Human time perception and its illusions

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Original paper:

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Eagleman D. M. (2008). Human time perception and its illusions. Current opinion in neurobiology, 18(2), 131–136. https://doi.org/10.1016/j.conb.2008.06.002

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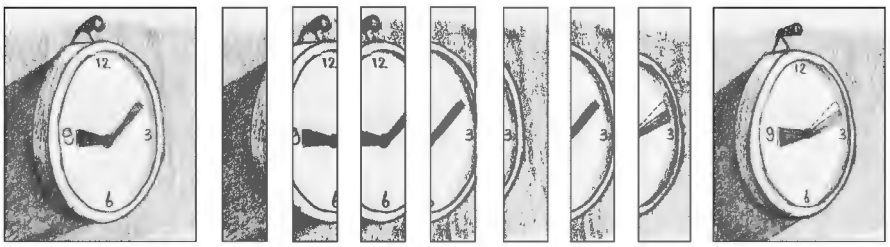
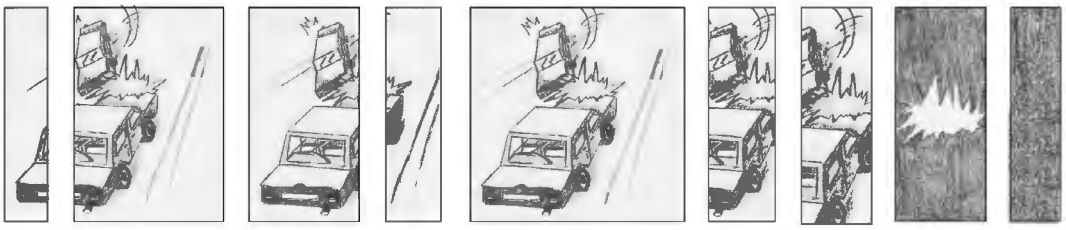
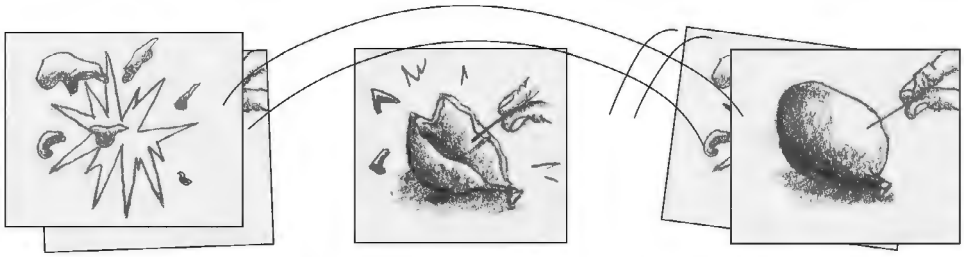


"Why does a clock sometimes appear stopped?"



"Is it possible to perceive the world in slow motion during a car accident?"

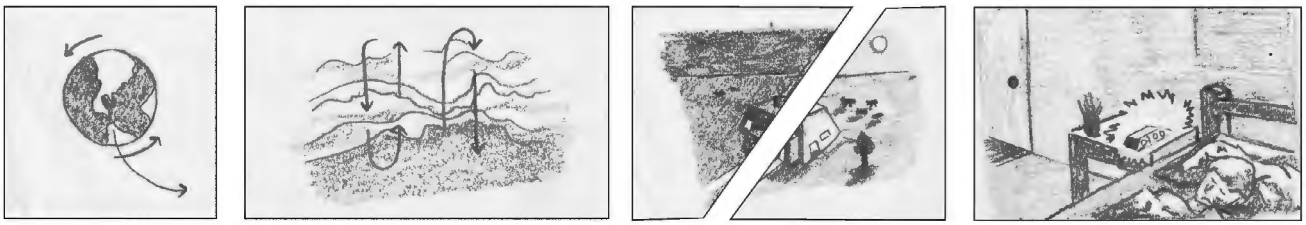


"Can action and effect be reversed?"

