Introduction to the *Journal of Consciousness Studies* Special Issue on Sentience and Consciousness

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It is with great pleasure that we present this special issue of the *Journal of Consciousness Studies*. The issue had its inception in London after Alfredo Pereira Jr. stayed for 6 months as Visiting Researcher at Goldsmiths University of London and gave an Alfred North Whitehead lecture there on his work on sentience. During this lecture, he briefly speculated on the implications of his work for medical practice and this led to a recommendation that he attend a conference on Disorders of Consciousness (cited in his work here) that alerted him to the need to stimulate discussion on this topic as reported here in this special issue.

The special issue consists of a preface by Antonio and Hanna Damásio, a target paper entitled *The role of sentience in the theory of consciousness and medical practice* written by Alfredo Pereira Jr., 10 commentaries on this paper, a second 'technical paper' that complements and develops some arguments and concepts introduced in the target paper, and, finally, a reply by the author to each one of these commentaries as well as to the preface (that started life as a commentary) and to Karina's requests for clarification on the concept of sentience.

Building on the theories of consciousness invoked in the medical sciences in general, and in neurology and psychiatry in particular, the target paper develops a concept of sentience with the aim of expanding our understanding of its relevance to medical diagnosis and to therapeutic interventions into disorders of consciousness.

The enterprise takes as its starting point the conceptual delimitation of sentience from cognitive consciousness, as being two broad modes intrinsic to the notion of consciousness. Pereira Jr. defines sentience as the capacity to be awake and to have feelings, by which he mainly means basic sensations, such as feelings of hunger, thirst, and pain. In turn, cognitive consciousness is conceived as the mode of consciousness thanks to which we can elaborate

complex representations of reality, which includes our ability to retrieve episodic memories and to plan deliberate actions.

This endeavor is not merely conceptual. Pereira Jr. seeks to delineate the different neural correlates associated with each of these modes, and argues that our understanding of these different correlates is important in the development of better tools for medical diagnoses and therapies.

The paper consists of an *Introduction*, a section entitled *Conceptual Questions*, three other sections, respectively entitled *Brain Function, Sentience and the Control of Homeostasis*, *Sentience in Neurology*, and *Sentience in Psychiatry*, and, finally, rounds off with concluding remarks.

The paper's introduction announces the thesis that the epistemological distinction between sentience and cognitive consciousness can be useful for medical diagnosis and therapy. The author discusses the conceptual relationship between sentience and cognitive consciousness, including its neurological and psychological correlates, by developing an axial hypothesis: although cognitive consciousness is distinct from sentience in terms of level, it depends on sentience and, more than that, sentience is the minimum - not negligible - level of attribution of conscious mental states to a person. For this reason, it is imperative that medical therapies and diagnoses give special meaning to sentience; otherwise, they will fail to consider the propensity for basic conscious experiences in persons suffering from hunger, thirst and pain but unable to perform more elaborate tasks.

In the section of the target paper entitled *Conceptual Issues*, Pereira Jr. starts from the commonplace definition of sentience that we find in dictionaries and reminds us that sentience is an elementary level of (pre-)consciousness that is not to be confused with notions of perception and thought. Rather, sentience is the *capacity* we have, for example, to nurture proprioceptive sensations and to express them as emotional feelings and, more than this, it enables us to have qualitative experiences. In other words, it is what is known in Affective Neuroscience as the *affective impulse* that makes us conscious at a given moment of mental processing. Pereira Jr. also reminds us that, in Affective Neuroscience, the immediate level of expression of sentience is conceived of as being distinct from the level of cognitive consciousness; within the terminology advanced by Marie Vandekerckhove (one of the invited contributors to this issue), affective and/or *anoetic consciousness* is distinguished from the *noetic* and/or *self-noetic* modes of consciousness, because the latter modes are mediated by mental *representations* about the Self and the World which are, in the human mind, mostly based on imagery and verbal languages.

In pursuing the discussion of sentience and cognitive consciousness, the author of the target paper invokes another distinction between the unstructured 'here-and-nowness' and the episodic experience, filled with representations associated with qualitative properties (*qualia*) and structured with a *sense of self* and a *sense of world*; sentience, it is argued, refers to this unstructured 'here-and-nowness', while cognitive consciousness refers to the episodic experience. This consideration provides an interesting launching off point for the next section, entitled *Brain function, sentience and the control of homeostasis*. This section begins by delineating the assumed three levels of dynamic organization in the architecture of the mental and vital functions of living individuals. These are, respectively, (i) the processes proper to life, (ii) the processes proper to sentience and (iii) the processes proper to conscious emotion and cognition. The author of the target paper states: "On the basis of this architecture, I claim that sentience, the second level, arguably present in all multi-cellular organisms [which includes plants and colonies of unicellular living systems] is the basis for the third, 'higher' level". From this it follows: "Information processing without feeling (as in computers) is not conscious; when there is a feeling about the meaning of the information, the pattern is conscious" (Pereira Jr., this journal issue).

