I welcome Amy Ione's recent article in the Journal of Consciousness Studies. It fuels a debate that is long overdue, of the relationship between brain processes and artistic creativity and appreciation. Why should such a study and such a debate be of any interest to a neurobiologist, unless he is an artistic dilettante or an aesthete? The answer is simple: the human brain is the most perfected product of biological evolution. It has many characteristics, and among the most important is the production of subjective mental states, which is indeed almost a defining characteristic of humanity. These states can be expressed in a variety of ways and art, in the broadest sense, is one of them. The study of neurological processes underlying artistic achievement and appreciation therefore constitutes an important area of work in neurobiology, and a crucial area for studying subjective mental states. Artists and their historians have much to contribute to such a study. Ione in fact agrees with much that I have said, 'adapting rather than adopting my views'. There still remain important points of debate, perhaps owing to misunderstanding but also to genuine differences of view, that are worth addressing here.

We can communicate about art and through art, without the use of the written or spoken word. This in itself is a remarkable achievement and underlying it is a remarkable fact, little appreciated by those whose profession lies outside the study of the brain – namely that underlying the subjectivity in mental states and their variability is a commonality. The study of that commonality is well within our reach. It is indeed because of it that brain studies enjoy such an enormous success. At a relatively elementary level of observation, one normal brain is pretty similar to another. Superimposed upon this, though, is another factor: that of variability in the capacities of human brains. This is an area of huge importance, but which brain studies have not so far been able to address, partly because we still have a very incomplete picture of the common organization of the human brain. The study of variability will assume a high and honourable place once we achieve this.

I have tried in my articles and in my recent book to enquire into what our present-day knowledge of the visual brain can tell us about one of its products, namely visual art, its creation and its appreciation. I have been at pains throughout to emphasize that there is little we can say today about the neural processes underlying aesthetics, which is why I have restricted myself largely to perceptual processes that are common to the mightiest artist and the humblest of persons. But to one even this limited aim represents an outdated folly because its unlikely scientists will be able to establish hard-and-fast principles in this area given how artists work and 'since it seems unlikely that we could ever reduce the experimental approach an artist uses to easily definable brain functions and neural processes'. Brave and bold statements these, with which I would not have the courage either to agree or disagree. For me there is only the trying.

Historians of art, as opposed to artists, seem on the whole to fear a study of the common neural machinery that makes subjective experiences possible. For them, the notion that the subjective experience of colour, for example, depends upon the brain's ability to construct colour, which, in turn, depends on a machinery whose anatomical location is well known and whose functioning follows common rules in different brains – including that of artists, is anathema. They stigmatize it with the word 'reductionist' and argue in terms of a vague holism (Ione rather accepted, without the slightest intellectual control, all that his retina presented to him. He did not suspect that the visible world can become the real world only by the operation of the intellect; or of Cézanne's belief that Monet painted with his eye – 'a metaphor for the intuitive process of visual apprehension', as she wants us to believe? Or of a separation between the retinal image, the perceptual processes and higher cognitive functions, which she unwittingly champions in the above quotes, and which is in fact the reductionism that she rigidly
adheres to but dislikes so much in others? And what of the statement of J. J. Gibson, so beloved of art historians: ‘The visual world can be analyzed into impressions which are object-like, and these impressions are traceable to stimulation... These impressions do not require any putting together since the togetherness exists on the retina’, another ‘metaphor for the intuitive process of visual apprehension’?

Elsewhere Ione attacks me for statements that are not mine but attributed to me by her. She says that I describe statements that are not mine but attributed to me by her. She says that I describe ‘Cézanne’s work as a painted epistemology’ on the evidence that Cézanne supposedly shared Kant’s views. She flatters me – it is not easy for me to imagine such loaded terms. I was in fact quoting an article by Novotny and added that I agree with Kahnwiler when he says ‘I insist in passing that none of these painters... had a philosophical culture and that any possible connection between their view – and above all those of Locke and Kant – was unknown to them, their classification being more instinctive than reasoned’”. My very next statement should also have reassured her: ‘the preoccupation of artists has, instead, been less exalted... of exposing themselves once and all and never changes. What we see today, or are actively engaged in artistically, also forms part of the visual memory record and no doubt modifies it in ways that neurobiology has still not properly addressed. Hence her attack loses much if not all of its force, and her statement that ‘Cézanne, like painters in general, was also looking at what he was building on the canvas’ and that he ‘continually found ways to perceptually deepen all he wanted to express with paint’ hardly comes as news! I too have emphasised in my book the development that marks Cézanne’s work, seen especially well in the successive paintings of the Montagne Sainte-Victoire, also noted by her.

But perhaps Ione’s best part comes towards the end where she describes what she believes is the plasticity of Jonathan I’s brain, the artist who became colour blind. This is a case which to her is ‘particularly important in terms of Zeki’s ideas’ because my descriptions, ‘while accurate... would have been more convincing (and seemed more relevant to art) if [Zeki] had attempted to neurologically consider how Mr. I’s art changed in relation to his brain’. This case, she believes, illustrates ‘how Zeki’s conclusion seem[sic] to miss important modalities related to artistic creation, artistic perception, and artistic vision – especially in relation to the brain’.

She says that Jonathan I ‘did not lose his appreciation of art. He not only remained a painter after losing his ability to see colour, the neurological evidence shows that [he] was able to substantially remap his brain after the tragic accident that deprived him of colour vision’ (original emphasis). I do not know where she obtained the evidence that he substantially remapped his brain, but it is clear that the remapping did not resuscitate his sense of colour and that he had lost not only the sense of colour, but its aesthetics too. Ione writes, ‘He continued to paint although colour ceased to be a part of his mental knowledge and his mind... People applauded the black-and-white paintings he now produced.’

Now there is a paint that all anti-neuro-reductionists might want to consider.

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Unfixed action patterns: social behavior and the brain
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Social interactions are important: how else to explain the willingness of 25 000 neuroscientists to gather for five days every year in cavernous convention centers filled with thousands of simultaneous poster presentations, lectures, arguments and annual reunions? For the truly courageous, pre-meeting workshops and symposia add one or two days onto the marathon that is the Annual Meeting of the Society for Neuroscience. The J. B. Johnston Club has met the day before the Neuroscience Meeting for the past 20 years, with an eclectic array of talks about comparative neuroscience and evolutionary biology, and during the past 12 years, it has sponsored an additional day devoted to the Karger Workshop, supported by Karger Press, which examines a single neuroscience topic from a comparative perspective.

The 2000 workshop was organized by Matthew Grober (Arizona State University, Phoenix, AZ, USA), and focused on the reciprocal relationships between social interactions, and the neural and hormonal mechanisms underlying them. Six presentations and an audience accustomed to lively