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Evolutionary Diminishment of Participatory Consciousness

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Introduction

Beginning 45,000 years ago in the last glacial phase of the earth's cycling climate, *Homo sapiens* began to exhibit significant advances in stone and hunting technology. Spear and arrow points of a new style replaced the handaxes that had prevailed during the long reign of *Homo erectus*.and her cousins. In addition, bows and arrows and spear throwers began to appear. Group size and density increased, leading to more complex social situations; settlements became more permanent. Art and consistent indications of symbolic behavior appeared. These changes are know as the Upper Paleolithic transition and are well documented (Campbell, 1988; Donald, 2001; Mithen, 1996; Oppenheimer, 2004; Potts 1996; Sale, 2006).

Changes in behavior were associated with changes in brain shape and organization rather than with further increases in size. Apparently a limit in skull and brain size at birth compared to the size of the birth canal had been reached. In fact, our average brain size has decreased by about 10% over the last 20,000 years. However, changes in the shape of brain and skull did become apparent with the arrival of *Homo sapiens*. Stringer (2012, p. 209), a paleoanthropologist who has specialized in studying the variations in ancient and modern skulls, described the changes this way,

> It is certain …that the overall shape of the brain and the brain case that envelops it changed from archaic to modern humans, becoming shorter and higher, narrower lower down and broader higher up, with a particular expansion in the upper parietal area.

Bruner (Bruner, 2010; Bruner & Iriki, 2015), a paleoneurologist, using computer-assisted morphometrics, has shown that modern skulls exhibit a much more complex array of blood vessel impressions on the inside of the bone over the parietal lobes than archaic skulls. He concluded that "Only *Homo sapiens* shows a generalized enlargement of the entire parietal surface" (p. S77). These findings implicate the parietal lobes in particular as a brain area whose reorganization played a role in the rise of *Homo sapiens* as the only surviving hominid. Furthermore, changes in this and nearby brain areas were accompanied by a lessening of ancient participatory consciousness, leading, at least in part, to the separatist mode of consciousness that reigns in today's disenchanted world.

Assessing functions of specific brain areas

What brain areas were most critical for the radically interconnected participatory consciousness of our hominid ancestors? Obviously we cannot study their brains to find the answer. We can, however, deduce from the nature of that mode of consciousness the likely brain areas to be involved. Thus, the integration of perceptual features of the world (animals, rocks, trees, rivers, etc) with self and group awareness and with the cosmos (spirit realm), tells us that we must find brain areas that are multi-modal, where neurons respond to multiple inputs. Primary sensory areas will not do. This is practically the definition for what are called "association" areas of the cerebral cortex. These areas do not receive their major inputs directly from sensory systems.

Rather, they receive their inputs indirectly from the primary sensory cortical areas via thalamocortical fibers — from thalamic nuclei, e.g., the pulviner nucleus, which themselves receive their input from sensory cortical areas via corticothalamic fibers — and via corticocortical fibers from primary sensory areas as well as other brain areas. Their outputs are particularly strong to regions of the frontal lobes important for planning and other executive functions. These cortical association areas are considered to be the highest level of integration in the brain.

The association area likely to be the most important for our original capacity for a robust participatory consciousness is located at the junction of the temporal, occipital, and parietal lobes (the TOP network). Kandel, in his textbook, *Principles of Neuroscience*, states the integrative importance of the parietal lobe contribution to the region:

> "Real as well as imagined and remembered extra personal space is represented in the posterior parietal association cortex… [which] integrates somatic sensory information with other sensory modalities, an integration that is necessary for three-dimensional perception and planned manipulation of objects" (p. 392).

