromones, of components that were not selected for their odor, like disassimilation products, and whatever genetic accidents might throw in the mix – assumes a host of roles, from marking territory to signaling the presence of a possible mate. Such assemblages are recurrent in many disparate phylogenetic lines. We are not dealing here with a chance event that we could discount, as we would do with the possibility of a monkey typing a Shakespeare play, when studying primate cognition. These are forces steadily operating in all organisms, and frequently coalescing to form structures significant for many species.

There is also a second counterargument Tooby and Cosmides construct in response to the idea that many of our psychological features might be unselected. It addresses specifically the problem of spandrels. Thus, Tooby and Cosmides contend that any attempt to explain spandrel-driven behavior must ultimately resolve into an evolutionary story of how such side-effects appeared. They hold that "the explanation for any specific concomitant or spandrel consists in the identification of the adaptation or adaptations to which it is coupled, together with the reason why it is coupled."[21] For instance, the color of bones is an inevitable consequence their composition. As such, their whiteness could be given an evolutionary explanation, by pointing at the past processes that that made bones contain certain minerals and the reasons why such a composition colors them white (i.e. mentioning the optical proprieties of certain substances). Therefore, adaptionism can explain away spandrels. They no longer pose a problem to those assuming that biological structures must be shaped uniquely by natural selections, as such by-product structures can be shown once again to be the sheer outcomes of an adaptive processes.

But if we are to be precise, such explanation can be constructed only if evolutionary theory is supplemented with one or more truths extraneous it. They can be provided by other sciences, such as chemistry or physics, as are those about

[21] Tooby and Cosmides, "The Psychological Foundations," 63.

the optical proprieties of calcium compounds. Or, in order to explain the coupling, the additional statements might describe contingent facts, which allows randomness to creep in again. For instance hydrangeas have developed the capacity for the hyperaccumulation of aluminum. This ability is routinely explained as an adaptation, whenever the soil releases large quantities of that substance, in occurrence aluminum. One side effect of the high aluminum levels in the organism is that, by interfering with the chemistry of certain pigments, it alters the color of the flowers. Thus, in acidic soils, which favor aluminum absorption, the flowers will be blue. But if grown in non-acidic soil, which lowers the quantity of absorbed aluminum, the flowers turn pink or cream colored.[22] Flower color is a spandrel. It is the accompanying effect of the selected capacity to accumulate aluminum. But in order to explain the flower color of a population, or the variation of color within the members of the entire species the population belongs to, we must call in an accidental factor – the peculiar environmental conditions the plants just happens to live in, or, in the latter case, to point at the contingent, historical fact that the species managed to colonize or was cultivated in soils with a lower pH than those presumably put a selective pressure on it Only by invoking such fortuitous factors we can link plant color to evolutionary history and selection, and see how one leads to another. Color is not the effect of adaptation, not even its automatic side effect. There is more to the story than evolution. Biological features are structured by many more factors, from stable laws of nature to sheer environmental contingencies.

From environmental conditions to mental structures: adaptationism as method

Some adaptationists decided to bite the bullet and accept that non-selected components are effectively part of our psychological makeup. They came to see the idea that psychological traits are adaptations as a mere methodological presupposition we need to embrace provisionally, in order to further the evolutionary investigation of our mind. Of course, reply the partisans of this stance, not all features are selected. But if we are going to apply Darwinism, they contend, whenever we are dealing with a biological trait, we need to start by supposing that the feature under consideration is selected, so that we could construct a theory accounting for its evolution, a theory which of course, could later be falsified.[23] Or to put it as Dennett does, "it is never a mistake to ask the

[22] P. B. Larsen, "Unraveling the Mechanisms Underlying Aluminum-Dependent Root Growth Inhibition in Genes for Plant Abiotic Stress," in *Genes for Plant Abiotic Stress*, eds. Matthew A. Jenks and Andrew J. Wood (Wiley-Blackwell, 2009).

[23] Cf. John Alcock, *The Triumph of Sociobiology* (Oxford: Oxford University Press, 2009).

adaptationist's 'why' question, even when the true answer is that there is no reason."[24]

I actually have no reticence to accept that provisionally assuming adaptation, as an essential part of the construction of a larger scientific hypothesis, might yield good method whenever we know what the features characterizing a species are and, subsequently, we are seeking to establish how they appeared. But vice-versa, by assuming that there was an adaptive process in order to determine the structures of the mind, we are stepping on shaky grounds. Given our task, we shall see whether presupposing that an adaptation has taken place yields a good methodology for evolutionary psychology. Unfortunately, it doesn't, at least if we see the the method of evolutionary psychology the way Tooby and Cosmides do.

