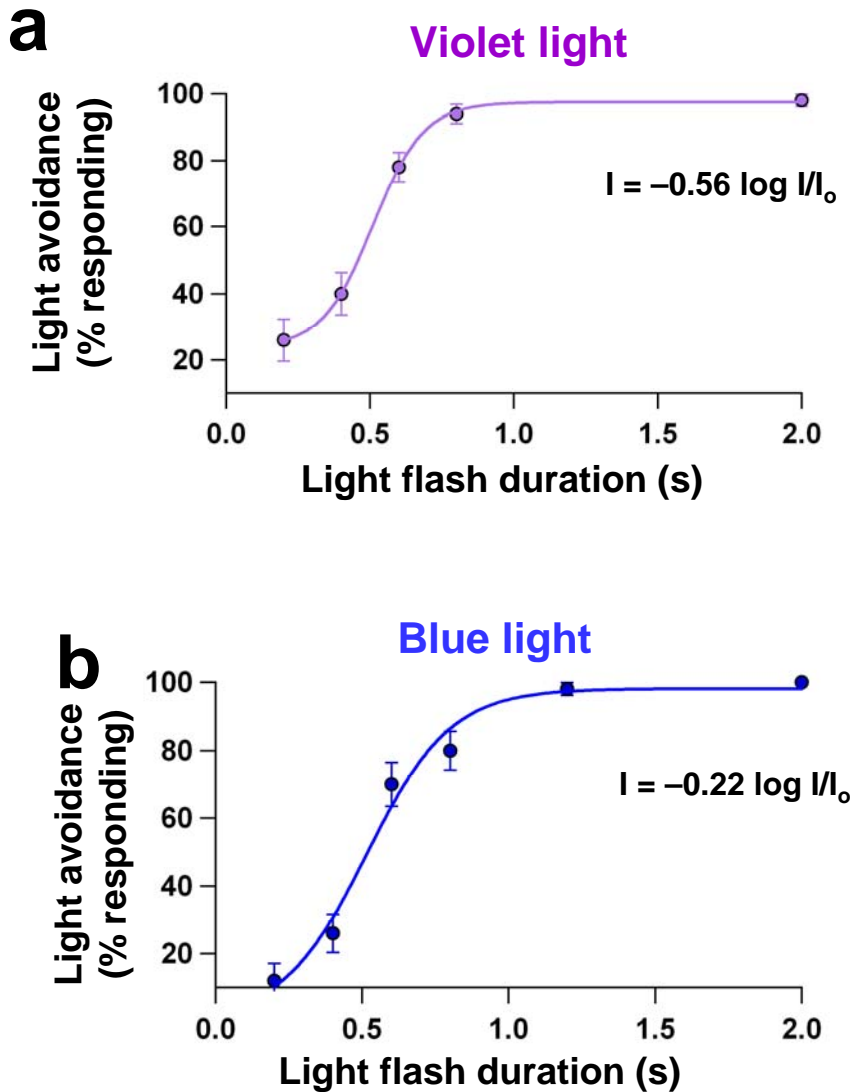
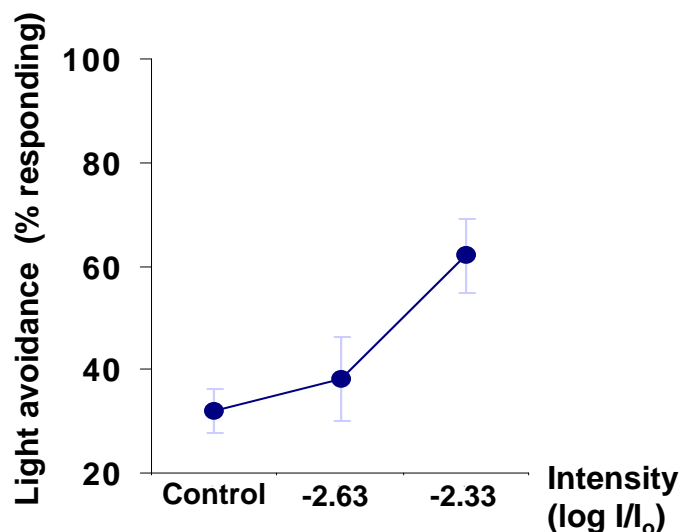


