UNDERSTANDING DREAMS FROM AN EVOLUTIONARY PERSPECTIVE: A CRITICAL STUDY

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Dreams have fascinated mankind for all of recorded history and probably long before. People have always been interested in the how and why of dreams and theories of dream functions have ranged from the esoteric to the mundane. Many contemporary dream theorists suggest that dreaming is functionally significant, but some others argue that, dreams are epiphenomenal and have no value in and of themselves**.** **Antti Revonsuo**[1], among others, upholds the former view, proposing a well-articulated theory of dreams that, for him, can be empirically tested. **OwenFlanagan**[2]**,** on the other hand, argues persuasively for the latter view. In this contribution an attempt has been made to consider, though briefly, the debate on the function, namely, what purpose if any does dreaming serve, what it is designed for - from the evolutionary perspective. Further, I would also question whether the concept of applying an evolutionary perspective to the issue of the function of dreaming is at all plausible.

Evolution and Functionality

First, let us turn to the preliminaries, namely, what is meant by dream function from an evolutionary perspective. From an evolutionary perspective, the function of dreaming is explained in evolutionary terms of natural selection. Living creatures within a species vary from one another in their traits which are passed on to their offspring, and there is competition for survival and reproduction amongst all of these creatures. Resultantly, those creatures that have traits better suited for survival and reproduction will precisely be the creatures to survive and reproduce and pass on the successful traits. Dreaming is a universal phenomenon, and the brain's capability to produce subjective, hallucinatory experiences during sleep seems to be a part of our biological machinery. Dreaming, then, from the evolutionary perspective, is a biological phenomenon residing in the brain and can thus be explained in a similar fashion as any other biological phenomenon.

The Debate: Flanagan vs. Revonsuo

Flanagan's Spandrel Thesis

Let us now turn to the debate centring round the function of dreaming as mentioned above. Flanagan, an evolutionary pluralist[3], in his book "Dreaming Souls" argues that even though dreaming is a type of consciousness, it serves no fitness-enhancing function whatever. Following Gould and Lewontin[4], the two well- known evolutionary pluralists, Flanagan divides biological traits into three non-mutually exclusive types- adaptations, exaptations and spandrels. Evolutionary biologists use the term "**adaptation**" in a restricted sense to mean that a trait is an adaptation if and only if the trait arose due to selection pressures for it, i.e. if it is fitness-enhancing-- if it contributes to reproductive success, to genetic fitness, to human flourishing and so on. "**Exaptations**", on the other hand, are neutral traits or non-adaptations that serve no purpose, but may be co-opted by natural selection to serve the function they

eventually serve. So an exaptation becomes an adaptation relative to that new function. For example, feathers of birds are believed to have been initially selected for to serve some thermo-regularity function (i.e. keeping the birds warm). Later wings eventually gave rise to flight. So we have birds that can stay warm as well as can fly. A "**spandrel**", the third type of biological trait, is an architectural term that refers to the triangular space left over when arches are placed next to each other at right angles, so as to begin mounting a dome—as we find in many great churches. Spandrels are the inevitable by-products of arch and column design. Thus, both exaptations and spandrels arise as non-adaptations, but while exaptations are co-opted by natural selection to serve a fitness-enhancing function, spandrels are neither selected and maintained nor co-opted.

Flanagan argues that there is no fitness-enhancing effect for which dream consciousness was selected and maintained when it first came on the scene, nor is there any fitness-enhancing effect for which dreaming was co-opted. He agrees that dreams are a result of the cortex processing noise, but denies them any biological function and also denies that the phenomenal aspect of dreaming was selected for. Hence, dreams, for him, are not worth remembering and they have no correlate, but since dreams are not maladaptive, they have survived. To put it in Flanagan's words, "Mother Nature caused us to dream because dreaming is what you get as a non-adaptive side effect of putting in place certain adaptations, especially ones involving selection for sleep and sleep-cycling."[5]

Dreams, therefore, on Flanagan's view, are evolutionary epiphenomena, just/mere side effects to the general architecture of mind, or spandrels of sleep. Sleep and sleep-cycling, NREM and REM sleep, have proper evolutionary functions (i.e. they restore, conserve and build) and thus are adaptations. Dreams do not have proper evolutionary functions, and thus, are not adaptations with a primary function. Neither are dreams exaptations with a secondary function. Dreams, which sit in between the functioning of the mind and sleep are, at best, spandrels or by-products of sleep, mere epiphenomenal, serendipitous accompaniments of what sleep is for.

