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Sex at Dusk, Sex at Dawn, Selfish Genes: How Old-Dated Evolutionary Ideas Are Used to Defend Fallacious Misogynistic Views on Sex Evolution

Rui Diogo*

Department of Anatomy, Howard University College of Medicine, Washington, DC, USA

Abstract

Ryan and Jetha's 2010 book "*Sex at Dawn*" caused a huge controversy within the academic community, with several papers, commentaries, and even a whole book, "*Sex at Dusk: lifting the shiny wrapping from Sex at Dawn*" published in 2012 by Saxon, being written to attack it. However, when one reads the so-called 'scientific' publications that were produced after, and as a reaction to, *Sex at Dawn*, one can see that the major controversy is not really about monogamy vs polygamy, as the general public tends to think, but about our 'sexual nature' being mainly polygynous (1 male having several females) as argued in *Sex at Dusk*, vs multimale-multifemale (each female and each male having various partners of the other sex) as argued in *Sex at Dawn*. In other words, both models assume that it is mainly part of our 'human nature' to have a male copulating with several females: what hit the nerve of people, with the publication of *Sex at Dawn*, is mainly its idea that it is also part of our 'nature' to have a female having the *sexual drive/desire* to copulate with various males. What is particularly interesting is that Saxon published *Sex at Dusk* mainly as if it were an analysis of the evolution of sex in humans based on 'accurate', 'deep knowledge' of evolutionary biology, an idea often accepted in the few book reviews published about this book, which considered the book to be a 'scientific rebuttal' of the 'pseudo-science' of *Sex at Dawn*. However, despite the crucial importance of the subjects debated in these books for discussions on human evolution, and the huge repercussion of these debates for the media and broader public, puzzlingly no publication has examined so far, in detail, if the 'evolutionary framework' followed in *Sex at Dusk* is truly a reflection of a 'deep knowledge' of current evolutionary ideas. In this paper I will show that a careful analysis of *Sex at Dusk* shows that the book instead uses old-dated, extremist adaptationist 'selfish genes' evolutionary ideas that were popular 5 decades ago but that have been more and more discarded since then. In fact, *Sex at Dusk* has nothing new or progressive: it is just one more repetition of misogynistic narratives/just-so stories that have been strongly contradicted by empirical data in the last decades. That is, *Sex at Dusk* - written exclusively to attack *Sex at Dawn*, a book precisely aimed to put in question such old-dated, misogynistic tales - just confirms the premonition made in works such as Ackerman's *Natural History of Love*: that due to a powerful combination of strong biases and the use of antiquated fallacious evolutionary ideas, such narratives will in fact likely not "change very soon".

Keywords

Sex, Polygyny, Polyandry, Polygamy, Monogamy, Primates, Human Evolution, Selfish Genes, Adaptationism, Darwin

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1. Introduction

In the book "*Sex at Dawn*", Ryan & Jetha essentially defend the idea that, at least in the earlier evolutionary stages of our

human lineage, and possibly also until the Neolithic revolution, the predominant type of sexual organization was somewhat similar to the 'multimale-multifemale' type of organization found in both common chimpanzees and

* Corresponding author
E-mail address: rui.diogo@howard.edu

bonobos [1]. That is, in which each female and each male have various partners of the other sex. This book, and particularly this latter idea, caused a huge controversy within the academic community, with several papers, commentaries, and even a whole book, Saxon's 2012 "*Sex at Dusk: lifting the shiny wrapping from Sex at Dawn*" [2], being written to attack it. However, when one carefully analyses those attacks, it becomes clear that the major controversy is not truly about monogamy vs polygamy, as the media and broader public tends to portray it, but instead about which kind of polygamy is most prominent within our 'human nature'. That is, the controversy is more about our 'sexual nature' being mainly polygynous (1 male having several females) as argued in *Sex at Dusk* vs multimale-multifemale as argued in *Sex at Dawn*. In other words, both models assume that it is mainly part of our 'human nature' to have a male copulating with several females: the main attacks to *Sex at Dawn* concern mainly its idea that it is also part of our 'nature' that a woman copulates with various men and particularly that she does that because she has the *sexual drive/desire* to do so.

One can see this in the very aggressive tone in which many authors write against *Sex at Dawn*: it is not at all the typical tone that scientists use, when they criticize a book by their peers that has some flaws. Why is this visceral reaction? Why so much hate? The type of aggressive visceral reaction just shows that *Sex at Dawn*, with the eventual flaws that a book covering such a wide range of fields and topics normally has - which it does have, I am not arguing against that, as explained below -, did hit a nerve. It shows that it provoked a reaction by referring to a sensitive topic that is deeply intricate with narratives that most humans have been accepting since the Neolithic revolution or at least the first major organized religions (e.g. [3-21]). There are so many scientific books that have flaws, including *Sex at Dusk* as I will be explaining below, but most of them do not have the 'honor' to have several papers, blogs, and even a whole book including its on name ("*Sex at Dawn*") in its own title (as *Sex at Dusk* does), written just to criticize them, particularly in such a visceral way.

So, why? Well, it is easy to answer by a simple look at history: such visceral reactions were also provoked by ideas that have put in question the prevailing narratives. I am not saying here that all those ideas turn out to be right, as surely not everything that is written in *Sex at Dawn* is right (see below). But such aggressive reactions are not at all just because the authors having them modestly want to simply provide a "fuller and corrected picture of the 'evidence' put forward" in the books of others, as argued by Saxon in her book *Sex at Dusk*. If this is so, why didn't Saxon do this for all the thousands of books that have been written about sex, love and/or marriage, and that also have flaws? In fact, even

if one can argue that *Sex at Dawn* does has its flaws - as it does -, at least it tries to present empirical data from various fields - e.g. primatology, evolutionary biology, social psychology, sociology - to support its ideas, contrary to most books written on those topics, which are mainly just-so stories based on theoretical concepts or self-aid propositions that are not grounded on biological and anthropological empirical data at all.

Before discussing more in detail *Sex at Dusk*, I will provide just a few - but particularly relevant - other examples of the visceral reaction to *Sex at Dawn*. Barash, an emeritus Professor of Psychology at the University of Washington, wrote in a piece in the *Chronicle of Higher Education*: "A little while ago, I worried that the next time someone asked me about the book, *Sex at Dawn*, I might vomit. An over-reaction? Perhaps. And one likely composed, in part, of simple envy, since their book seems to have sold a lot of copies. At least as contributory, however, is the profoundly annoying fact that *Sex at Dawn* has been taken as scientifically valid by large numbers of naïve readers ... whereas it is an intellectually myopic, ideologically driven, pseudo-scientific fraud" [22]. Two points are particularly interesting. Firstly, how many times you see an emeritus professor using the word "vomit" to describe a book? An over-reaction, indeed. Secondly, the criticism about a book should be based on the information provided in that book, nothing else. Not about the personal life or status of the author (s), nor about how many books it sold, or about how many 'naïve readers' bought it or liked it. Why are scholars, who clearly should know how to talk about, and criticize, a book, not following at all those typical academic guidelines in the case of *Sex at Dawn*? That small passage of Barash's text clearly shows that this is more than just objective criticism: it is personal, it is visceral, and yes, it does have to do with envy - a word used by Barash himself -, with jealousy, as well as the argument from authority, both against the authors of *Sex at Dawn* and the "naïve readers" of that book. Poor "naïve readers": they desperately need Professor Barash - or, by that matter, Saxon's *Sex at Dusk* as will be seen below - to tell them what is true and what is not in the dangerous, "ideologically driven" *Sex at Dawn*. One of the brilliant aspects of Sapolsky's 2017 book *Behave* is to show that all of us, humans - including those scientists that argue to be so 'objective' and have such noble, non-ideologically driven intentions -, we are all - including myself, obviously - truly '*Homo irrationalis*', much more than '*Homo sapiens*' [23]. The harsh, visceral criticisms to *Sex at Dawn* are much more than just a simple noble criticism to 'correct' its flaws: they are often a biased reactionary reaction to maintain the status-quo, either concerning the prevailing narratives, or within the views accepted in a certain area of science, such as

evolutionary psychology. Another clear example is the case of Pinker, the avowed Hobbesian that spend most of his career defending the benefits of civilization (e.g., [24]), who famously twitted that *Sex at Dawn* is just "pseudoscience". So, what is truly happening here?

2. Sex at Dusk vs Sex at Dawn: Old-Dated Evolutionary Ideas, Misogyny, and Sex

In order to better understand this, one should focus of course on the pinnacle of the over-reaction to *Sex at Dawn*, which is the book *Sex at Dusk*, not in terms of its aggressiveness - at least Saxon does not use the term vomit, although in some parts her tone is very disrespectful towards the authors of *Sex at Dawn* - but because it is a 364-pages book written explicitly, and solely, to criticize *Sex at Dawn*. One interesting opinion piece about this subject is that written by Robin Hanson, in the sense that he refers to a direct answer provided by Saxon herself to a question about her book [25]. He wrote:

"A key question, to me, is what percentage of our forager ancestor kids were fathered outside pair-bonds. That is, what fraction of kids were born to mothers without a main male partner, or had a father different from that partner. This number says a lot about how "natural" are such things. Alas, none of these authors (of *Sex at Dawn* and *Sex at Dusk*) give a number, but my impression was that Saxon would estimate less than 20%, while the *Sex At Dawn* authors would estimate over 50%. Even 20% would be consistent with a lot of human promiscuity. I asked Saxon directly via email, however, and she declined to give a number - she says her main focus was to "argue against *Sex At Dawns* "paternity indifference" theory (that humans (males) don't care which kids are theirs)".

