Color Afterimages as Innate Memories as Hypothesized by the Mirror Universe Theory

Stephen P. Smith

Abstract. This paper considers two explanations for negative color afterimages: that they are the result of overstimulation of the retina, or that they are a result of training and are part of an innate memory that begins in the retina. Moreover, the innate memory hypothesis comes with an additional speculation that innate memories are part of a mirror universe and have a panpsychist origin. By measuring the duration in one person's experience it was found that a 40-second exposure to blue comes with a yellow afterimage that lasted 35 seconds. This was only 4 seconds longer than the afterimage that followed eight 5-second showings of blue that were separated by seven 5-second refractory periods that showed white light. That is, the skimpy 4 seconds did not impress given the claim that overstimulation causes afterimages and given the whopping 35 seconds (7×5) of refractory time allotted to the alternative. Because the seven refractory periods also came with afterimages, the cumulative duration of afterimages was actually 66 seconds and this provides a stronger contradiction of the explanation based on overstimulation. Furthermore, a 5-second showing of blue generated a 10-second afterimage, a 200% increase over the showing of blue. However, with more stimulation the 40-second showing of blue generated an afterimage that was only 87.5% as long as the stimulation time. Taken together, these demonstrations marginally support the memory explanation, but there remains room to disagree.

Key Words: Additive Color Model, Afterimage, Color Afterimages, Color Complement, Cortex, Memory, Mirror Universe, Retina**,** Two-sidedness.

1. Introduction

Afterimages that come as negative images are thought caused by bleaching of photoreceptors in the retina that leads to a state of fatigue needing recovery (MacLeod and Hayhoe 1974, Williams and MacLeod 1979). This paper offers an alternative view, that color afterimages are part of an innate memory that starts in the retina and carries itself to the brain. Moreover, this paper connects this memory with the mirror universe theory and an associated panpsychism.

Color Afterimages are described in Section 2, and are found as near color complements under the additive color model that involves the basic colors of blue, green and red. Section 3 presents some additional references that support the fatigue-based explanation. The memory model and its connection to the mirror universe is detailed in Section 4. Section 5 presents three demonstrations that are found supporting the memory hypothesis, based on the personal visual experience of the author. While the results of these demonstrations are likely repeatable experiences,

they do not provide conclusive evidence. However, they are strongly suggestive, and it is because of these findings that the memory theory is offered. Section 6 presents the conclusions, and includes some speculations and questions involving a broader connection to the mirror universe hypothesis.

2. Color Afterimages

Afterimages can be both positive and negative. In the morning when my eyes are fresh, and when I momentarily look out the window and see the first sunlight in the sky and the outline of trees and their branches, and still before any color shows, I may momentarily see the positive afterimage when I close my eyes. The sky remains white, and against the white background the dark outline of trees and branches are visible. The positive afterimage soon fades, and gives itself over to a more longer lasting negative afterimage where what was white becomes black and what was black becomes white. This image will fade as well but before it completely disappears, by putting my hands over my eyes to block out any light, the positive afterimage immediately reappears before it too fades.

Afterimages need not be restricted to black and white. There are also color afterimages, and they also come in both the positive and negative modes. The negative color afterimages are the subject of this paper, and they are most striking and easy to create. Manzotti's (2017) model of color afterimages will be adopted without debate. This model is based on the colors blue, green and red, which are basic colors in the additive color model. When these three colors are brought together at full intensity, or combined to make an additive mixture, what results is white light. The additive mixture is not the same as what comes by mixing pigments of paint. When paint is mixed what comes out follows the principle of a subtractive mixture, and this recognizes that colors are absorbed by pigments and what gets reflected and seen is what's not absorbed.

Manzotti's model predicts that the color's afterimage showing on a white background is the color's complement (found by negating the additive mixture of the color from white light) plus mixing[1] back an arbitrary proportion of white pigment to soften the afterimage.

