Adaptation to Tilted Scenes

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Background

- The human visual system encodes:

  - Simple properties like orientation, spatial frequency and contrast, from a specific part of the visual field

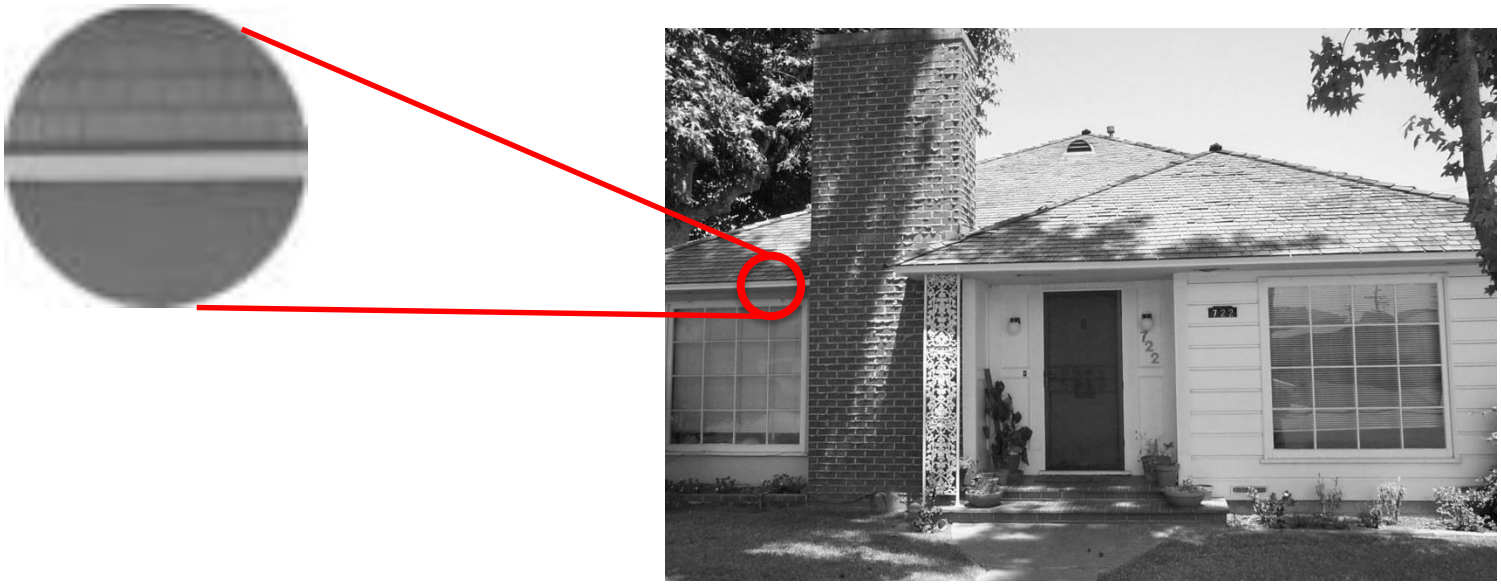
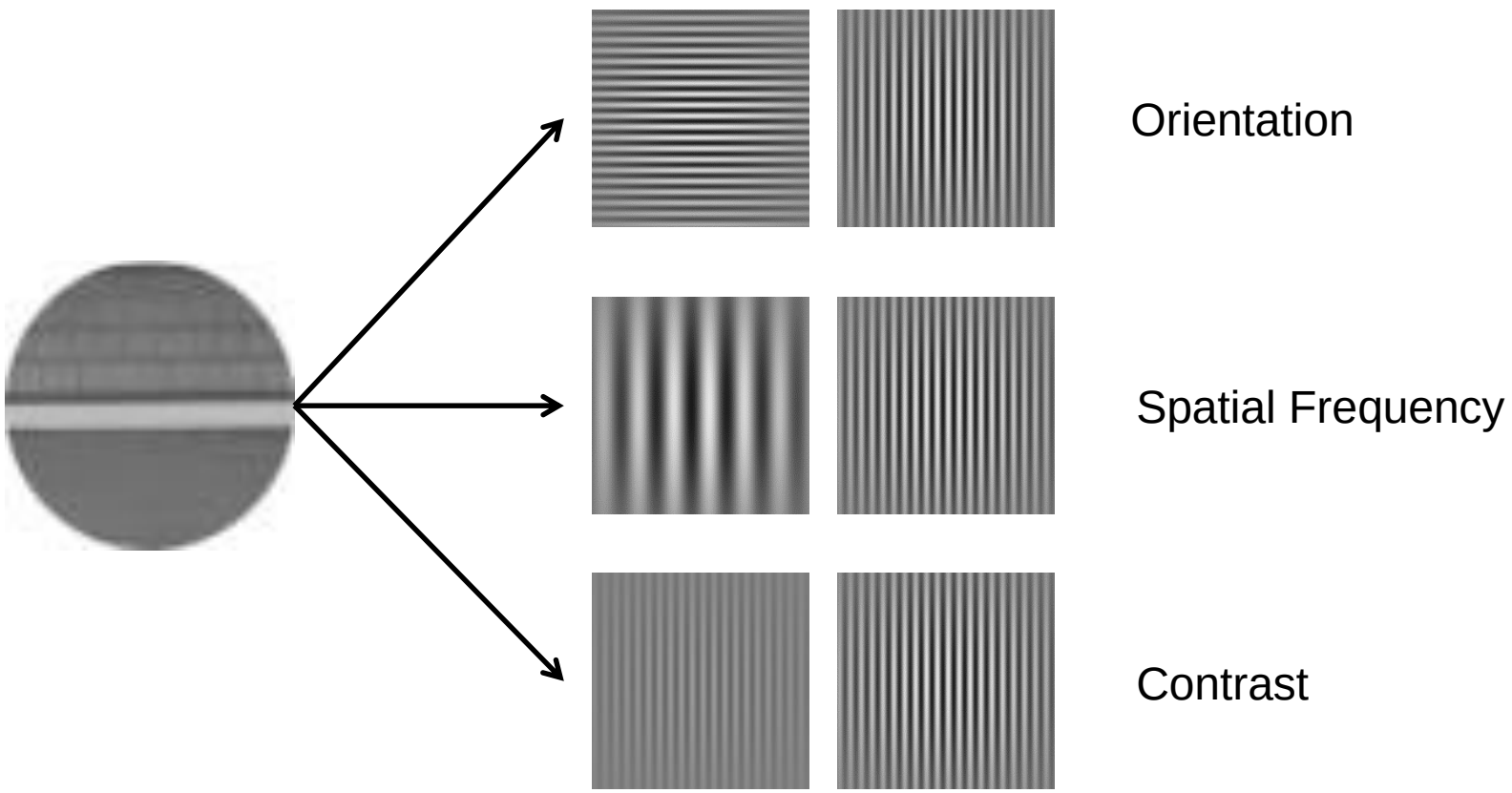


