Berkeley’s Essay

“My Design is to shew the manner, wherein we perceive by Sight the Distance, Magnitude, and Situation of Objects. Also to consider the Difference there is betwixt the Ideas of Sight and Touch, and whether there be any Idea common to both Senses. In treating of all which, it seems to me, the Writers of Optics have proceeded on wrong Principles.”

(Berkeley 1709, I)\(^{(1)}\)

These are the words in Section I of An Essay Towards a New Theory of Vision published three hundred years ago by George Berkeley (figure 1) at the age of 24.

In his Essay Berkeley inveighed against the dominant analysis of vision in terms of optics: “Those Lines and Angles have no real Existence in Nature, being only an
Hypothesis fram’d by Mathematicians, and by them introduced into Optics, that they might treat of that Science in a Geometrical way” (1709, XIV). He did not deny that light passed through the eye in a lawful manner to form an image. Indeed, he wrote: “There is, at this Day, no one Ignorant, that the Pictures of External Objects are Painted on the Retina, or Fund of the Eye” (LXXXVIII). What he refuted was that perception was a consequence of ‘natural geometry’ in which the lines and angles are used to determine distance and magnitude. This was expressed explicitly in the context of convergence providing a cue to distance as a consequence of calculating the angle between the optic axes: “I know it is a receiv’d Opinion, that by altering the disposition of the Eyes, the Mind perceives whether the Angle of the Optic Axes is made greater or lesser. And that accordingly by a kind of Natural Geometry, it judges the Point of their Intersection to be nearer, or farther off. But that this is not true, I am convinc’d by my own Experience. Since I am not conscious, that I make any such use of the Perception I have by the Turn of my Eyes. And for me to make those Judgments, and draw those Conclusions from it, without knowing that I do so, seems altogether incomprehensible” (XIX). Berkeley’s alternative interpretation was that the muscular sensations attending convergence are associated with distance: “From all which it plainly follows, that the Judgment we make of the Distance of an Object, view’d with both Eyes, is entirely the Result of Experience. If we had not constantly found certain Sensations arising from the various Disposition of the Eyes, attended with certain degrees of Distance, we shou’d never make those sudden Judgments from them, concerning the Distance of Objects; no more than we wou’d pretend to judge of a Man’s Thoughts, by his pronouncing Words we had never heard before” (XX).

Berkeley based his new theory on certain phenomena that were taken as self-evident, like the constancies of vision, the upright appearance of a visual world, and he deliberated over Molyneux’s question as well as the moon illusion.

Berkeley was born near Kilkenny, Ireland, and became a fellow at Trinity College, Dublin, in 1707. The Essay was published two years later and his Treatise Concerning the Principles of Human Knowledge in 1710. Following extensive travels throughout Europe he journeyed to America in 1728 in order to set up a missionary college in Bermuda. His long voyage finally terminated at Newport, Rhode Island, and he remained there until 1731, returning to London without setting foot in Bermuda (see Gaustad 1979). He was appointed Bishop of Cloyne in 1734, a post he occupied for most of the rest of his life (see Luce 1949). The Scottish painter John Smibert (1688 – 1751) accompanied Berkeley to America, but he settled in Boston and became a prominent colonial portraitist. Smibert painted the portrait of Berkeley a detail of which is used in figure 1.

In line with other empiricist philosophers, Berkeley was not empirical in his methods and he did not cite the experimental literature of the day. He was, however, familiar with the first book on optics written in English, by his fellow Ulsterman, William Molyneux (1692, figure 2, left), and he cited a large section from Isaac Barrow’s Lectures on Optics and Geometry (1674, figure 2, right). Despite his antagonism to ‘Writers of Optics’ Berkeley drew upon Molyneux’s work extensively and he also devoted many pages to a discussion of Molyneux’s problem (see Wade and Gregory 2006). The distinguishing feature between them was Berkeley’s emphasis on touch as providing a reference for visual perception.

In contrast to ‘natural geometry’ Berkeley placed touch firmly at the centre of vision: “It has been shewn, there are two sorts of Objects apprehended by Sight; each whereof hath its distinct Magnitude, or Extension. The one, properly Tangible, i. e. to be perceiv’d and measur’d by Touch, and not immediately falling under the Sense of Seeing. The other, properly and immediately Visible, by Mediation of which, the former is brought in View” (LIV). Thus, touch was considered to provide a reference for spatial extent that was not available to vision. This spatial elevation of touch above
vision, while spanning back to the early Greek philosophers, was disputed by many, particularly William Porterfield (ca 1696–1771). He presented a nativist theory of vision that contrasted starkly with Berkeley’s empiricism and argued that touch was as arbitrary in its representation as was vision: “for the tangible Ideas are as much present with the Mind as the visible Ideas, and, on that Account, must be equally incapable of introducing the Idea of any Thing external” (1759, page 307).

Berkeley was selective in the aspects of optics he wished to dispel from his Theory. On the one hand, he argued that the lines and angles of the optical projection are not available to perception, while on the other, he used the fact that the image on the retina is inverted to amplify the importance of touch. As with many of his other ideas, the seeds were sown by William Molyneux, who gave a similar analysis but without the reference to touch: “How then comes it to pass that the Eye sees the Object Erect? ... But yet that in this Matter we may offer at somthing, I say, Erect and Inverted are only Terms of Relation to Up and Down, or Farther from and Nigher to the Centre of the Earth, in parts of the same thing. ... The Image of an Erect Object being Represented on the Fund of the Eye Inverted, and yet the sensitive Faculty judging the Object Erect; it follows that when the Image of an Erect Object is painted on the Fund of the Eye Erect, the sense Judges the Object Inverted” (Molyneux 1692, pages 105–106, original italics).

Both Molyneux and Berkeley were examining an old problem and it was based on the analogy of the eye with a camera (Wade 2007). This parallel had been drawn long before the dioptries of the eye were fully understood. Unlike Berkeley, Molyneux displayed a reluctance to enter into matters philosophical in his Dioptrica Nova, but he nevertheless gave what was generally taken to be the correct solution: the terms up and down are relative, and since it is not the eye itself that sees, the relativities can be resolved in the mind. Berkeley (figure 3) considered the problem of the inverted retinal image in the context of a blind person seeing for the first time. He concluded that not only are the terms up and down relative, but they are meaningless without recourse to touch. In the case of upright vision, Berkeley enlisted movements of the eyes and head to provide cues for tangible indices of upright and inverted.
Berkeley's Essay presented a radical approach to vision and its limitations. It had a turbulent reception in philosophy but its ripples have lapped the sands of sight for longer (see Schwartz 1994).

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**Figure 3.** [In colour online.] *Berkeley and the Inverted Retinal Image* by Nicholas Wade. The portrait of Berkeley was derived from a detail in a painting that hangs in Honyman Hall, the parish offices of Trinity Church, Newport, Rhode Island, where Berkeley preached during his sojourn in America between 1729 and 1731.

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