

# Cue Combination

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# When are Cues Valid?

- Examples. Strong Coupling: Model Selection.

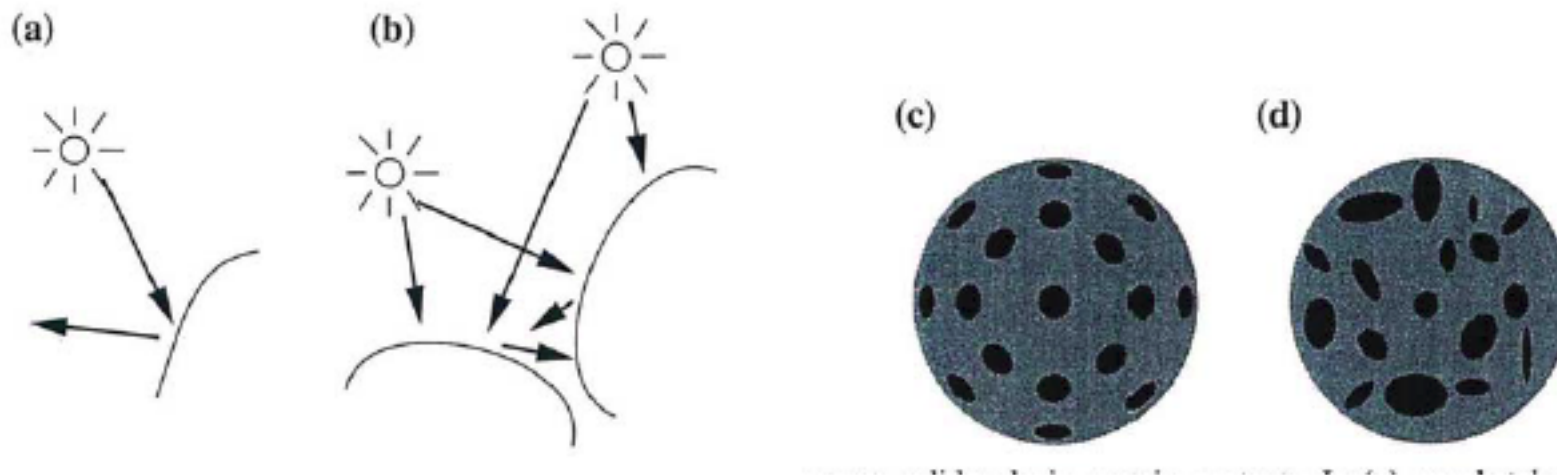


Fig. 2. Model selection may need to be applied in order to decide if a cue can be used. Shape from shading cues will work for case (a) because the shading pattern is simple == a smooth convex surface illuminated by a single source. But for case (b) the shading pattern is complex – due to mutual reflection between the two surfaces – and so shape from shading cues will be almost impossible to use. Similarly, shape from texture is possible for case (c) because the surface contains a regular texture pattern but is much harder for case (d) because the texture is irregular.

# Model Selection: several alternatives

- Blake and Bulthoff. Kersten and Bulthoff.