As described above, the method proposed by Tooby and Cosmides requires us to figure out ancestral environments and assume there was of an adaptive process resulting in a psychological mechanism, whose computational structure should be then deciphered. But this it is a very unreliable guide for singling out specific psychological structures and assigning them biological functions and internal architecture. Such a method for mapping the structures of the mind and brain is undermined by several factual and epistemological problems.

First of all, the picture of the human psychological evolution Tooby and Cosmides work with – one of specific environmental conditions creating specific psychological adaptations – is at least disputed if not empirically mistaken. For instance Potts[25] argues, based on a solid geological record, that the specific traits of humans took shape in an era of increased environmental variability. This determined the replacement of environment-specific adaptations with mechanisms capable to deal with the inconsistent environmental conditions. This leads him, contra Tooby and Cosmides, to assert that it "is patently incorrect to characterize the human ancestral environment as a set of specific repetitive elements, statistical regularities, or uniform problems which the cognitive mechanisms unique to humans are designed to solve. This portrait of the Pleistocene environment should be discarded and with it the view that the human mind is composed mainly of innate special purpose devices or algorithms tied to a particular array of past adaptive possibilities."[26] According to Potts, nature seems to have favored more flexible mechanisms, capable of yielding adaptive behavioral

[24] Daniel Dennett, *Darwin's Dangerous Idea* (New York: Simon & Schuster, 1995), 276.

[25] Richard Potts "Environmental Hypotheses of Hominid Evolution," *Yearbook Of Physical Anthropology* 41(1998): 93–136; Richard Potts, "Variability Selection in Hominid Evolution," *Evoutionary Anthropollogy* 7(1998): 81–96.

[26] Potts, "Environmental Hypotheses."

responses in a broader spectrum of situations. Therefore the picture of the evolution that portrays psychological mechanisms as adaptations to specific environmental conditions rests on disputed premises.

Moreover, besides the fact that the argument is based on questionable assumptions about the Pleistocene environment, the conclusions drawn by Tooby and Cosmides simply do not follow.[27] Even if we disregard the empirical data and assume that humans evolved in relatively stable environments, we cannot anticipate whether the psyche will contain adaptations specific to a peculiar class of problems. One reason is that, we cannot tell, based on environmental or comparative data whether a certain psychological adaptation has effectively evolved at all. Thus, an adaptation to a specific challenge might never appear at all, even in populations that manage to survive and reproduce. There are quite a few alternative scenarios to that of environmental pressure generating a matching adaptation. First, the lack of a specific adaptation in a certain respect might be compensated by other very successful phenotypic traits. Prairie grasses, unlike thorny shrubs or the plants that accumulate nasty tasting substances in their leaves, have no way of avoiding being eaten by grazing animals. Their success is ensured by other means, such as high fecundity and the ease of spreading, which compensates for their vulnerability. Thus, one cannot infer that certain specific adaptation has taken place – for instance avoiding being eaten by grazing animals – even when we can identify a clear selective pressure in that direction. This applies to the psychological adaptations too. For instance our ability to cooperate helped us in many tasks – for instance hunting – for which other species developed specific cognitive adaptations – like better sensory discrimination, helping them to better spot pray in dense vegetation. Though fitness might be increased by a certain adaptation, species might do without it, just because they present other overwhelmingly advantageous features. It would have been nice to spot game faster, but we managed to overcome our mediocre visual processing by organizing battues with the other members of the group, thus relying on our social

[27] Some critics of evolutionary psychology also objected that the paucity of raw data about the environments of our ancestors, precludes us from drawing any conclusions with regard to our psychological adaptations (Cf. Robert Richardson, *Evolutionary Psychology as Maladapted Psychology* (Cambridge: MIT Press, 2007)). This might be true, but it cannot be a fundamental objection. The accumulation of paleontological data might solve many of our problems here, in the same manner many other scientific enigmas in all areas of research were answered by newer and richer data. What we hold is more radical, namely that even if we knew perfectly well the environment and the populations that were the basis of selection, strictly speaking, we would be able to conclude nothing about the adaptations a certain species has accumulated.