Image retrieved from: “Pasadena Buildings” - Caltech Computational Vision Data Sets. http://vision.caltech.edu/archive.html

Background

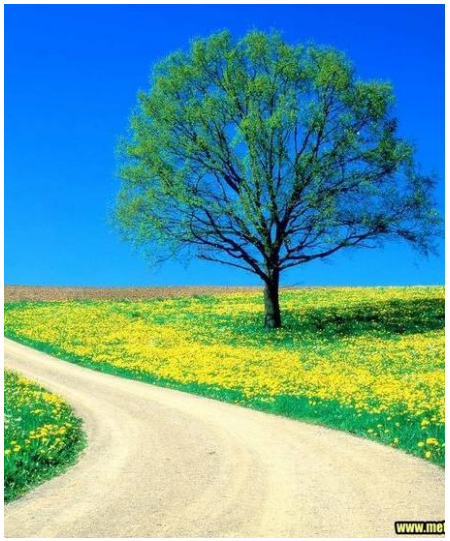
- The human visual system encodes:



Background

- The human visual system encodes:

  - Complex properties, combining information from different parts of the visual field (eg: faces, scenes)



Images retrieved from the following URLs (left to right):
http://www.unilad.co.uk/articles/apparently-this-is-the-most-beautiful-man-and-woman-in-the-world/
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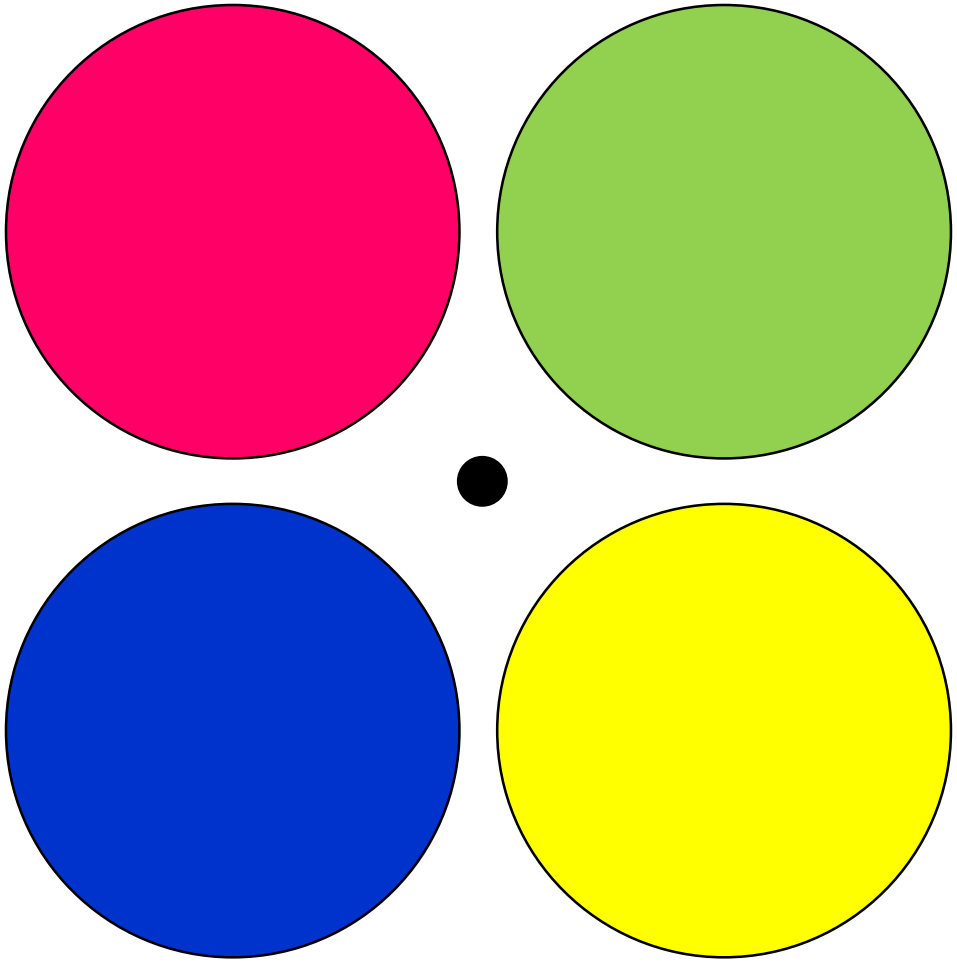
Background

- Perceptual after-effects can reveal the selectivity of the visual system to different stimulus properties