Some physiological information about the neural mechanisms of sentience in animals and notably also in plants is then provided. An important claim is made about the evolutionary motivation for the emergence of sentience in living beings. To quote: "During the evolution of life, this supplementary type of mechanism emerged, endowing living systems with the capacity of having a 'feeling of what happens' within their bodies and in the environment".

In the section of the target paper that follows, entitled *Sentience in Neurology*, the author develops what is promised in the abstract, namely the idea that sentience is distinguished from consciousness not only at a conceptual, semantic and/or terminological level but also at a physiological level; for instance, it is claimed that general anesthesia is targeted to promote a loss of sentience. When medicine seeks to prevent a patient from feeling pain during surgery, it aims at the temporary loss of sentience, rather than the loss of our most elaborate cognitive functions.

Equally pertinent is Pereira Jr.'s discussion in the section entitled *Sentience in Psychiatry.* The author makes a comparison between neurological injuries and mental disorders, namely: "neurological lesions and dysfunctions are losses in sentience, while disorders of conscious functioning are more properly related to psychiatry". Nevertheless, the author plausibly argues that not only neurological problems, but also mental disorders treated by

psychiatrists can and should be viewed from the perspective of sentience and disruptions in the neurological mechanisms that underpin it.

All the evidence adduced by the paper provides a compelling argument for sentience being distinct from cognitive consciousness and of critical importance for medical diagnosis and treatment. In the words of Pereira Jr., epistemologically speaking, distinguishing sentience from cognitive consciousness "has powerful medical implications for the treatment of patients in vegetative states". After all, as he explains, "the claim that the capacity of elaborating mental representations is less fundamental for the evaluation of conscious activity than the capacity for sentience, if true, could have an impact in medical practice and bioethical considerations…the minimal requirement for considering a person conscious is, in this line of reasoning, if she feels or does not feel basic sensations as hunger, thirst and pain". Moreover, "higher-level capacities, such as imagining playing tennis...may not be adequate as a general standard for medical diagnosis of disorders of consciousness". We can be experiencing the most basic and fundamental qualitative sensations whilst not satisfying such an elaborate standard: "As a result, instead of 10% of persons in a vegetative state being conscious (Monti *et al.*, 2010), there may be far more of them being sentient, with similar ethical implications".

The first commentary, by Chris Nunn, is entitled *The Role of Sentience in the Theory of Consciousness and Medical Practice: a commentary*. Nunn aims to show that the concept of sentience proposed in the target paper is ambiguous, and that the role proposed for astrocytes depends on a sort of 'cognitive illusion' due to consequences of scaling. Therefore, Nunn concludes that "all that one can say about the possible roles of astrocytes in illnesses is that they do have a role". Finally, Nunn pointed out that the content of 'cognitive consciousness', but not its phenomenality, is addressed in the target paper.

Stevan Harnad is the author of the second commentary. In his text, entitled *On the (too) Many Faces of Consciousness*, he argues that Pereira Jr. rightly defines sentience as the capacity to feel (anything). However, Harnad claims that the message is scrambled "in an incoherent welter of weasel-words for consciousness and the [mistaken] notion that there are *two* consciousnesses (sentience and "cognitive consciousness")"; he suggests that one "hard problem" of consciousness is already "more than enough".

The third commentary, entitled *Why is There Sentience? A Temporo-Spatial Approach to Consciousness*, is by Georg Northoff. His commentary addresses the following question: why and how is there sentience? Reviewing different lines of data, Northoff proposes that temporo-spatial mechanisms that underpin the brain's spontaneous activity are key to making possible the capacity to feel, namely sentience. Why do we have the capacity for feeling and

thus for sentience? For Northoff, it is because our brain continuously integrates the different inputs from body and environment within its own ongoing temporo-spatial matrix. Our brain's temporo-spatial dimensions (and, hence, neuro-ecological and neuro-bodily dimensions) provide the capacity to feel, that is, sentience.

The next commentary, by Gerry Leisman and Calixto Machado, is entitled *Many Paths to Consciousness or Just One? Life in a Bounded Continuum*. Leisman and Machado understand that Pereira Jr. argues for sentience and cognitive consciousness each possessing their own independent physiological correlates and claim otherwise. They contend that there are not separate systems that construct consciousness, given that such an arrangement would be singularly inefficient and perhaps even dangerous. They invoke sentience as the basis of our interaction with our environment and, therefore, not a separate component of consciousness but rather an integral part of it. They argue that disorders of consciousness reflect a functional disconnection syndrome, and that the best marker of clinical disorders of consciousness is disrupted global functional inter-connectivity rather than activity associated with only a part of the larger system.

The fifth commentary, entitled *The Role of Sentience in Discovering the Beholden by The Beholder*, is by Tina Lindhard. She proposes a new approach to consciousness research by including the study of the development of our body during our embryological past as a way of clarifying our fundamental nature and its relationship to cognitive and sentient principles. In her commentary, she advances the idea that the cardiac system underpins sentience, making it a property of our fundamental nature.