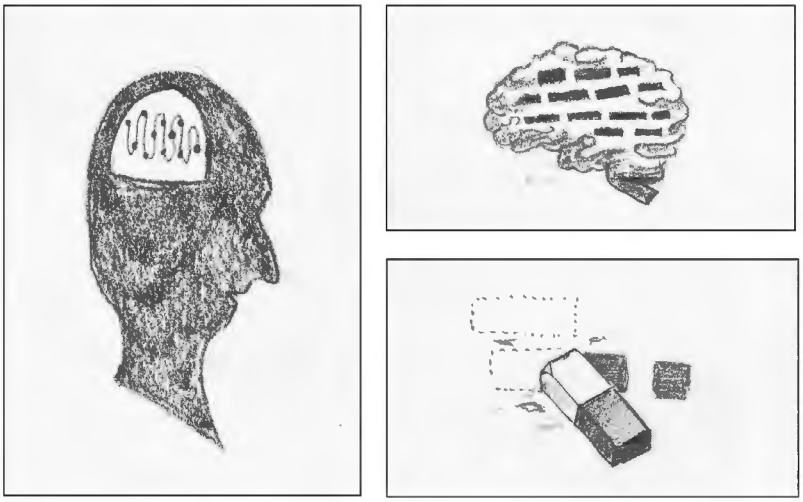
Human time perception and its illusions

"Time perception is surprisingly prone to measurable distortions and illusions. The past few years have introduced remarkable progress in identifying and quantifying temporal illusions of duration, temporal order, and simultaneity." (Eagleman, 2008, p. 131)

Introduction



Time is visible in many facets during the day. But not only is time visible in our daily rhythm or our planning, visual illusions show us the underlying neural mechanisms of time perception and thus, the extensiveness of the sence of time.