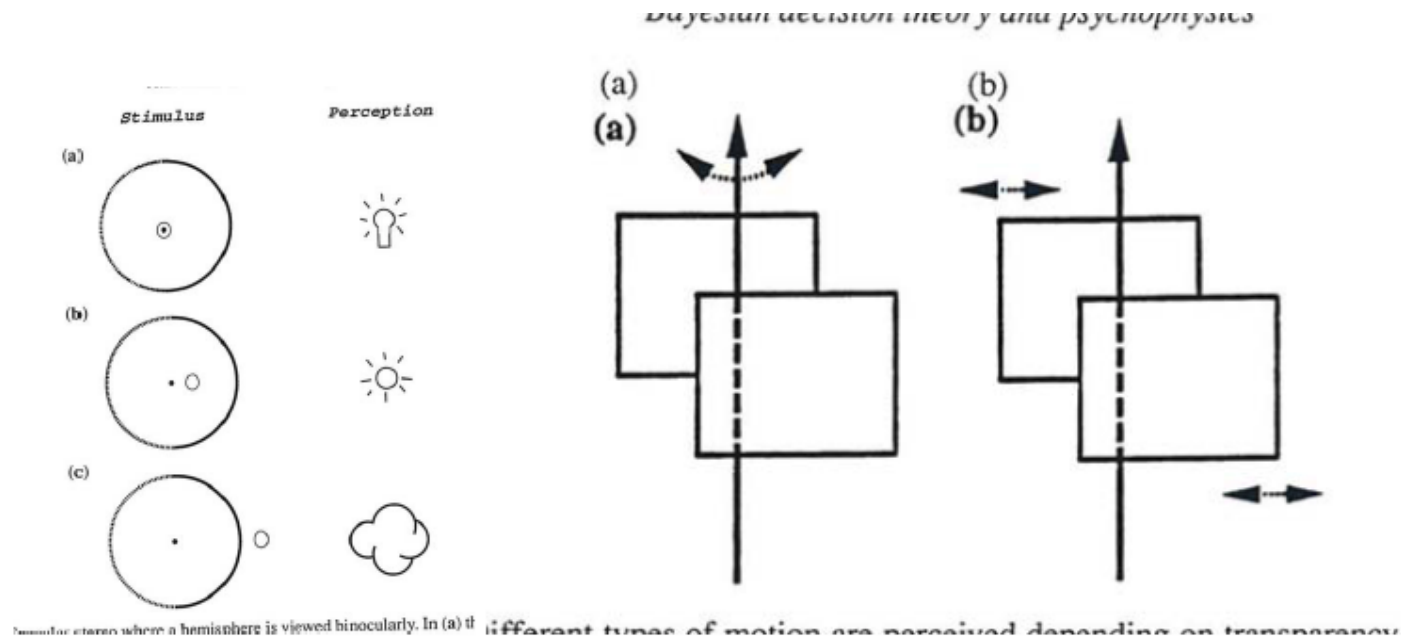
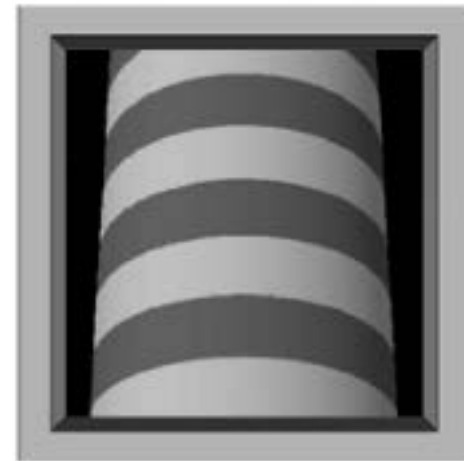
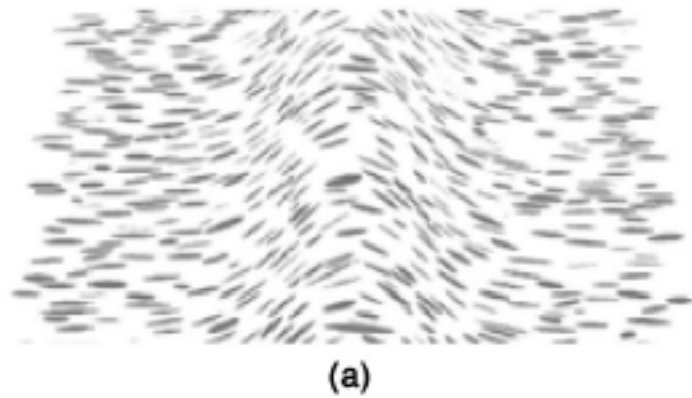


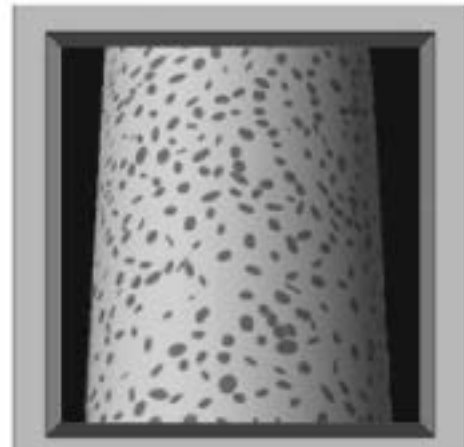
Fig. 3. Examples of strong coupling with competitive priors. A sphere is viewed binocularly (left) and small changes in the position of the specularity lead to very different percepts (Blake and Bulthoff 1990). Similarly altering the transparency of the moving surfaces (right) can make the two surfaces appear to rotate either rigidly together or independently.