This is an interesting aspect, because in fact the points that Saxon often state to be the crucial ones of *Sex at Dawn*, and that she aims to contradict with the evidence presented by her, are not at all truly the central focus of *Sex at Dawn*. For instance, the 'paternity indifference of human males' - and even the 'lack of jealousy of both human males and females' - are actually minor points compared to the major point made by *Sex at Dawn*: that humans have a 'natural' predisposition to feel sexual desire by many partners throughout their lives and, most importantly, that this also applies to *women*. These are the central topics of *Sex at Dawn*, as clearly shown by the title of the book "*Sex at Dawn: how we mate, why we stray, and what it means for modern relationships*". That is, *Sex at Dawn* goes against still prevailing narratives - cultural, religious, and even scientific, as is illustrated by the very

publication of *Sex at Dusk* - that our 'natural predisposition' is instead to have 'nuclear families', i.e. to have at least a social type of monogamy, with eventually "some extra-pair sex" as stated by Saxon - thence why it would not be true sexual monogamy, as she recognizes (see below). A main problem is precisely that, as noted by Hanson, Saxon never states, or even discusses, how much is "some" extra-pair sex. What is our 'natural predisposition'? To have just two or three affairs during our lifetime, outside our supposedly 'natural' nuclear family? Or to feel desire by, let's say, one person every week? And how does that affect the sex with, and the sexual attraction towards, our 'nuclear familiar partner'? Are 'some extra-pair sex' affairs enough to make our 'nuclear familiar'-marriage kind of relationship to be 'naturally' fulfilling, with both love and sexual passion lasting until 'death take do us part'? It is very strange that Saxon, who supposedly engaged in the noble mission of writing a whole book to simply 'correct' the answers that *Sex at Dawn* gives to those central questions, did not actually answer any of them, in her book.

Yes, Saxon indeed provides a valuable contribution in the sense that she does correct some details about various specific case studies that are given in *Sex at Dawn* to justify some of the minor points made in that book referred to above, such as those concerning paternity indifference or lack of jealousy. I will further discuss this subject below. But the main point of *Sex at Dawn* that really hit a nerve within part of the broader public that continues to propagate or accept long-standing narratives that women are less 'sexual' than men (e.g. reactionaries, misogynists, religious extremists), and within the scientific community (e.g. many evolutionary psychologists) that supposedly provides 'support' for those narratives, is that the *desire* to have sex with many partners is not only exclusive to men: it also applies to women. This is clearly illustrated in the last, crucial chapter of *Sex at Dusk*, titled: "Sluts or Whores". The most striking aspect is how Saxton, in a text that clearly follows and supports the status quo of using ideas mainly created by misogynistic men such as Darwin, such as the notion that women are mainly 'asexual' "whores" (using her own words), tries to give it a spin of feminism. Here is an excerpt of that chapter (p. 328):

"The particular removal by Ryan and Jetha of pre-copulatory female mate choice in our ancestors is particularly disturbing, and even more so when this is added to their 'evidence' that women's bodies want a lot more sex than their minds want. A belief in a repressed natural female desire for sex with all-comers, and the potential removal of a woman's right to have her "no" taken seriously, is obvious a serious and potentially very dangerous, error. Some readers may still wish to argue that females are not being denied the opportunity to say "no", but the actual arguments throughout *Sex at Dawn* are that

very much females rarely, if ever, have any reason to refuse sex connected to this is their argument that 'slut' is good and 'whore' is bad, yet females across species are 'whores' not 'sluts'. Rather than an ejaculation, i.e. the potential *end* point of a male's reproductive effort, reproductive success for females is about translating actual resources into actual offspring".

I would call this intellectual dishonesty. First of all, *Sex at Dawn* is not at all about what the women's *bodies* want versus what the women's *mind* want. This body/mind division is not all part of the arguments of that book. Instead, it actually always stress the difference between what one (including obviously 'body' and 'mind', in that sense) *wants to do* based on our 'natural instincts'/evolutionary history (e.g., to have sex with more than one partner), vs what one is *supposed to show/do*, based on social norms, cultural stereotypes and narratives followed by the groups to which one belongs (e.g., to get married, and be faithful, to a single partner). Secondly, *Sex at Dawn* never argues that women *want* to have sex with "all-comers", with everything that moves: it simply argues that it is probably 'natural' for women to *want* to have sex with more than a single partner and, yes, that cultural stereotypes/narratives have tried to 'repress' that aspect of female sexuality for too long. A major point of *Sex at Dawn* is that it is clearly a revolt against misogynistic ideas and the view that women are 'naturally' sexually passive and mainly 'asexual', that they just want to have sex with a single man, mainly to get married to and have children with that man, more than for the pleasure/fun of it. Therefore, *Sex at Dawn* is arguing that females should have the *choice* to be with more than one men, *if they want to*. So, when Saxon distorts what is said in that book and then goes on all the way to suggest that *Sex at Dawn* could lead to sexual harassment/rape by not respecting women's choices, it is a kind of disturbing manipulation that one almost never sees within scholars, at least nowadays.

That *Sex at Dawn* clearly hit a nerve of Saxon can also be seen in the sentence where she states that while males have "ejaculation", women are just focused on their offspring. This is hard-core misogynistic thinking, dressed as science. For instance, the idea that only "ejaculation" is pleasurable, as if women did not have pleasure from sex, goes against any empirical evidence, which indicate that women, in average, actually have more intense, complex, and long orgasms, as well as that they more often have full-body orgasms and multiple orgasms than men, and that the clitoris has about twice the number of sensory receptors than the penis has (e.g. [3, 13, 26]). Another example is when Saxon basically summarizes her whole argument: women, as most females across species, are merely 'whores', that is, they are 'passive' in the sense that they have sex not because they really *want*

to, but because they 'need' to, to gain resources for them/their offspring. That is, the active, primary player of the movie, the one that actively *wants* and will actively behave in a way to have sex, is the man: the woman just passively accepts that behaviour, as a secondary, passive player, without really wanting sex, just to gain favours from the man.

Yes, even nowadays there are many women who do *need* to engage in sex even without desire in order to get resources from men - female prostitution being a good reminder of it -, precisely as a result of a long history of men economic domination and the propagation of cultural stereotypes and misogynistic narratives. But going to the point to suggest that this happens with women *as a rule*, that it is basically their 'nature', in a book that is supposedly scientific, in the 21st century, exactly as it has been defended by religious extremists for centuries, against what the empirical data truly show, is very disturbing indeed.

But what is particularly more striking - for a scientist as myself, at least - about *Sex at Dusk* is that apart from distorting the arguments made by the authors of *Sex at Dawn*, it also does general statements about evolutionary biology that are mostly out-dated and often completely fallacious. This is distressing because Saxon invokes the argument from authority precisely based on the fact that she is a 'true' evolutionary biologist, while the authors of *Sex at Dawn* are not. She makes this point very clearly in the very beginning of the book, in the Preface (p. v-vi), to be sure readers don't miss it: "Not evolutionary biologists (their interests are psychology and Ms Jetha is a practicing psychiatrist), the authors (of *Sex at Dawn*).. while evolutionary psychology is not my main concern, evolutionary biology is.. I have read and debated on the evolution of sex and the sexes for many years". This is a typical argument from authority: "for many years" - what is the importance of this, does the fact that Saxon did it 'for many years' make her arguments more plausible? There are many well-know cases in which this is not so, and also in which great ideas, backed by solid empirical data done, were elaborated/written by very young scientists. Moreover, the text reads, again, as at least a bit misogynistic. Why does Saxon write "Ms Jetha", and not just Jetha, as she does for Ryan? Actually, it is very unusual to use "Ms" in such a scientific context, to talk about a peer, as it is well know, in academy, that by using "Ms" one is often stressing that this is a person 'without a higher or honorific or professional title' - which is, moreover, not at all the case, as Jetha is actually a MD, what officially translates to "Doctor of Medicine".

But let's focus instead on what truly matters: the so-called 'evolutionary' ideas of *Sex at Dusk* per se, and in particular how distorted and old-dated they often are. *Sex at Dusk* is clearly based on an extreme adaptationist view of evolution,

which is very much characteristic of some - not all, it needs to be stressed - evolutionary psychologists. Such a view has been increasingly abandoned by evolutionary biologists in general, particularly since the works by Stephen Jay Gould published in the 1970's and the 1980's, and the rise of Evolutionary Developmental Biology (Evo-Devo) in the last decades. Saxon's view of evolution is clear, when she refers (p. 7) to a line from a novel by David Lodge - "literature is mostly about having sex and not much about having children: life's the other way round" - and then writes: "*Sex at Dawn* is almost all about sex and not much about children, yet evolution is very much about reproduction - variation in reproductive success *is* evolution". She goes on to say (p. 14) "evolution is now defined as the change of the frequency of genes, or alleles". Even in a more extremist way, she cites Dawkins' 'selfish genes' idea as it is was a dogma within evolutionary biology (p. 75): "individuals both suffer and inflict suffering doing what their genes 'want' them to do, including - or specially - with regard to sex and reproduction". If Saxon's book was published in 1976, as Dawkins' book *The Selfish Gene* [27] was, it could be understood: some of these ideas were defended by some evolutionary biologists then. But *Sex at Dawn* was published in 2012, almost half a century later. None of those ideas, that she refers to as if they were evolutionary dogmas - she does not say 'in my opinion', or 'many researchers think that', she just refers to them as if they were proven facts - are actually consensual among evolutionary biologists nowadays. In fact, this is a common criticism that evolutionary biologists do regarding those evolutionary psychologists that follow an extremist adaptationist view of life, as I explained in detail in my book "*Evolution Driven by Organismal Behavior: A Unifying View of Life, Function, Form, Mismatches and Trends*" [28].

Most current evolutionary biologists don't agree that evolution is nothing more than 'selfish genes', or 'reproductive success', or the 'change of the frequency of genes'. Evolution is much more than this. Epigenetics is now much in vogue - and it was already seven years ago, when *Sex at Dawn* was published - in evolutionary biology. As the Greek prefix 'epi-' implies, in the *sensu lato* epigenetics refers precisely to features that are 'over', 'above', 'on top' or 'in addition' to genetic inheritance. Basically, Saxon's knowledge of evolutionary biology seems to predate the rise of epigenetics in the field, something that has been happening already for some decades. In fact, with the rise of Evo-Devo, researchers have increasingly pointed out the need for a "post-Neodarwinist view" of evolution, or an "Extended Evolutionary Synthesis" (e.g. [29-30]). These authors dispute the gene-centered view of evolution of Neo-Darwinists. For instance, some of them attempt to make the "epigenetic turn",

i.e. to stress the importance of cellular, physiological or anatomical traits that are mainly related to external/environmental factors, and not exclusively "coded" by the genome (e.g. [31]). Since many years ago authors such as West-Eberhard have been particularly influential in promoting the importance of epigenetics in evolution, by arguing that the external environment profoundly affects even early developmental stages - e.g. her concept of "entrenchment" [32-34]. It is now also widely recognized that ecological inheritance is a core component of extra-genetic inheritance - it has indeed become central to attempts within evolutionary biology to broaden the concept of heredity beyond transmission genetics [35-37]. In summary, apart from genetic inheritance, we now know that other types of inheritance, such as epigenetic, ecological, and cultural inheritance, are extremely important in evolution.

