Functional seeing

Perception words have rich ambiguities. Perhaps the deepest and the oldest is ‘seeing’—meaning visual experience and also understanding. Thus “I see the tree” and “I see what you mean” use ‘see’ quite differently. One might say the first is perceptual and the second conceptual. The question how these are related tends to get swept under the carpet—perhaps for fear of a dusty answer, as Greek philosophers frequently discussed it.

In the *Timaeus* (Section 14) Plato, being a philosopher, argues that gaining understanding is the essential purpose of vision: *(1)*

“For I reckon that the supreme benefit for which sight is responsible is that not a word of all we have said about the universe could have been said if we had not seen stars and sun and heaven. As it is, the sight of day and night, the months and returning years, the equinoxes and solstices, has caused the invention of number, given us the notion of time, and made us inquire into the nature of the universe .... This is what I call the greatest good our eyes give us.”

He continues:

“[The] cause and purpose of god’s invention and gift to us of sight was that we should see the revolutions of intelligence in the heavens and use their untroubled course to guide the troubled revolutions in our own understanding.”

Plato takes this to speech and into art:

“Speech was directed to just this end, to which it makes an outstanding contribution; and all audible sound is given us for the sake of harmony, which has motions akin to the orbits in our soul, and which, as anyone who makes intelligent use of the arts knows, is not to be used, as is commonly thought, to give irrational pleasure, but as a heaven-sent ally in reducing to order and harmony any disharmony in the revolutions within us.

We started with the two senses of ‘seeing’—for the Greeks and perhaps all languages—visual experience and understanding. There are related ambiguities of many other perception words. Thus ‘smell’ is rich in ambiguities: “I smell” may mean that I emit an odour, or that I experience one. Then there are colloquial meanings, such as “I smell a rat”. ‘Touch’ is just as rich, ranging in meaning from the afferent sensation to emotional empathy. ‘Tickle’, or ‘being tickled’, can, at least colloquially, mean being amused or generally pleased. ‘Pain’ has at least as wide a range of meanings, and so has ‘taste’—extending to judgments of conduct and style. ‘Feel’ also extends far beyond afferent sensation to judgment, as in “I feel you are right”. ‘Hear’ again has extended meanings, such as in “I hear you are leaving”. One might have read some hint of this and yet call it ‘hear’. What of the frankly general-purpose word ‘sensation’? This extends from sensations (or qualia) of any of the senses to anything amazing: “He was a sensation as Hamlet”. ‘Sense’ can mean sensation or good judgment. And lastly, ‘perception’ has a vast range of meanings, even beyond the various technical senses we give it, or allow it in this Journal bearing its name.

Given all these ambiguities in the word-tools of our trade, it is a testimonial to the intelligence of readers of *Perception* that its authors are understood. Yet even a sentence such as: “I feel that, although brilliant, you have not touched soundly on the

*(1)* Translated by Desmond Lee, 1977 *Timaeus and Critias* (London: Penguin Classics) pp 64–65.
sensitive issues that colour the sensational views in your perspective” has some sort of meaning.

We started with ambiguity of ‘seeing’—as visual experience, and as understanding. But is this an ambiguity? Are not these, rather, the components of all perceptions? For perceptions are experiences linked with understanding. To see a table, we must know something of what tables are: what they can be used for, what they are made of, and so on. Pictures of tables, or of people or whatever, call upon hard-won knowledge of objects for seeing squiggles of paint as things, and for seeing things from retinal images. Most of us believe that the patterns of retinal images and their signals to the brain would be meaningless without knowledge and understanding to interpret them. And it is reasonable to believe that the more relevant the knowledge the richer the perception. So there is more to improving vision than is dreamed by ophthalmologists.