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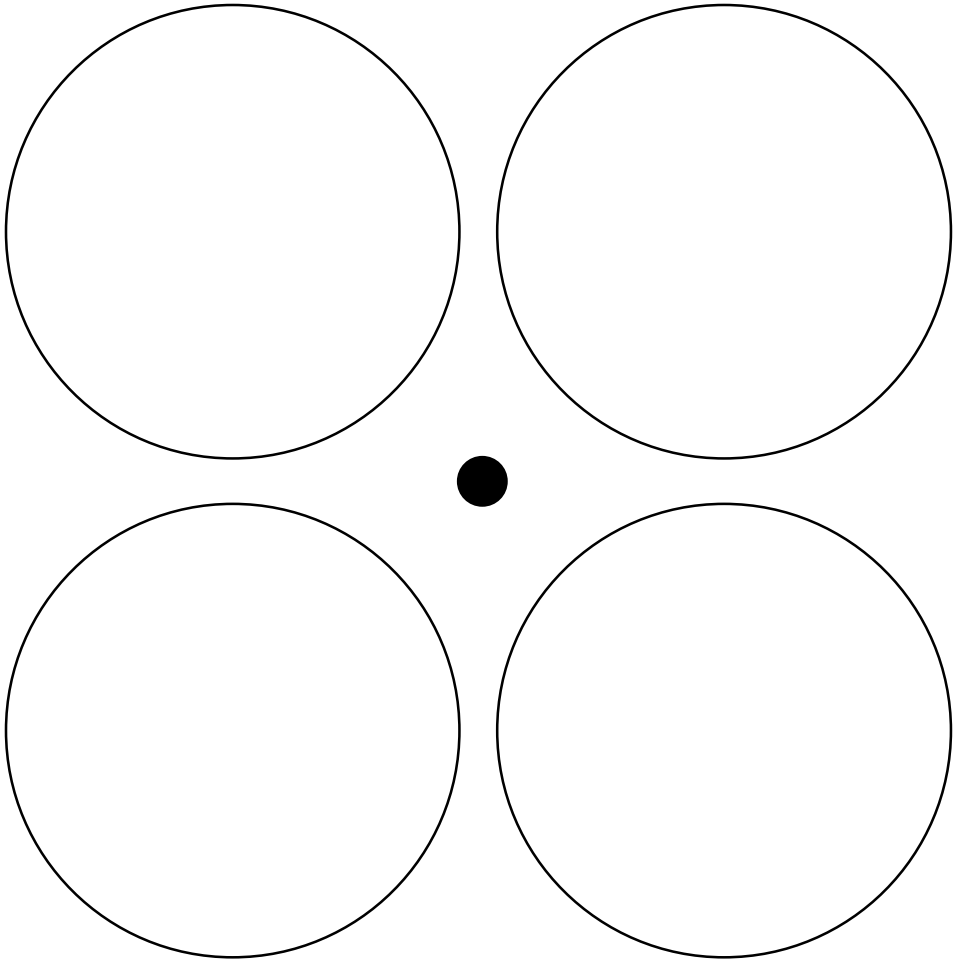
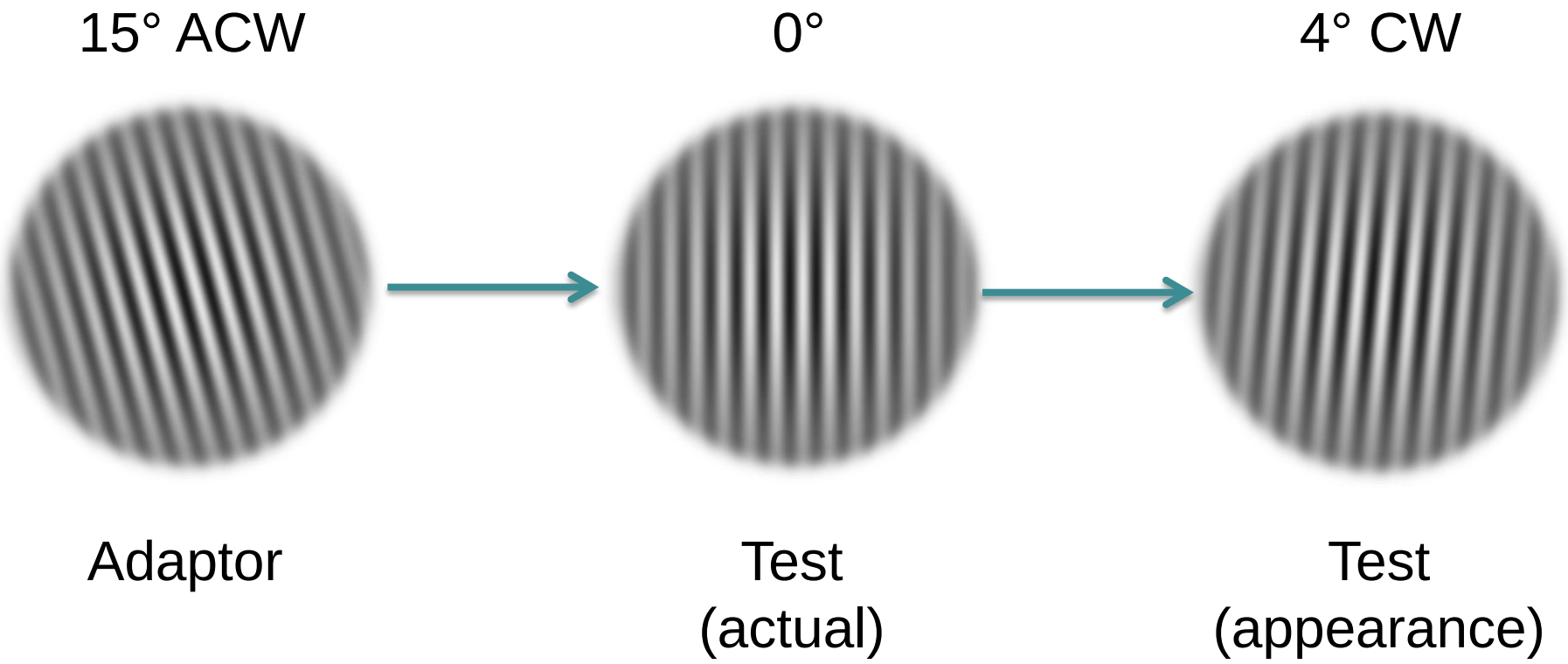