# Model selection: Knill's texture and Sf contour

- Homogeneous texture. Isotropic homogeneous texture,



(a)



# Common Cause (1)

- Kording Experiment.

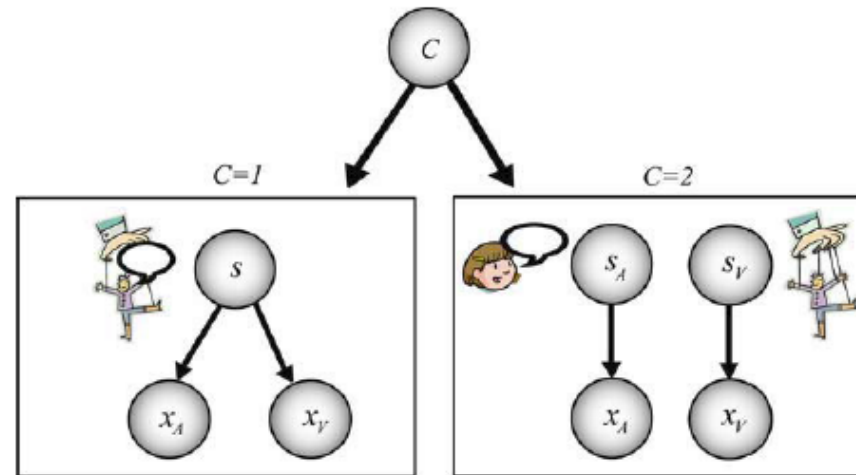


Fig. 4. The subject is asked to estimate the position of the cues and to judge whether the cues are from a common cause – i.e. at the same location – or not. In Bayesian terms the task of judging whether the cause is common can be formulated as model selection – are the auditory and visual cues more likely to be generated from a single cause (left) or by two independent causes (right).

# Common Cause 2

- Results --

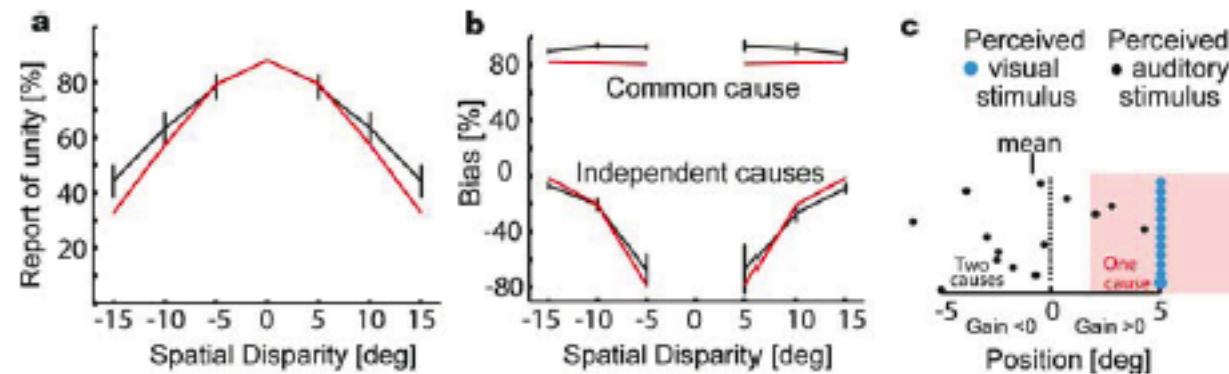


Fig. 5. Reports of causal inference. a) The relative frequency of subjects reporting one cause (black) is shown (reprinted with permission from [15]) with the prediction of the causal inference model (red). b) The bias, i.e. the influence of vision on the perceived auditory position is shown (gray and black). The predictions of the model are shown in red. c) A schematic illustration explaining the finding of negative biases. Blue and black dots represent the perceived visual and auditory stimuli, respectively. In the pink area people perceive a common cause.