A major difference between the Neodarwinist way of seeing evolution that was prevalent in the 1970s - from which most ideas of Saxon come - and this new way of viewing evolution is that in the former organisms are mainly merely *passive* players, slaves of the external environment and/or their 'selfish' genes [28]. This passivity is exactly the way in which Saxon describe women as 'whores': they are mainly passive during sex, mainly 'asexual' in the sense that they do not 'do it' because they have a *drive* for it, because they *want* it, for the pleasure/fun of doing it - they merely are passive, letting males do what 'needs to be done' so their selfish genes replicate by gaining resources from males, for them and/or their offspring. What a dark view of life, and particularly of women. In contrast, the new way in which more and more evolutionary biologists see life attributes to the organisms an *active* role in evolution (summarized in e.g. [28, 38]). Niche construction is an illustrative example in which organisms contribute to change their own niches and thus their own evolutionary history, through behavioural/cultural inheritance. A book that is said to be written to 'correct' *Sex at Dawn* by examining the history of sex in our lineage in a 'proper' evolutionary context cannot make the mistake of just repeating ideas that were accepted by some evolutionary biologists in the 1970's and ignore - or, in fact, by even being dishonest about - the huge amount of work that has been done, and dramatic changes for the field that have occurred, since then.

A case where Saxton clearly does that, to the point of being untruthful, is when she states (p. 7-8) that *Sex at Dawn*'s idea that the sharing of food or sex by hunter-gatherers might be related to the fact that this might be "good to the group" is wrong because "group selection arguments have been almost totally dismissed in evolutionary biology, and with good reason because the unit on which selection acts is the 'gene': if behaviour is about helping a close relative then it is about

helping shared genes in another body which is kin selection". Really? Everything that any organism does, during all the seconds of its life, is merely to be a slave of its selfish genes? In fact, a major difference between current evolutionary biology and traditional Neodarwinism is precisely that the former recognizes that selection can work at many levels, including populations, an idea that was emphatically defended decades ago by authors such as Stephen Jay Gould and which was supported by a gigantic compilation of empirical data in his last book, *The Structure of Evolutionary Theory* [39]. That book, the most comprehensive one of one of the most prominent and influential evolutionary biologists of the last decades, was published in 2002, i.e. ten years before *Sex at Dusk*. Still, Saxton seems to be completely unaware of it, or of the ideas and huge amount of empirical data provided there, which were by themselves a compilation of what was becoming to be increasingly accepted in the field in the last decades before its publication in 2002. In fact, the acceptance that selection operates at many levels - including 'group selection' - is one of the main pillars of the Extended Evolutionary Synthesis, being also widely accepted within numerous other fields of science, including anthropology, history and philosophy of sciences (e.g. [36]).

There are more examples of distortion of actual data in Saxton's book, including some concerning one of the central topics of that book: the behaviour of non-human primates. After reviewing data on the behaviours of the great apes, she writes (p. 80): "this even suggests an *alternative* breeding scenario for our common ancestor with the gorilla: monogamous pairs". In order to infer a trait of the last common ancestor of the members of an extant taxon, evolutionary biologists usually use phylogenetic tools, which often incorporate the outgroup method, which pays attention to the closest relatives to that taxon. It is consensual that orangutans have a 'dispersed' type of sexual behaviour - they are often solitary, so it is difficult to accurately access the number of sexual partners, but they are clearly not sexually or socially monogamous (e.g. [18, 40]). Extant gorillas are clearly polygynous, that is, many females living with a male, with is 'cheated on' by at least some of the females, and, as noted above, both common chimpanzees and bonobos tend to live in multimale-multifemale groups (e.g. 18, 40). In addition, paleontological studies of body size of individuals of our lineage strongly suggest that, at least during the first three million years since we split from chimpanzees, we had a pronounced sexual dimorphism, a feature usually correlated with a non-monogamous - both social and sexual - type of life (e.g., [18]). So, based on these empirical data, how can someone arguing to be objectively guided by evidence state that the available data indicate that the last common ancestor of gorillas, common chimpanzees, bonobos and humans lived

in "monogamous pairs"? At least in this case Saxon is not dishonest to the point of stating that this is the 'consensual' view among biological anthropologists and primatologists, as she calls her scenario 'alternative', clearly recognizing, in a way, that it is in fact clearly different from anything that is currently consensually accepted by researchers within those fields.

The same types of flaws discussed above - distortions, the tendency to 'focus only on the branches instead than on the whole tree' and the blind following of ideas that are less and less accepted within evolutionary biology - also apply to other parts of *Sex at Dusk*, such as those focusing on hunter-gatherers. Saxon spends the whole chapter 4 of her book reviewing data from South American 'pre-agricultural' groups, trying to show how wrong the authors of *Sex at Dawn* are concerning those data, or, worse, even manipulated them. Again, I am not saying that the latter authors did not overemphasize some parts of the data to make their point, as scientists often do - once more, all scientists are just humans, with their own biases, it is important to stress this. However, with the obsessive level of scrutiny and detail in which Saxon analyzes *Sex at Dawn*, one would always be able to find at least some specific errors in any scientific book ever written. It suffices to say that her book, written with the single purpose of obsessively criticizing *Sex at Dawn*, has 333 pages of text (within the 364 pages of her whole book), which is more than the 314 pages of text of *Sex at Dawn* itself. But that is not the problem at all, because it is actually good that scientists detect errors/biases in the works of other scientists, even if they do it in an obsessive way. The problem is when they do it in a distorted, highly biased way, referring to so many minutiose criticisms and details to give the impression that the book they are criticizing is so flawed, while they 1) do that using *a priori* premises that are becoming obsolete within their own fields of science, and that they moreover follow and describe as dogmas, and 2) don't actually discuss the central points of the book they are criticizing.

For instance, Saxon mainly uses the descriptions of Beckerman & Valentine [4] to refer to various South-American horticulturalist groups, which *Sex at Dawn* provided as examples to illustrate that 'pre-agricultural' societies tended to be, in general, both sexually and socially non-monogamous. Saxon spends more than 30 pages repeating sentences such as (p. 112) "the Cashinahua allow for discreet extramarital sex but public acknowledgement is rare", "she is expected to allow perhaps as many as 25 men to have sex with her, (but) female orgasm does not occur". So many "buts": however the real but is that all these examples do not contradict at all *Sex at Dawn's* message that in this groups social monogamy is not strictly enforced. Primates

that are socially monogamous, such as gibbons, have a few extra-couple affairs, as revealed by DNA studies for instance - that is why they are not truly sexually monogamous, almost no mammalian truly is (e.g., [18]). But gibbons clearly don't have rituals where a female has sequential sex with 25 males. This is an illustrative case where one looks 'at each branch of a tree' with so much detail, that one forgets to see - in the case of Saxon, I would say that she actually tries deliberately to not see - the 'whole tree'. Actually, most of the 'buts' she refers to in chapter 4 of her book are cited from Beckerman & Valentine book "*Cultures of Multiple Fathers*", which as its name clearly indicates argues that these Amazonian societies are not monogamous, nor polygynous, because females usually have sex with various males [4]. That is, that book precisely contradicts - exactly as does *Sex at Dawn* - the types of dogmas that authors such as Saxon continue to defend, as it is made clear in the official description of the book:

"*Cultures of Multiple Fathers* is the first book to explore the concept of partible paternity, the aboriginal South American belief that a child can have more than one biological father - in other words, that all men who have sex with a woman during her pregnancy contribute to the formation of her baby and may assume social responsibilities for the child after its birth. The contributors, all Amazonian ethnologists with varied anthropological backgrounds and arguably the world's experts on this little-known phenomenon, explore how partible paternity works in several aboriginal societies in the South American lowlands. Many findings in this book challenge long-held dogma in such fields as evolutionary psychology and evolutionary anthropology and sociology. For example, under some circumstances, children with multiple putative fathers have higher prospects for surviving than do children ascribed to only a single father. Among several ethnic groups, a strong case can be made for a pregnant woman having a lover so that her child will have more than one father and provider".

The highly ironic fact that Saxon uses a book that is obviously against the dogmas that she defends to criticize another book that is also against those dogmas shows to what level she can distort ideas and data to favour such dogmas and her own *a priori* assumptions. Apart from her argument that there is some kind of 'jealousy' among those Amazonian societies - very likely indeed, as will be noted below - even the specific details (branches of the tree) that she focus on are usually based on *a priori* assumptions that are more and more discarded within modern evolutionary biology. Specifically, when she discusses the numerous clear cases in which women of those societies have sex with various men, she repeatedly makes personal statements such as (p. 123) "I

have to agree, that female orgasm does not occur". Yes, she has "to agree" because her *a priori* dogmatic assumption is that females, across species, tend to be "whores", i.e. to have sex not for pleasure but in order to gain favours from males to help them raise their offspring. This, again, is based on her blind acceptance of an extreme adaptationist dogmatic view much accepted decades ago that anything and everything that an organism does, each second of its life, is just for the propagation of 'selfish genes'. As explained above, for many decades before the publication of Saxon's book many researchers - mostly men - have used such dogmatic assumptions to argue that females can only be sexually passive, having sex merely for reproduction, to the point of arguing that, at least in theory, females should not have orgasms at all. Fascinatingly, instead of admitting that the actual data showing that females of various non-human species do have orgasms and that women tend to have more intense, long and complex orgasms than men (see above) contradict those dogmas/misogynistic narratives, such researchers instead choose to see these facts as a kind of 'paradoxal' evolutionary anomaly. That is, instead of questioning their *a priori* just-so stories, they instead choose to blindly follow those stories and try to find a way to solve the 'puzzle' of women orgasm within the framework of those just-so stories (see, e.g., [41]).