Figure S1



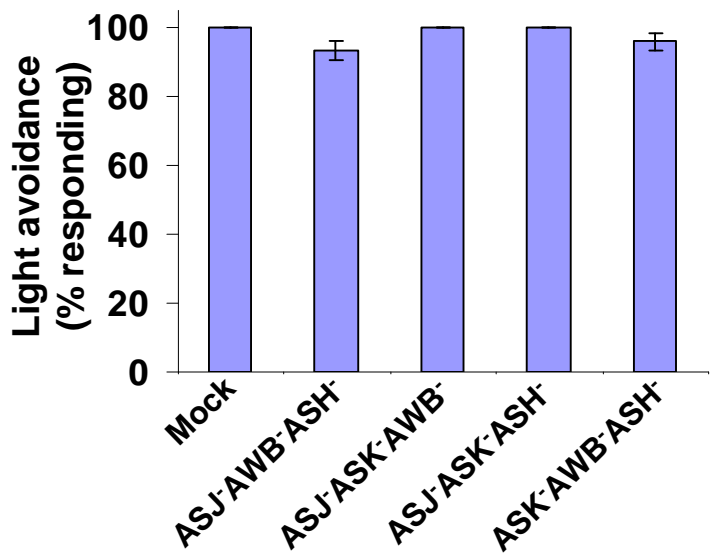
Supplementary figure 1. Worms respond to light in a duration-dependent manner. Light pulses of varying duration were tested for the avoidance response. Shown here are data for violet light (**a**) and blue light (**b**). Please see data for UV light in figure 1c. n=10. Error bars: SEM.