Flanagan clearly distinguishes his view on dreaming from that of the neuro-cognitivists, like Hobson and Crick and Michison[6] - -according to whom, dreams

serve important cognitive functions - such as firmly fixing, filing and consolidating memories worth keeping or forgetting things worth forgetting. These cognitive functions, according to Flanagan, however, are served by sleeping rather than by dreaming, for he argues, "there is no evidence that what we dream about is relevant to what the mind-brain should be trying to remember or trying to forget for efficient cognitive functioning by daylight."[7]

Flanagan here presents a nuanced position when he argues that, though dreaming has no fitness-enhancing effects on the dreamer (i.e. the organism that dreams); yet dreaming does not detract from fitness. In his words," so long as a spandrel does not come to detract fitness, it can sit there forever as a side effect or free rider without acquiring any use whatsoever."[8] To clarify, Flanagan cites an example. The colour of blood or heart sounds, for instance, are biological spandrels for redness of blood comes as an inevitable side effect of all the important features of blood; similarly the noise that heart makes has not played any role in the evolution of the heart by natural selection. But this feature, Flanagan argues, does not detract from their usefulness in medical diagnosis. Flanagan further points out that, to argue that dreams are "spandrels of sleep" does not imply that they are meaningless garbage. Dreams, for him, serve a derivative psychological function, for the contents of dreams are not totally meaningless. Just as spandrels in architecture add to the architectural beauty, so also "Dreams", says Flanagan," can be used to shed light on mental life, on well- being and on identity" [9], and are, therefore, of great importance to a good life. But do dreams matter more than we think they do, as Freud thought? According to Flanagan, although dreams are not meaningless noise, neither are they privileged mode of thought beneath which lies something like our true or essential self. In fact, Flanagan stands in opposition to both Freud[10] and Jung [11]in that the function of dreams is not to deliver wish-fulfilment whilst keeping the individual asleep, nor is it to perform some homeostatic or self-regularity function towards maintaining the psychological well-being and development of individuals. To be sure, wish-fulfilment and apparent psychological compensation do sometimes occur in dreams, but this is because, Flanagan contends, we think during sleep and hence some human cognition does take place. The spandrel thesis about dreaming, Flanagan concludes, is more plausible because to argue that dreams have functions end up in nothing more than a

"just so" story, the result of speculation and guess work that cannot meet the standards of the ideal adaptation explanation.

Revonsuo's Threat Simulation Theory

Antti Revonsuo, an evolutionary psychologist, stands in opposition to Flanagan by arguing that dreaming is not a non-functional epiphenomenon of other sleep-related mechanisms, but an adaptation with a specific function. He strives to deliver an account that meets the stringent criteria of a scientific explanation of the adaptation of dreaming. His Threat Simulation Theory or TST, in short, is clearly distinct from the functional theories proposed by the neurocognitive scientists, noted earlier, which, according to him, cannot clearly distinguish the function of dreams from that of sleeping. Flanagan's Spandrel thesis, Revonsuo argues, neglects the vast literature on the phenomenal content of dreaming as well as its evolutionary context. Revonsuo's proposal to explain dreaming as an adaptation, he believes, comes close to the ideal adaptation explanation.

Now functionality, from the evolutionary perspective, is determined by whether or not something serves as beneficial to an organism or increases the likelihood of survival and reproduction. So if dreams are functional, this is what is expected of them i.e. if we dream we survive. According to Revonsuo, the biological function of dreaming is to simulate threatening events and to rehearse threat perception and threat avoidance. To show this he considers the original evolutionary context of dreaming and the possible traces it left in the dream content of the present population. Now, in the ancestral environment human life was short and full of threats. Any behavioural advantage then in dealing with these different kinds of dangers would have increased the probability of survival and reproduction. The dream production mechanism, by selecting threatening waking events and simulating them over and over again in various combinations would have provided early humans, our ancestors, with an adaptive advantage - threat - perception and avoidance skill - and this was selected into our genetic make-up.Revonsuo's TST, therefore, presents dreams as specialising in the re-creation of life-like threatening scenarios with the intent of improving the subject's capability to perceive or recognise and avoid diverse threats in waking life. The Threat Simulation system, then, can be seen

as an ancestral defense mechanism comparable to any biological defense mechanisms; it is activated in the presence of real threats in waking life.

