THE SYNESTHETIC SCIENTIST:

The Induction of Sense-Mixing to Open New Frontiers in the Laboratory

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> The answer is clear: we cannot discover it from the inside...we need a dream-world in order to discover the features of the real world we think we inhabit (and which may actually be just another dream-world).
> – PAUL FEYERABEND, Against Method, 1992, page 22.

AS THE SCIENTIFIC WORLD and its associated worldview have emerged over the past few centuries, many scientific methodologies have been inarguably dominated by the action of visual observation for purposes of accumulating both qualitative and quantitative data. Within this scientific world, the objectivity of human ocular observation is often taken for granted, and Jonathan Crary (1988) describes the action of seeing, however scientifically trained, as necessarily subjective. Limited by one's own biologically and socially defined humanly body, which serves as the primary machine for data reception, vision transforms, from a "privileged form of knowing," into an "object of knowledge, of observation" (Crary, 1988, p.5). Just as Paul Feyerabend calls for new methodologies that utilize a "new conceptual system that suspends, or clashes with, the most carefully established observational results" (1992, p.22), methods can be developed by researchers to deconstruct, advance, and multiply the very sensory capabilities that currently limit their laboratory work.

Such a practice would allow scientists to escape some of the bias of their own sense-monitoring - or, at least reach into a realm beyond the subjective-objective dichotomy.

Vision is understood to be the most disinterested sense – but how could it be, if a human body and mind moves the eyeballs to observe what she wants to see?

One hypothetical method for circumventing the visually-dominated human sense hierarchy during research is the chemical or technological induction of a synesthetic-like sensory state within laboratory experimentation. Synesthesia, the rarely-occurring natural phenomena of sense mixing within the human perceptive system, transcends the traditional five separate senses as they have been historically defined. This phenomenon mirrors the actuality of the Homo sapiens organism as a perceptive whole without the nurturing cultural training that teaches it to sensorially operate as human. In the body, the senses do not operate in isolation, and they often work in tandem with one another to gather and process mixed sensory data. Though easier said than done, employing assisted or induced synesthesia and encouraging researchers who naturally experience sense-mixing to incorporate it within their work answers Feyarabend's call for a "dream-world" which counters that which humans inhabit and believe they experience, and may lead to the discovery of new ways to capture data within, and not separate from, the realm of human corporeal sensation. Through the imposition of an involuntarily-mixed sensory experience which transcends the boundaries of separate senses and their corresponding socially-reified "sense organs," the practice of synesthesia induction would allow for new laboratory methodologies that break the subjective-objective binary to occur through, and within, a human researcher's body.

A new approach to "sensing" in the laboratory is necessary now more than ever: for centuries, what has been visually observed in the laboratory has faced little disputation on the grounds of 'biased vision,' especially if the gazes of other human researchers have confirmed the

results obtained through the first set of eyes. During the 18th century, during which the methodology of scientific inquiry was first established, the visual sense was often understood as the most useful, objective, and unbiased sense modality in human five-sense typological system. Michel Foucault explained that vision was then understood as "a perceptible knowledge" that countered the subjective understandings of vision that were proposed by previous scholars, including Immanuel Kant and William Blake (Crary, 1988, p.5). As the scientific method has thus far depended on the primacy of the visual to structure laboratory techniques, the social construction of gaze, never mind the entire traditional Aristotelian five-sense typological system of perception itself, has been conveniently ignored by the scientific community (Hellner-Roazen, 2009, p.163; Keeley, 2002, p.8). Although vision is treated for error, it is rarely treated for penchant or proclivity within scientific literature, and little consideration is given for how the socially-mediated practice of observing introduces additional layers of subjectivity into the scientific method. Historians of science Lorraine Daston and Peter Galison define objectivity in the sciences as "blind sight, seeing without inference, interpretation, or intelligence" (2010, p.17), and explain that the eyes are ascribed with the ability to operate impartially, separately from the human mind.

Vision is understood to be the most disinterested sense – but how could it be, if a human body and mind moves the eyeballs to observe what she wants to see? On one hand, vision is imagined as the most passive and receptive sense, yet on the other hand it is ascribed the most power and agency. Even material that is invisible or imperceptible can be *visualized* for the purposes of both experiment and explanation (Otegem, 2005, p.620; Singy, 2006). Optical devices and technologies that played an important part within the early history of science, such as microscopes, the camera obscura, and telescopes, together "spawned a new mass visual culture in the nineteenth century [which] are inseparable from the new normative sciences of the observer and the seeing body" (Crary, 1988,

p.15). The visual sense is an expert in the act of persuading the mind, and serves as a talented summarizer that can generalize from infinite visual cues (Gordin, 2011, p.137-140). The idealization of the visual sense as both omniscient and objective obscures the subjectivity of humans who perform the act of seeing. Escaping the visually-dominated frame of scientific knowledge production would allow for the exploration of new directions in the scientific tradition, yet such an abdication would be constrained by a long historical and cross-cultural tradition of ascribing objectivity to sight, positioning it at the top of the sense hierarchy.