The sixth comment, by Samuel Bellini-Leite, is entitled *How Sentience Relates to Dual Process Distinctions of Consciousness*. Bellini-Leite aims to contrast the concepts of conscious, explicit, and controlled processes, and their counterparts, unconscious, implicit, and automatic processes, to determine whether they have specific meanings or if they are just different words for the same phenomenon. He concludes that, although these terms can be misused in the literature, we can find a specific use for each. Building on this analysis, he discusses the concept of sentience, as proposed in the target article, and concludes by claiming that sentience is a distinct concept from those extant in the cognitive literature, and that any complete characterization of mental functions, which is after all precisely the goal of cognitive psychology and cognitive neuroscience, should include sentience.

In the seventh commentary, *The Role of Instrumental and Epistemic Inferences in Sentience and Cognitive Consciousness*, Mariano D'Angelo and Maicol Vallicelli analyze Pereira Jr.' approach using Karl Friston's *Predictive Coding* framework. They propose that

sentience can be described in terms of "instrumental interoceptive inference" and that cognitive consciousness, as described by Pereira Jr., is evolved from "epistemic active inference". In line with the work of Anil Seth and Manos Tsakiris, both cited in the commentary, they argue that the instrumental inference may originate a "phenomenology of being a self", a minimal sense of selfhood which is non-localized and non-object based.

Sentience and the Evolution of Animal Mind is the title of the eighth commentary, by Antonio Alcaro. Alcaro proposes that Pereira's statements should be carefully considered by researchers interested in the topics of consciousness and the mind-body connection. He argues that Pereira's criticism of the "neural doctrine", that attributes an exclusive role to neurons (and their patterns of activity) in generating mental experiences, is useful since it calls into doubt this attribution that is generally accepted by neuroscientists, psychologists and philosophers of mind. He concludes that the broader view advanced in the target paper can contribute to a better approach to studying the correlates of animal sentience and consciousness.

Alessandro Colasanti and Hugo Critchley are the authors of the final commentary, entitled *Primordial Emotions, Neural Substrates and Sentience: Affective neuroscience relevant to psychiatric practice*. In this commentary, the notion of sentience is appraised from the perspective of affective neuroscience. Colosanti and Critchley consider interoceptive and motivational feeling states as foundational to the emergence of core sentience from allostatic regulation. The role of glia in mediating the adaptive functions of reactive neural architectures is acknowledged as being increasingly appreciated within a broader emerging formulation of brain biology across spatiotemporal scales, arguably grounded in the governance of energy metabolism. The relevance of Pereira's formulation of sentience for psychopathology, as expressed through the filter of affective neuroscience, is critically reviewed by Colosanti and Critchley and contrasted with emerging models of psychopathology informed by evolutionary considerations.

In his reply to the comments, Pereira Jr. summarizes the theory of consciousness that supports the target taper's claims directed at medical practice and replies to each commentary and the criticisms therein in turn. According to his understanding, the criticisms are mostly directed at equating sentience and homeostasis and at separating two fundamentally different types of consciousness. In reply, he explains that sentience "is not homeostasis, but a feature of the process (allostasis) that drives the recovery of stability, after a stimulation that moves the physiological process beyond the baseline" (Pereira Jr., this journal issue). He also calls attention to the temporally continuous nature of the process connecting sentience to consciousness, invoking "anoetic consciousness" as the most immediate expression of the

sentient capacity in conscious experience which is also manifest in non-human animals and possibly in plants. Building on the exposition of the theory and the ensuing discussion, he sketches future directions, pointing to an opportunity for developing *Sentiomics*, a science of the universal patterns of sentience, as distinct from *Qualiomics*, a study of qualitative subjective features of first-person conscious experiences.

This special edition also features a second paper by Pereira Jr., entitled *Sentience and Conscious Experience: Feeling Dizzy in a Virtual Reality Roller Coaster Ride* which is intended to complement the target paper. In this text, Pereira Jr. proposes that conscious experiences are dynamic and relational phenomena, depending on the tuning of internal dispositions of sentience (the affective drive) and affordances that arise in the domain of the interaction of the agent with the physical and social environment. Focusing on the example of a Virtual Reality Roller Coaster (VRRC) conscious experience, he invokes his first-person experience of feeling dizzy in the VRRC ride and associates it with third-person experimental results about its neural correlates - involving the vestibular system and the direct perception of a visual cliff - to offer an explanation of why some people feel dizzy during the downward phase of the ride while others do not. The proposed explanation serves to illustrate how affective, cognitive, and enactive functions are integrated in the formation of conscious episodes.

We conclude this introduction by giving the final word to Antonio and Hanna Damásio who kindly agreed that we could use their commentary on the target paper to furnish the preface that follows this introduction. Their comments serve to put this endeavour into historical context and to sing out its main message, namely that consciousness has its foundation in fundamental processes that Pereira Jr. terms ‘sentience’ that we share with even rudimentary life forms. Thus a consciousness of these fundamental processes can hopefully not just inform medical practice but also give us a reverence for life in all its forms.