To conceptualize his theory, Revonsuo, based on data from psychology, biology and neuroscience, puts forth his six claims thus:

1. Dreams are too organized and reminiscent of reality to be considered random noise;
2. dreaming is specialized in the simulation of threatening events;
3. genuine threats experienced in waking life have a profound effect on subsequent dreaming;
4. threat simulations produced are perceptually and behaviourally realistic rehearsals of threatening events;
5. the realistic rehearsals lead to enhanced performance regardless of whether or not the training episodes (i.e. learning) are explicitly remembered;
6. and finally, dreaming provided early humans with an adaptive advantage and was thus evolutionarily selected into our genetic make-up.

The TST, as a whole, Revonsuo admits, cannot be tested directly, for the presence or absence of dream threats cannot be controlled and, further, one's level of waking adaptations depends on factors that go beyond the context of dream content. However, he claims that his theory can be tested indirectly. The question arises, how could one test the dreams of the ancestral humans and analyze the relation between the dream content and survival rates across hundreds of generation. Revonsuo argues that, it is possible to test whether a biological system performs a specified function (e.g. whether the function of the heart is to pump blood) even if we have no access to data on the evolutionary history of the system. We simply study the behaviour and the mechanisms of the system to determine its biological functional role in the organism. In the same vein it is also possible to test whether the function of dreaming is threat simulation by simply testing whether dream content and mechanisms behave in a way that realizes this function.

Now the two chief strands of evidence that Revonsuo puts forth to support his Threat Simulation Theory are - first, he points to the marked impact of traumatic or threatening events on dream content. For him, the threat simulation mechanism is

uniquely activated when real threats are experienced. Secondly, he argues that empirical research on dream content indicates that "ancestral threat scripts" predominate even in everyday dreams. In support of this contention Revonsuo cites the predominance of negative emotions (anxiety, fear, panic) in our everyday dreams. Before going into the details of Revonsuo's claims, let us first consider the question of plausibility of using dreaming as a model system.

Some thinkers like Windt and Noreika[12] have voiced certain concerns about the adequacy and practical feasibility of using dreaming as a model system. First, they point out that there are certain theoretical concerns about the concept of modelling. A model is a system that adequately represents a particular explanatory target or certain of its properties and their relations, thereby contributing to its better understanding. But the problem is how to determine the relevant degree of similarity between a model and its explanatory target since there is no precise answer. Secondly, questions may arise concerning the adequacy of applicability of the concept of modelling to dreaming. Now Revonsuo argues for an identity between the qualities of dream experience and those of waking experience which leads him to contend that, "the dreaming brain could be viewed as a 'model system' for consciousness studies"[13]. Yet, there are, no doubt, certain dissimilarities between dreaming and standard wake states which raise concerns about the adequacy of dreaming as a model system. For example, for Churchland[14], there are distinctive differences, both in phenomenological and neurophysiological terms, between dreaming and wake experiences. Even Revonsuo,[15] who claims that the qualities of dream experiences and waking experiences are identical, admits that dreaming and waking consciousness differ with respect to the causal paths of production.

Windt and Noreika, therefore, conclude that it would be premature to identify dreaming as a model for standard waking consciousness. Leaving these preliminary queries aside, we would like to make a couple of observations that would put Revonsuo's position on dream content into question.

