On Photons and Perception—2

A. Halliday

Abstract: This is a reduced version of my essay of 2015 on photons and perception. It argues that light is opaque; that visual perceivers cannot look through light to their emitting objects. The conclusion is twofold: direct perception of the physical world is not possible, therefore indirect perception, via representations, is how visual knowledge of the world is obtained.

Philosophers, since the era of the Ancient Greeks, devoted much time and thought on how knowledge of the objective world is acquired. They have, for example, explained light, what happens inside the eye during perception and how data is subsequently transmitted to the visual cortex. Today, biologists know almost everything of the structure of the eye and physicists understand light and its constituent units, photons.

Facts further understanding of the objective world, and are often the bedrock that philosophical argument is grounded on. This essay argues that biological and physical facts point to a fundamental barrier between objects in the world and the retina of the eye. That barrier is light. Light prevents visual perception of real, physical objects. If so, how is that explained?

Light waves, part of the visual region of the electromagnetic spectrum, are transmitted from a primary source, such as the sun, a fire or torchlight. Light waves strike objects, and are absorbed by its superficial atoms. Those atoms emit photons that contain an energy level that represents the object's surface property—in this case, colour. Newly emitted photons form light waves, now a secondary source of light, and a few of those enter the eyes of a perceiver.

In the eye, photons at the leading point of a light wave strike a cone or a rod in the retina, transferring its energy to it. The absorption of its energy is the initial step in the sight-building process. (From light reflected off of an object until it reaches the cones and rods, is termed pre-vision.) On losing its energy, photons are destroyed. After absorption, a chemical conversion occurs, signals travel through the retina, along the optic nerve, and thence to the visual cortex. There, the content field—representations of physical properties, often referred to as givens, or appearances—is thought to appear. However, what is it about light waves that prevent visual perception of objects?

Light fills ambient space between observers and objects. (The physical observer is a member of that world.) Indeed, light fills the space around all perceivable objects to such an extent that objects and observers are bathed in light. Irrespective of the distance to perceivable objects, light fills that space.

If photons extend along the length of a light wave, then each arrives at the retina in a particular order: leading photons first, then the remainder in order of distance from the eye.[1] Those further back could be many miles from the eye. (Moonlight travels more than 240,000 miles to Earth.) Those latter photons carry information on a property. But, as they stream forward, that is all that they do: they transport a package of energy, also referred to as data, to the eye.

Because photons arrive in a particular order, only absorbed photons have an effect on the retina. Leading photons are the first to arrive, therefore their energy is

[1] An emitted light wave has 'no end' if it is emitted by a primary light source, such as the Sun. All stars continuously emit light until they die. Exterior objects do not emit photons if there is no primary light source. Secondary light sources, such as house furnishings in a closed room, emit light if there is an active, secondary source of light—such as a light bulb.

absorbed prior to the arrival of those still trailing forward. Trailing photons have no effect on visual perception prior to absorption. It is only with the transfer of energy that sight processes are initiated. Trailing light waves are ineffective: they 'block' visual perception of objects. Trailing light is opaque to the eye.

As light is the only visual intermediary between retina and object, given the object-light-eye structure, direct perception of objects is not possible. For that to happen, observers would have to look through light waves to emitting objects; trailing photons, irrespective of their distance from the eye, would have their energy absorbed prior to arriving at the retina; photons along the length of a light wave would have to be simultaneously effective. But, only these photons that have their energy absorbed by either a cone or a rod can initiate visual processes.

In vision, the only known intermediaries between the visually perceiving mind and objects in the world, is the visual processing system—the visual cortex, optic nerve, and the cones and rods in the retina—and light. Photons are the only known particles that initiate those processes.[2] The role of photons ends at the cones and rods. At that point, their energy is fully absorbed. Inside cones and rods, chemistry and electrical signalling take over.[3] Those processes could be called the beginnings of mid-vision.

As subsequently arriving photons cannot initiate the visual processes prior to their arrival, it cannot be possible to look through light waves. Therefore, emitting objects are permanently hidden from visual perceivers of 'the world'. Light—the train of light waves that follow its leading point—is, essentially, opaque to the eye. Given that it is not possible to look through light waves, then direct knowledge of the objective world is not possible? Direct knowledge implies seeing remote, physical objects as they really are. Visual perceivers—bird, animal and fish—look out at a mind-dependent, phenomenal world: a constantly refreshed, coloured representation of objects. Visual perception of the objective world is permanently closed to sentient creatures.

[2] It is logical to argue that, even if physicists posit a new structure of light, then the same basic argument applies. Light is thought of as opaque, not fundamentally because it has photons or frequency, but because only the leading point of a light wave initiates the perceptual processes.
[3] The frequency of light waves contain data that results in the appearance of colour, rather than photons. In this essay photons make it slighter easier to visualise what happens at the retina and in the light wave itself.