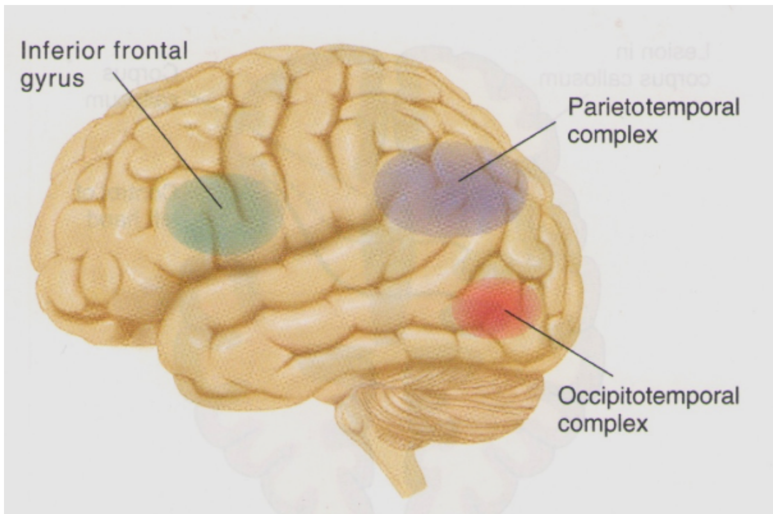
How Neurological Damage Reveals Function

Neural activity in the TOP association area is necessary if the perceiving individual is to know and appreciate the meaning of his or her world. Left hemisphere was mainly directed to meaning-finding in the righthand world; right hemisphere mainly to the lefthand world. We know this area is critical for participatory consciousness less through direct measurement than by how consciousness changes when those areas are 1) usurped by other functions (Corbalis et al, 2000) or 2) are damaged by injury or cerebral vascular accident (stroke). Usurpation of evolutionarily old functions by a newer function is a well-known method of brain reorganization. Dehaene (2004) for example, says it this way: "when the old and new functions are incompatible… through competition for cortical space, the evolutionary older competence may be reduced or even lost." This occurred for the meaning-finding function of the TOP neural network in the left hemisphere. This network was originally necessary for participatory consciousness with respect to the right world, but loss of that old evolutionary function occurred as it became specialized for providing for language. The meaning-finding function provided by those neurons shifted from the world, to word sounds.

Additional usurpation of function occurred in this same area as tools became more complex. To know the meaning of a tool, i.e., what the tool is for and how to use it, also required neural activity in the left hemisphere TOP association area (Johnson-Frey, 2004). As the usurpation of function in the left hemisphere progressed, human groups were also becoming larger, more complex, more dense, and social interactions more variable and complex (Graeber & Wengrow, 2021; Powell et al, 2009); language itself changed to become more transactional and less holistic.. The capacity for knowing the living world via participatory consciousness provided by the left hemisphere was diminished. Nevertheless, the overall capacity for engaging a participatory consciousness persisted in the developing world through historical times (Naydler, 2018) and for indigenous groups up until the present day (Peoples *et al*, 2016). In the developing world, the diminished capability of left hemisphere neural processing to provide for participatory consciousness was further diminished, even obliterated, by the development of reading and writing (Dehaene, 2004; Dehaene et al, 2010). The meaning-finding capability of left hemisphere TOP neural processing now had to be applied to deciphering squiggle marks on paper or electronic screens. Abram (1997, p. 131) describes it this way:

In learning to read we must break the spontaneous participation of our eyes and our ears in the surrounding terrain (where they had ceaselessly converged in the synesthetic encounter with animals, plants, and streams) in order to recouple those senses upon the flat surface of the page… As nonhuman animals, plants, and even “inanimate” rivers once spoke to our tribal ancestors, so the “inert” letters on the page now speak to us! *This is a form of animism that we take for granted, but it is animism nonetheless — as mysterious as a talking stone.*

The figure below (Carlson, 2004, p. 512) shows the cortical areas, including the TOP area, that become active when children read words:



The posterior occipitotemporal region is associated with seeing the words and the forward inferior frontal gyrus region is associated with the motor mechanisms for speaking words. The parietotemporal region, which is part of the TOP area is associated with their knowing the meaning of the word. In today’s world, the left hemisphere TOP area is tasked with making sense of language, tool use, and reading and writing and its capacity to provide for participatory consciousness of the external world is vestigial at best. The TOP association area of the right hemisphere has become the major or only means of engaging the world with a participatory consciousness.