Now, TST revolves round two propositions based on natural selection--- 1) the operation of "ancestral threat scripts" in dream and 2) the bestowal of waking adaptive advantage from dream simulations. Both these propositions have been contested. For first, the preponderance of threat themes in everyday dreams is questionable, especially, where the definition of "threat" is restricted to "realistic

threats to physical survival". To clarify, Revonsuo's claim-"the operation of ancestral threat scripts in dreams" tends to show that TST works under the constraint that only severe threats to physical survival activate the TS mechanism and, therefore, the only threats which this evolved mechanism is able to deal with are realistic threats to physical survival. However, recent dream research indicates that current dream content shows more balance in the emotions reported.[16] In other words, the majority of dream content does not feature relevant threats of TST system; thus threatening events are overrepresented in Revonsuo's dream theory. Again, in the full panoply of threatening scenarios that dreams specialize, the obvious avoidance example is the fight/flight response. This, however, is an involuntary, unconsciously initiated process and not one involving the dreamer's repetitive rehearsal as Revonsuo argues. Why should behavior that is instinctual be repetitively rehearsed?

However, the definition of threat can be broadened to include social and psychological threats which abound in every society and are relevant in dreams as well as in waking life. But if this be included in dream analysis, this would entirely change Revonsuo's original contention that, "dreaming is concerned with our physical survival to fulfill its biologically adaptive task, regardless of the effects on our psychological well-being". [17]However, Revonsuo's reluctance to consider psychological adaptation to play a role in survival seems questionable. Science no longer entirely dissociates mental from bodily processes; hence the overall chances of survival and reproduction are compromised in individuals whose mental/psychological health is weakened.

We now turn to Revonsuo's second claim about the adaptive function of dreams. Threat avoidance is the pivotal feature of Revonsuo's proposed function for dreams. On this view dreams are specialized in simulating threats and better preparing humans for real threats in waking life. The crucial factor seems to be that responses to particular threats are remembered and thus future function is improved in the face of similar threats. Hence those with this system in place had increased chances of surviving and reproducing under selection pressures.

But some types of dreams, it has been suggested, reflect a breakdown in this dream function. For instance, Kramer[18] argues that nightmares represent a failure in the mood regularity function of dreams since the psychological experience of dreaming is unable to contain the emotional surge which accompanies REM sleep.

Similarly, it has been argued that recurrent dreams (i.e. dreams that recur over time while maintaining the same theme and content) constitute a partial failure in the Threat Simulation system. This is especially so, when highly dangerous threats are present in recurrent dreams (i.e. events that would be considered threatening to the physical or mental well-being of an individual if they occurred in waking state), these generally do not allow the dreamer to improve his or her ability to perceive realistic and probable threatening events nor to successfully avoid them. As a critic points out, "how do recurrent dreams about one's teeth falling out, having bathroom walls disappear when one goes to the washroom, being visited by a deceased person---contribute to the individual's adaptation and to the maintenance of his or her reproductive abilities"?[19] Revonsuo's[20] suggestion that such dreams may be linked to the dreamer's actual physical state (such as full bladder, fever or any other illness) implies the role of somatic or sensory stimuli upon dream content. But surely the role of bodily states in recurrent or even in everyday dreams remains to be empirically investigated. Where, then, is the mechanism that could bestow adaptive advantage on dreams!

TST is an evolutionary theory and applying an evolutionary perspective to the question of the function of dreaming seems, no doubt, valuable. If dream consciousness has an adaptive function then it follows that dreaming has, evolutionarily speaking, causal powers in enhancing survival and reproductive abilities. But in the light of the above arguments, Revonsuo's claim does not seem plausible. Probably a broader consideration of other testable evolutionary theories is called for. That being said, should we denounce the evolutionary perspective in the understanding of the function of dreams?

Concluding Remarks

Scientists over the past two centuries have proposed set of theories about the causal process responsible for the design of humans and other life forms. Indeed, only one theory of origins that has held sway among scientists is the Darwinian theory of evolution by natural selection. Natural selection is generally regarded as the most important known causal process that is capable of producing complex functional design that characterizes each species. What insights into human nature or, rather the human mind can be provided by examining our evolutionary nature? Evolutionary psychology provides an analysis of human mind as a collection of evolved

mechanisms with certain specific features/properties that historically contributed to the survival and reproduction of the early humans, our ancestors. A central premise of evolutionary psychology is that the main non-arbitrary way to identify, describe and understand evolved psychological mechanisms is to articulate their function. Turning to dreaming as an evolved psychological mechanism the question naturally arises, does dreaming show a clear design for a specific function? Is it specifically engineered to solve a specific adaptive problem?