abilities. Secondly, even where an adaptation does effectively appear, there is the often emphasized possibility that its propagation in a population might be stopped in its tracks by unfortunate events, eradicated the eruption of a volcano or epidemics wiping out the small population where the adaptive structure first makes its way into the world. Thirdly, even if we knew that a certain biological function is effectively performed, there is no guarantee that it is performed by a psychological mechanism. Take for instance protection from the harmful effects of UV. It can be obtained through a psychological mechanism that makes the individual move into the shade when insolation is at its peak, or through a purely biochemical mechanism, like secreting melanin into the skin. Again, we cannot infer the existence of a psychological mechanism. These situations do not in any way pretend to exhaust the possible range of scenarios where a certain psychological adaptation, though extremely useful, did not effectively arise. As a matter of fact, we will point to yet another important scenario at the end of our paper. What they are meant to emphasize is how many alternatives there are to a psychological adaptation, showing it to be far from the mandatory effect of a certain environmental pressure.

Unfortunately, the whole methodology Tooby and Cosmides recommend involves the assumption that there must be a program put together by evolution, whatever might be its algorithms, whose purpose is to address the problems the Pleistocene environment threw at us with the resources our ancestors had at their disposal.[28] There is nothing that guarantees us that the problem has been addressed through psychological mechanisms, to which subsequently we should unravel the inner structure and then test our hypothesis about the algorithms composing it against the patterns of contemporary behavior. Methodologically, presupposing the existence of a psychological structure for each problem the environment creates is a bad move: if we aren't guaranteed that a psychological adaptation evolved effectively, the method Tooby and Cosmides endorse will be necessarily unreliable, misleading us into following false tracks when applied consistently.

But even in the scenarios where it is true that pressure leads to some form of psychological adaptation, that fact would be of no use in guiding us through the meanders of our psyche. The method Tooby and Cosmides propose has trouble individuating the modules or structures we might posses. The reason is that often evolution chooses to go for multipurpose mechanisms. One reason is that developing an organ, be it mental or physical, for each challenge a population encounters might prove extremely costly from a metabolic standpoint. There are a

[28] Cf. Tooby and Cosmides, “Evolutionary Psychology I,” 40-41.

few viable alternatives here. One of them is a domain nonspecific structure, that solves a broader range of tasks than those required by adapting to a peculiar set of circumstances. Another option, which Gould has already emphasized,[29] consists in redeploying a structure that already exists and is employed for different tasks, but which can take up a new job, that is through exaptation. Exaptations and newly created multiple purpose mechanisms might yield mediocre results, compared to a dedicated module. Nevertheless they get the job done, enabling the organism to survive in a set environment.

Both possible evolutionary outcomes imply that we cannot hold that specifiable persistent conditions in our ancestral environment require dedicated modules. Consequently, we cannot conclude from data about a peculiar environmental pressure to the existence of a mental organ performing a determinate set of functions, and whose inner workings could presumably be further investigated by cognitive science or psychology, once isolated. In other words, we cannot identify the specific structures of the mind based upon environmental conditions. Concretely, evolutionary considerations cannot tell us how many modules or distinct structures there are, designed to cope with environmental problems, or even what is the distribution among them of the psychological functions that the mind, globally, fulfills. Once we have multipurpose devices, the whole approach Tooby and Cosmides try to construct collapses. The method Tooby and Cosmides propose is incapable to come up with a set of devices and their functions, which is a mandatory step for them to be "reverse engineered." We are in the dark to how to carve the mind into meaningful units and establish what each is for, in order to subsequently expose its inner workings, that is the algorithms they run.

Thus, the method proposed by Tooby and Cosmides fails in one of its intermediary aims, which is to individuate the structures of the mind, as a prelude for the decipherment of their computational structures. This makes the method they advance an ineffective guide to what is in our heads, as evolutionarily speaking the researcher is confronted with a variety of alternatives Applied faithfully, it would take us astray.

[29] Gould and Vrba, "Exaptation."

No royal way to the mind

So what could be the contribution of identifying the peculiar selective pressures to building hypotheses about our mind or linking psychology with the rest of science? Of course, heuristically speaking, knowing the environmental circumstances in which certain species evolved often suggests reasonable psychological hypotheses. But merely suggesting is a very unremarkable feat. The condition of suggesting scientific hypotheses can be very easily satisfied, even by the casual observation of banal everyday things. It too could suggest highly plausible or significant ideas to scientists, but that does not recommend it as a method of choice for science.