Orientation selectivity

- Tilt after-effect



Orientation selectivity

- Tilt after-effect
  - The magnitude of the after-effect depends on:
    - The similarity for spatial position and spatial frequency between the adaptor and test (Gibson, 1937; Ware and Mitchell, 1974).
    - Angular separation between the two : maximum effect at 15° and no effect at 90° (Gibson & Radner, 1937).

Aim

- Does the visual system selectively encode the global tilt of a scene

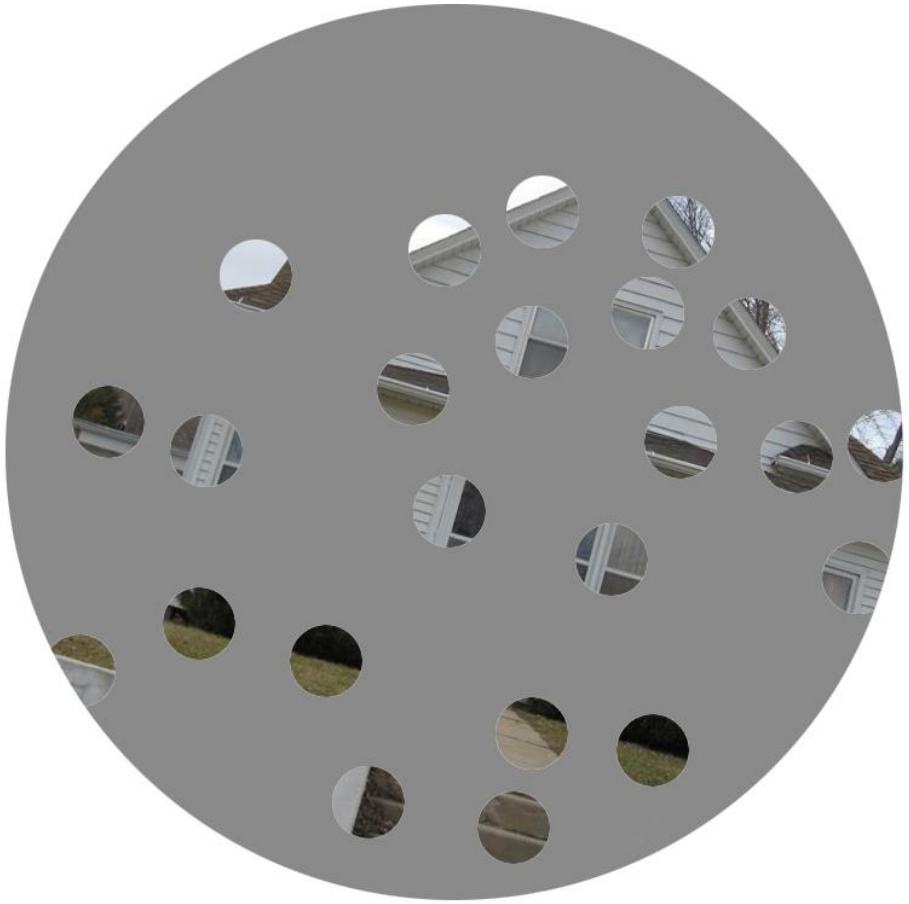


Image retrieved from: Xiao, J., Hays, J., Ehinger, K., Oliva, A., & Torralba, A. (2010). SUN Database: Large-scale Scene Recognition from Abbey to Zoo. IEEE Conference on Computer Vision and Pattern Recognition

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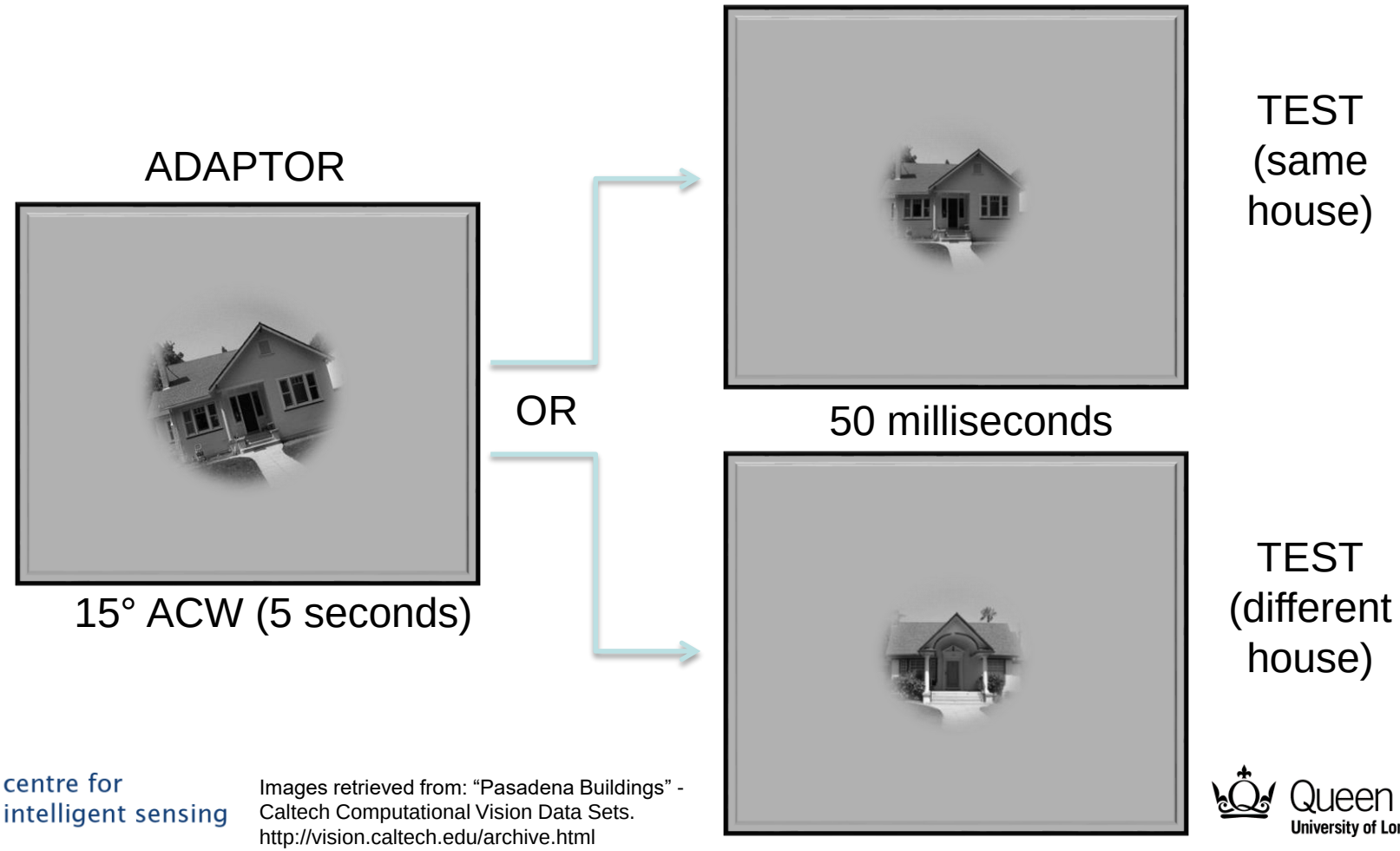
Experiment 1

