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Reality Check: Insights from Cognitive Science

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Bill never understood the importance of face masks.[1] He didn't see why people would go to such great lengths to cover up an identity that wasn't particularly unique to begin with. For Bill, faces looked somewhat like knees: if you have seen one, you have seen them all. One afternoon Bill even walked by his mother on the sidewalk but never even stopped to say hello. He couldn't recognize her face amongst the throng of passersby. In a world where first impressions count and personal appearance is a booming industry, Bill was blind to faces.

This syndrome, also known as prosopagnosia, occurs when there is damage to the temporal lobe of the brain, an area that is specialized for looking at faces. Most people with this disorder can recognize other objects, and even emotional face expressions, but they can't recognize face identity. Some prosopagnosics can't even recognize their own face in the mirror. For Bill and others, reality is different from what we normally expect. This is one example of how a loss of function in a specialized brain area, leads to a corresponding loss of that element in reality.

So what is reality? Many people think of reality as an independent entity, but this may not be true. Even if an external reality does exist, we can never truly know the answer. Visual objects in the outside world do trigger certain visual processes, but everything we perceive and know as our reality is the end result of this process. This means that reality is always filtered by the creative powers of our mind, thoughts, and fantasy. We can't escape the influence of fantasy because this is precisely what we use to determine and translate our perceptions of reality. Just think of Bill: he experiences the same world as we do, but he perceives it in an entirely different manner, leading him to see a different reality. His reality is different because his constructive powers are different. And our mind's constructions are one form of a disciplined fantasy.

We can further observe this intertwining of fantasy and reality in the case of Jonathan. After working in New Mexico with Georgia O'Keefe, he enjoyed a long and successful career as an artist. His remarkable talents with color served him well until, at age sixty-five, a car accident left him with a concussion. He recovered and suffered no ill effects except one: he could no longer see colors, only dingy shades of gray. For Jonathan, ketchup looked black, flowers gray, and skin "rat-colored". And because the

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[1] The following case studies can be found in Carter, R. *Mapping The Mind.* California: University of California Press, 1998.
Sacks, Oliver *An Anthropologist on Mars.* New York: Vintage, 1995.
Ramachandran, V. S. *Phantoms in the Brain*. New York: Quill, 1998.
Cytowic, Richard E. *TheManWhoTasted Shapes*. NewYork: Tarcher/Putnam, 1993.

brain damage that destroyed his ability to see color in reality also destroyed his ability to see color in fantasy, his nights were composed only of colorless dreams.

This correspondence between seeing and imagining is not just true for color, but for most all objects and visual properties that we perceive. Brain-imaging techniques like the fMRI show that different areas become active when we view objects such as faces, houses, and chairs. These techniques also show that when we imagine objects such as faces, houses, and chairs the same separate areas we used to see these objects are activated, but to a lesser extent. This raises some interesting, perhaps unanswerable questions: if the equipment necessary to perceive reality is in our minds, than does reality have an external or internal existence? Is reality really just fantasy in a candy-coated package, thus making it easier for the skeptic to swallow?

It is possible that some will look upon fantasy as a handicap, and as a trait that may eventually be woven out of our gene pool, allowing us to see the world as it really is. But this can never be. The information at our senses—at our eyes, ears, and skin—is not sufficiently detailed to logically determine the state of reality. Instead, we enlist the help of our cognition and our fantasy to make sense of the world around us. Using hypotheses, biases, and probabilistic methods, fantasy makes the world a stable and predictable place. Our senses invite the outside world in, but our fantasy and cognition are responsible for translating and creating perceptions that we can understand.

It is true that reality depends on fantasy for its construction, but it is also true that fantasy can't function without reality. We like to think that fantasy is boundless in its abilities, a true creative Picasso. In fact, it has strict limits. Have you ever tried to imagine a new color? If you close your eyes, you may notice that every color you think of is one you have already seen. This is perfectly normal, indeed it is a paradoxical question because it is quite impossible to imagine a visual element that you are incapable of perceiving in reality. Since the brain is used for both vision and imagination, they also share the same abilities and, in the case of the new color, limitations. Just like Jonathan, who could neither see nor dream in color, fantasy depends on reality for its tools.

Fantasy and reality work with the same properties, so there isn't a strict fundamental difference between the two, but there is a technical difference: fantasy is more creative. To perceive our visual realities we can work only with a stimulus that is presented to us, but with fantasy we can conjure up any visual element we wish, whenever we wish. This allows us to combine the elements of reality in flexible and novel ways. Even though you haven't seen a green snake with the wings of an eagle, legs of a Chihuahua, pointed ears of a rabbit, and wearing a small blue baseball cap turned backwards, fantasy quickly conjures this chimera by combining visual fragments obtained from experiences in reality.