As emphasized by Stephen Jay Gould, the extreme adaptationism of many Neodarwinists is in many ways very much like a religious belief: it cannot be truly tested, it is a just-so story, and when a new discovery contradicts the accepted dogma (e.g. the earth moves around the sun, females do have orgasms, and so on) people often just create a new just-so story to make it fit within other existing just-so stories [39]. Saxon does this over and over in her book: women have to be "whores", because the selfish genes just oblige them to have sex to propagate themselves: so they can never have true pleasure, even if they have sex with many men, even when they are pregnant/menstruating and cannot truly conceive, and so on. That is why Saxon "has to agree" that the women of those Amazonian societies cannot have orgasms when they have sex with all those men, because they are just "whores" in search for the favours of men. Within the hundreds of examples I could cite here, from Saxon's book, I will cite one written specifically in the part about Beckerman & Valentine book "*Cultures of Multiple Fathers*" [4]. Saxon states (p. 138): "what we actually find in all those partible paternity societies is the same as we find everywhere else - the more likely copies of my genes are in you the more likely I care about you". I wonder who are the "we" she is referring to, as the book was written only by her. Is she referring to the extreme adaptationist, 'gene-centric' Neodarwinists that still exist as a small minority within the field of evolutionary

biology, and that she blindly follows? Or to the vast amount of people - not only men, but also women, as can be seen in Saxon's case - that still accept long-standing misogynistic narratives of "whore females" even if they go against actual empirical data? In fact, this is a clear case where the mix between two completely unfounded teleological narratives, a religious one - the purpose of women is to please men - and a scientific one - the purpose of evolution is the replication of selfish genes - combine to form a totally groundless just-so story: females don't have orgasms, or if they have, it is just an anomaly/an evolutionary byproduct, because they shouldn't have orgasms, in theory (that is, based on those a priori dogmatic teleological narratives).

It is indeed amazing to see that within this circular reasoning those "we" people manage to make a way in which any kind of sexual behaviour that is found in non-human taxa and in humans - social monogamy, polygyny, polyandry, multimale-multifemale, homosexuality, abstinence, sex with orgasms, sex without orgasms, and so on - always fit their own *a priori*, simplistic dogmas: these dogmas can never be falsified, they are totally impervious to any kind of data/evidence.

Surprisingly, contrarily to the general tone and main thesis of the book, including its last chapter that summarizes that thesis by arguing that women are "whores" and not "sluts", chapters 5 and 6 of *Sex at Dusk* concede that women can eventually have sexual desire per se. Apart from the many strange aspects of that book already referred to above, a particularly odd one is the lack of consistency within the whole book. Sometimes it appears as if there were at least two different persons writing it. In fact, there are many sentences of the main part - the more extremist one, defending the type of misogynistic ideas discussed just above - that seem to have been written by, or at directed under the influence of, and author that is both a man, and an evolutionary psychologist. This is further reinforced by the fact that the book as a whole, and particularly that part, uses as its main scientific base an extremist adaptationist gene-centric view that is now almost obsolete in evolutionary biology, but that is still defended by a relatively significant part of the evolutionary psychology community. It is indeed not a coincidence that *Sex at Dawn's* criticism is mainly directed to evolutionary psychologists rather than to evolutionary biologists. It is interesting that there is indeed a lot of speculation about the 'true' author (s) of *Sex at Dusk*. For example the authors of *Sex at Dawn* publicly stated that they think that "Lynn Saxon" is not the real name of the author, as there is nothing to be found online, at any level, about such a person: no books, papers, or even blogs or simple notes, before the publication of *Sex at Dusk*. Some researchers even go as far to give a specific name for the author of *Sex at Dusk*, which is precisely the name of a

famous evolutionary psychologist male. However, I don't want to enter in such murky waters here and I will therefore not provide that name, nor give more details about/importance to this subject, because as I explained above it does not matter at all who writes a book. What matters, in this case, is the validity of the data presented, and if they are discussed in a comprehensive, coherent, and intellectually honest way and based. The aim of this and the next paragraphs is therefore simply to show that the discussion of the data in *Sex at Dusk* is not only not comprehensive (its focus is on the branches, rather than the whole tree) and intellectually honest as noted above, but is also not coherent at all.

This is because while the main idea defended in *Sex at Dusk* is the long-standing misogynistic view that women are 'whores' and not 'sluts', in chapters 5 and 6 Saxon suddenly acknowledges that women might in fact have a 'natural' desire not only to have sex, but to have sex with multiple partners. That is, without admitting it - or perhaps realizing it, due to both her obsession to criticize everything in *Sex at Dawn* and her tendency to focus only on the branches of the tree - in those chapters she basically agrees with the main, crucial point of *Sex at Dawn*. For instance, in p. 173 she agrees with previous authors that answer to the question of why matrilineal societies such as the Mosuo "still have marriage when it is not necessary for reproduction or the economic division of labour", by stating that it is because of the "human desire to both possess one's partner *and* to have multiple partners". Importantly, the idea that humans of *any gender* have a 'natural desire' to both possess one's partner (jealousy) and to have multiple partners (polygamy) - which is strongly supported in Sapolsky's excellent book *Behave* [23] as well as by my own literature review on the subject - is different from *Sex at Dawn's* suggestion that jealousy is mainly a 'social construct', rather than a 'natural tendency' of humans.

In his book *The Incurable Romantic*, Tallis writes (p. 67-68), "why do people get jealous? If you love someone you should want them to be free and happy - true love knows no bounds, it releases the soul". But he notes that, as it is often the case, the roman poet and philosopher Lucretius "gets much closer to the truth when he warns us that the goddess of love has sturdy fetters - we are only free to be ourselves and that isn't very free of all" [20]. Tallis further notes that "utopian communities have adopted 'free love' as a guiding principle, but virtually all of them have dwindled or collapsed on account of group members reverting to monogamy - the internet has opened up a channel of communication between young couples eager to explore a 'polyamorous' lifestyle, yet many of them confess that overcoming jealousy is a major obstacle. couples who manage to maintain stable 'open'

relationships and raise children constitute only a tiny fraction of the general population". He concludes that "whenever social engineers or political visionaries have attempted to alter the structure of society, the family unit returns. our need to privilege a single, exclusive relationship and guard it jealously is clearly hardwired".

However, in my opinion it is not simply 'nature' vs 'nurture'. Yes, our 'natural jealousy' - which is nothing more than a subset of territoriality, a type of behaviour found in many animals including primates, and clearly illustrated by e.g. infanticide by gorilla alpha-males - surely plays a huge role, and should not be completely neglected in philosophical, political, and social discussions. But one cannot also say that jealousy is just 'hardwired' in our 'nature': it is itself also bombarded to us since a very young age, within all the narratives of 'romantic love' seen in all kinds of painting, books and movies - even, or perhaps particularly, in movies for children, such as Cinderella, the Mermade, Snow White - repeating over and over tales of 'the only one', 'if you love me truly you would not be with someone else', and so on. Because these latter narratives, and the extreme type of 'monogamous-jealousy' that they promote, are clearly also not completely 'natural', as recognized by Tallis himself in his book (p. 87-88): "some 20 to 40% of married heterosexual men admit to having had at least one extra-marital affair - as do 20 to 25% of heterosexual women.. approximately 70% of dating couples cheat on each other over half of the single population engage in 'mate poaching' - attempting to break up an existing committed relationship from the perspective of evolutionary psychology, the human reproductive strategy is mixed, a judicious combination of pair bonding and opportunistic sex". The only aspect I would contradict here is the use of the word 'judicious', because I fully agree with Sapolsky's 2017 *Behave* book in that not everything we do is necessarily 'judicious': actually our behaviours tend to often be rather 'injudicious', part of our paradoxical *Homo irrationalis* 'nature'.

That is, the idea defended in Sapolsky's book and in the present paper is in this sense a combination between *Sex at Dusk* (jealousy being a crucial point in human sexual behaviour) and *Sex at Dawn* (human females do *want* to have sex with many sexual partners, for many reasons including simply the fun/pleasure of doing so). That is, the paradoxical brain of our species - and I would argue of at least great apes such as chimpanzees as well - tends to want this: 'you are only mine, but I can be with many'. It is very interesting to see that in human societies where men and/or a particular ruler are particularly powerful, one of the first things that they precisely try to do, even to the point of writing laws to allow them to do so, is precisely to follow that 'natural' human dream. This was for instance commonplace in the

'patriarchs' stories of the Old Testament, in which nearly all males had more than one wife, while women were their property and each woman could be only with one of these patriarchs [12].

Therefore, *Sex at Dusk* does seem to be right about our 'natural jealousy', contrary to *Sex at Dawn*. But Saxon seems to be clearly wrong about marriages being a 'natural tendency of humans'. Within those cultures impregnated with social constructions and teleological narratives to justify polygyny, many - if not most - women do not agree at all with polygynous marriages, which are therefore mainly *imposed to them*: they do not come naturally from them (see, e.g., [42], and references therein). Another question is: why does Saxon repeat over and over in the chapters 5 and 6 of her book that both men and women have a 'natural desire' for multiple partners, against the main idea defended in that book that women are mainly 'whores' without a true 'desire', much less a 'desire' for many men? Because those chapters deal with marriage - and thus with divorce - and also with jealousy. In fact, there are so many divorces that are related to 'cheating', and jealousy is a very prominent subject in discussions on love and marriage, for instance as a reason for 'not cheating' as well as in 'post-cheating' confrontations, even leading to numerous ill-named 'crimes of passion' in all regions of the planet, mainly undertaken by men. If modern humans were 'naturally sexually monogamous', or even 'naturally socially monogamous' with a 'few occasional affairs' as Saxon seems to defend, it would be difficult to understand all the fuzz about 'cheating' and jealousy: these should be rather rare, 'occasional' topics of discussion, and not topics that are the crucial subject in literally millions of songs, movies and books - both scientific and fictional. Saxon seems to understand this paradox, and thence tries to solve it, but in a rather unsatisfactory way, by precisely acknowledging that women do have, after all, at least some 'desire' for sexual relationships with multiple men (p. 208): "when both sexes want to possess their partner while still desiring other partners, monogamy can only be a compromise - but one that most likely benefited our offspring in the environment in which we evolved". She seems to be again unaware that this is exactly what Ryan, one of the authors of *Sex at Dawn*, has defended.