Our personal experience of color is subjective, it is what Chalmers (1995) refers to as "qualia" in his treatment of the "hard problem of consciousness". Nevertheless, some of the qualia we experience represents a shared experience, as implied by Manzotti's model. While the name of any color is by convention, it remains possible that folks that see yellow could actually be seeing what I call blue, and vice versa. I could settle the issue if only I could step inside their head and check, but that is impossible. It remains remarkable, however, that complementary pairs of colors, like blue and yellow taken together, have a shared reality across observers while leaving our naming convention

[1] As in mixing paint.

otherwise undisturbed. The exceptions are those that experience color blindness.

If this is your first time studying afterimages please view my 14-minute video posted on YouTube:

https://www.youtube.com/watch?v=3WL8lxO4hzg

Understand that the account in the video that describes the mirror universe theory and its relation to afterimages is only an introduction and can be misleading. A better treatment is presented in Section 4.

3. Explanation Based on Fatigue

One theory of afterimages is that (1) they are generated in the retina, and (2) are the result of fatigue in the retina. There is some evidence to support this view that they are generated by the retina, and are also modified by cortical processes (Zaidi et al. 2012). The idea that afterimages are a result of fatigue-causing bleaching, or a neural adaptation in the retina, has also been advanced (Shimojo, Kamitani and Nishida 2001).

Whether afterimages are derived from the retina alone or not, the fatigue-based theory carries the connotation of a one-way information transfer from eyes to brain that is overly mechanistic and lacks substantiation, and it implies that afterimages are less than perfect defects and have no redeeming qualities.[2] Both of these connotations are rejected in the next section where a memory-based theory is introduced.

4. Explanation Based on Memory in the Mirror Universe

The discussion must necessarily and abruptly switch from neurobiology and over to cosmology. Boyle, Finn and Turok (2018), Barbour (2020), Cyr-Racine, Ge and Knox (2022) have all advanced a mirror universe cosmology. The typical account describes a mirror universe reflected across the big bang, or Janus point. The universe on the other side may be viewed as separated. However, this specification is unnecessary, and hence there can be alternative ways to describe the mirror universe more precisely, and this flexibility is most serious when the cosmology is further represented by a space-time geometry. Note that if the mirror universe hypothesis is true, there would be no way to distinguish one universe from its twin. Because the laws of unified field theory

[2]A proponent of the traditional explanation might object while claiming that the term "bleaching" carries no such connotation, and that "bleaching" only states the reality that photoreceptors may become bathed in light. However, scientific debate must get beyond simple truisms, and the noted connotations tend to be carried as unstated preconceptions that go with Cartesian dualism. Moreover, the traditional account has left the phenomenon of memory untouched, and the present paper is explicitly about memory.

are CPT[3] invariant, those same laws look unchanged on the other side. By applying a CPT inverse transformation[4] to the equations of general relativity, the same identical equations are returned. Moreover, statistical mechanics is found unchanged, with the same statistical laws applying on both sides. From the perspective of each side it is quite possible that entropy is found increasing in the universe, and the universe appears to expand. It is only in relative comparisons, of one side relative to the other side, that we may cognize a possible reversal in time and the flow of entropy (e.g., Sidis 1925). Those reversals are important, as will soon be hypothesized, but using current physics there is no way to distinguish one side from the other.

Smith (2021) adopted the mirror universe hypothesis but explicitly joined the universe with its twin to create the property of two-sidedness, and in doing this Smith introduced a property dualism[5] that was compatible with panpsychism; essentially, overthrowing Cartesian dualism. Memory is the result of one side looking at its other relativistically and engaging in time travel into the past, as in looking at stars in the night sky and peering into the distant past as stipulated by special relativity. The capacity for memory is therefore determined by the un-named aether that joins the sides of the two-sided. Such a hypothesized aether that is spaceless and timeless lacks a frame of reference for inspection, hence it is invisible to the five senses.