Sometimes a small stroke can make a big change in our reality. When Steve regained consciousness after his stroke, the left side of his body was paralyzed, but he had no idea. Besides having a headache, nothing else seemed to be wrong. Steve described his experience like this: "To my mind, I was fully aware of all parts of my body

on the right side. The left side simply did not exist! … When I shaved, I neglected the left side of my face. When I dressed, I would incessantly leave the left arm outside its sleeve . . . There is no way that you can have any idea of what happens in Wonderland unless a denizen describes it to you."

Steve suffered from a syndrome known as hemi neglect: the left side of fantasy and reality simply did not exist for him. We are the creators of our realities and fantasies, and when our creative abilities are damaged, our fantasies and realities can become radically warped.

In hemi neglect, fantasy and reality are dramatically contracted, but for some people, known as synaesthetics, fantasy and reality are dramatically expanded. Do you feel anything with your hands when you taste something with your tongue? Most of us don't, but Michael, who has synaesthesia, enjoys a rich and unique experience of touch for everything that he tastes. For instance, when he tastes Angostura bitters his hands feel, "the springy consistency of a mushroom, almost round, but I feel bumps and can stick my fingers into little holes in the surface. There are leafy, tendril-like things coming out of the holes, about six of them." And when he tastes mint his hands feel smooth, cool, columns of glass. As a chef, these touch fantasies enrich his cooking realities: he uses the nuances of touch that he feels to guide his choice of spices and seasoning.

If Michael can use synaesthesia to improve his cooking, are there other things to be learned from the relationship between fantasy and reality? In the literary world, it can mean the difference between a mediocre book and a classic. Sometimes when we close our eyes and try to imagine something specific, it is difficult. Fantasy may work with the elements of reality, but somehow the colors seem rather flat, the objects are not as rigid, and the detail is diminished. But under the expert guidance of a gifted author, we can be transported into worlds that seem as rich and vivid as the present world around us. Effective authors engage with their words the same visual processes that are engaged when we view real scenes. Again, we see the connection between fantasy and reality since the use of principles from reality enhances our experiences of fantasy.

Just as expert authors describe visual principles with their words, talented representational artists depict visual principles with their paintbrushes. Using tools of perspective, texture, and relative size, some art is so realistic that it becomes hard to distinguish a painting from a photograph or even a view from a window. In literature, the author has to rely on the reader's own personal memories and experiences to help construct the guided fantasy, but in art a visual stimulus is provided directly to the observer. This is one of the closest links we have to experiencing another person's visual reality. By now it is clear that realities are not universal: they are a byproduct of many different cognitive processes, including fantasy. However, in art we are able to explore another person's visual construction, and in doing so share their perspective and gain insight to their cognitive processes.

The fantasies we construct when reading a book or enjoying a painting, and the realities we construct when viewing the world, can even be influenced by gender. In

certain aspects of structure and function, the brains of men and women differ. The two halves of a woman's brain are more interconnected than those of a man's, and when men and women perform the same cognitive task, more areas of the brain become active in women than in men. In some cases the active areas are almost entirely different.

Men and women differ not only in the cognitive functions of their brains, but also in the way their brains process emotions. The brain has, for instance, two amygdalas, one on the left side and one on the right. If a man is shown movies that evoke negative emotions, the amygdala on the right side of his brain becomes active. But if a woman views the same movies, the amygdala on the left becomes active. Moreover the portions of the amygdala that are active in men send messages to areas of the brain involved in action and planning, whereas the portions that are active in women send messages to areas involved in visceral response. When men and women look at the same visual scene, or read the same passage in a book, the fantasies they entertain and the realities they construct may be very different.

So, is there a real difference between fantasy and reality? Most of us would probably answer that there is a vast distinction. In fact, however, recent advances in cognitive science indicate that the boundary is quite hazy, and that fantasy and reality are deeply intertwined. Indeed, the world of fantasy could not exist without the elements of reality; it would be like an artist without any tools, full of possibilities but nothing to draw with. And reality, without the visual cortex's hypothetical predictions, constructions, and fantasies, would not exist as we know it. The stability of colors, shapes, depths, and motions all depend on our perceptual equipment, and on our creative powers of fantasy. Sometimes we may take for granted the rich visual worlds that appear before us because we don't realize that the simple act of seeing recruits half of our brain's cortex. And because this whole process feels so effortless we fail to recognize that reality is not passively perceived but actively constructed. Fantasy has always been saluted as a visionary, but perhaps now we can recognize the role of fantasy in constructing both our future realities and the realities we experience everyday.