Figure S2



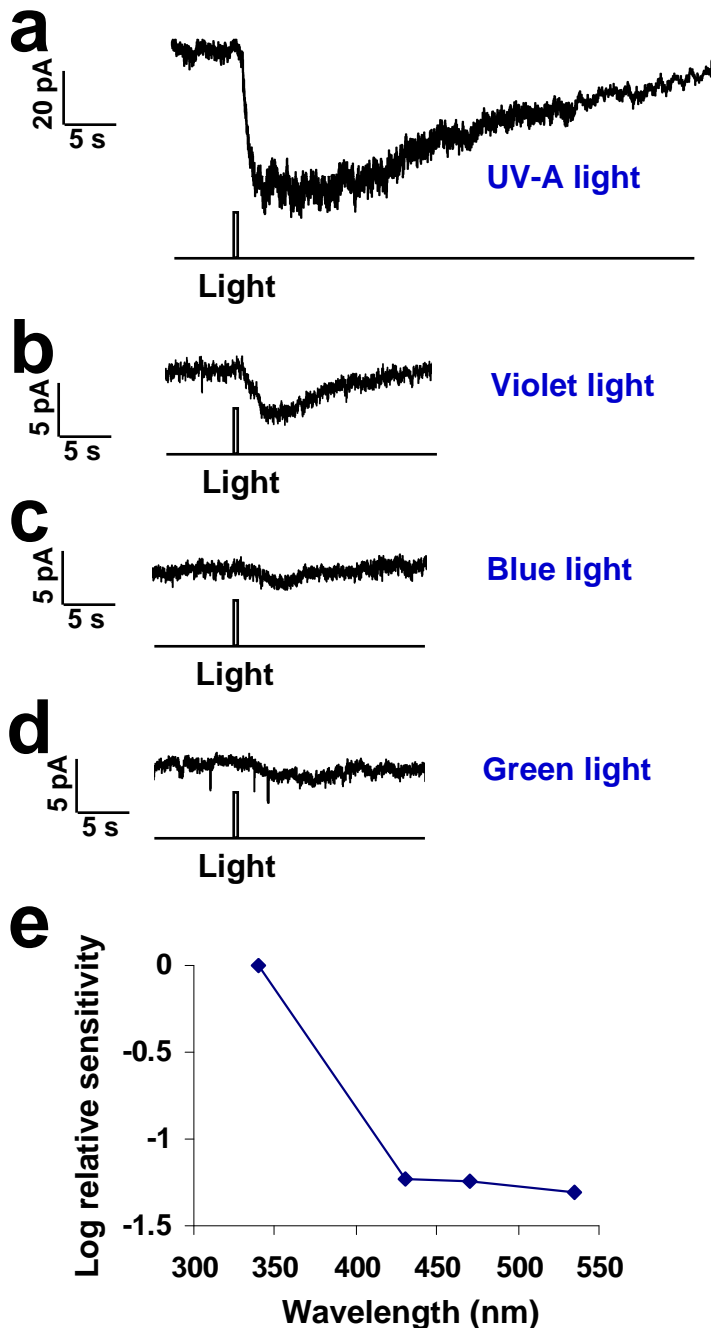
Supplementary figure 2. The threshold of UV-A light intensity in inducing an avoidance response in worms. Using a slightly longer duration of UV-A pulses (5 s instead of 2 s), we began to observe phototactic responses at an intensity of -2.63 log I/I₀ (control: no light). This intensity is equivalent to 47 $\mu\text{W}/\text{mm}^2$, which would probably become lower if the stimulus duration is further increased. The UV-A component (310-400 nm) in the sunlight at a summer day (e.g. mid-June) in the U.S. can reach up to $\sim 74 \mu\text{W}/\text{mm}^2$ (Langley-Calibrated irradiance) in Manna Loa of Hawaii, $\sim 64 \mu\text{W}/\text{mm}^2$ in Homestead of Florida, and $\sim 55 \mu\text{W}/\text{mm}^2$ in Pellston of Michigan based on the data monitored by the U.S. observatories sponsored by the USDA (raw data are available at its website and were integrated across 310-400 nm). Thus, while it is always difficult to compare conditions in the laboratory and those in the natural environment, it remains possible that the UV-A component alone in the sunlight could be sufficient to induce an avoidance response in worms. UV-B light is also present in the sunlight and may further contribute to evoke a response. In addition, violet and blue light in the sunlight may also further contribute.

Figure S3



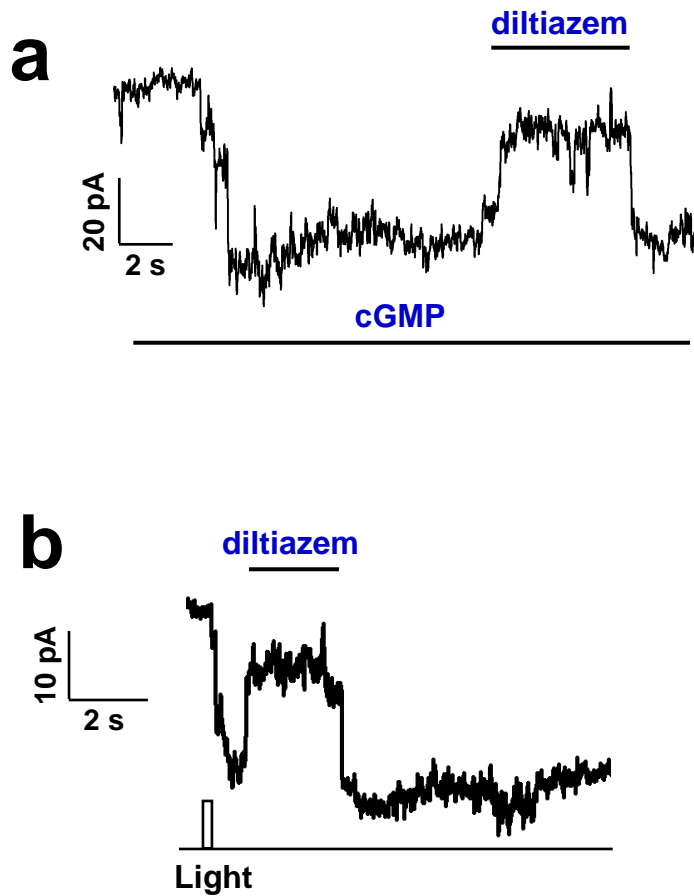
Supplementary figure 3. Additional laser ablation data. Laser ablation of different combinations of sensory neurons. No severe defect in light-induced avoidance responses was observed in these combinations. A 2 s light pulse (UV-A, $-1.43 \log I/I_0$) was used in the test. $n \geq 5$. Error bars: SEM.

