This is an excerpt from a report on the Sensory Substitution and Augmentation Conference at the British Academy in March of 2013, written by Kevin Connolly, Diana Acosta Navas, Umut Baysan, Janiv Paulsberg, and David Suarez, available at http://networksensoryresearch.utoronto.ca/Events_%26_Discussion.html

1. Does sensory substitution generate perceptual or cognitive states?

Sensory substitution devices (SSDs) deliver information about the environment normally perceived through stimulation in one sensory modality (the "substituted modality"), through the production of stimulation in another sensory modality (the "substituting modality"). Most SSDs aim to substitute for vision, and consist of a video camera that feeds information into a conversion unit which then converts that information into auditory or tactile stimuli. Such devices are often used by the blind to assist in their autonomous navigation of the world. For instance, tactile-vision sensory substitution (TVSS) devices are SSDs that convert patterns of luminance picked up by a camera into isomorphically-organized tactile stimuli which are delivered to the skin through a matrix of solenoids usually mounted on the back, or a matrix of electrodes held on the tongue.

There is no doubt that sensory substitution devices can convey information to subjects using them. But is the information conveyed to subjects via SSDs perceptual information? Following Ophelia Deroy and Malika Auvray, we may call the assumption implicit in current discourse that the use of SSDs is akin to the appropriation of a sensory modality, the *perceptual assumption*. As Deroy and Auvray put the perceptual assumption:

> [T]he perceptual assumption considers that sensory substitution follows what occurs with canonical cases of perception through one of the typical sensory modalities, that is as specialized channels for transducing external information. As spelled out by Grice (1962), perceiving through each of these specialized sensory routes typically starts out with specific kinds of receptors being stimulated by certain kinds of stimuli; the information is then further processed (at least at an early stage) by dedicated sensory mechanisms that finally deliver a representation of a certain kind of object or properties or leads to specific responses.

One way to settle whether the perceptual assumption is true is to ask whether the information conveyed by SSDs is the output of a perceptual mechanism or not. Deroy and Auvray argue that since the use of SSDs fails to meet the conditions required for the constitution of an appropriation of a perceptual mechanism (stimuli, receptors, processes, and outputs), the perceptual assumption is false. Deroy and Auvray propose an alternative model for understanding the use of SSDs, according to which the use of SSDs is a *cognitive* extension of existing perceptual skills such as reading.

In her reply to Deroy and Auvray, Jennifer Corns detailed three different ways in which we can read the perceptual assumption: (i) *The strong reading*: The use of an SSD is akin to the appropriation of a particular natural sensory modality, such as vision, or audition; (ii) *The moderate reading*: The use of an SSD constitutes a novel and unique sensory modality akin to the natural modalities. (iii) *The weak reading*: The process involved in the use of an SSD constitutes a perceptual process.

Here, Corns notes that the weaker the claim, the stronger are the demands to reject it. To reject the strong reading we only need to demonstrate that there is a difference between the use of an SSD and the target natural sense modality. To reject the moderate reading we need to demonstrate that there is a difference between the use of SSDs and natural sense modalities as such. Finally, to reject the weak reading, one must demonstrate that the information processing involved in the use of an SSD is different than a perceptual process as such.

So one question that arises is whether the evidence cited by Deroy and Auvray is sufficient to reject the perceptual assumption on all three readings. But more importantly, Corns asks the following question: suppose that SSD use differs from perception (in any of the above readings); why assume that the only route is to reject the perceptual assumption? Instead, Corns

suggests that in light of the evidence, one might opt to revise one's conception of either: 1) the particular sense modality in question (for example, vision), 2) one's conception of a sense modality, or 3) one's conception of a perceptual process.

At the start of this section we asked whether the information conveyed to subjects via SSDs is perceptual information or not. It has been suggested that the answer to this question depends on whether that information is the output of a perceptual mechanism. In trying to provide an answer to the second question, the discussion revolved about the perceptual assumption with the thought that if the perceptual assumption is false then the information conveyed via SSD is not the output of a perceptual mechanism. But providing an answer to our second question may not be as straightforward as one would have hoped. At the heart of the problem is the following question: do the data about the use of SSDs warrant a rejection of the perceptual assumption (on any of its readings) or a revision of our conception of perception?

References:

Deroy, O., & Auvray, M. (2012). Reading the world through the skin and ears: a new perspective on sensory substitution. *Frontiers in Psychology*, *3*(457), 1–13. doi:10.3389/fpsyg.2012.00457

Grice, H. P. (1962). "Some remarks about the senses," in Analytical Philosophy (First Series), ed. R. J. Butler (Oxford: Basil Blackwell), 248–268.