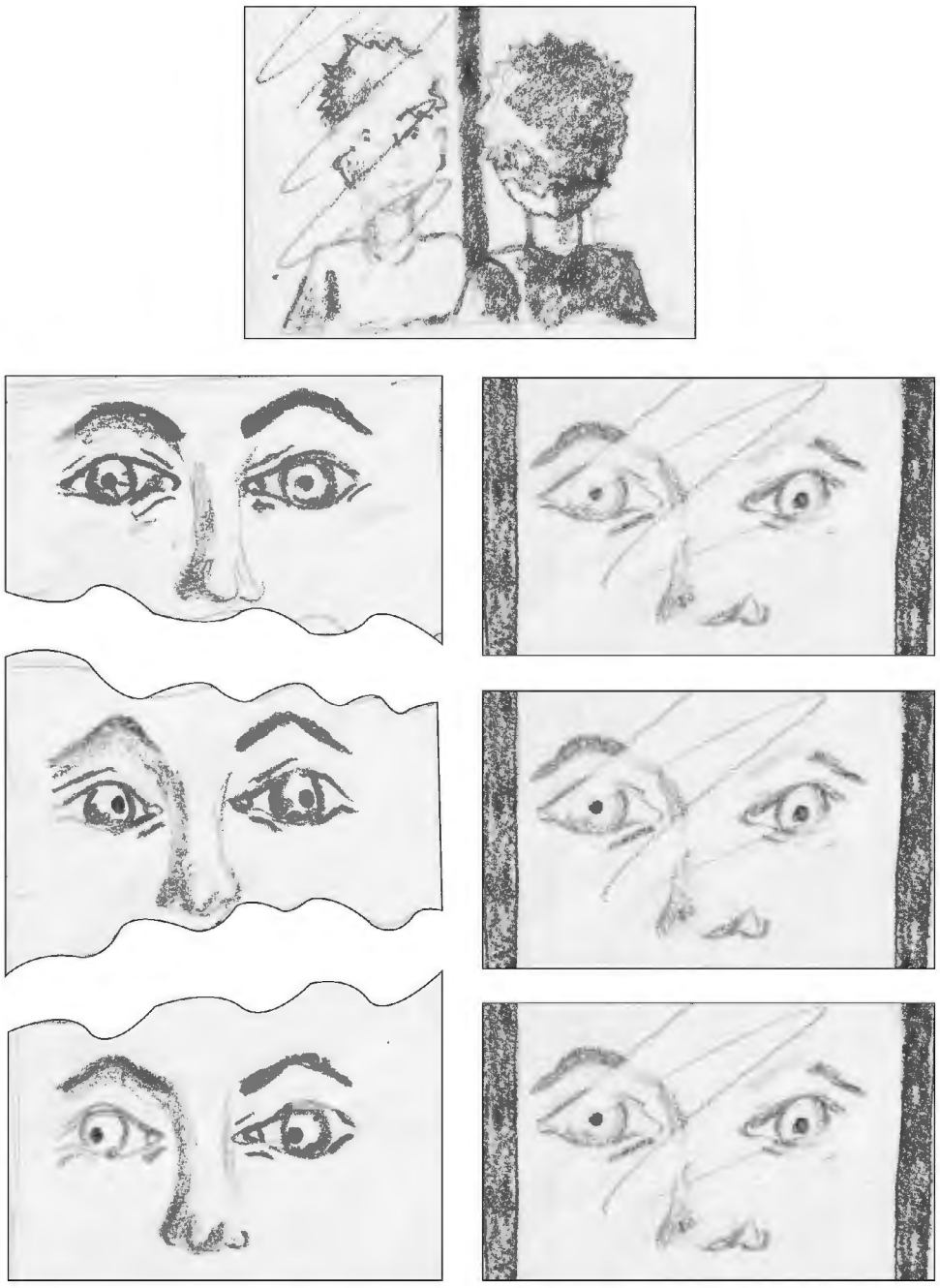


This illustrative paper is a visualization of a paper by Eagleman (2008). It gives insight into a few time illusions. As formulated by Eagleman: "Temporal judgments are constructions of the brain, and, as we will see in this paper, surprisingly easy to manipulate experimentally" (Eagleman, 2008, p. 131).

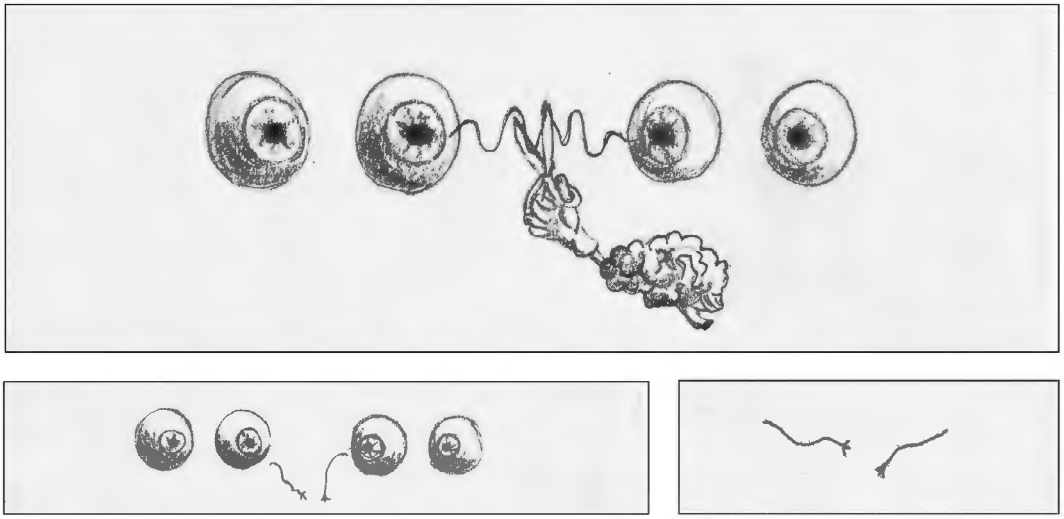
In this document, time will be expressed using winding lines, to show either deceleration or acceleration of time. In addition, time is emphasized by duplicating frames to show the sequence of time moments.

