Lecture 04: Seeing Causal Interactions

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'When we consider these objects with the utmost attention, we find only that one body approaches the other; and that the motion of it precedes that of the other, but without any sensible interval.' (Hume 1978, p. 77)

'the account flies in the face of our common-sense conviction that we do perceive causal relations all the time. The experience of perceiving one event following another is really quite different from the experience of perceiving the second event as caused by the first'

'the researches of Michotte and Piaget would seem to support our common-sense view' (Searle 1983, pp. 114-5)

Sometimes 'a causal impression arises, clear, genuine, and unmistakable, and the idea of cause can be derived from it … in just the same way as the idea of shape or movement can be derived from the perception of shape or movement.' (Michotte 1963, p. 270–1)

'the causal perception is the perception of the work of a mechanical force, just as the impression of the movement of a car is the perception of its displacement in physical space' (Michotte 1963, p. 228)

'This causal impression, however, would have been for him [Hume] … nothing but an illusion of the senses, as is shown by his views with regard to the feeling of effort. … [I]t is probable that his [Hume's] philosophical position would not have been affected in the least.' (Michotte 1963, p. 256)

'In a great boulder rolling down the mountainside and flattening the wooden hut in its path we see an exemplary instance of force … these mechanical transactions … are directly observable (or experienceable)' (Strawson 1992, p. 118)

'just as the visual system works to recover … physical structure … by inferring properties such as 3-D shape, so too does it work to recover … causal … structure … by inferring properties such as causality' (Scholl & Tremoulet 2000, p. 299)

'we seem to be as far as ever from deciding whether the hypothesis is true: whether we perceive launchings rather than recognizing them by means of stored patterns in long-term memory.' (Rips 2011, p. 92)

1. A Puzzle about the Development of Causal Understanding

'A similar permanent dissociation in understanding object support relations might exist in chimpanzees. They identify impossible support relations in looking tasks, but fail to do so in active problem solving.' (Gómez 2005)

'to date, adult primates' failures on search tasks appear to exactly mirror the cases in which human toddlers perform poorly.' (Santos & Hood 2009, p. 17)

2. Perception of Causation: Key Findings

'There are some cases … in which a causal impression arises, clear, genuine, and unmistakable, and the idea of cause can be derived from it by simple abstraction in just the same way as the idea of shape or movement can be derived from the perception of shape or movement' (Michotte 1963, p. 270–1)

Infants at around six months of age seem also to distinguish launching from other sequences, much as adults do (Leslie & Keeble 1987).

'… why it is that in our experiments certain particular conditions were found necessary in order to give rise to a causal impression. They correspond to the different characteristics of reproduction. … anyone not very familiar with the procedure involved in framing the physical concepts of inertia, energy, conservation of energy, etc., might think that these concepts are simply derived from the data of immediate experience' (Michotte 1963)

3. Object Indexes

'the movement performed by object B appears simultaneously under two different guises: (i) as a movement (belonging to object A), (ii) as a change in relative position (by object B)' (Michotte 1963, p. 136)

'the physical movement of the object struck gives rise to a double representation. This movement appears at one and the same time (a) as a continuation of the previous movement of the motor object, and (b) as a change of relative position (a purely spatial withdrawal) of the projectile in relation to the motor object.' (Michotte 1963, p. 140)

The *object-specific preview benefit*: 'observers can identify target letters that matched the preview letter from the same object faster than they can identify target letters that matched the preview letter from the other object' (Krushke & Fragassi 1996, p. 2).

4. Object Indexes and the Launching Effect

Causal Object Index Conjecture: Effects associated with the 'perception of causation' are consequences of errors (or error-like patterns) in the assignments of object indexes and their phenomenal effects.

Predictions: (i) Where there is perception of causation, there will be errors (or error-like patterns) in the assignments of object indexes. (ii) Factors that can influence how object indexes are assigned or maintained can influence perception of causation.

Objection: adaptation (Rolfs et al. 2013). But see further **?**.

'Michotte and his followers worked out many of the factors which mediate the perception of causality, such as the role of absolute and relative speeds, spatial and temporal gaps in the objects' trajectories, differences in the durations and angles of each object's trajectory, etc … 'This research has generally shown that many different spatiotemporal parameters are critical for perceiving causality, but that featural parameters (eg colors, shapes, sizes) play little or no role.' (Scholl & Nakayama 2004, p. 456)

'when there is a launching event beneath the overlap (or underlap event) timed such that the launch occurs at the point of maximum overlap, observers inaccurately report that the overlap is incomplete, suggesting that they see an illusory crescent.' (Scholl & Nakayama 2004, p. 461)

Why does the illusory causal crescent appear? Scholl and Nakayama suggest a 'a simple categorical explanation for the Causal Crescents illusion: the visual system, when led by other means to perceive an event as a causal collision, effectively 'refuses' to see the two objects as fully overlapped, because of an internalized constraint to the effect that such a spatial arrangement is not physically possible. As a result, a thin crescent of one object remains uncovered by the other one-as would in fact be the case in a straight-on billiard-ball collision where the motion occurs at an angle close to the line of sight.' (Scholl & Nakayama 2004, p. 466)

'object perception reflects basic constraints on the motions of physical bodies …' (Spelke 1990, p. 51)

'A single system of knowledge … appears to underlie object perception and physical reasoning' (Carey & Spelke 1994, p. 175)

5. Phenomenal Expectations

… are aspects of the overall phenomenal character of experiences which their subjects take to be informative about things that are only distantly related (if at all) to the things that those experiences intentionally relate the subject to.

Phenomenal expectations can be thought of as sensations in approximately Reid's sense: they are monadic properties of events, specifically perceptual experiences, which are individuated by their normal causes and which alter the overall phenomenal character of those experiences in ways not determined by the experiences' contents (so two perceptual experiences can have the same content but distinct sensational properties).

Phenomenal expectations are signs: they can

lead to beliefs only via associations or further beliefs (Reid 1785a, Essay II, Chap. 16, p. 228; Reid 1785b, Chap. VI sect. III, pp. 164–5).

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