

Light

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1. Introduction

This exercise was adapted from:

Jonathan Osborne, Sibel Erduran, Shirley Simon, *Ideas, Evidence & Argument in Science (IDEAS)*, King's College London, 2004, pp. 31-33, <https://www.stem.org.uk/elibrary/collection/3308>
<https://www.stem.org.uk/resources/elibrary/resource/28125/ideas-resources>

The aim of this exercise is to explore alternative theories for why we see objects by developing evidence-based argumentations. Section 2 presents the inquiry and Section 3 presents the corresponding argumentation developed with the sInvestigator system. sInvestigator may be downloaded from <http://lac.gmu.edu/sInvestigator/>

The knowledge base containing the argumentation may be downloaded from <http://lac.gmu.edu/sInvestigator/CaseStudies.html>

2. Inquiry: How do we see things?

Consider the following statements related to light:

- Light travels in straight lines.
- We can still see at night when there is no sun.
- Sunglasses are worn to protect our eyes.
- If there is no light we cannot see a thing.
- We 'stare at' people, 'look daggers' and 'catch people's eye'.

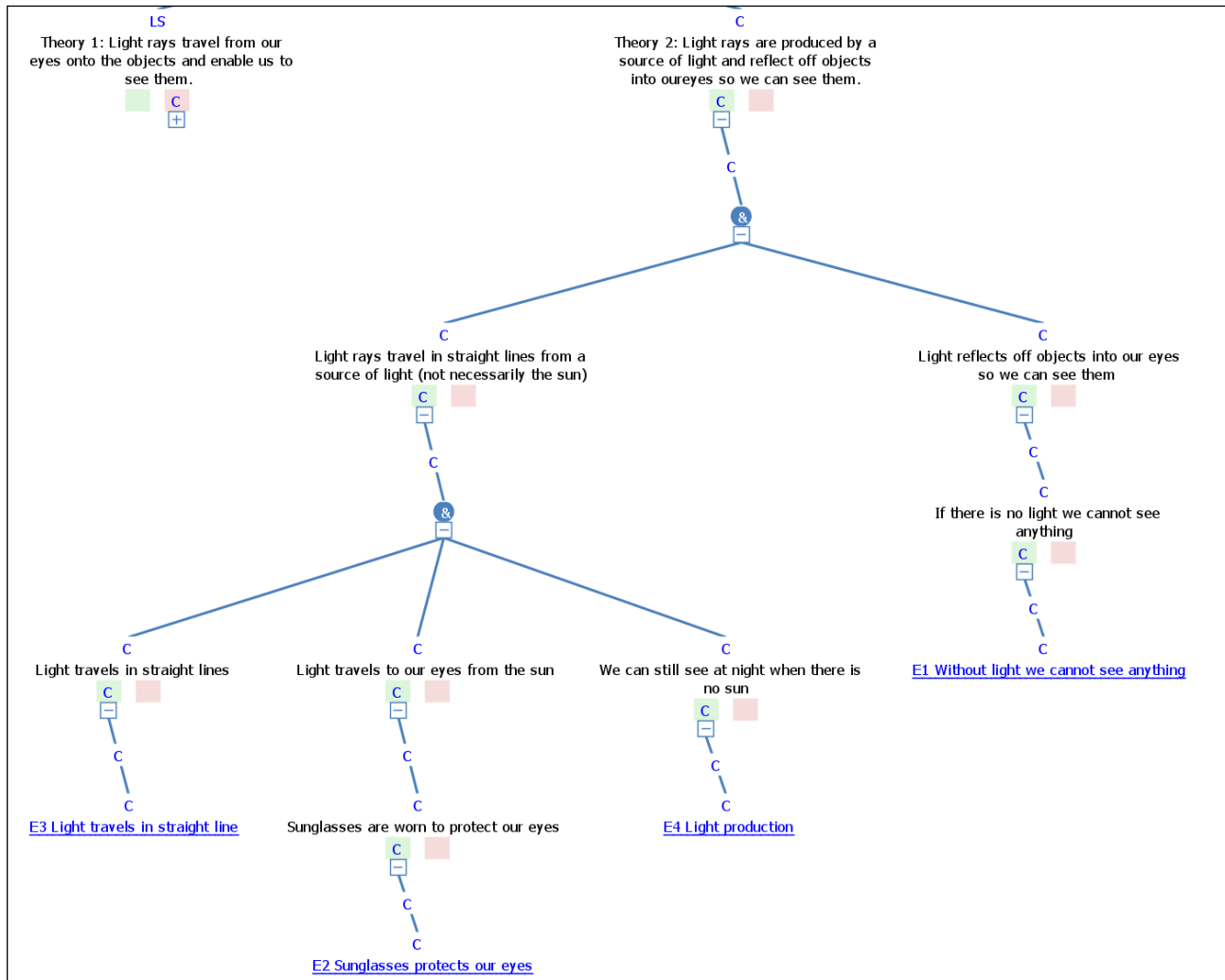
Use them and evidence to determine which of the following theories of light is correct:

Theory 1: Light rays travel from our eyes onto the objects and enable us to see them.

Theory 2: Light rays are produced by a source of light and reflect off objects into our eyes so we can see them.

3. Analysis

Argument
Evidence
<p>E1 Without light we cannot see anything </p> <p>(During the evening when the Earth has rotated to a position where the light from the sun can no longer reach our part of the Earth (due to its inability to bend around the spherical shape of the Earth), objects on Earth appear black (or at least so dark that we could say they are nearly black). In the absence of a porch light or a street light, the neighbor's house can no longer be seen; the grass is no longer green, but rather black; the leaves on the trees are dark; and were it not for the headlights of the car, it would not be seen approaching the intersection. Without luminous objects generating light that propagates through space to illuminate non-luminous objects, those non-luminous objects cannot be seen. Without light, there would be no sight.)</p>
<p>E2 Sunglasses protects our eyes </p> <p>(Sunglasses or sun glasses (informally called shades or sunnies; more names below) are a form of protective eyewear designed primarily to prevent bright sunlight and high-energy visible light from damaging or discomforting the eyes. They can sometimes also function as a visual aid, as variously termed spectacles or glasses exist, featuring lenses that are colored, polarized or darkened.)</p>
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Argument

Evidence

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E3 Light travels in straight line (Once light has been produced, it will keep travelling in a straight line until it hits something else. Shadows are evidence of light travelling in straight lines. An object blocks light so that it can't reach the surface where we see the shadow. Light fills up all of the space before it hits the object, but the whole region between the object and the surface is in shadow.)

E4 Light production (When a light globe is turned on it gives out light. There are many other things that produce light. Candles, fluorescent tubes, the Sun, television screens, computer screens and glow-worms are just some of them. After light has been reflected off an object, such as a tree or a book, it still travels in straight lines, but in a new direction. If the light enters our eyes, we see the object (ie our eyes can detect light).)

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