Short interval durations

"Duration judgments at short intervals are subject to several types of illusions. Here is a do-it-yourself demonstration to set the stage: look at your own eyes in a mirror and move your point of focus back and forth so that you are looking at your right eye, then at your left eye, and back again" (Eagleman, 2008, p. 131).

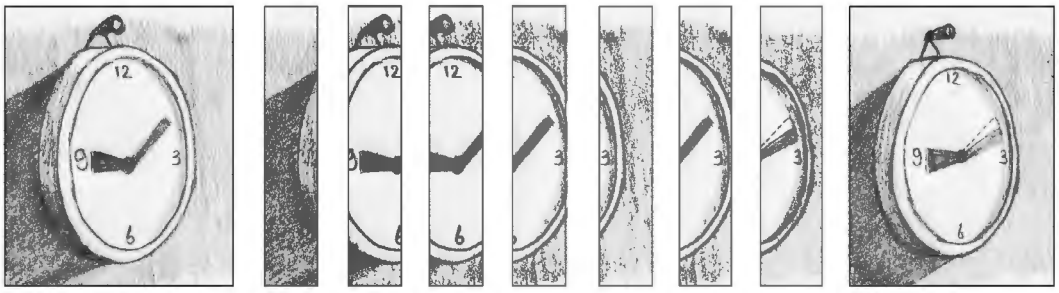


"Your eyes take tens of milliseconds to move ballistically from one position to the other — but here is the mystery: you never see your own eyes move"(Eagleman, 2008, p. 131) .



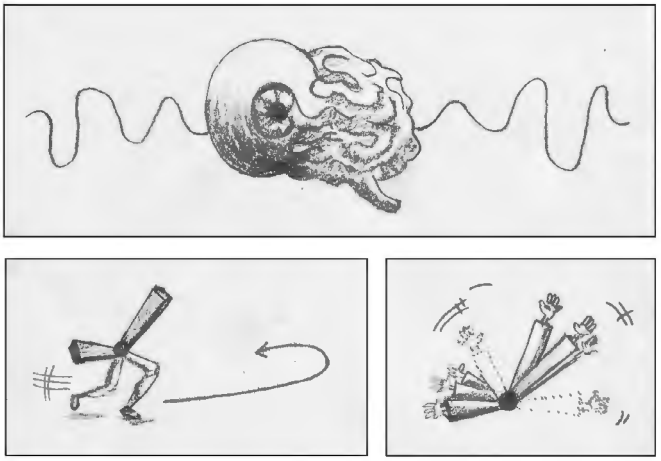
"What happens to the gaps in time while your eyes are moving?

Why doesn't your brain care about the small absences of visual input?" (Eagleman, 2008, p. 131)



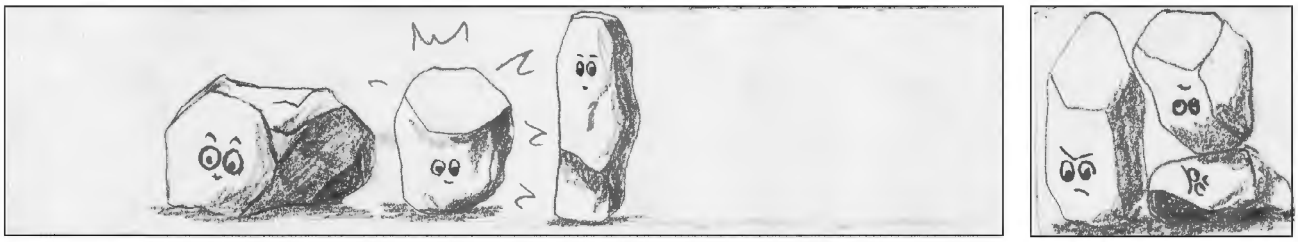
"In recent years, several groups looked at time perception around eye movements more carefully. This began with an examination of the 'stopped clock' illusion: upon first glance, the second hand of a clock sometimes seems to be stopped in place momentarily before it continues to tick at a normal pace" (Eagleman, 2008, p. 131).