But dreaming also relates to or affects other psychological or conscious/ non conscious phenomena. So dreaming needs to be tied to other subjective and psychological phenomena which figure in the etiological level explanation for behaviour.[21]

These implications render the study of dream a difficult and daunting task - which calls for a multi-level explanation. Such a multi-level frame-work, which proceeds with a holistic approach, is likely to provide a promising basis for dream research, for this would also accommodate interdisciplinary approaches to the development of an overarching theory of dreaming.

References

1. A. Revonsuo, (2000) The reinterpretation of dreams: An evolutionary hypothesis of the function of dreaming, Behavioural and Brain Sciences, 23, 877-901
2. O. Flanagan, (1995) Deconstructing Dreams: The spandrels of sleep, The Journal of Philosophy, 92, 5-27
3. Evolutionary pluralists claim that traits in the natural world are not always the result of natural selection but may be for a plurality of other factors such as genetic drift and structural constraints on development. The debate between adaptationists and pluralists centers on the pervasiveness of natural selection in shaping traits.
4. S.J. Gould & R.C. Lewontin, the two evolutionary pluralists, admit the primary importance of natural selection, but insist that there are other principles and processes that can give rise to the traits, characteristics and capacities of living things.
5. O. Flanagan, (2000) *Dreaming Souls*, 112
6. A. Hobson, F. Crick and G. Michison all agree that a brain-based explanation of sleep and dreams is necessary. They are in different ways functionalists about dreams.
7. O. Flanagan, *Dreaming Souls*, 122
8. Ibid.,108
9. Ibid., 123
10. Questions may arise as to whether we can club Freud and Jung under evolutionary pattern. Freud was not an evolutionary biologist; but his theory of dreams can be easily recast in evolutionary terms of natural selection. Freud thought that we dream in the way we do because it aids individuals in

surviving and so is passed on and therefore positively selected. But how does dreaming help individuals to survive? Freud postulates that dreaming simultaneously serves two functions—at the psychological level, the primary function is wish-fulfillment and since this mechanism could keep human desires in check, it would be selected for. At the physiological level, the primary function of dreaming is to keep an individual asleep while satisfying his unconscious desires. This may be considered as beneficial for the individual's survival. Jung's evolutionary story of dreaming differs from Freud's. His collective unconscious is where the ancestral memories are stored and are common to all. For Jung, dreaming serves multiple functions in keeping the individuals appropriately adapted to their social setting. Jung's theory is more often interpreted in Lamarckian than in Darwinian terms. According to Lamarck's conception of evolution, traits developed during lifetime can be subsequently passed on to the next generation. For Jung symbols that are learned during an individual's historical period can be genetically coded and passed on.

11. J. M. Windt & V. Noreika, (2011) How to integrate dreaming into a general theory of consciousness - A critical review of existing positions and suggestions for future research, Consciousness and Cognition, 20, 1091-1107

12. A. Revonsuo & K. Valli (2000), Dreaming And Consciousness: Testing the Threat Simulation Theory of the Function of Dreaming, Psyche, 6(8)

13. P. Churchland (1988) Reduction and neurobiological basis of consciousness, Consciousness in Contemporary Science, edit. A.Marcel & E. Bisiach, Oxford, Clarendon Press.

14. K. Valli & A. Revonsuo (2006), Recurrent dreams: Recurring threat simulations? Commentary on Zadraet.al, Consciousness and Cognition, 15, 464-469

15. Threat in dreams is argued to be over-represented compared to threat in everyday life. In fact everyday dreams contain other elements too.

16. Revonsuo, (2006)

17. M. Kramer,(1991), The nightmare: A failure in dream function, Dreaming, 1, 277-285

18. S.Desjardins & A. Zadra, (2006), Is the threat simulation theory threatened by recurrent dreams?, Consciousness and Cognition, 15, 470-474

19. A. Revonsuo (2000), Did ancestral humans dream for their lives? Behavioural and Brain Sciences, 23(6),1063-1082

20. Many theories of dreaming, while assigning a biological function for dreaming propose effects ranging from emergence of self-awareness to enhancement of social skills and to threat avoidance behaviour. Recently dream imagery is linked with the psychological well-being of the individual