On the other hand, the capacity of evolutionary thinking to suggest psychological hypotheses makes no difference with regard to the efficacy of the thus generated research programs in forging links with the rest of science or in elucidating the mental mechanisms, compared to any other discipline that has something to do with human behavior. Things might have been different had it been shown that the generation of evolutionary psychological hypotheses were based on peculiarly strong constraints between theories. As a matter of fact, many other disciplines suggest hypotheses about the specific mechanisms of the human mind. For instance so does economics, when studying investor or consumer behavior. The kinematics of a ball thrown by a sportsman say a lot about his motor control mechanisms. But inspiring psychological hypotheses doesn't grant these disciplines, ranging from social sciences to Newtonian mechanics, a privileged position with regard to deciphering the human psyche or linking it with the rest of science. So far it looks that all these disciplines stand on equal footing, or at least no grounds for thinking otherwise were provided.[30]

There also is no denial that sometimes, due to shared cognitivist and (post)sociobiological influences or even to an explicit allegiance to a methodology, those seeking to apply evolutionary theory to mind and behavior might follow, to a certain point, the path of reasoning described by the method of Tooby and Cosmides. Generally speaking, the results that are still in wait of a definitive assessment.[31] The jury is still out to what will be the future of current attempts to

[30] Also, leaving aside suggesting hypotheses, stratigraphical or paleontological hard data and hypotheses might offer corroboration for psychological theories, but that is nothing special either. In fact any data, economic statistics, ball trajectories, PET scans, and whatever we might reasonably infer from them might do so.

[31] Tooby and Cosmides offer an example of such an application in their more applied work on the psychological mechanisms underpinning social exchange (see Leda Cosmides and John Tooby, "Evolutionary Psychology and the Generation of Culture, Part II. Case Study: A

ally evolutionary biology with disciplines dealing with mind and behavior.[32] Nevertheless, we are perfectly disposed to concede that such inquiries might get it right and come up with true theories. After all, it is as certain as it can be that our minds do contain adapted structures, and some of them might very well be single-purpose modules. Supposing that there is a module for x when such a module truly exists yields true theory. The work of many researchers is thus likely be confirmed by the future science. Other factors might contribute too to the success of their endeavors. The long familiarity of the experienced scholar with a research domain that makes her better at spotting patterns, in occurrence patterns of behavior and evolution, turns their hypotheses into more than mere shots in the dark. General scientific practices, not specific to the inquiries into behavior or evolution, applied skillfully might play their part too. But this are factors independent of the Tooby and Cosmides rulebook advance, sometimes offering guidance where otherwise there is none. They are capable to improve the efficacy of scientific inquiries, whatever the specific paths of discovery followed in a peculiar domain and whatever the domain. But applying consistently the method constructed by Tooby and Cosmides is might create confusion and, moreover, make us miss systematically what is not domain specific and is not selected.

The relations between evolutionary thinking and psychology: an assessment

Tooby and Cosmides' adaptionism is in trouble, and it cannot solve its problems even after a second round of arguments. But what is the relationship between evolutionary thinking and psychology? Strictly speaking, psychological research can dispense entirely with identifying adaptations. Evolutionary considerations will make no difference, because, as we have seen, strictly speaking they say nothing about how mind is organized and cannnot constrain the hypotheses one can advance. They imply nothing about what distinct structures the mind possess and what they're for, that is, they constrain in no way the type of hypothesis we can make.

Computational Theory of Social Exchange," *Ethology and Sociobiology* 10 (1989): 51-97), if we are to look for an example of consistent and orthodox application of their method.

[32] As a matter of fact the bold entry of Darwinism into this new arena stirred quite a bit of controversy with regard to their rigorousness of the results, regardless of the peculiar school of thought that produced them, be it the older sociobiology or the more modern evolutionary psychology; see Philip Kitcher, *Vaulting Ambition: Sociobiology and the Quest for Human Nature* (Cambridge: MIT Press, 1985) and David J. Buller, *Adapting Minds. Evolutionary Psychology and the Persistent Quest for Human Nature* (Cambridge: MIT Press, 2005).

