

Letter from the Desk of David Challinor
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At this point in my life I have had ample opportunity to reflect on and contemplate “Who am I?” I have always thought that whatever stage of life you find yourself occupying, your personality or “personhood” reflects the sum of your past experiences. Where does your personhood reside? This is a difficult question and, as I begin this letter, I feel that I am sailing in uncharted waters. Nonetheless, I will stick out my neck and try to tackle **self-identification**, and **self-awareness**, at least from my own perspective.

I begin with **self-identification**. This morning while shaving before a mirror, I wondered “Who am I?” The image of me that I saw was dynamic in that it differed in detail from last week’s image when I needed a haircut and had a bandaid on my temple. Fast backward to 1936 when, as a teenager, I was just starting to shave and was completely despondent over discovering yet another acne breakout. The “me” then was as clear and valid as the “me” today, despite the intervening wear and tear on my face.

Self-recognition is a tricky quality, however, and there are individuals who, because of brain malfunction, are afflicted with prosopagnosia—a highly selective inability to recognize faces, including their own either in a mirror or in a self-portrait, despite normal vision. An extraordinary aspect of this deficiency is that many who suffer from this handicap are nonetheless quite sure about who they are and what they feel and believe.

In fact, the inability to recognize one’s face is not uncommon and often depends on the circumstances. C.W. Huntley, a researcher at Harvard in the 1940’s, conducted an experiment in which he gathered, unbeknownst to his subjects, samples of their handwriting and photos of the backs of their hands and of their faces in profile. The subjects were informed that this material was being assembled, but under the pretext that it was for a different experiment. Huntley then had the subjects carry out certain controlled activities while he surreptitiously photographed the backs of their hands and a silhouette of their head. The subjects were re-assembled six months later and presented with four silhouettes, one of which was their own. He then sought “recognition” or “no recognition” of the objects presented, being careful not to hint that they were observing images of themselves. The results were fascinating: half the subjects recognized their silhouetted profile, a quarter had no recognition, and the others were unsure or felt that the profile might be their own. Backs of hands fared worse with only about a quarter of the subjects recognizing their own hands. As you read this, look at the back of your own hands. Could you recognize a photo of them? I’m not sure I could. Actually, I’m impressed that half the subjects recognized their own profile silhouette. How often do

you have a chance to see your face in profile? For me, it is only on those relatively rare occasions when I buy a new jacket and stand in front of the triptych-like, full-length mirror while the tailor measures sleeve length.

If many people fail to distinguish their own profile, consider the difficulty of voice recognition, especially prior to the ubiquitous answering machines. We do not hear our own voices as we talk in the same way we hear others talking to us; rather, our voices enter our heads through the bones of our skull as well as through the air. I remember clearly the first time I listened carefully to my own voice. It was during WWII while training to use proper radio/telephone (R/T) procedure when communicating with planes aloft. The shock I felt at hearing my own voice was real. Thus, voice has not often been used as a device to test self-recognition.

Advances in technology—especially computers—has led to ever more sophisticated self-recognition tests. For example, scientists can now take a full face picture of a well-known individual, such as Bill Clinton, and combine his image with that of another man. This is called “morphing,” whereby you start with an image of Clinton and gradually over four or five photos morph into an image of the subject in the recognition experiment. The subject then tries to determine from four or five sets of morphed images of other famous men the point at which he recognizes his own image. This technique allows the experimenter to determine how much of “you” is needed in a morphed picture before the viewer can recognize himself. This is an important point: the morphed images appear on a computer screen and the subject presses a key when he thinks he sees himself. The experiment was repeated with female morphed photos with interesting but differing results. Morphing photos across sex did not work because in male and female faces, differences are too extreme. The experiment was further refined by having the subject press the key in one series of image recognition photos with his left hand (controlled by the right hemisphere of the brain) and in another series with his right hand. Without going into all the details, the experimenter concluded that self-recognition was controlled by the brain’s right hemisphere.

There is a distinction between self-recognition and **self-awareness**—a more subtle feature of our psyche. We evidently share self-awareness with chimpanzees, and since most evidence indicates that our common ancestor existed about 5 million years ago, this characteristic has been around for a long time. Human children seem to show the first signs of self-awareness at about a year-and-a-half. It is possible, however, that chimpanzees and humans developed self-awareness independently after diverging from our common ancestor, although that does not seem likely as orangutans also show self-awareness. The orangutans split off from the chimp/human tree more than twice as long ago. Although gorillas separated only about 7 ½ mya, they seem to have a restricted sense of self-awareness. That would suggest that there could be other factors determining this important characteristic of humans, chimps and orangutans.

Self-awareness clearly was an extraordinarily crucial component in our evolution. It allowed us not only to consider ourselves as individuals but also to understand many

aspects of another's character and behavior. Furthermore, we can draw on past experiences to use in planning future activities. For example, when I was an adult graduate student (37) preparing for examinations (in which I had to get A's) to complete required course work prior to starting my dissertation research, I realized the advantage I had because of my age. Being a contemporary of or older than some of my professors, I could draw on past experience to determine what was important to know and not waste time studying subjects of lesser relevance. In other words, I had a better idea of what the faculty were thinking when they lectured than had I been 15 years their junior.

As with all assets, including self-awareness, there is also a cost. Our brains must be relatively larger and certainly more complex than those creatures lacking this attribute. Our large brains require lots of energy to function, such as continued access to oxygenated red blood cells. And the elaborate circuitry that allows our brain to function so elegantly is vulnerable and crucially dependent on a steady supply of this vital "fuel." Even a momentary cut-off can cause permanent damage to the brain. That shutdown affects the whole body and frequently can be lethal and is the third highest cause of deaths in the U.S.

So how can we discover the location of "self" in each of us? Some believe that you are your brain, but I disagree; I think that I am my whole body. The brain is an important component, but it is wired to the whole self, each of whose parts determine who we are. Understandably, there are body parts we can lose and still function reasonably well—hair, a finger, a leg and on up the scale—but operating with these lost parts demonstrates how adaptable most humans are.

The appeal of neurophysiology as a discipline is clear, because we have barely scratched the surface in understanding how the brain works. Research in artificial intelligence proceeds apace with considerable success in certain limited fields. Computer-operated chess, for example, has reached the level (thanks to ever larger and more efficient machines) where even a Grandmaster can no longer win a match against a well-programmed computer.

As an optimist, I anticipate that my grandchildren may witness a large-scale artificial human brain with neural connections traceable through a model human body. The brain would light up when it hears a command—"pick up that pencil"—and then the viewer could watch the appropriate neural circuits light up in the "brain" and then travel through the "arms" to the "finger muscles" to grasp the pencil. What happens in nanoseconds in a real body would have to be slowed down in the model to allow the viewer to follow the exact path of the neural impulse, slow enough also to watch the relevant muscles react to achieve the goal. Although such a model may seem farfetched today, the astounding developmental pace of nanoengineering, computer graphics, flexible plastic, etc. practically ensures eventual success. Imagine witnessing such a model in action and be glad that there are hordes of bright teenagers throughout the world

who, given time and opportunity, can make these technological miracles happen. I am sure that in the process, all will gain an even clearer understanding of the essence of **selfness**.

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P.S. Much information for this letter came from Keenan, J.P., G.C. Gallup Jr. and D. Falk, *The Face in the Mirror*, Harper Collins Inc. New York (2003).