Or, better said, probably she does not want to recognize this so her readers do not know, because over and over she continues to refer to ideas that are a *false caricature* of *Sex at Dawn*, and not at all those truly defended in the latter book. For instance, in p. 209 Saxon states: "*Sex at Dawn* (is) a contemporary middle-class, child-free, sex-obsessed, male fantasy projected back onto prehistory.. it may increasingly become our present but it certainly isn't our human past and 'recreational' sex is not what creates the future". There are so

many wrong layers within this small amount of text. Firstly, it clearly shows - as noted above - that Saxon's book is mainly a reactionary one in the sense that it wants to defend the status-quo of the narratives written by men, and is clearly uncomfortable about the changes that are happening in "our present" and in our "contemporary middle-class", regarding sexuality, particularly the way women live it. The very fact that she equates a "sex-obsessed fantasy" with a "male fantasy" shows, ironically - because again she is intellectually dishonest to the point of trying to make her misogynist ideas sound feministic - that she cannot stand/accept the idea that women can also be sex-obsessed. Within her reactionary framework, only men can be, as women are clearly passive, asexual beings. However, many women that have their own jobs and raise enough money and thus have no 'need for men's favours' decide, on their own, to have 'recreational sex', including sex with multiple partners, sometimes at the same time (trios, and so on): are they just following a 'male fantasy', really? It is instead Saxon that is following a male narrative, by doing such a statement. She is also following a clearly reactionary statement by putting 'recreational sex' in quotes, showing a clear distaste for that type of 'sex', as if it were an abnormal kind of 'sex': not leading to the replication of selfish genes, the only 'true purpose of evolution', as she repeats over and over.

Besides the reactionary tone and the obvious fact that humans *do have a lot* of recreational sex - not only in 'modern societies' but also in every single other society, either the horticulturalist Amazonian cultures mainly emphasized by *Sex at Dawn* or the hunter-gatherer ones Saxon refers to in *Sex at Dusk* -, she is intellectually dishonest in the caricature she makes of *Sex at Dawn*. Is *Sex at Dawn* really a "child-free, sex-obsessed fantasy", arguing for everybody to simply have sex with everybody without any kind of attachments, and live happily forever after? Regarding the "child-free" part: Ryan repeated in many instances, publicly, that in cases of parents with children, having a "0-tolerance" (no-cheating at all) is probably not the best solution, but that at the same time if they have disagreements about/problems with their sexuality, having both parents staying together with the children might actually be the best solution, in many cases. Regarding the part about the hippie fantasy of no attachments: it suffices to say that the two authors of *Sex at Dawn*, Ryan and Jetha, married with each other.

Another criticism that Saxon makes about *Sex at Dawn* in those chapters 5 and 6 (p. 180) is that "almost all peoples presented by Ryan and Jetha are settled horticulturalists or are otherwise not representative of pre-agricultural ancestors" and that they offer "no explanation as to why marriage exists at all". But *Sex at Dawn* clearly takes into account that

marriage exists, following the explanation defended by most anthropologists and historians (see above): that its origins in most, if not all human cultures had mainly to do with, for instance, economical (e.g. distribution of material objects among people/their offspring), social (e.g. bounding between families, bands or other groups of people) and/or teleological (religious/'purpose of women is') reasons, and not at all with 'true love' or 'sexual desire' between the people involved, particularly the women, in a planet mainly dominated by men. In fact, the crucial point of *Sex at Dawn* is precisely to go against both the narratives made by men that such marriages are good to women because they are 'passive' and 'asexual' anyway, and the laws that are made to impose those marriages and/or a '0-tolerance' type of fidelity within them, *in opposition* to what the women - and also the men - often truly *want*. As explained above, a recurring theme in *Sex at Dawn* is precisely about what people 'naturally' want versus what they are supposed to do within the rules/social norms/narratives accepted by the societies in which they live. A point raised in *Sex at Dawn*, when the authors review the history of the inquisition and so on, is that if monogamy were so 'natural' to humans, there would be no need to use threats of fire and brimstone and, in some cultures, even death to enforce it. So, instead of obsessively criticizing *Sex at Dawn*, what Saxon should actually try to do is to answer this question: if social monogamy and pair-bounding/the existence of 'nuclear families'/marriage' are part of our 'human nature', as she argues in her book, why do *all* groups of humans in which such 'nuclear families'/marriages' exist have such strict rules/norms to impose them? Eating is surely 'natural' for our species, as it is sleeping, for instance. Do we need to have threats of fire and brimstone, and even to kill people, to oblige them to eat, or sleep? As shown above, it is clear that in societies where polygynous marriages are common practice, often most women do not agree with those types of marriages: they are imposed to them, by the misogynistic society in which they live.

Also, Saxon should try to answer why in the Na of south-western China - said by some researchers to be the only society known in which marriage is not a significant institution - brothers and sisters live together, jointly raising, educating and supporting the children to whom the sisters give birth to [8]. That is, what a coincidence that in this society where marriage is not *imposed* by others/the society, instead of the type of pair-bounding that is said to be 'natural' for our species by Saxon, one actually sees the type of organization predicted to be more 'natural' by *Sex at Dawn*. In fact, as noted by Coontz, even when, as it happens in some cases, some Na couples do practice a more public relationship - for instance the man comes to the woman's home earlier in the evening, more openly and more regularly

than in the usual sexual affair -, "the partners owe each other nothing" [8], similarly to what would be predicted by *Sex at Dawn*.

As Saxon criticizes *Sex at Dawn* by referring mainly to horticulturalist Amazon societies, let's see what the data cited about hunter-gatherer cultures in her own book actually says about this subject. About the !Kung, an African group that mainly used traditional methods of hunting and gathering for subsistence until just some decades ago, she writes (p. 162): "the young girls may be pressured into accepting these early marriages as they are important to older family members in creating ties between in-laws and for the 'bride-service' the husband provides young !Kung girls (whom) are usually afraid of their new husbands". Interestingly, Saxon uses this and other examples of imposed marriage to criticize *Sex at Dawn* in the sense that these are not the 'ideal, primitive, sexually free, equal-sharing' pre-agricultural societies that Ryan and Jetha refer to in their hypotheses. However, firstly, Saxon neglects the fact that *Sex at Dawn* does not defend the notion of "Noble Savage": its authors clearly state (p. 100-101) that most pre-agricultural societies are more equalitarian than most modern societies - as they truly are, including the !Kung - "not because they are particularly noble, but *because it offers them the best chance of survival*. indeed, under these conditions, egalitarianism may be the *only* way to live.. institutionalized sharing of resources and sexuality spreads and minimizes risk, assures food won't be wasted in a world without refrigeration, eliminates the effects of male infertility, promotes the genetic health of individuals, and assures a more secure social environment for children and adults alike". In the same passage, they further note that "far from utopian romanticism, foragers insist on egalitarianism because it works on the most practical levels". Secondly, and more important for the present discussion, is that by giving those examples, Saxon is actually providing data to support the views of *Sex at Dawn*, i.e. that women and in many cases also men do not get married or have sex with their 'pair-bounding' partner because they *want* to, but because they are *supposed* (social construction), or even forced (laws, stoning, fire, killing), to do so. Therefore, again, it is not Ryan and Jetha, but instead Saxon, who needs to answer the question of why this is so, if pair-bounding was in our 'deep human nature', as well as why, despite all those norms, rules, and force, so many people still 'cheat' or divorce.

Saxon states (p. 181-182): "if our pre-agricultural ancestors were really living like bonobos we would not expect marriage and socially recognized pair-bounding to figure so prominently across the (human) world.. Ryan and Jetha simply present us with a bonobo-like ancestor up to 10000 years ago and use the absence of life-time sexual monogamy today as the evidence for that ancestor, completely ignoring

our obvious pair-bounding". I completely agree that that *Sex at Dawn* sometimes over-emphasizes the similarity of pre-agricultural humans with bonobos. But it should be stressed that they do that mostly regarding sexual behaviour, not social organization as a whole. Still, as will be explained below, studies of body size clearly indicate that sexual dimorphism between modern women and men is in average less prominent today than it was three million years ago, and than than seen in modern chimpanzees, although it is still clearly more prominent than in the socially monogamous gibbons. Moreover, as pointed by Saxon, a scientific study of promiscuity and the primate immune system indicated that a higher white blood cell count is found in species where females mated with more males, and that humans have counts more closely aligned with the polygynous gorillas, and secondarily with the socially monogamous gibbons. So, these empirical data do seem to suggest that, in terms of our 'true nature' (if it could be completely decoupled from our 'nurture'), we are somewhere in between polygamous gorillas/multimale-multifemale chimpanzees and socially monogamous gibbons. But these data do not suggest at all that we are truly at the level of gibbons, contrarily to the suggestion of many authors, including Saxon, that we are 'truly' socially monogamous, with a 'natural' tendency to form a woman-man pair-bounding and to have just very few, occasional 'affairs' outside of it. A main difference between us and gibbons is precisely that, as noted in *Sex at Dawn*, in humans the marriage/pair-bounding clearly seems to be mainly a product of 'nurture', rather than an "obvious" natural tendency as suggested by Saxon, because it is often imposed to people via social norms/pressure, force, or even death threats. No field study of gibbons as shown that they need to be physically forced by older members of their families, or by threats of stoning, fire, or death, in order to form their pair-boundings, as it happened so frequently during our history, and sadly continues to happen both in pre-agricultural and post-agricultural cultures (the Taliban, Isis, and other similar groups being particularly sad, extreme and contemporary examples of it).

Importantly, this difference also applies to chimpanzees, what allows to answer Saxon's question about why pair-boundings are so common in humans but not in common chimpanzees: they are not physically forced by older members of their families, or by threats of stoning, fire, or death, in order to form their pair-boundings. So, why do humans, and not chimpanzees, do this? Let's go back to some of the reasons that anthropologists and historians often list to explain the origins of marriage: economical, social and/or teleological reasons. Clearly, humans, even well before agriculture, were very different from chimpanzees concerning the possession of material goods. I agree that this is a point that often is

neglected by people that try to romanticize the life of pre-agricultural societies, as if they had 'nothing', being completely 'un-materialistic'. It is now well-known that humans used stone tools for at least 2.6 million years ago, and did projectile points, pigment processing, long-distance exchange, bone tools, barbed points, notational pieces, microliths, beads and even images at least some dozens of thousands years ago: i.e., well before agriculture (e.g. [43-44]). So, in term of material goods and economy, pre-agricultural groups were very different from chimpanzees. Moreover, we know burials, as well as at least some kind of religious ideas, appeared well before agriculture. As marriage is often much more connected to materialistic/economical aspects and teleological narratives than to the 'true will' of the individual people that is married, it does not seem so difficult to see why humans would differ from chimpanzees in this respect trough 'nurture', even if our 'true natural' sexual desires would be the same as those of chimpanzees, as argued in *Sex at Dawn*. In fact, as noted above there is plenty of evidence that in many so-called 'pre-agricultural' societies marriage was also mainly related to material goods - although in a much less extreme way than in most agricultural societies - and/or establishing connections. One particularly illustrative example is given in Coontz's book "*Marriage, a history*" (p. 31): "the Bella Coola (small Indian group of Canada) and the Kwakiult societies of the Pacific Northwest provide a striking example of how establishing connections between kin groups sometimes took precedence over sexual or reproductive issues in determining marriage - if two families wished to trade with each other, but no suitable matches were available, a marriage contract might be drawn up between one individual and another's foot or even with a dog belonging to the family of the desired in-laws" [8].