On the other side, psychological inquiry of the regular, non-evolutionary sort is required for verifying all theory about the evolutionary processes that led to current psychological structures. This is even the final step in the methodology Tooby and Cosmides endorse, as it demands that the final hypothesis abut the mechanisms and their functioning must be checked against the current patterns of behavior (see above). Such a relation completes the conditions for an actual reversal of the roles. While evolutionary theory has nothing constraining (or peculiarly interesting compared with any other science) to say with regard to our psychological structures, the data of psychology (and of anthropology, sociology or economics for that matter) provide mandatory information about our patterns of behavior and establishing these patterns has to be done with the methods of psychology, anthropology and so on. This makes those types of investigations the ultimate arbiter with regard to the existence of a certain mechanism and the way it functions. Thus, on one hand, regular psychology and cognitive science are ultimately unconstrained by evolutionary theory, and, on the other hand, evolutionary theorizing must acknowledge its dependence of the regular psychological or cognitive theories.

Nature and culture – a wider stance

After dealing with the the detail problems of the method, I would like to turn to an ensemble view of the kind of endeavor Tooby and Cosmides advocate, as a final step towards elucidating the place of cultural behavior in the architecture of nature. From this broader standpoint, the whole adaptionist programme of Tooby and Cosmides seems to rest on the following picture of the relationship between the organisms and their environment:

> Organisms transact the business of propagation in specific environments, and the persistent characteristics of those environments determine the dangers, opportunities, and elements the organism has to use and to cope with in its process of propagation. Consequently, the structure of the environment causes corresponding adaptive organization to accumulate in the design of the organism (....) This functional organization in the organism - its set of adaptationsis designed to exploit the enduring properties of the environment in which it evolved (...) and to solve the recurring problems posed by that environment. Adaptations evolve so that they mesh with the recurring structural features of the environment in such a way that reproduction is promoted in the organism or its kin. Like a key in a lock, adaptations and particular features of the world fit together tightly, to promote functional ends.[33]

[33] Tooby and Cosmides, "The Psychological Foundations," 69.

Unfortunately, this turns out to be an one-sided view of what actually happens. Adaptation is bidirectional. It does not consist solely in a continuous shaping of the internal structures, but also in modifying the environment, making it fit the needs of the organism. As it has been already emphasized, organisms actively construct their niches.[34] For instance, by damming rivers, beavers alter the environment they will live in. Deciduous trees change soil composition to one that better suits their needs. Generally speaking, adaptation is not achieved solely trough modifications of the inner mechanisms. Sometimes adaptation is achieved by changing the external environment. Yes, the adapted populations and their environment fit like a key and lock. Nevertheless, the match may be achieved not by key cutting, but by adjusting the lock so that it would fit a preexisting key, or by adjusting both the key and the lock.[35]

This has two consequences. One is of fairly obvious import for rejecting the general picture Tooby and Cosmides embrace and the methodology it underpins. Developing cultural behaviors mitigates the problems created by peculiar environmental conditions, by altering them. There was no need to develop a dedicated psychological module that would make us survive arctic weather. We invented instead sewing and the appropriate clothing, as well as ways to build shelters, which allowed us to control the microclimate surrounding our bodies. Instead of developing mental or physical organs for finding food we created the agricultural practices that have overpopulated our environment with useful species. Of course, it is still unclear what was the range of techniques our ancestors mastered, but the point is that they did use tools. We, as well as our Pleistocene ancestors, created handy environmental items and the associated procedures to manipulate them, thus managing to reduce the environmental pressures, which might have otherwise led to psychological and physiological adaptations. Internal changes can be replaced by a modification of the environment, once the appropriate technique is devised.[36] Whenever there is

[34] See Richard Lewontin, "Adaptation," *Scientific American* 239 (1978): 156-69 and also his "Gene, Organism, and Environment," in *Evolution. From Molecules to Men*, ed. D.S. Bendall (Cambridge: Cambridge University Press, 1983), 273–285.

[35] It is at least plausible that some of this 'niche construction' might have fed back into our genetics, as some argue, leading to a process of gene-culture coevolution; see F. J. Odling-Smee, K.N. Laland, and M.W. Feldman, "Niche Construction and Gene-Culture Co-Evolution: An Evolutionary Basis for the Human Sciences," in *Perspectives in Ethology* Vol. 13, eds. Peter H. Klopfer and Nicholas S. Thompson (New York: Plenum, 2000), 89–111.