This story about how our capacity for participatory consciousness was diminished in the late stages of our evolution is supported by a wealth of data about the behavioral and cognitive effects of injuries to the TOP association areas of each cerebral hemisphere. For example, strokes involving the TOP area in the left hemisphere leave patients with a striking disorder of language known as Wernicke’s aphasia. The individual has poor speech comprehension and, though still able to speak, is unable to produce meaningful speech or to connect his or her thoughts to the correct words. The stroke has destroyed the neurons whose activity was a necessary part of finding meaning in words. Damage to this area can also lead to a loss of the ability to read and loss of ability to correctly use tools.

Before considering the effects of damage to the TOP area of the right hemisphere, let’s consider some of its functional specializations and deficiencies. A notable deficiency is that with right hemisphere neural processing the patient is mute, unable to speak. This is true even though the patient can recognize words and understand speech. Note also that this region of the right hemisphere is critical for appreciation of ones spatial relationship to the world, both right world and left world as compared to the visual straight ahead. There are other functional specializations that are also important for our story. These are that the right hemisphere is the leading hemisphere for appreciation of limb movement or kinesthesia (for both right and left limbs; Naito et al, 2005), for tactile location processing for right and left sides of the body (Van Boven, et al, 2005), and for conscious appreciation of interoceptive and painful stimuli on either side of the body (Craig 2003; Craig 2004). Furthermore, the right hemisphere is necessary for intact assessment of time, including the sense of lived time, i.e., duration. (MCGilchrist 2021, pp.75-81). Although unable on its own to provide for speech, there is every indication that neural processing by the right hemisphere TOP is able to provide for the comprehension of speech.

Damage to the TOP junction region of the right hemisphere is associated with a condition known as “spatial neglect” (Bisiach, 1997; Halligan et al, 2003; Ramachandran, 2004) wherein a patient’s left world, so far as he or she is able to experience it, disappears and sometimes in its place a phantom hallucinated by the left hemisphere may occur. McGilchrist (2021) had some important insights about the distortions in consciousness that such patients exhibit. He said that it is wrong to regard neglect as a purely sensory phenomenon, that rather “The problem arises at the level of the whole world coming into being (p.71). He goes on to describe (pp. 75-76) right hemisphere lesioned patients as having a “failure of imagination, the creative power that enables us to enter into what is there… [they] *can not longer imagine —summon up— what it must be like to be different.* Despite being able to ‘perceive with his senses,’ he has lost, not just knowledge of the body now, but of it *at any time*, past, present for future.” he experiment that I want to describe was done with carefully controlled verbal instructions for a patient whose corpus callosum had been sectioned. Visual stimuli were restricted to the portions of the visual fields, inputs from which were carried to either the left or the right occipital lobes, respectively. Thus, while the patient, following verbal instructions, focused on a designated point at the center of the binocular visual field, a picture would be briefly (so as to avoid eye movements) flashed on either the right side or the left side of the fixation point. Now, because the nasal part of the visual field of the right eye and the temporal part of the visual field of the left eye both project to the right hemisphere, and vice versa, visual input could be restricted to one or the other hemisphere. And, since the corpus callosum was sectioned, there could be no sharing of visual information between the two hemispheres.