Figure S4



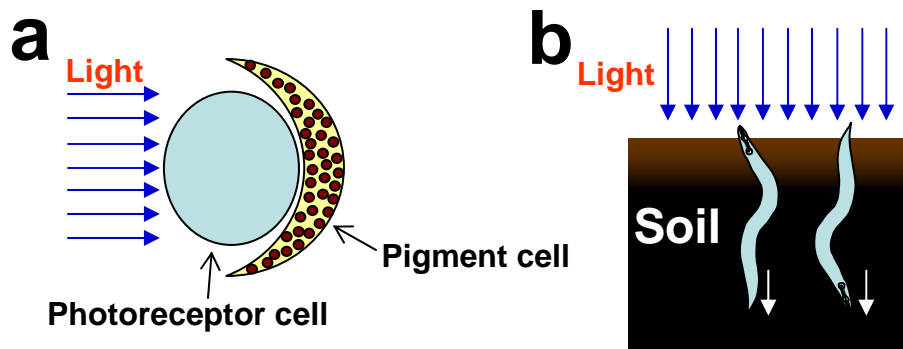
Supplementary figure 4. ASJ is more sensitive to UV light than to violet, blue and green light. (a) ASJ was recorded by perforated whole-cell patch-clamp. A 0.5 s of light pulse (UV-A, $-1 \log I/I_0$) was used to simulate ASJ. The trace is a duplicate of figure 5a. (b-d) ASJ respond to violet, blue and green-2 light but with a lower sensitivity. (e) Log relative sensitivity of the ASJ neuron to UV-A, violet, blue and green light.

Figure S5



Supplementary figure 5. The inhibitory effect of L-cis-diltiazem on the light- and cGMP-induced currents is reversible. (a) cGMP (1mM) was dialyzed into ASJ by the recording pipette. After the development of an inward current, L-cis-diltiazem (100 μ M) was briefly (~5 s) perfused toward ASJ via a pressurized rapid perfusion system (i.e. puffing). **(b)** ASJ was recorded by perforated whole-cell patch-clamp. A 0.5 s of light pulse (UV-A) was used to simulate ASJ. After the appearance of an inward current, L-cis-diltiazem (100 μ M) was then very briefly (~2 s) perfused toward ASJ via a pressurized rapid perfusion system. Rapid local perfusion often causes loss of goggle-seal during recording.

Figure S6



Supplementary figure 6. Schematic models. (a) A schematic illustrating Darwin's prototype eye. Light shed from the right was not drawn, but would be blocked by the pigment cell, such that only the light from the left would be sensed by the photoreceptor cell. **(b)** A schematic showing that a worm living in soil approaches the surface of the ground with its head or tail. Light would only be shed from top but not from underneath. Under this scenario, light would trigger an avoidance response, and the worm would be driven back to soil.

Supplementary Video Legends

Supplementary Video 1. Head avoidance response. The movie is in AVI format. The animal was in forward motion at the beginning. At 5.80 s, a flash of light (2 s duration, A) was turned on. At 7.05 s, the animal paused and initiated backward movement that lasted for 7 head swings followed by an omega turn. The stage was moved manually during recording to keep the worm in the view field.

Supplementary Video 2. Tail avoidance response. The movie is in AVI format. At 1.72 s, a flash of light (2 s duration, UV-A) was turned on. At 2.85 s, the worm responded by stopping backward movement and beginning to move forward. The stage was moved manually during recording to keep the worm in the view field. Light shed on the tail or body of a worm in forward motion would further stimulate its forward movement.