The proposed model for color afterimages is that they are innate memories coming from the past, as part of the mirror universe where memory in the panpsychist sense is ubiquitous. Imagine a spyglass to look through, but a spyglass that is focused to see the immediate past. If you trained your eyes to see blue, and the blue is switched off leaving a white background, looking threw the spyglass and you will see yourself on the other side perceiving blue until the memory fades. But because your twin is seeing blue in the past, the white light that is being absorbed in the present moment looks to be the complement of blue which is yellow; hence, the afterimage of blue is yellow.

So because your eyes can be trained to see a color, when exposed to white light your eyes will see the color's complement according to the Manzotti's model because your twin in the past is still seeing the original color. Your twin is acting as part of your memory, given that you stand in front of a two-sided mirror and cannot tell which side you are on. The two sides are sublated into unity because it is impossible to distinguish the sides apart. A dominant time arrow points in the direction where the universe appears to expand, agreeing exactly with perspectives coming from both sides. However, the sublation cannot be 100% despite the close agreement because a

---

[3]CPT is an acronym for charge, parity and time.

[4]By negating time and all the spatial coordinates.

[5]Property dualism is the panpsychist alternative to a substance dualism that characterizes Cartesian dualism while admitting to only one reality rather than two.

shadow remains that provides a relativistic and bidirectional time where your twin may venture into the past as a memory; perhaps as a manifestation of warm-body quantum mechanics, providing an alternative explanation; or perhaps representing what has been characterized as the “antimemory” (Barron et al. 2016) as it’s the color’s complement that is being perceived and remembered rather than the actual color.

The two-sided mirror represents a fundamental and other reflections do not have the property of two-sidedness and are relativistic. Most mirrors come with reflections where it is obvious which side the observer is situated and a frame of reference is therefore implied. These alternative mirrors are lesser mirrors but they are possibly spun off from the most fundamental reflection by the property of strange attraction and are found supporting awareness and agency (like the rearview mirror in a car); this possibility (of being spun off) represents a vitalism that is contrary to the theory of natural selection. Lesser mirrors carry interesting properties beyond the viewing of afterimages. It is possible to reflect musical notes in a mirror and pitch-invert entire songs, and it each case finding an alternative song that carries a new melody, if not a very pleasing melody (Smith 2020).

5. Initial Experimentation to Begin to Settle Dispute

First note that it is difficult to experimentally distinguish between a model based on fatigue and one based on memory. To establish a memory requires exposure and training, and more generally involves the brain. The more training the better the memory, provided a refractory period is also permitted. Training will necessarily carry fatigue. To prepare for a scholastic test by studying late into the night, it is also recommended to get a good night sleep before taking the test in the morning. Sleep is needed for health and a good memory. Nevertheless, training and hard work are also needed, otherwise sleep by itself won’t earn a good grade on the test.

Training necessarily leads to fatigue, hence, confounding makes it hard to distinguish between the fatigue and memory theories. Nevertheless, it is to be argued with minor evidence that the color afterimages result from an innate memory that is part of a panpsychism and a mirror universe where memory is ubiquitous.

Some experimental evidence has contradicted the theory that afterimages are the result of fatigue in the retina alone, while having found involvement of the cortex (Dong, Holm and Bao 2017). However, our investigation must go further to look closer at both fatigue and training, in particular. In this paper, two demonstrations will be presented[6]: the first is intended to generate afterimages with subsequent training and refractory periods; followed by a second demonstration that is intended to generate afterimages by fatiguing the eyes the most by offering no refractory periods. The demonstration that outperforms its rival will tilt the scale of comparison by favoring one theory over the

[6]To be followed by a third demonstration.

other.

In the first demonstration, the total amount of time training the eyes to experience blue is set to 40 seconds, but separated by seven refractory periods to rest the eyes during which afterimages can become visible prematurely. Each blue exposure will last 5 seconds, followed by a 5 second rest on the first seven showings. The duration of the afterimage at the end of training will be recorded, as well as noting the intensity of the afterimage.