Many other examples are given in the 2016 book *Domestic Tensions, National Identities - Global Perspectives on Marriage, Crisis, and Nation*, edited by Kristin Cerello and Hanan Kholoussy [11]. For instance, it is noted (p. 2-4) that "states around the world have sought to produce and promote certain types of marital arrangements, with the goal of maintaining *control* over their citizens/subjects (also) turning men and women into husbands and wives, marriage has *designated* the way both sexes act in the world". One of the examples provided in that book concerns 1930s colonial Burma (p. 8): "at a time in which nationalist leaders were coming of age and the Burmese economy was struggling resentment of Indian men's status in the colonial regime and access to financial resources ran high the rapidly expanding press seized hold of this discontent and created a crisis, castigating the Burmese women who were willing to marry these men for sullyng their race and religion. it thus became women's responsibility to marry the 'right' kind of man to

guarantee the success of the Burmese national project". Similarly (p. 9), "in China after the communist came to power in 1949, the party's first piece of national legislation promoted marriage as a means of embodying socialist values, bringing the state more fully into the intimate lives of its citizens". Another example (p. 9-10, 171) concerns "the long history of marriage in Nigeria. even though monogamous unions were the norm, precolonial Nigerians also sanctioned a wide range of marital practices, including polygamy - (including) polyandry, the community and ritually sanctioned encouragement of women to move from husband to husband, as they wished, while staying legally married to each -, deity-to-human marriages, and woman-to-woman marriages.. British colonial officials, as well as the post-independence Nigerian government, however, sought to quash this diversity in favour of a single acceptable model of heterosexual, male-headed unions". It is just striking to see how, which such clear examples, and the amount of empirical data available in the literature, authors such as Saxon still continue to refer to marriage as a 'natural feature' that somewhat spontaneously occurs in humans, both men and women. No, it is not: marriage has been historically mainly imposed, for instance by subjugating men within pre-state societies and/or by political systems that subjugate their citizens within post-state ones.

Because things are much more complex than simply 'nature' versus 'nurture' - as the two are deeply related - probably they interacted with each other and now modern humans are also 'naturally' different from chimpanzees, as can be seen from comparisons regarding sexual dimorphism based on body size or concerning white blood cell count, as noted above. But we are also surely different from gibbons, being probably somewhere between 'natural' polygamy and social monogamy. As a thought experiment, it is plausible to consider that if a certain group of humans were 'naturally' polygamous but were obliged by force, fire, stoning or dead threats to get married and be mainly seen with their spouse (that is, to give at least the appearance of social monogamy), a substantial part of the population would do so, despite of their 'natural desires'. So, the existence of marriage in a certain group does not necessarily prove that it is because each of its members 'naturally' wants it: in theory, it can in fact happen totally because of 'nurture'. What would be less plausible to explain is why in a species that would be 'naturally' socially monogamous, 1) there would be so much pressure, and force, historically used to keep those pair-bounding/marriage, and why 2) despite all that pressure/force, a substantial part of humans, among all groups, both 'pre-agricultural' and 'post-agricultural' continue to have extra-marital sexual relationships.

So, let's go back to the examples about 'pre-agricultural'

hunter-gatherer groups provided by Saxon in *Sex at Dusk*. She states (p. 190-191): "in hunter-gatherers we often find groups with fluid membership mostly comprising mobile nuclear family units that are linked through marriage into a much larger network.. looking at one hunter-gatherer culture, the Hadza, serial monogamy is the best way to describe the mating system. though perhaps 20% of Hadza stay married to the same person their whole life, divorce is often due to the pursuit of extramarital affairs". When asked "what happens if someone finds out his or her spouse has had an affair? 38% of men and women said the man would try to kill the other man, 26% said a woman would fight with the other woman, 20% said a man would leave his wife, and 13% said the woman would leave her husband". So, once again, this is another clear example where both women and men may be 'faithful to his/her spouse' not because they have no sexual desire for others, but instead because they would be abandoned, physically attacked, or even killed if they would do so. Apart from possible social pressure from the broader community - Saxon does not refer to this in this passage -, it does seem that jealousy might be playing a substantial role in these outcomes, as defended by Saxon, further reinforcing the point made by Sapolsky's book *Behave* and in the present paper: humans are paradoxical, they want to have sex with many partners, but want each of those partners to be only theirs. About the Aka, another hunter-gatherer African culture, Saxon states (p. 195) that divorce is common among them, and that "in 64% of divorces the cause was the spouse sleeping with, searching for, or finding another mate".

The last example, among the many I could provide here from *Sex at Dusk*, concerns again the !Kung, from the book "*Nisa: The Life and Words of a !Kung Woman*". Saxon explains (p. 191) that in that book it is written that "sex is also recognized as tapping some of the most intense and potentially explosive of human emotions - especially where extramarital attractions are concerned. In such cases, sex is considered outright dangerous: many affairs that become known lead to violence, which, in the past, sometimes resulted in death.. therefore people that participate in such relationships are extremely careful and discreet the best assurance against complications arising from love affairs is not to be found out". Of course Saxon uses this text to criticize *Sex at Dawn* - she uses any possible source of information to do so - but the text again clearly supports the main point of *Sex at Dawn*. This is because it comes directly from a !Kung woman that clearly explains how such affairs are not *supposed* to happen and can even lead to death, but still happen frequently because women - as men - have extramarital *attractions*. These attractions are so strong that, despite the risk of death, the solution is not to avoid them but instead to make sure the *love affair* is not found out. Of course, Saxon, in her

obsession of seeing just the branches instead of the whole tree, and of criticizing Ryan and Jetha, does not even seem to realize this, actually making a personal commentary that clearly reveals, once more, her own a priori prejudices and reactionarism (p. 193): "Nisa herself has an unusual number of husbands and lovers, and of her four children none survived, which could be related to her unstable marital relationships and sexual behaviour (which) is even criticized by a fellow !Kung as being like that of a man". Firstly, once again it reveals that in Saxon's head the sexual behaviour/desire of a woman can never be naturally like that of a man, so using her typical circular reasoning this can be only because Nisa was somehow an 'anomaly'. Secondly, she even suggests, without providing any kind of empirical data to support this suggestion, that perhaps Nisa's four children died because of this 'anomalous' sexual behaviour and "unstable marital relationships". Once again, there is a very thin - too thin - line between Saxon's book and what one can read from a 16th century religious text. To give a specific example, in *The Book of Common Prayer*, which was originally published in 1549 and became widely disseminated in Europe, it was written that "whatsoever your sickness is, know you certainly, that it is God's visitation" [45]. At that time, it was not uncommon to consider that the death of children was a direct punishment from God to the abnormal behaviour of the mother, including their sexual behaviours and/or unstable marital relationship.

As Saxon noted in her book, according to estimates by researchers that studied the Aka, another African hunter-gatherer culture, between the ages of 18 and 45 married people have sex 2 to 3 times a week and average sex three times on each of those nights. It is striking, and again a sign of intellectual dishonesty, that Saxon gives these numbers in the passages where she discusses hunter-gatherers to criticize, as she always does, *Sex at Dawn*, particularly the notion that hunter-gatherers in general have/had a higher frequency of sex than 'modern' societies do. This is because these numbers are much higher than those reported for married people in almost any 'modern' society. To give an example here, of the numerous ones that could be given, cohort analyses of sexual frequency in a representative sample of 7483 people living in the USA in 1988 show that younger couples who have been married for less than two years tend to have sexual relations an average 2 to 3 times a week, whereas older couples and those who have been married for more than two years tend to engage in intercourse only 1.5 times per week [46]. So, the average numbers for all the sampled married Aka between 18 and 45 are *only* seen in the sampled USA couples that are *both* young and married for less than two years, that is, in a very small proportion of the married USA population. According to Theiss, in 'modern' societies "a variety of life

events can also contribute to temporary conditions in a relationship that impede sexual contact. One obvious life event that interferes with sexual intercourse is pregnancy and childbirth. couples report engaging in intercourse four to five times per month during pregnancy, engage in no sex for the first month after the birth of the child, and return to levels of sexual activity similar to what they had experienced during pregnancy within the first year after birth" [47]. Theiss then states: "in another study, new parents engaged in intercourse only one to two times per month for up to four years after the birth of the first child, often citing tiredness as the main barrier to physical intimacy".

And there are cases within 'developed' countries which are much worse than the USA. For instance, in a country that is often said to be the 'technologically most developed one', Japan, people have an average frequency of 45 intercourses per year - i.e. 0.9 times per week -, with only about 27% reporting to have sex more than once a week [48]. These numbers are consistent with those from the *Sexual Well Being Global Survey* involving 26,032 respondents from 26 countries (minimal age: 16): as noted by Wylie, "two thirds (67%) of participants described having sex once a week, with people in Greece (89%) and Brazil (85%) having sex most often sex happened the least for participants in Japan (38%)" [49]. So, what is striking is not only the fact that in Japan almost two thirds of the people don't have any sex during a whole week: it is that this applies to one third of the people at a global scale, within 'modern', post-agricultural societies.