- Observers' perceived tilt for upright scenes was measured following adaptation to tilted scenes



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Experiment 1

- Observers' perceived tilt for upright scenes was measured following adaptation to tilted scenes
- Adaptation resulted in a repulsive tilt after-effect of around 1° in magnitude
- The visual system is therefore selective to the scene's global tilt and the after-effect transfers between different scenes

Experiment 2

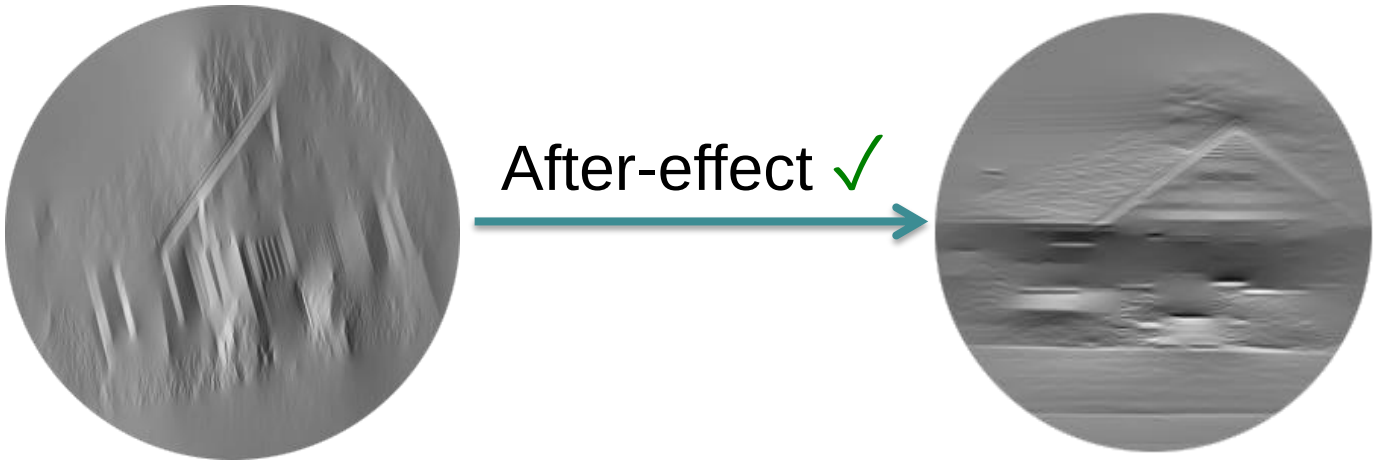
- Is the mechanism similar / different to those encoding local orientations?

ADAPTOR
(high spatial frequency)

TEST
(low spatial frequency)

Experiment 2

- Is the mechanism similar / different to those encoding local orientations?



