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For human beings, and most other animals on the planet, the perception of reality is predominantly mediated by the five senses: taste, touch, smell, hearing, and vision. Though some animals, like bats, may be deficient in one of these areas (i.e. vision), and other animals, like the platypus, may have an extra 'sixth sense' (i.e. electrolocation), human beings are relatively comfortable with the idea of having five distinct senses, all of which serve to discern, detect, and inform us of different facets of reality. However, over the past 200 years, and perhaps since even earlier than that, it has come to be understood that these five senses may not necessarily be so separate after all. Synesthetes, or people who experience the phenomenon of synesthesia, have "cross-linked" senses, such that a stimulus in one sense modality may cause a sensation in another [1]: examples include "seeing" colors upon hearing certain sounds or music, or "feeling" geometric shapes while tasting certain foods [2,3]. This paper will attempt to briefly recount the history of synesthesia, beginning with a short stop in ancient Greece, continuing on to the first medical account of synesthesia in 1812, examining some of the earliest comprehensive investigations of synesthesia, and eventually progressing towards more contemporary studies. It is my hope that this historical recounting will demonstrate that the scientific perception and neural understanding of synesthesia has vastly shifted not only over the past few centuries, but also in the last few decades, and that through further elucidation of this intriguing phenomenon, we may come to more fully understand how our brains and our senses work together to mediate our perception of reality.

Though no overt reports of synesthesia exist from the time of the ancient Greeks, synesthetic ideas and motifs were still manifest in their culture. For example, in the 6th century BC, the Pythagoreans sought to pair a particular color with each musical note, and also promoted the notion of the music of the spheres, whereby the positions and revolutions of the celestial bodies cooperated to orchestrate a symphony of universal harmony [1,4]. Aristotle himself also advocated the synesthetic idea of the existence of a harmony of colors that was analogous to the harmony of sounds [4], though he was also responsible for codifying the decidedly un-synesthetic notion of the existence of five absolutely distinct senses [1,2]. Thus there appears to exist an apparent dichotomy in ancient Greece with respect to synesthesia: there was both an appreciation for the underlying connections and the interwoven nature of different physical concepts like colors and music and space, but also a bias towards the strict and stark delineation of the five senses that perceived these physical phenomenon. It is perhaps thanks to this deep-rooted notion of the five distinct senses that synesthesia has for so long been classified as a neurological abnormality [1].

The first documented case of synesthesia comes to us through the writings of Georg Tobias Ludwig Sachs, who in 1812 published a medical dissertation that described himself, his albinism, and also his synesthesia [1,2,4,5,6]. Though potential cases of synesthesia prior to 1812 do exist (for example, the case of John Vermassen of Maastricht, who was blind but could apparently distinguish colors through touch

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[2,6]), Sachs' dissertation is widely considered the first legitimate report on synesthesia. Sachs describes his synesthesia (in the third-person) by explaining:

"I cannot express it better than to say that a colored idea appears to him….Particularly those things which form a simple series; e.g., numbers, the days of the week, the time periods of history and of human life, the letters of the alphabet, intervals of the musical scale, and other such similar things, adopt those colors." [6]

Sachs continues on, describing how the number 0 appears "as if it were very light and bright in a pale-yellow color," while the number 4 is vermilion, 6 is indigo, and so on [6]. The consistent nature and the detailed specificity of Sachs' account is likely what affords it its credibility, as these two qualities have become a hallmark of contemporary synesthesia literature [6].

Despite the intriguing descriptions of Sachs and other early writers of synesthesia, these early 19th century reports did not immediately arouse a great deal of interest [5]. It was not until 69 years later, in 1881, that Eugene Bleuler and Karl Lehmann carried out the first comprehensive study of synesthesia [1,4], and even then, it wasn't until Francis Galton's study in 1883 that the topic of synesthesia became "respectable" in the scientific community [4,5]. Galton's study conclusively found that a small number of people had the capability of experiencing the stimulation of a single sense in a multimodal fashion [5], and inspired further work by the likes of de Rochas, Lauret, and Albertoni [4]. Despite its slow start at the beginning of the century, synesthesia and 'colored hearing' were such wildly popular subjects by the end of the 19th century that a committee of prominent psychologists was necessarily assembled to standardize the terminology of the phenomenon and advance its scientific understanding [4]. Thus, it took over two millennia for synesthesia to overcome the dominion of the Aristotelian view of the five distinct senses, and to emerge as an experience that was thought of less like a physiological perversity and more like an important psychological phenomenon [4]. However, the study of synesthesia had not yet reached its golden era, and indeed, was about to take a large step back.

With the onset of behaviorism in the 1930s, a psychological approach that lauded observable behavior while castigating the unobservable events that occur in the mind, the serious study of synesthesia was all but ceased [5]. The consequent deficit in psychological and medical information pertaining to synesthesia during this period resulted in many misfortunate events, including the diagnosis of synesthetes as schizophrenics or drug addicts, and their subsequent consignment to mental hospitals [5]. This trend of behaviorism persisted for many decades, and led to the characterization of most of the early modern investigations into synesthesia as mere curiosities of psychology and neuroscience [3,5].

Recently however, psychologists and neuroscientists have begun to once again take notice of synesthesia [1,3,5]. Through the use of psychometric methodology, the phenomenon of synesthesia has effectively been proven to be a legitimate area of research in the scientific community [5], and significant advances in neuroimaging techniques have made the neural elucidation of this phenomenon a more realistic possibility [1,5]. This renewed vigor in the field of synesthesia research has helped liberate the phenomenon from being thought of as 'abnormal', and has led to a great

variety of intriguing hypotheses: for example, Ramachandran and Hubbard have suggested that the neural basis of some forms of synesthesia is the “crossactivation” of different, adjacent areas of the brain (i.e. between the grapheme region and the hV4 visual area) [3], while Maurer and Mondlach have posited that almost all human infants are born synesthetic, and that neural and synaptic pruning throughout infancy and childhood give rise to the notion of the five distinct senses [7]. Thus, though there has been a great revival of interest in synesthesia research, a large abundance of questions remain. Perhaps now that synesthesia research has established itself on a firm scientific footing, it may finally enter its golden age.

Though this tour of the history of synesthesia has been brief, it has hopefully been ample enough to demonstrate the vacillating nature of the perception of synesthesia through time, from the ancients to the present. Synesthesia has been both venerated and reviled; it is a phenomenon that is at once familiar to non-synesthetes (e.g., many people would agree that the color blue elicits a “cool” sensation, while orange and red are “hot”), and yet utterly unfathomable to them as well. Now that the imaging tools and the scientific knowledge exist to more fully elucidate the neural basis of synesthesia, we may gain deeper insight into the inner workings of sense and sensory relationships, and how they mediate and affect our very perception of reality.

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