This negative correlation between sexual activity and the type of continuous stress felt by many people because of the 'modern, fast-paced, work-materialistic-productive centered lifestyle' in 'developed countries' and particularly big cities is in fact well documented in the scientific literature, being consensual within sexologists (e.g. [50-54]). As clearly stated, for instance in Hamilton & Meston's paper on "*Chronic stress and sexual function in women*", a type of chronic psychosocial stress that often has damaging effects not only on reproduction but also on sexual arousal and activity is that related to the "accumulation of small stressors that are *constantly or frequently* present, such as deadlines that never seem to be met, traffic, or financial worries" [52]. These are, of course, all items that particularly apply to life in so-called 'modern, developed cities'.

As a further attempt to go away from the discussion of the very different statements that *Sex at Dawn* and *Sex at Dusk* do about the same topic, often even about the very same empirical data, let's provide here references from researchers that have extensively studied and written about the history of love, sex and marriage in a way that seems much less biased. For instance, Coontz, in her book "*Marriage, a History*" [8].

She states (p. 20-29):

"Eskimo couples often had consensual arrangements, in which each partner had sexual relations with the other's spouse. In Tibet and parts of India, Kashmir, and Nepal a woman may be married to two or more brothers, all of whom share sexual access to her. The children of Eskimo consensual partners felt that they shared a special bond, and society viewed them as siblings. Such different notions of marital rights and obligations made divorce and remarriage less emotionally volatile for the Eskimo than it is for most modern Americans. Among Tibetan brothers who share the same wife, sexual jealousy is rare. The expectation of mutual fidelity is a rather recent invention. Numerous cultures have allowed husbands to seek sexual gratification outside marriage. Less frequently, but often enough to challenge common preconceptions, wives have also been allowed to do this without threatening the marriage. In a study of 109 societies, anthropologists found that only 48 forbade extramarital sex to both husbands and wives in some societies the choice to switch partners rests with the woman. Among the Dogon of West Africa, young married women publicly pursued extramarital relationships with the encouragement of their mothers. Among the Rukuba of Nigeria, a wife can take a lover at the time of her first marriage. Several small-scale societies in South America have sexual and marital norms that are especially startling for Europeans and North Americans. In these groups, people believe that any man who has sex with a woman during her pregnancy contributes part of his biological substance to the child. The husband is recognized as the primary father, but the woman's lover or lovers also have paternal responsibilities, including the obligation to share food with the woman and her child in the future. During the 1990s researchers taking life histories of elderly Bari women in Venezuela found that most had taken lovers during at least one of their pregnancies. Their husbands were usually aware and did not object. When a woman gave birth, she would name all the men she had slept with since learning she was pregnant, and a woman attending the birth would tell each of these men: you have a child. When Jesuit missionaries from France first encountered the North American Montagnais-Naskapi Indians in the early 17th century, they were shocked by the native women's sexual freedom. One missionary warned a Naskapi man that if he did not impose tighter controls on his wife, he would never know for sure which of the children she bore belonged to him. The Indian was equally shocked that this mattered to the Europeans: "you French people love only your own children, but we love all the children of our tribe", he replied".

Clearly, the statements of Coontz - using both examples not cited, as well as case studies referred to, in *Sex at Dusk* and *Sex at Dawn* - are much more in line to what is stated in the latter book. In fact, having read in detail, and several times, both these books, as well as Coontz book and an endless number of other books about these subjects, I can say that this happens in almost all cases: *Sex at Dusk* is frequently out of line, mainly because Saxon insists in seeing the branches and not the whole tree, and due to her circular reasoning. In fact, it is striking that in a book exclusively focused on sex and pair bonding in humans, Saxon did not even cite Coontz's book "Marriage, a history", which is considered by many as one of the more important references on the history of marriage. Saxon was apparently more interested in criticizing *Sex at Dawn* than in investigating in detail the subjects she was supposed to discuss on her book. This is a pity, because if Saxon had read Coontz's book, she would see how this book provides extensive evidence against Saxon's main idea: that, because of 'selfish genes', women are mainly 'whores'. Coontz explains (p. 35-45):

"According to the protective or provider theory of marriage - still the most widespread myth about the origin of marriage - women and infants in early human societies could not survive without the men to bring them the meat of woolly mammoths and protect them from marauding saber-toothed tigers and from other men seeking to abduct them. But males were willing to protect and provide only for their 'own' females and offspring they had a good reason to believe were theirs, so a woman needed to find and hold on to a strong, aggressive male. One way a woman could hold a mate was to offer him exclusive and frequent sex in return for food and protection. According to the theory, that is why women lost the estrus cycle that is common to other mammals, in which females come into heat only at periodic intervals. Human females became sexually available year-round, so they were able to draw men into long-term relationships. In anthropologist Robin Fox's telling of the story "the females could easily trade on the male's tendency to want to monopolize (or at least think he was monopolizing) the females for mating purposes, and say, in effect, 'okay, you get the monopoly and we get the meat' ". The male willingness to trade meat for sex was, according to Fox, "the root of truly human society". Proponents of this protective theory of marriage claim that the nuclear family, based on sexual division of labour between the male hunter and the female hearth keeper, was the most important unit of survival and protection in the Stone Age. People in the mid-20th century found this story persuasive because it closely resembled the male breadwinner/female homemaker family to which they were accustomed. The idea that in

prehistoric times a man would spend his life hunting only for the benefit of his wife and children, who were dependent solely upon his hunting for survival, is simply a projection of 1950s marital norms onto the past. But since the 1970s other researchers have poked holes in the protective theory of marriage they argued that the origins of marriage lay not in the efforts of the women to attract protectors and providers but in the efforts of men to control the productive and reproductive powers of women for their own private benefit. Some (researchers) denied that male dominance and female dependence came from us from our primate ancestors. Studies of actual human hunting and gathering societies also threw doubt on the male provider theory - in such societies, women's foraging, not men's hunting, usually contributes the bulk of the group's food. Nor are women in foraging societies tied down by child rearing. One anthropologist, working with an African hunter-gatherer society during the 1960s, calculated that an adult woman typically walked about twelve miles a day gathering food, and brought home anywhere from 15 to 33 pounds. A woman with a child under two covered the same amount of ground and brought back the same amount of food while she carried her child in a sling, allowing the child to nurse as the woman did her foraging. In many societies women also participate in hunting, whether as members of communal hunting parties, as individual hunters, or even in all-female hunting groups. Today most paleontologists reject the notion that early human societies were organized around dominant male hunters providing for their nuclear families (instead) there is strong evidence that in many societies (particularly) sedentary agriculturalists - marriage was indeed a way that men put women's labour to their private use. Women's bodies came to be regarded as the properties of their fathers and husbands."

So, in a nutshell, in this passage of Coontz's 2005 book she shows that this provider/'whore' theory is a very old just-so story that is mainly based on misogynistic biases rather than on actual empirical evidence. This is also shown in many other passages of numerous specialized papers and of other books, including the influential 2009 book *Mothers and Others* of Hrdy. Interestingly, Saxon does cite Hrdy a lot in *Sex at Dusk* to supposedly 'support' her ideas, but in reality Hrdy defends views that are very different from, and often even opposite to, those ideas. In fact, as the title of her 2009 book clearly indicates, Hrdy provides literally hundreds of empirical examples and case studies that completely destroy the two ideas that are the bulk of *Sex at Dusk*: that is, the 'husband-wife-children nuclear family' idea and the 'men hunter/women whore' idea. For instance, Hrdy explains (p. 147) that these are old just-so stories that date back all the

way to Darwin (e.g., [55] and to the Victoria era, and that are contradicted by actual empirical data (p. 150-151):

"From the outset, they (evolutionists) assumed that (the) provider must have been her (the wife's) mate, as Darwin himself opined in *The Descent of Man and Selection in Relation to Sex*. Indeed, it was the hunter's need to finance slow-maturing children, Darwin thought, that provided the main catalyst for the evolution of our big brains: "the most able men succeeded best in defending and providing for themselves and their wives and offspring", he wrote. it was the offspring of hunters with "greater intellectual vigour and power of invention" who were most like to survive". According to this logic, males with bigger brains would have been more successful hunters, better providers, and more able to obtain mates and thereby pass their genes to children whose survival was underwritten by a better diet. Meat would subsidize the long childhoods needed to develop larger brains, leading eventually to the expansion of brains from the size of an australopithecine's to the size of Darwin's own. Thus did the 'hunting hypothesis' morph into one of the most long-standing and influential models in anthropology. at the heart of the model lay a pact between a hunter who provided for his mate and a mate who repaid him with sexual fidelity so the provider could be certain that children he invested in carried at least half of his genes. This 'sex contract' assumed pride of place as the "prodigious adaptation central to the success of early hominids". (However) as it became apparent that among foragers (like the !Kung) plant foods accounted for slightly more calories than meat, researchers started paying more attention to female contributions (also). when Frank Marlowe interviewed Hazda still living by hunting and gathering, he learned that only 36% of children had fathers living in the same group. a hemisphere away, among Yanomano tribespeople in remote regions of Venezuela and Brazil, the chance of a 10-year-old child having both a father and a mother living in the same group was 1/3, while the chance that a Central African Aka youngster between the ages of 11 and 15 was living with both natural parents was closer to 58%. pity the Ongee foragers living on the Andaman Islands: none of the 11- to 15-years-olds in that ethnographic sample still lived with either natural parent."

In the same passage, Hrdy further notes: "when anthropologists reviewed a sample of 15 traditional societies, in 8 of them the presence or absence of the father had no apparent effect on the survival of children to age 5, provided other caregivers in addition to the mother were on hand in a position of help".

Therefore, as noted above, Saxon is being intellectually dishonest when she portrays *Sex at Dusk* as an updated

and progressive pro-women attack against *Sex at Dawn*: her book has nothing new or progressive, it is just one more repetition of misogynistic just-so stories that have been strongly contradicted by empirical data in the last decades, and that - precisely because of that - *Sex at Dawn* aims to put in question and discard, once for all. Similarly, in her book *Natural History of Love*, Ackerman notes (p. 278-279):

"It's worth noting that when we talk about gender we say that a man has a penis and a woman has a vagina. This distinction, which we take for granted, hides a prejudice about the baseness of women. A man's pleasure organ is the penis, and a woman's pleasure organ is her clitoris, not her vagina. Even if we're talking about procreation, it's not accurate: a man's penis delivers sperm and can impregnate, and a woman's womb contains eggs, which can become fertile. Equating the man's penis with the woman's vagina says, in effect, that the natural order of things is for a man to have pleasure during sex, and for a woman to have a sleeve for man's pleasure. It perpetuates the notion that women aren't supposed to enjoy sex, that they're bucking the natural and social order if they do. I don't think this will change very soon, but it reminds me how many of our mores travel almost invisibly in the plasma of language".