"Yarrow et al. proposed that the scene the eyes land upon fills the time gap retrospectively. Such that the eye movement is an integral part of the sense of time" (Eagleman, 2008, p. 131).

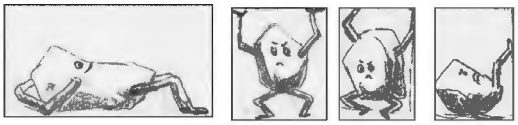


"Kanai et al. explored the basis of motion-induced time dilation and concluded that temporal frequency was the crucial element in the distortion rather than the motion per se. In support of this, they demonstrated that duration dilation could be induced simply by a flickering stimulus" (Eagleman, 2008, p. 131).

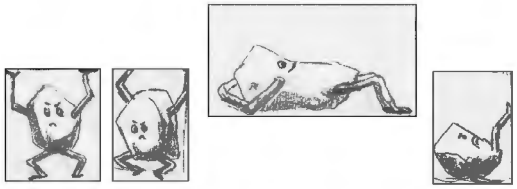
Predictability modulates duration



"Xuan et al. demonstrated that duration is dilated by the magnitude of the stimulus. Larger, brighter, and higher numerosity stimuli were all perceived to have a longer duration than equal-length stimuli of smaller magnitudes along those axes" (Eagleman, 2008, p. 132).

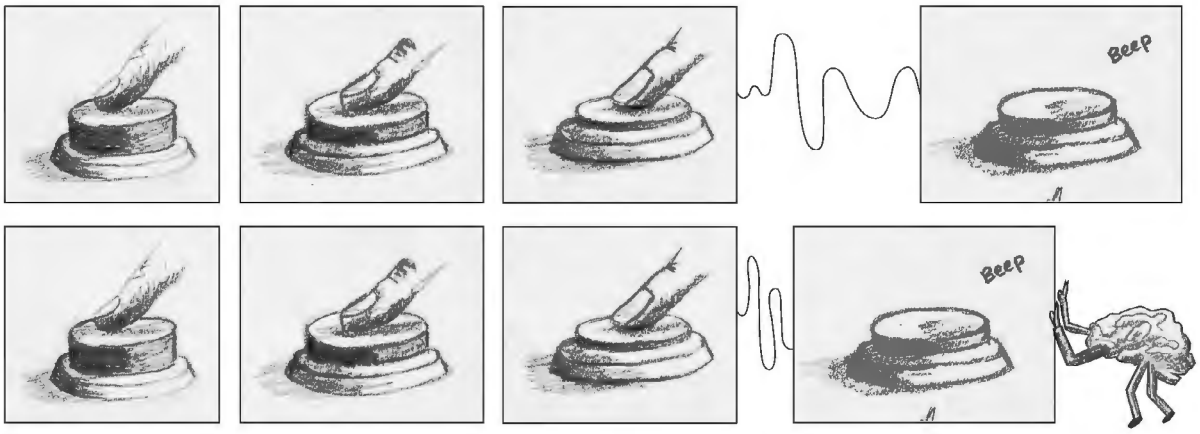


"When a stimulus is shown repeatedly, the first appearance is judged to have a longer duration than successive stimuli" (Eagleman, 2008, p. 132).

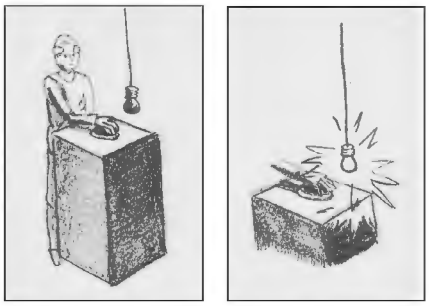


"Similarly, an 'oddball' stimulus in a repeated series will also be judged to have lasted longer than others of equal physical duration" (Eagleman, 2008, p. 132).