In this experiment by Cooney & Gazzaniga (2003) the scene which required left hemisphere neural processing was a chicken claw and the scene to which the right hemisphere connected was a snow scene. The subject was then shown a set of pictures and asked to <u>point with the right hand</u>, i.e., using left hemisphere neural processing, to the one he had seen; he pointed to a picture of a chicken. Then he was asked to <u>point with his left hand</u> to the same set of pictures and he pointed to a picture of a snow shovel. So far so good. When asked to verbally explain both choices, the patient replied: “Oh, that’s simple. The chicken claw goes with the chicken, and you need a shovel to clean out the chicken shed.” Here is a blatant example of confabulation when the patient is asked to make sense of a scene using only left hemisphere neural processing. This is very characteristic of left hemisphere controlled behavior of split-brain patients: they are masters of denial, fail to admit to not knowing, and just make stuff up (McGilchrist, 2021, pp. 81-89) In addition, they are usually perfectly happy with whatever story they have concocted.

Another example that is even more striking is provided by Ramachandran & Blakeslee (1998). A patient with a right hemisphere lesion and “neglect” of her left side was confronted by Dr. Ramachandran standing on her right (sensorially intact) side and holding a large mirror so that his assistant who was standing on her left (neglected side) and holding a pen in his hand could be clearly seen in the mirror. He asked her if she could see herself, his assistant, and the pen and she said that she could. He then asked her to reach out with her right (non-paralyzed) hand and grasp the pen. Here's what happened:

> "…[M]y patient began clawing at the surface of the mirror, even reaching behind it, …I explained that I didn't want her to reach for the reflection but for the real pen. The patient replied: 'The real pen is inside the mirror, Doctor,' or, on another occasion: "The pen is behind the darn mirror, Doctor."

Ramachandran explains his results as follows: "I think the patient knows she's looking at a reflection, therefore the object is on her left. But because left doesn't exist in her universe the only possible explanation [for left hemisphere neural processing], however improbable, is that the object is inside the mirror." Ramachandran's explanation doesn't make sense, but this result has an interesting link to Alfred North Whitehead's scheme of three modes of perception: a non-sensory sharing of feelings called perception in the mode of causal efficacy (prehension); a sensory neural dependent mode called perception in the mode of presentational immediacy; and a mode that integrates those two modes called perception in the mode of symbolic reference (Whitehead, 1925; 1929). Without perception in the mode of causal efficacy, Whitehead claimed that sensory processing alone was of limited use. He specifically noted (1929, p. 173) that "Language almost exclusively refers to presentational immediacy" and considered (1929, p. 122) the belief that "the image of a grey stone as seen in a mirror illustrates the space behind the mirror" as an example of "the pure mode of presentation immediacy." This suggests that whatever processes account for participatory consciousness may also account for perception in the mode of causal efficacy, i.e., prehensions. This link will be explored in another essay.

Patients with damage to the TOP area in the right hemisphere not only lose their left world, they also experience, with the same remarkable lack of surprise and interest they exhibit toward their left-sided paralysis, hallucinated presences in what used to be their left world. One patient reported in McGilchrist (2021, p. 87) experienced another (extra) hand and part of an arm about which she was nonchalant, noting that sometimes it was heavy and a nuisance. She suggested to the doctor, "Why don't you take it home with you. I'd like to know what your wife would say." Another patient was reported to insist that there was a woman lying in the bed at his left side (p. 90). A woman insisted that her paralyzed left arm was her mother's arm (p. 93).

Conclusion

From a remarkable mode of consciousness that appreciated without paradox our existence in both the physical world and the spiritual world, one that was fully participatory in a living, spirit-filled interconnected cosmos (Stoney, 2022), changes to our brains and our societies have led us to a narrower, more restricted, more separated mode of consciousness today. The diminishing of participatory consciousness accompanied the rise of civilization and changes in the organization of our brains. The meaning-finding capacity of our left hemispheres, which was originally directed toward the external environment and which was once critical for our contented sense of being in a living world, has been usurped by our need to speak, use tools, and read and write (Stoney, This essay). That makes meaning-finding provided by our right hemispheres solely responsible for our exercising participatory consciousness in today's world. Damage to the right hemisphere areas critical for that interconnected mode of being leads to profound alterations in consciousness that demonstrate the fundamental role of participatory consciousness in our ordinary lives.

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