This notion that knowledge is part of perception can be pushed towards elementary perceptions, such as movement. Pictures of people leaning forward, or horses suspended over the ground, are seen as moving; for we understand by learned conceptual physics that the person must be running, and the horse galloping, as these attitudes are not physically static possibilities, for people or horses. We see movement here (but which sense of ‘see’?) not as directly signalled but from concepts of instability. So, while looking at pictures or objects we see with concepts, and we may see concepts. Knowledge allows and limits what we see—as evidenced by the dramatic perceptual phenomena of ‘flipping’ ambiguity such as the duck/rabbit, which surely depends on knowledge of ducks and rabbits, including that they are very roughly equally probable. The Hollow-Face illusion occurs because the probabilities are highly unequal. This at least is how I see perception. The cortical processes may be appearing (Kenet et al 2003).

From sensory signals and brain-stored knowledge we see concepts such as functions of things. With sufficient understanding, we see the ribs of a cathedral and its flying buttresses as channeling forces to hold up the roof. We may see the great dish of a radio telescope, with its central antenna collecting invisible energies from space, as similar not only in shape but also function to the tiny buttercup, collecting heat from space to heat its central stamen. By understanding (though implicitly) the principle of degrees of freedom, we see that a three-legged table cannot rock. So a fourth leg can compromise the function of the other three. A camera tripod has a special elegance: the beauty of functional perfection.

This is often missing in art. I remember a London exhibition of ‘pretend’ machines, especially non-function pretend parts of aircraft; which at least to me were futile and silly, because they could not get off the ground. Heath Robinson was different: he cartooned functions, to wonderful humorous effect. His drawings emphasise the knowledge-component of perception; which is all too rare in art, and which indeed unfortunately separates art from science. There should be an annual Heath-Robinson Prize, to balance the Turner Prize. My bet is it would be a lot more interesting. It would have deep aesthetics; for no doubt visual aesthetics comes very largely from early environments where useful plants grew, and there was fresh water and materials for making shelter and tools. Aesthetics embodies implicit knowledge of functions. But with the astonishing burgeoning of technology the range of functions has increased enormously. So aesthetics (including what is seen as ugly) has grown to encompass aircraft and space rockets, cars and (Apple) computers. But the Fine Arts lag behind our developing understanding. We can see more than artists provide. For the Heath-Robinson Prize, I would nominate a picture of a radio telescope and a buttercup. Their similar shapes both function as focusing mirrors, directing energy from space to the central antenna of human technology and the stamen of natural selection. Here the so far parallel technologies of human technology and far older natural selection separate:
one receiving information from the antenna, to link our brains to the universe; the other
to heat the stamen by a few degrees, to spring the flower to life. My picture would
include a human eye, with a brain computing functions to see the point. Perhaps it
would also show molecular agitation increasing with heat to speed chemical processes
of life. Suggestions for the Heath-Robinson Prize, and especially functional pictures
would be welcome. If eighteenth century portraits showed the social standing of their
subjects, these should show conceptual understanding of the world we live in. They
could have any of the ambiguities of ‘seeing’. They might tickle humour or cultivate
taste. Above all, they should touch the imagination to help us see concepts, processes,
and functions, that are indirectly cast by the optical shadows in Plato’s Cave of eyes.
The prize goes for mental acuity.

Seeing functions challenges the intelligent eye. The difficulties are made explicit in
the problems of reading functions from magnetic resonance brain imaging—fMRI.
There must be background understanding, including assumptions that may be wrong,
to see locally increased metabolism for showing brain functions. Only skilled engineers
or anatomists can see functions in subtle complex structures; yet we do see functions
all day long with our imaging eyes and knowledgeable brains, for surviving in a hostile
yet when understood more friendly world. As seeing is largely reading functions, perhaps
we should call visual perception fSEEING. The awareness with qualia might be qSEEING.

Richard Gregory

Reference
Kenet T, Bibitchkov D, Tsodyks M, Grinvald A, Arielli A, 2003 “Spontaneously emerging cortical
representations of visual attributes” Nature 425 954–956
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