[36] Of course, tool use might have induced psychological adaptations. But the important thing here is that this is not always the case. For instance metalworking or agriculture is unlikely to have fed back into the mechanisms of our psyche. It might not be required.

cultural innovation, psychological adaptation becomes optional. Such a view brings into discussion one more possibility to construct evolutionary accounts of culture. It is the approach complementing the method of Tooby and Cosmides advocate, one that they are quick to reject.[37] It consists in constructing evolutionary theories about specific behavioral patterns, without making explicit their underlying psychological mechanisms. I do not advocate returning to a form of cultural adaptionsm which presupposes that all such patterns of behavior must be adaptive. Quite on the contrary. People and groups do not always succeed in addressing their problems. Also, not all of our culturally acquired behaviors must have an evolutionary utility. For instance a culturally acquired habit like smoking clearly hasn't. Therefore, adaptiveness won't constrain these outer phenomena either. Yet many social and cultural practices do effectively address problems in the environment. After all, the cultural behavior is a phenotypic trait of mankind, even one that is arguably shared by a few others species,[38] so we might expect it to be shaped, amongst other forces, by the natural selection. Also, the role of cultural behavior in the evolutionary success of mankind seems beyond doubt. Assessing the contribution each social practice or of recurring components of social practices in the survival of human groups is a worthy intellectual enterprise, one that was pursued in a broad range of disciplines, from history to human behavioral ecology, although often from a strong adaptationism stance.

This approach, mirroring that of Tooby and Cosmides, is bound to respect the autonomy of social sciences too, wile making evolutionary accounts dependent on the non-evolutionary investigations. On one hand, any evaluation of adaptedness requires prior anthropological and sociological fact-finding work to clarify the structure of the practice under scrutiny. Also, where the modeling of the relations between environmental variables and cultural practices is involved,

---

[37] Tooby and Cosmides, "The Psychological Foundations."

[38] Not only do the usual suspects, the primates, come up with techniques that they spread within the group, like for instance those very well documented in Japanese macaques (Masao Kawai, "Newly-acquired Pre-cultural Behavior of the Natural Troop of Japanese Monkeys on Koshima Islet," in *Primates* 6, 1 (1965):1-30; Ichoru Tanaka, "Matrilineal Distribution of Louse Egg-Handling Techniques During Grooming in Free-Ranging Japanese Macaques," *American Jorunal of Physical Anthropology* 98, 2 (1995): 197-201), but so do species that resemble little to man. There is strong evidence that New Caledonian crows are not only creators and employers of tools, but also that they operate changes in the design of their tools, which they socially transmit to the fellow members of their population, giving rise to divergent 'cultures' (Gavin R. Hunt and Russell D. Gray, "Diversification and Cumulative Evolution in New Caledonian Crow Tool Manufacture," *Proceedings of the Royal Society of London B* 270 (2003): 867-874).

we need the same traditional sociological or anthropological research in order to be able to test such models, by comparing the predictions with the reality on the field.[39] This makes traditional non-evolutionary research a prerequisite for any Darwinian theorizing of the human mind. On the other hand, we cannot expect culture to provide effective solutions to each problem presented by the environment. In addition, we need to leave room for cultural behaviors which lack any biological function. Both leave the selective forces unable to constrain the patterns of behavior a sociologist or psychologist can expect in a group. *Mutatis mutandis*, cultural behaviors replicate the relation of psychological mechanisms with natural selection. In sum, Darwinian inquiries into the human mind and culture turn out to be dependent of the truths established by the non-evolutionary investigations in social sciences, while the latter remain unconstrained by the former.

In other words, social sciences are autonomous with respect to evolutionary biology. But autonomous does not necessarily mean disconnected. The ties are there, but it is not the social sciences that have to take notice of what evolutionary theory has to say. On the contrary, evolutionary theory needs to employ the results of anthropology or psychology, so that it could come up with a full picture of how Darwinian forces shaped humankind, its psychological and cultural phenotype. In order to succeed, evolutionary psychology has to take into account maladaptation and contingency, which are normal parts of the life of our species, as well as the bidirectional nature of adaption. It has to fully realize that there are a myriad of historical brute facts, that cannot be anticipated by sheer adaptiveness considerations, such as cultural inventions, that shaped the way we behave and function psychologically or socially and area part of our evolutionary history. In order to fully succeed, it needs to heed to what psychology and social sciences can and need to discover independently, in order to evolutionary thinking to be able to build solid theories accounting for such realities. The sort of tight integration we expect from a properly scientific discipline with the rest of science is there, but we should somehow revise our expectations about how the ties must be forged.

[39] These models, whatever they might look, should allow for occasional maladaptive responses of groups to environmental pressures.