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Evolved Consciousness[1]

Anchor experiences were introduced in the fish to play a role in the survival of the species. We humans have not escaped evolution, but these conscious experiences have taken on a different role in humans. They enable the human individual to learn new behaviors without having to undergo new biological mutations.

Desire

When a human desires the keys to his car, he simply reaches for them. Researchers prefer to use the word "intension" rather than desire, probably because it seems less emotionally charged. They call "reaching for the keys" an intension-driven behavior. Desire and intention are of course the same thing with different emotional intensities. They are both anchor experiences that enhance the behavior to which they are attached. I prefer to use the word "desire" because it does not bury the emotional aspect of this experience.

Imagine that a human has the desire to learn a new behavior. He desires to twirl a baton with his left hand, and he has never done that before. He begins by picking up the baton with his left hand, a behavior that accompanies a desire to do so. Desire causally supports rather than represses that behavior. If his next move fails to get the desired result, the immediate visual and tactual feedback will produce something akin to a fear of failure that will repress the associated behavior. Again, I prefer to say, "fear of failure" rather than something more emotionally neutral like "disappointment." It makes a stronger connection to the physiology of fear that has already been established. In any case, the repressed behavior includes

[1] This chapter is taken from portions of Mould [2010a] with some modification.

all of the neurological activity that completes the unsuccessful loop from the sensory organs to the motor cortex to the cerebellum, and from there to the fingers of the left hand.

The human tries again. He again picks up the baton with his left hand, a behavior that is again accompanied by a desire to twirl the baton. The previously tried neurological route has been repressed, so the brain tries another path going from the motor cortex to the fingers. If it succeeds this time, pleasure will support the new behavior and will reinforce the neurological pathway chosen on this occasion. A fear of failure repressed the first chosen pathway, but the pleasure of success enhanced the second pathway. *At the level of humans, the causal influence of consciousness has more to do with the repression or enhancement of neurological pathways than it does with the pathways of evolution*. The plasticity of the human nervous system makes this possible. Learning flexibility in the modern sense appears to be the great advantage of consciousness, although again, we cannot say that a robot cannot evolve with these same capabilities. However, we do know that our species has not taken the robotic route. For better or for worse, our line of evolution has made use of consciousness as a punishment or reward device for the purpose of learning new behaviors.

Neuromotor Prostheses

When a human reaches for the keys, he has the impression that it is his desire for the keys that empowers the response of his arms and fingers. That is correct. It even works when the neural pathways from his brain to his limbs have been artificially replaced.

The conscious desire to reach for something is caused by neuronal activity in the brain that is detectable at the part of the somatomotor cortex that governs the arm, hand, and fingers. If the subject does not have an arm, hand, or fingers, the initiating activity in the motor cortex can be used to activate a prosthesis that performs the desired task, thus retrieving the keys to the car. Visual feedback then

informs the subject of his success, and that completes the learning loop [Hoshberg 2006].

However sophisticated the electronics that connect the neuralmotor activity with the prosthesis, the result is likely to be crude compared to the smooth motion that intact limbs achieve. But brain plasticity allows alternative neural pathways to be found in the motor cortex as the subject visually monitors his failure or success. After some practice, fairly smooth command of the prosthesis is achieved in this way.

If the subject is asked how he does it, he will respond in the same way that you or I would respond to the same question. We say, "I desire (or intend) to reach for the keys, and it just happens." This leaves out all of the neurological detail, but the answer is essentially correct. Desire is a *causal* element in this process. It enhances the behavior that carries out the desired response.

There are those who would use the word "will" instead of desire or intent, and who go further to call it "free will." The term "will" is all right, but it is not free. There is nothing in the post-Big Bang universe that is free of contingencies, circumstances, or initial conditions. Human "will" does not exist independent of neurological configurations that are themselves prompted by external conditions. It is nonetheless causal in its physiological influence.

Vision

Like pain and fear, vision is an experience that covers an entire behavior. It is not simply a response to a stimulus of some kind on the retina, or a specific configuration of neurons that fire in the visual cortex. Visual experience extends all the way to the level of behavior, as is demonstrated in the classic experiments with visual inversion.

In visual inversion, a subject wears an optical apparatus that inverts the retinal image so that the world appears upside-down and/or left-right inverted. At first the subject is disoriented, but after a time he *learns* to see things correctly. This recovery is due to the amazing plasticity of the brain. The brain is able to rewire

itself to right the image so the subject can use vision to maneuver about the world in a causally effective way. That is, his vision again performs in the same space as his arms and legs. This conversion to normality does not occur at once throughout the visual field, but applies first to those parts of the field that involve some activity. Between the onset of the experiment and the time of complete accommodation (as much as two or three weeks later), the subject will experience a fragmented visual field where some parts have been righted while other parts remain inverted. If the subject is using tools, it is the tools that first become corrected while the background remains inverted. After eighteen days of wearing reversing glasses, a subject standing on a curb is reported to correctly see cars moving to his right, but he continues to see license plates numbers as mirror images [Kohler 1951, O'Regan 2001 sect. 5.9]. Clearly, vision is not just a function of where and how the retina is stimulated, but it also has an apparent relationship to attention and behavior. This includes how a subject becomes consistently involved in a whole-body experience, such as seeing a car go to the right at the same time as hearing it go to the right, or such as lifting an object up and seeing it go up. More generally, Noë says, "consciousness is a world-involving dynamic process" [Noë 2009].

This example illuminates the point made in the previous chapter concerning the piecemeal way in which visual consciousness became established in evolution. Visual consciousness came into being over a series of many mutations. It was probably fragmented as it is in the case of inverted glasses, where the first additions to vision were those parts of the environment that are of the greatest working interest to the species. Furthermore, this process may have happened over a span of time that included more than one species – not just a fish. It may also have happened in concert with other non-anchor sensations like tactual and auditory input, as well as in conjunction with anchor experiences like smell and taste that are heightened by hunger, as described in the previous chapter. So the first object appearing in a conscious representation of three-dimensional space may have been the *victim of feasting behavior*, and that this flora's or fauna's objectification (in consciousness) may have taken place over many mutations covering many species, and coincident with the gradual phasing in of a number of different kinds of

contributing experiences like vision – similar to the phasing in over time of the visual field of a person wearing inverted glasses.

The Purpose of Consciousness

Consciousness was originally introduced as a selection mechanism in the survival struggle of a primitive robotic fish. It either enhanced a behavior with pleasure consciousness, or repressed it with pain. That was the purpose of consciousness at this stage of evolution. But somewhere along the line, consciousness formed an alliance with brain plasticity that allowed a new way of learning. The new learning would not require a biological mutation together with the long and painful demise of an old model. Instead, consciousness, now allied with plasticity, directly repressed undesirable neural pathways and enhanced more desirable ones. This, it appears, is the primary purpose of consciousness in the more advanced creatures in which it appears.

Perhaps the above learning processes were present from the beginning. It is certainly possible that consciousness teemed up with brain plasticity when it first appeared in Robofish. That would not change the argument of Chapter 1, for each kind of experience (e.g., pain, pleasure, fear, vision, and so on) would still have to be introduced by mutation. Only then might the causally effective repression and enhancement properties of consciousness join with plasticity to permit learning in the modern sense.