In the second demonstration, the total time of exposure to blue will again be set to 40 seconds, but coming with no rest. This demonstration is designed to tire the retina the most compared to the first demonstration. Then the time and intensity of the afterimage will be measured at the end of the exposure.

These demonstrations are presented in this YouTube video:

https://www.youtube.com/watch?v=aEvseSoqdQI

When I entertained these demonstrations, I found that my closing afterimage in demonstration 1 lasted 31 seconds, compared to 35 seconds for demonstration 2. In both cases the afterimages started with a high intensity before gradually fading.

The fatigue model predicts that the second duration should be longer than the first. However, the 4-second extension is surprisingly small. If afterimages are a defect in vision caused by overstimulation, then one might expect a bigger difference for such a presumed detrimental distortion to our vision. Therefore, my experience is only weakly supportive of the fatigue model. However, it is also possible to argue the converse, that the memory hypothesis is finding support. In fact, the 4-second extension is found consistent with the memory hypothesis given that the blue that showed in demonstration 2 is more recent relative to its afterimage, compared with the showing of blue in demonstration 1. Fortunately, this comparison does not end here. The seven 5-second refractory periods in demonstration 1 also showed a yellow afterimage to my eyes. This is a total of 35 seconds of additional duration showing afterimages coming in demonstration 1. If this is added to the 31 seconds, we find that the cumulative duration of afterimages was 66 seconds in demonstration 1. Now the comparison to the 35 seconds of afterimages seen in demonstration 2 is significant, and this finding contradicts the fatigue model.

The above video also permits a third demonstration, where a 5-second showing of blue comes with an afterimage and where the duration of the afterimage can be measured. When I watched blue for 5 seconds, my afterimage lasted 10 seconds. That is, my afterimage was 200% as long as the 5-second showing of blue that made it. This is in comparison to demonstration 2, where the afterimage was only 87.5% as long as the 40-second showing of blue that produced it. This comparison is going in the wrong direction if afterimages are being caused by overstimulation.

Taken together, my experience with the three demonstrations do not support the theory that color afterimages are caused by fatiguing the retina. The demonstrations support the theory that these images are part of training and memory. Of course, this conclusion presupposes that my experiences can be repeated by other subjects that entertain these demonstrations, and I make no necessary prediction on how a larger survey with better scientific controls might unfold. What I am presenting are only hints. Moreover, proponents of the fatigue theory might offer alternative explanations for these results, assuming my experiences are repeatable.

6. Conclusions

The dispute is far from settled, and Section 5 only hints that color afterimages represent an innate memory that starts in the eyes and ends up in the cortex. The more ambitious hypothesis is that memories like this are part of a mirror universe cosmology, and hence such memories are ubiquitous in the panpsychist sense and are found outside the human brain. It is such a panpsychist memory that may be carried by the retina and finds a home in the cortex, agreeing post hoc with Dong, Holm and Bao (2017) and Zaidi et al. (2012).

There are many open questions beyond the stated hypothesis. Are negative afterimages that might impact the cortex examples of false memories (Sinclair et al, 2021) or antimemories (Barron et al. 2016) that may demand some sort of regulation, excitation or inhibition to find a better balance with reality? And regarding positive afterimages, are they just expressions of the eidetic memory? Do memories always represent a complementary pair in the mirror universe?

There are even more speculative questions involving phenomenon outside of the brain and biology, beyond DNA and epigenetics and out in the open universe, a phenomenon that might be better characterized as ontologically equivalent to a category defined as innate memory. Are orbits of planets in the solar system, presently characterized by the action of gravity, also equivalent to an innate memory operating in the mirror universe? Sounds outlandish until you fathom the possibility that the mirror universe might also explain the action of what had been the realm of dark matter and dark energy (Cyr-Racine, Ge, and Knox 2022).

