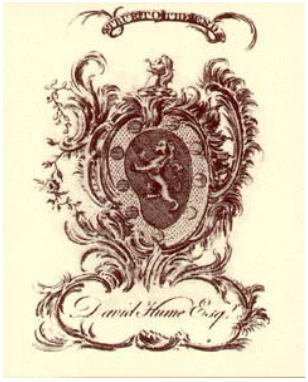

"Magic Buffalo" and Berkeley's *Theory of Vision*: Learning in Society
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Introduction

Berkeley's *Theory of Vision* contains the remarkable claim that the perception of distance is learned by experience. This thesis is rooted in Berkeley's doctrine that the physical basic of optical perception is angular. An impression of angle θ impacts upon the optic nerve. The interpretative problem confronting an individual is that of reconstructing *two* pieces of information, distance d and magnitude m, from one datum θ. Let the ratio of m/d form arctan θ. How do we come to distinguish between the pair m^1, d^1 and the pair m^2, d^2 when $m^1/d^1 = m^2/d^2$? How do we distinguish big objects at a distance from small objects up close?

The evidence Berkeley provides for this thesis is of a funny sort. He gives examples that we do, in fact, distinguish large distant objects from small near objects. Since the arctan of the pair m^1, d^1 is by hypothesis the same as that of the pair m^2, d^2 then recognizing distance must be a learned ability. We cannot extract d and m from θ alone. The proper interpretation of Berkeley's philosophy of science is a matter of considerable debate.[1] Nonetheless, as a working theorist of visual perception he is a fairly simple-minded falsificationist. Here is what he says: find a person born blind who comes by surgery to see. If that person can distinguish at a glance big distant objects from small near objects, I'll amend my theory.[2]

The literature on Berkeley's *Theory of Vision* can be fairly said to bifurcate between those who "see" the argument and those who don't. Berkeley's most important eighteenth century disciple, Adam Smith, extended Berkeley's teaching to encompass the remarkable claim that we learn to perceive our economic interest (Levy 1992a, 1992b). The negative reaction to Berkeley's theory starts in 1842 with Samuel Bailey who pronounced himself mystified by the very claim that we learn to perceive distance. The debate between Bailey and John Stuart Mill, a debate which has twentieth century counterparts, has all the characteristics of people talking past each other.

The missing social dimension

The problem, as I see it, with Berkeley's proposed critical test—stipulating his own doctrine—is that a blind person would grow up in a sighted community. Perhaps, if he grew up in a blind community, and most of the community became sighted at the same time he did, all the community might be able to perceive distance. The problem with Berkeley's test is that if he himself is correct about the importance of heuristics in making the visual distinctions, the fate of one individual is somewhat beside the point. One individual surely cannot create the necessary heuristics. This learning requires some evolutionary social process. Thus, while Berkeley's thesis requires some claim about some very basic social epistemology (Fuller 1988), his proposed test, asking about a blind person growing up in a community silently presumed to be sighted, does not take into account the social dimension of learning.

Having said this, it is easy to think of a better test for Berkeley's theory of vision. Let us find an entire community where life takes place without the visual perception of great distance. Take any individual from this community and ask Berkeleian questions. Now, we know the answer because just such a dialogue was reported thirty years ago. One society which fulfils the test criterion is that of the BaMbuti people who lived their life in a very dense African forest.

The American anthropologist Colin Turnbull took his friend from the BaMbuti, Kenge, to the top of a hill. Here is Turnbull's famous report:

> Then he saw the buffalo, still grazing lazily several miles away, far down below. He turned to me and said, "What insects are those?"
>
> At first I hardly understood; then I realized that in the forest the range of vision is so limited that there is no great need to make an automatic allowance for distance when judging size. Out here in the plains, however, Kenge was looking for the first time over apparently unending miles of unfamiliar grasslands, with not a tree worth the name to give him any basis for comparison. The same thing happened later on when I pointed out a boat in the middle of the lake. It was a large fishing boat with a number of people in it but Kenge at first refused to believe this. He thought it was a floating piece of wood.
>
> When I told Kenge that the insects were buffalo, he roared with laughter and told me not to tell such stupid lies. When Henri, who was thoroughly puzzled, told him the same thing ... Kenge still did not believe, but he strained his eyes to see

> more clearly and asked what kind of buffalo were so small. I told him they were sometimes nearly twice the size of a forest buffalo, and he shrugged his shoulders and said we would not be standing out there in the open if they were. ...
>
> The road led on down to within about half a mile of where the herd was grazing, and as we got closer, the "insects" must have seemed to get bigger and bigger. Kenge, who was now sitting on the outside, kept his face glued to the window, which nothing would make him lower. I even had to raise mine to keep him happy. I was never able to discover just what he thought was happening—whether he thought the insects were changing into buffalo, or that they were miniature buffalo growing rapidly as we approached. His only comment was that they were not real buffalo, and he was not going to get out of the car again until we left the park. (Turnbull 1968, 252-53)

In addition to providing good evidence for Berkeley's thesis, this encounter with "magic buffalo" provides compelling evidence that ordinary people really do employ the kind of logic hypothesized in the Duhem-Quine thesis.[3]

Conclusions

The conclusion I draw from this encounter between Turnbull and Kenge, as representatives of their respective societies, is that Berkeley's *Theory of Vision* is absolutely correct. We as a society bring up our children to disentangle distant, large objects from near, small objects. We do this because it is economically important. Berkeley's failure was only in not imagining a society where such information is unimportant. Once this easily-mended flaw is addressed, then I believe the empirical proof of Berkeley's thesis is perfectly transparent.

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1. It has not helped in the slightest that Berkeley's most famous technical mathematical contribution—his demonstration that the foundations of infinitesimal calculus as presented by Newton and Leibniz were inconsistent—could only be fully appreciated by mathematicians after the development of non-standard analysis. Levy 1992a gives details of the massive rewriting in the history of mathematics of Berkeley's place in its development.
2. Berkeley (1975, 59): "I am informed that, soon after the first edition of this treatise a man somewhere near London was made to see, who had been born blind, and continued so for about twenty years.

Such a one may be supposed a proper judge to decide how far some tenets laid down in several places of the foregoing essay are agreeable to truth, and if any curious person hath the opportunity of making proper interrogatories to him thereon, I should gladly see my notions either amended or confirmed by experience."

3. I wrote the relevant parts of Levy 1992b in woeful ignorance of this marvellous example so I had to make up my own example of "black swans" which turn into "elongated ravens."

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