

## Humans rapidly switch priors to fit with the task environment

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According to the Bayesian framework of perception [1], humans infer the most likely interpretation of a stimulus from sensory information and prior knowledge. We asked how flexible humans are at changing their prior depending on the situation. Subjects binocularly viewed a 3D virtual scene composed of 9 discs. Slant and tilt of the discs differed randomly across the scene. For each disc, subjects adjusted a probe to appear perpendicular to it. Information about the discs' 3D orientation was provided by binocular disparities and the aspect ratio of the disc. Previous work [2] demonstrated that when inferring slant from aspect ratio, subjects base their judgments on a prior for circular shapes. We hypothesized that subjects should change their reliance on the circle prior depending on the task environment. In ellipse-environment trials, 7 out of 9 discs on the screen were ellipses with random aspect ratios; in circle-environment trials, they were circles. The 2 remaining discs contained 5-degree conflicts about 35 degrees of slant between the slants suggested by binocular disparities and by aspect ratio, given the circle assumption. Subjects' probe settings showed that subjects relied more on the circle prior in the circle environment, rapidly switching on a trial-by-trial basis.

Acknowledgements:

DFG TR528 1-3 to A.S. and J.T.,  
DFG Graduate Program NeuroAct,  
NIH R01-EY13319 to D.K.

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[2] D. C. Knill (2007). Robust cue integration: A Bayesian model and evidence from cue-conflict studies with stereoscopic and figure cues to slant. *J. Vis.* 7, 5.1-24