Temporal order judgments dynamically recalibrate

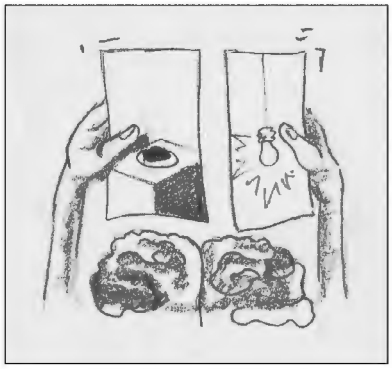


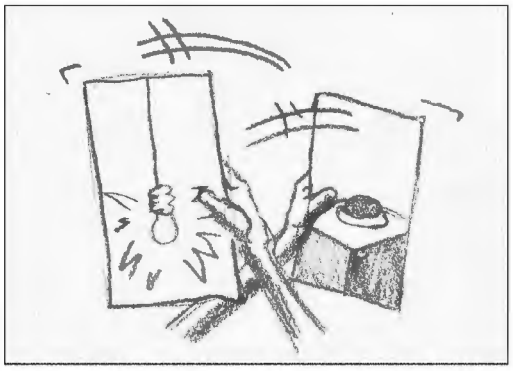
"In 2002, Haggard and colleagues noticed that when a subject made a motor act (such as a button press), subsequent events (such as a beep 250 ms later) appeared to be 'pulled' slightly closer in time to the button press." (Eagleman, 2008, p. 133) Moreover, Stetson et al. found that: "... the timing expectations of motor acts and sensory consequences can shift in relation to one another, even to the extent that they can switch places (Eagleman, 2008, p. 133).



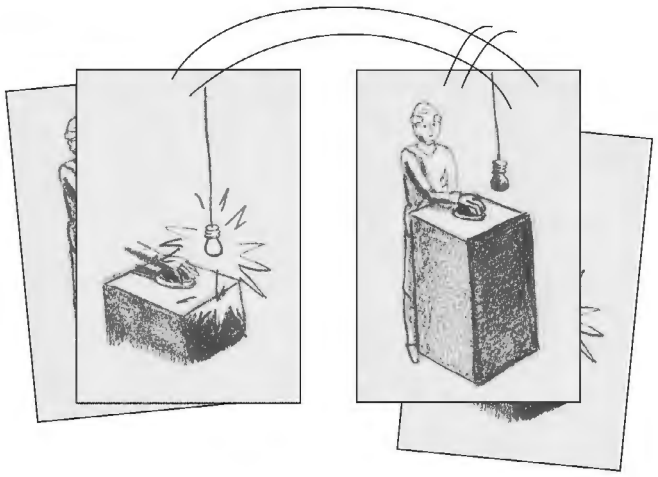
"Specifically, imagine that you can trigger a flash of light by pressing a button" (Eagleman, 2008, p. 133).

"Now imagine that we inject a slight delay — say, 100 ms — between your press and the consequent flash. After pressing the button several times, your nervous system adapts to this delay, such that the two events seems lightly closer in time, as Haggard and colleagues had suggested" (Eagleman, 2008, p. 133).





"Now that you are adapted to the delay, we now surprise you by presenting the flash immediately after you press the button: in this condition, you will believe the flash happened before your action — in other words, you experience an illusory reversal of action and sensation" (Eagleman, 2008, p. 133).



Conclusion

This paper illustrated a brief introduction including the questions made up by Eagleman (2008): "How are durations, simultaneity, and temporal order coded differently in the brain?" and "How does the brain recalibrate its time perception on the fly?" (Eagleman, 2008, p. 153) It will hopefully give a little understanding of the neurobiology of time.