3. Conclusions

In summary, it can be said that Saxon is being intellectually dishonest when she portrays *Sex at Dusk* as an updated and progressive pro-women attack against *Sex at Dawn*. In fact, *Sex at Dusk* has nothing new or progressive, it is just one more repetition of misogynistic narratives/just-so stories that have been strongly contradicted by empirical data in the last decades. *Sex at Dusk* therefore is simply one more book that follows a disturbing pattern that combines strong personal biases and the use of out-of-date evolutionary ideas to reduce women to a mainly passive role, in particular concerning their sexually. By doing this, unfortunately *Sex at Dusk* - published almost two decades after Ackerman's *Natural History of Love* and written exclusively to attack *Sex at Dawn*, a book precisely aimed to put in question and help to discard, once for all, such old-dated, misogynistic tales - just confirms Ackerman's premonition that such narratives will in fact likely not "change very soon".

References

- [1] RYAN, C. & JETHA, C. (2010). *Sex at dawn: how we mate, why we stray, and what it means for modern relationships*. Harber Collins Publishers, New York.

- [2] SAXON, L. (2012). *Sex at Dusk: lifting the shiny wrapping from Sex at Dawn*. CreateSpace, New York.
- [3] ACKERMAN, D. (1994). *Natural History of Love*. Random House, New York.
- [4] BECKERMAN, S. & VALENTINE, P., eds. (2002). *Cultures of multiple fathers*. University Press of Florida, Gainesville.
- [5] KELLY, R. L. (1995). *The Foraging Spectrum: Diversity in Hunter-Gatherer Lifeways*. Smithsonian Institution Press, Washington.
- [6] DIAMOND, J. (1999). *Guns, Germs, and Steel: The Fates of Human Societies*. W. W. Norton & Company, New York.
- [7] REDDY, W. M. (2012). *The Making of Romantic Love: Longing and Sexuality in Europe, South Asia & Japan, 900-1200 CE*. The University of Chicago Press, Chicago.
- [8] COONTZ, S. (2005). *Marriage, a history: how love conquered marriage*. Penguin Books, New York.
- [9] HRDY, S. B. (2009). *Mother and others - the evolutionary origins of mutual understanding*. Belknap Press, Cambridge.
- [10] HOLLAND, J. (2012). *A Brief History of Mysogyny - The World's Oldest Prejudice*. Constable & Robinson Ltd., London.
- [11] CERELLO, K. & KHOLOUSSY, H., eds. (2016). *Domestic Tensions, National Identities - Global Perspectives on Marriage, Crisis, and Nation*. Oxford University Press, New York.
- [12] VAN SCHAIK, C. & MICHEL, K. (2016). *The good book of human nature - an evolutionary reading of the bible*. Basic Books, New York City.
- [13] BROWNING, F. (2017). *The fate of gender: nature, nurture, and the human future*. Bloomsbury, New York.
- [14] FEILER, B. (2017). *The First Love Story - Adam, Even and US*. Penguin Press, New York.
- [15] FINE, C. (2017). *Testosterone Rex - Myths of Sex, Science and Society*. W. W. Norton & Company, New York.
- [16] FINKEL, E. J. (2017). *The All-or-Nothing Marriage - How the Best Marriages Work*. Penguin Press, New York.
- [17] GREENBLASTT, S. (2017). *The Rise and Fall of Adam and Eve*. W. W. Norton & Company, New York.
- [18] NELSON, L. H., ed. (2017). *Biology and Feminism - a Philosophical Introduction*. Cambridge University Press, Cambridge.
- [19] TALLIS, F. (2018a). Women are more prepared for love. *O Publico* 28 May 2018: 14-15.
- [20] TALLIS, F. (2018b). *The incurable romantic: and other tales of madness and desire*. Basic Books, New York.
- [21] VALENTINE, P., BECKERMAN, S. & ALES, C. (2017). *The Anthropology of Marriage in Lowland South-America: Bending and Breaking the Rules*. University Press of Florida, Gainesville.
- [22] BARASH, D. (2012). *Sex at Dusk*. *The Chronicle of Higher Education*, 21 July 2012.
- [23] SAPOLSKY, R. M. (2017). *Behave - the biology of humans at our best and worst*. Penguin Press, New York.
- [24] PINKER, S. (2011). *The Better Angels of Our Nature: Why Violence Has Declined*. Penguin Books, New York.
- [25] HANSON, R. (2012). *Sex at Dusk v. Dawn. Overcoming Bias (Blog)*, 30 August 2012 (<http://www.overcomingbias.com/2012/08/sex-at-dusk-v-sex-at-dawn.html>).
- [26] MAH, K., BINIK, Y. M. (2001). The nature of human orgasm: a critical review of major trends. *Clinical Psychological Reviews* 21, 823-856.
- [27] DAWKINS, R. (1976). *The selfish gene*. Oxford University Press, Oxford.
- [28] DIOGO, R. (2017). *Evolution Driven By Organismal Behavior - a unifying view of life, function, form, trends and mismatches*. Springer, New York.
- [29] PIGLIUCCI, M. & MULLER, GB, eds. (2010). *Evolution - the extended synthesis*. MIT Press, Cambridge.
- [30] KULL, K. (2014). Adaptive evolution without natural selection. *Biological Journal of the Linnean Society* 112, 287-294.
- [31] JABLONKA, E., LAMB, M. J. (2005). Evolution in four dimensions - genetic, epigenetic, behavioral, and symbolic variation in the history of life. MIT Press, Cambridge.
- [32] WEST-EBERHARD, M. J. (2003). *Developmental plasticity and evolution*. Oxford University Press, Oxford.
- [33] WEST-EBERHARD, M. J. (2004). Ryuichi Matsuda: a tribute and a perspective on pan-environmentalism and genetic assimilation. In *Environment, development and evolution: toward a synthesis (The Vienna Series in Theoretical Biology)* (Hall BK, Pearson RD, Müller GB, eds). A Bradford Book, Massachusetts. p. 109-116.
- [34] WEST-EBERHARD, M. J. (2007). Dancing with DNA and flirting with the ghost of Lamarck. *Biology & Philosophy* 22, 439-451.
- [35] LALAND, K. N., ODLING-SMEE, J. & TURNER, S. (2014). The role of internal and external constructive processes in evolution. *Journal of Physiology* 592, 2413-2422.
- [36] LALAND, K. N., ULLER, T., FELDMAN, M. W., STERELNY, K., MULLER, B., MOCZEK, A., JABLONKA, E. & ODLING-SMEE, J. (2015). The extended evolutionary synthesis: its structure, assumptions and predictions. *Proceedings of the Royal Society of London B* 282: 10.1098/rspb.2015.1019.
- [37] LALAND, K. N., MATTHEWS, B. & FELDMAN, M. W. (2016). An introduction to niche construction theory. *Evolutionary Ecology* 30, 191-202.
- [38] PRUM, R. O (2017). *The evolution of beauty - how Darwin's forgotten theory of mate choice shapes the animal world - and us*. Doubleday, New York.
- [39] GOULD, S. J. (2002). *The structure of evolutionary theory*. Belknap, Harvard.
- [40] DORUS, S., EVANS, P. D., WYCKOFF, G. J., CHOI, S. S. & LAHN, B. T. (2004). Rate of molecular evolution of the seminal protein gene SEMG2 correlates with levels of female promiscuity. *Nature Genetics* 36, 1326-1329.

- [41] PUTS, D. A., DAWOOD, K. & WELLING, L. L. M. (2012). Why women have orgasms: an evolutionary analysis. *Archives of Sexual Behavior* 41, 1127-1143.
- [42] AL-KRENAWI, A. (2013). Mental health and polygamy: The Syrian case. *World Journal of Psychiatry* 3, 1-7.
- [43] MCBREARTY, S & BROOKS, A. S. (2000). The revolution that wasn't: a new interpretation of the origin of modern human behavior. *Journal of Human Evolution* 39, 453-563.
- [44] DRISCOLL, C. A. & THOMPSON, J. C. (2018). The origins and early elaboration of projectile technology. *Evolutionary Anthropology* 27, 30-45.
- [45] CHURCH OF ENGLAND. (1844). *The Book of common prayer: printed by Whitchurch, March 1549; commonly called The First Book of Edward VI.* William Pickering, London.
- [46] CALL, V., SUSAN, S. & PEPPER, S. 1995. The Incidence and Frequency of Marital Sex in a National Sample. *Journal of Marriage and Family* 57, 639-652.
- [47] THEISS, J. A. (2016). Frequency of sexual relations in marriage. In *Encyclopedia of family studies* (Shehan C, ed.). Wiley-Blackwell, Hoboken. p. 1-5.
- [48] SECHIYAMA, K. (2014). Japan, The Sexless Nation. *Tokyo Business Today* 19 December 2014.
- [49] WYLIE, K. (2009). A global survey of sexual behaviours. *Journal of Family Reproductive Health* 3, 39-49.
- [50] BONDENMANN, G., LEDERMANN, T., BLATTNER, D. & GALLUZZO, C. (2006). Associations among everyday stress, critical life events, and sexual problems. *Journal of Nervous Mental Diseases* 194, 494.
- [51] BONDEMANN, G., ATKINS, D., SCHAR, M. & POFFET, V. (2010). The association between daily stress and sexual activity. *Journal of Family Psychology* 24, 271-279.
- [52] HAMILTON L. D. & MESTON, C. M. (2013). Chronic Stress and Sexual Function in Women. *Journal of Sexual Medicine* 10, 2443-2454.
- [53] KINGSBERG, S. A. & JANATA, J. W. (2007). Female sexual disorders: Assessment, diagnosis, and treatment. *Urology and Clinical N America* 34, 497-506.
- [54] MCCOOL-MYERS, M., THEURICH, M., ZUELKE, A., KNUETTEL, H. & APFELBACHER, C. (2018). Predictors of female sexual dysfunction: a systematic review and qualitative analysis through gender inequality paradigms. *BMC Womens Health* 18, 108.
- [55] DARWIN, C. (1859). *On the origin of species by means of natural selection, or, the preservation of favored races in the struggle for life.* J. Murray, London.