The researcher enters the cancer biology laboratory. She prepares her body to test a hypothesis through an established methodology. She cloaks herself in a colorless white coat and snaps thin latex gloves over her fingers for both her protection and tactile pleasure. To prevent injury to her eyes, and in subservience to her eyes' objective approach, she shields them from chemicals with clear glass lenses. She slides her gaze from the plastic dishes where she grows the cancerous cells to a nearby beaker, from which she eyeballs a measurement of modified Ringer's solution, a sweet-and-salty liquid, using a pipette calibrated by human hands. She coordinates the movements between her eyes and hands as she splashes liquid onto the dish for the cells to consume. She confirms that her cells, invisible to the naked eye, still live in amounts she has previously predicted: she counts them under a microscope as they consume the imperceptible molecules of sugar. The researcher controls, manipulates, and selectively reports on the eye's scientific vision as she works in the laboratory with these microscopic, metastasizing murderers. She sees the qualities of living and inanimate objects that she has been trained to look for, as she has been trained by the academy to observe.

If we understand that "objectivity is the suppression of some aspect of the self" (Daston & Gallison, 2010, p.36), we can assume that additional unexplored laboratory potential is suppressed as well by aiming for objective scientific work. Only

through one's body, through oneself, can a human researcher come to know about the world. The "lived body" encapsulates "both an objective subject and a subjective object" (Sobchack, 2004, p.15), and perhaps our trained use of these bodies prevents diversity and multiplicity from arising in our perceptive abilities. Sensory perception is a necessary laboratory tool, and there are myriad modalities through which the natural world – the very subject of scientific study – is perceived by living beings. Through the random and adaptive processes of evolution, different creatures have acquired various systems of organs, tissues, nerves, and neurons that are able to process qualitative and quantitative aspects of the surrounding environment. Within the embodied machinery that has developed through non-directional and purposeless evolutionary mechanisms, no organ or system has been designed to fulfill a particular function, and the collected sensory data "spill from one sensory system into another" (Maurer & Maurer, 1998, p.164). The meshing of the sensory input occurs within such a short time-span, that data is blurred (Guterman, 2001, A17; Sobchack, 2004, p.69). Scholar of synesthesia Richard Cytowic suggests that children experience a "horizontalization" of the senses and a cross-modal perceptive experience as they are, unlike adults, not acculturated to particular methods of sensing in separate ways (Cytowic, 1993, p.95-96).

Culture has helped humans to socially construct the boundaries between senses – the biological possibilities are far less limiting.

Yet through the social construction of separate sense modalities, which each include an "appropriately wired-up sense organ that is historically dedicated to facilitating behavior with respect to an identifiable physical class of energy" (Keeley, 2002, p.6), five specific sensory systems have been imagined to operate within the human body. Such a comparison with the trans-

sensory experiences of children is not meant to suggest the search for sensory origins, but is rather suggestive of the natural indeterminacy of our bodies in sensory operation. The five sense organs, as commonly understood in cultures around the world, perceive in distinctly different ways. The eyes perceive sight, the mouth perceives taste, the ears hear, the nose smells, and the skin perceives touch – each organ uniquely perceiving singular types of data in isolation from one another. Of course, this invented typology is not universal among all of Earth's creatures, for some species possess additional sensory capabilities such as magnetic sensory ability, echolocation, and infrared light detection (Keeley, 2002, p.10-11), and augmented or mixed-sense perceptive ranges further complicate the potential for sensation within other forms of life. The human brain, often coping with sensory overstimulation, may have adapted to partially inhibit sensory cross-talk (Stein, Wallace, & Stanford, 2005, p.711).

However, the biological brain does not necessarily parse the bits of sensory data into five separate categories; rather, it is the human consciousness and learned practice of typologizing that has led humans to believe such a process naturally occurs. Culture has helped humans to socially construct the boundaries between senses – the biological possibilities are far less limiting.

The researcher in real-time operation is impinged upon by many different waves of data: the wafting yeasty smells of cell growth and the counteracting scents of sterilizing alcohols, the various wavelengths of light and sound, and the splashing of liquid agarose as she swirls the cell plates. The vibrations of the buzzing laboratory ventilation system shake both her eardrums and her chair, tickling various types of nerve endings all over her body as she unconsciously perceives. Yet she keeps her eyes and hands steady, focuses on counting and quantifying, and returns to her laboratory notebook to complete numerical calculations. In her notebook, estimations are written as measurements, qualities become quantified, and improvisation

becomes methodology. Her documentation is visual, numerical, and objective – unlike her qualitative reality.