Similar questions can be refocused to the smallest scales. Neutrons stored in a laboratory bottle decay faster than those created in a particle beam, and physicists are trying to explain this behavior that seems outside known physics. To solve this puzzle, Broussard et al. (2019) consider the possibility that neutrons might oscillate into a possible mirror world. If there is such a polarity, how much of the beyond-theory behavior is related to an innate memory that is carried by neutrons?

Can water carry a memory of contaminating substances that have since been mostly diluted out of the water? While the field of homeopathy comes with much controversy,

there are serious scientists[7] investigating the possibility of water memory. A possible connection relating this memory to the mirror universe must first presuppose the reality of water memory.

References

Barbour, J., 2020, *The Janus Point: A New Theory of Time*, Basic Books.

Barron, H.C., T.P. Vogels, U.E. Emir, S. Jbabdi, R.J. Dolan and T.E.J. Behrens, 2016, Unmasking Latent Inhibitory Connections in Human Cortex to Reveal Dormant Cortical Memories, *Neron*, 90:1, 191-203.

Boyle, L., K. Finn, and N. Turok, 2018, CPT Symmetric Universe, arXiv:1893.08929v3 [hep-ph].

Broussard, L.J., K.M. Bailey, W.B. Bailey, J.L. Barrow, K. Berry, A. Blose, C. Crawford, L. Debeer-Schmitt, M. Frost, A. Galindo-Uribarri, F.X. Gallmeier, C.E. Gilbert, L. Heilbronn, E.B. Iverson, A. Johnston, Y. Kamyshkov, P. Lewiz, I. Novikov, S.I. Penttilä, S. Vavra and A.R. Young, 2019, New Search for Mirror Neutron Regeneration, *EPJ Web Conferences*, 219, 07002.

Chalmers, D.J., 1995, Facing Up to the Problem of Consciousness, *Journal of Consciousness Studies,* 2, 200-219.

Cyr-Racine, F.-Y., F. Ge, and L. Knox, 2022, Symmetry of Cosmological Observables, a Mirror World Dark Sector, and the Hubble Constant, *Physical Review Letters*, 128 (20), 201301.

Dong, B., L. Holm and M. Bao, 2017, Cortical Mechanisms for Afterimage Formation: Evidence from Interocular Grouping, *Scientific Reports*, 17, 41101.

MacLeod, D. I., and M. Hayhoe, 1974, Rod Origin of Prolonged Afterimages, *Science* 185, 1171–1172.

Manzotti, R., 2017, A Perception-Based Model of Complementary Afterimages, *SAGE Open*, 1-10.

Shimojo S., Y. Kamitani and S. Nishida, 2001, Afterimage of Perceptually Filled-in Surface, *Science*, 293 (5535), 1677-1600.

Sinclair, A.H., G.M. Manalili, I.K. Brunec, R. Alison Adcock and M.D. Barense, 2021, Prediction Errors Disrupt Hippocampal Representations and Update Episodic

[7] See the special issue of *Homeopathy, 2007, The Memory of Water, 96 (3), 141-230.*

Memories, *Proceedings of the National Academy of Sciences*, 118 (51), 1-12.

Sidis, W.J., 1925, *The Animate and the Inanimate*, The Gorham Press.

Smith, S.P., 2021, Two-sidedness, Relativity and CPT Symmetry, *Prespacetime Journal*, 12 (3), 245-252.

Smith, S.P., 2020, Pitch Inverted Songs as Affirmation of Panpsychism Based on a Theoretical Mirror Universe, *Journal of Consciousness Exploration & Research*, 11 (4), 358-369.

Williams, D. R., and D.I. MacLeod, 1979, Interchangeable Backgrounds for Cone Afterimages, *Vision Research*, 19, 867–877.

Zaidi, Q., Ennis, R., Cao, D. and Lee, B. 2012, Neural Locus of Color Afterimages. *Current Biology*, 22, 220–224.