ADAPTOR
(near vertical orientations)

TEST
(near horizontal orientations)

Experiment 2

- Is the mechanism similar / different to those encoding local orientations?
- Tilt after-effects to scene orientation are not selective for spatial frequency
- Tilt after-effects were obtained even with larger angular separation for local orientation content between the adaptor and test

Conclusion

- The human visual system does have a mechanism that selectively encodes the global tilt of a scene

- The mechanism is distinct from those encoding orientations of local edges

Thank You….!

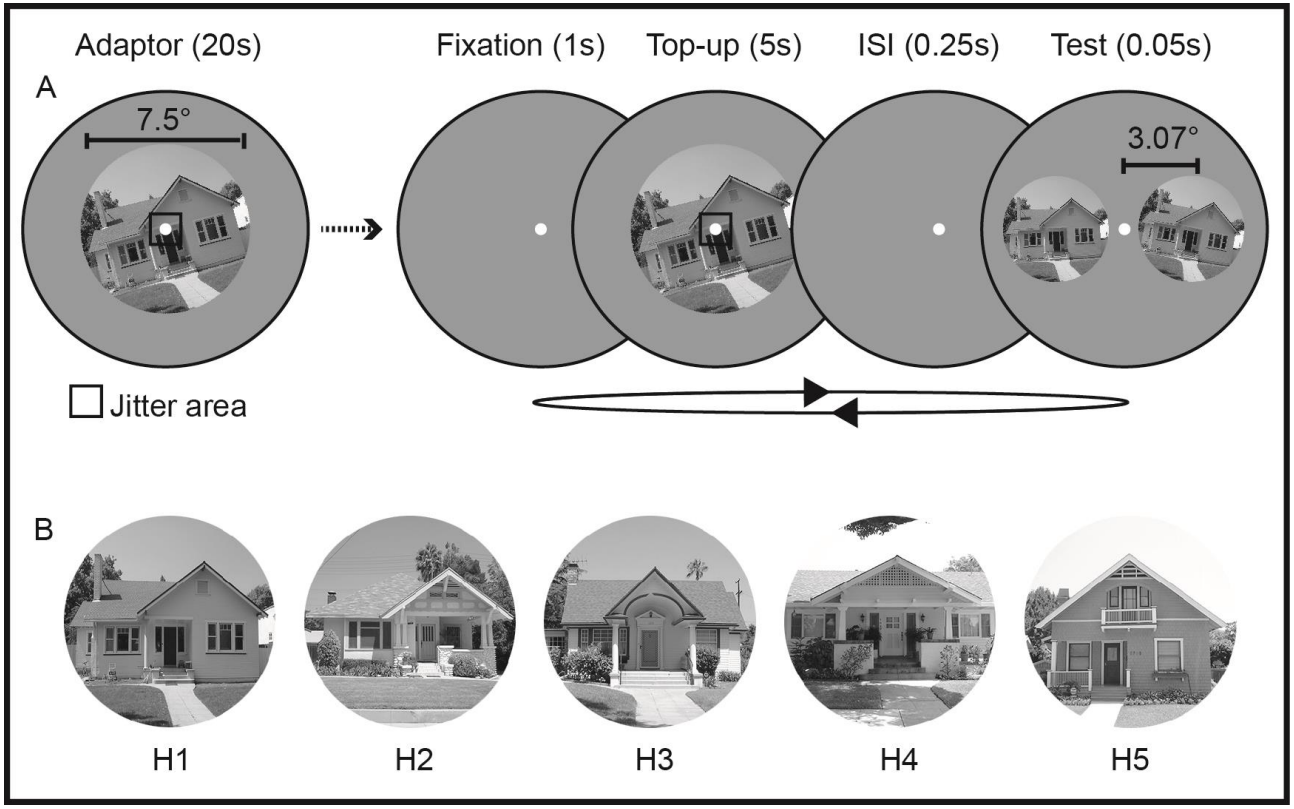
Dr. Isabelle

Prof. Josh

Dr. Miles

Extra slide (2)

- Experimental design



Extra slide (3)

- Results