The senses are the primary means for humans to engage in scientific research and understand nature, yet even the scientists who use these very embodied tools have typologized them into categories that do not even necessarily reflect the actuality of their operation. Determining how the senses work, both in universal and individual terms, is impossible. The focus of scientists has historically eradicated direct engagement with the world for "essentially mediated endeavor[s]... new instruments were not to assist the human senses, but to replace them" (Gal & Chen-Morris, 2009, p.122; von Mohl, 1846; Shickore, 2001, p.137). The machine-mediated collection of "knowledge that bears no trace of the knower – knowledge unmarked by prejudice or skill, fantasy, or judgment, wishing or striving" (Daston & Galison, 2010, p.17) through objective sensory means is impossible, especially if those means are constrained by penchants for particular socially-constructed typologies and culturally-learned observational behaviors.

Implementation of a mechanism for destroying as much as possible socially-learned sensory abilities would help to reshape science and its methodologies. Inducing a form of synesthesia would be one way to help randomize and recombine multi-sensory perception, to mix the senses within the bodies of researchers and allow them to intermingle with the varied subjective lived experiences in infinite non-objective ways. Synesthetes, or those who naturally experience synesthesia, sometimes do not distinguish between different sensory aspects, so that "a stimulus in one modality can elicit an entire complex of subjective impressions in another modality" (Stein, Wallace & Stanford, 2005, p.713). Cytowic notes that synesthesia is "not some intellectualized concept pregnant with meaning," and that it occurs through limbic processes that operate in concrete ways "more immediate than analyzing what is happening and talking about it" (1993, p.176). Clinical synesthetes experience

multi-dimensional experiences that combine any number of the five senses as well as temporal and spatial perception, and although an individual's unique synesthetic experience cannot be controlled in terms of intensity or quality, clinicians have documented that synesthetes have instantaneous and involuntary sensory experiences when exposed to particular stimuli. The lack of physical and palpable proof, or observable manifestations, of this sense-mixing syndrome has led the medical and scientific communities to understand synesthesia as a subjective experience (Cytowic, 1993, p.24, 64). However, a synesthetic and subjective scientific experience would not be based upon a personal bias towards particular information. Subjectivity would be invoked by science's new necessary location: an "interpretive framework" dwelling within a human body (Polanyi, 1859, p.60). Philosopher of science Thomas Kuhn explained that education of young researchers in the techniques of the laboratory is kinesthetically achieved by "imparting unarticulated skills and interpretive dispositions," and scientific perception is a trained experimental skill that requires such training (Golanski, 1998, p.17). If paradigms, "the core of the culture of science, are transmitted and sustained just as is culture generally" (Barnes, 1985, p.89; Golanski, 1996, p.16), then scientists will need to receive new sensory education to be socialized in these new methods. Like scientific technologies of the past that have been "valued and exploited only in the context of certain hopes and expectations" (Wilson, 1995, p.71), a new hope of post-objective research will lead to new understandings of the body's value during experimentation.

The researcher enters the laboratory, and ingests a small pill that induces a synesthetic response within the brain. A technological implant in her wrist is turned on, and her once-nervous system relaxes. In her new scientific dream-world, the data present themselves to her as clearly and truthfully as before: however, her body's complicated system of neurological channels trained to bottleneck and pre-categorize data are inoperative. Open to receive in limitless ways,

her brain makes involuntary and instantaneous connections between the different data waves that impinge upon her body's surfaces in ways it has never before. Or, perhaps her brain had always had made such connections, but decades of nurture had helped her to ignore them. Her notebook reads as a thickly-described Malinowskian adventure, one that she can only experience in her body, in this space. After hours of experimenting in this synesthetic state, her senses realign as they have been humanly trained to do, she unhooks, deactivates and powers down, and returns to more normative ways of seeing, sensing, and doing.

In the process of opening up the scientific field for multi-and-mixed sensory data collection, dethroning observation from its seat of objectivity could be achieved by employing a strategic new system of synesthetically sensing scientific data. Objectivity in the sciences has historically been echoed in the refrain, "let nature speak for itself," yet little consideration in the laboratory is given to the diverse ways in which our bodies, with or without chemical or technological assistance, may be spoken to (Daston & Galison, 2012, p.120). The dichotomy of objectivity and subjectivity should be problematized in terms of sensory perception as well, and the complexity of the senses should be acknowledged – and employed – within research. Rejecting the culturally and socially imposed classification of the senses, the problematic relationship between vision and the researcher, specifically in terms of the misplacement of agency and objectivity within a primarily ocular observational method, would be rectified. Though perhaps not easily implemented at the present, a trans-sensory method of relating to the practices and environments of the lab could be designed using implantation of computer chips within the human nervous system or ingestion of substances that would be safely designed for the purpose of scientific laboratory use. Assisting in the reception of mixed sensory data does not suppose the total eradication of the boundaries between the senses entirely, nor does it suggest removal of all bias from experimentation. However, this

trans-sensory laboratory methodology allows for a transcendence of both biologically imposed and socially constructed divides between sensory methods, and would open new doors for trans-sensory laboratory research to take shape through subversion of observation within scientific experimentation. ⊡

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