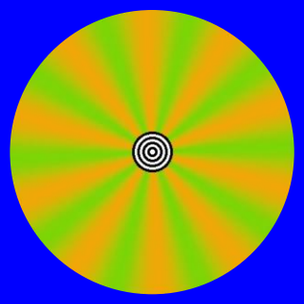
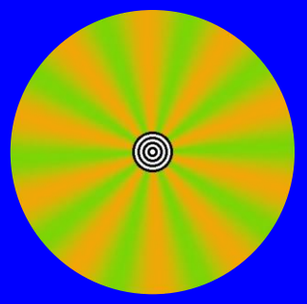
Tom Troscianko and the motion of pure colour

(see video of background motion effect at https://www.youtube.com/watch?v=y7Ud9jOHmBw)



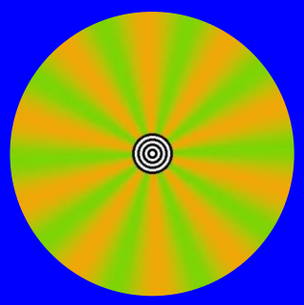
Context

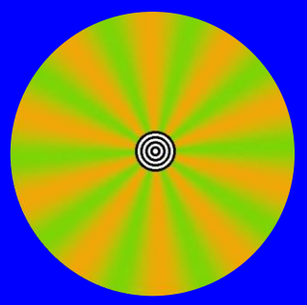


1970s and 1980s: Motion of colour gratings slowed and stopped when the colours were set to equal luminance

Taken as evidence of independent colour and motion modules, V4 and V5 with colour unable to drive motion sensitive units

Tom was not impressed





Tom's "Jitter Theory" of motion slowing

Troscianko T. (1987). Perception of random-dot symmetry and apparent movement at and near isoluminance. *Vision Res.*, 27, 547-54.

Troscianko T, Fahle M. (1988). Why do isoluminant stimuli appear slower? *J Opt Soc Am A.* 5, 871-80.

Trościanko T. (1994). Contribution of colour to the motion aftereffect and motion perception. *Perception* 23, 1221-31.

"isoluminant" stimuli acted as normal luminance stimuli but with position jitter

Jitter due to poor location specificity of early colour-selective units

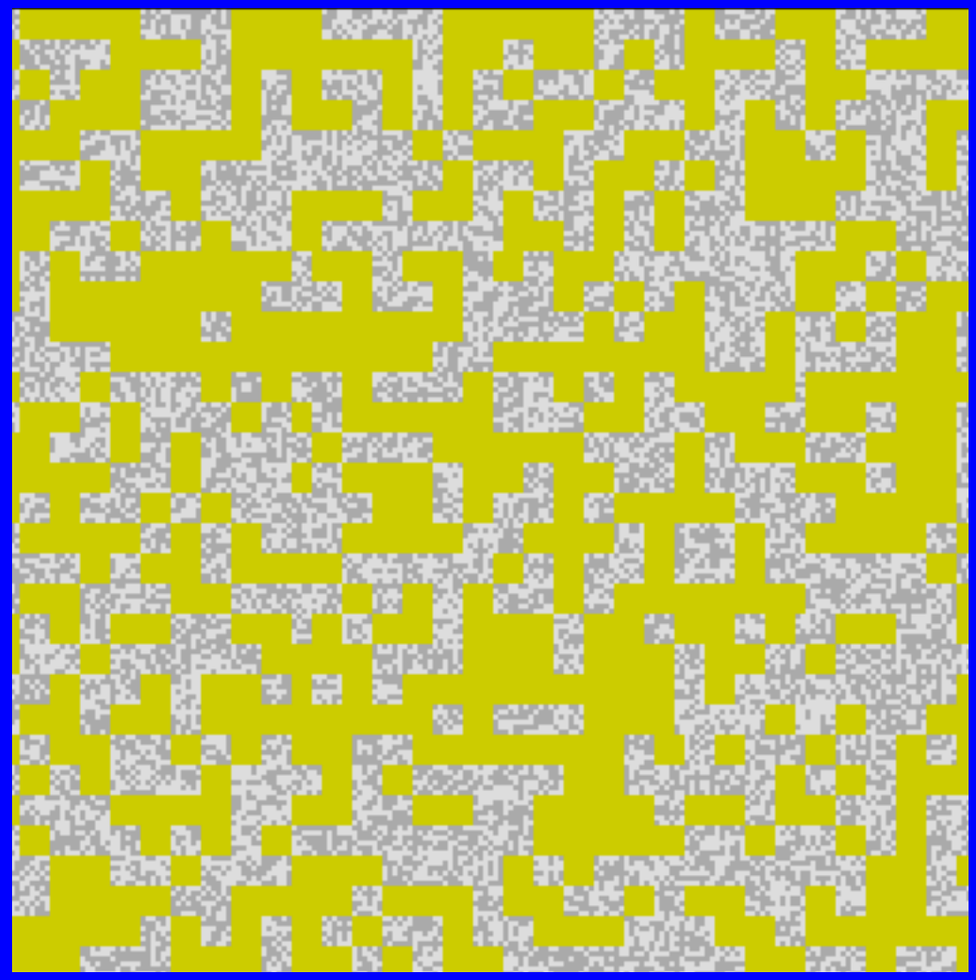
luminance with added jitter gave similar RT for motion cessation (with M. Fahle)

“This is another instance in which spatial scrambling is similar to the effect of isoluminance.”

“no need to postulate a lack of colour input to motion detecting units”

Example of slowing of motion and loss of motion-defined form

Please fixate the large bull’s-eye below. The luminance of the yellow will increase and then decrease, each time passing through the isoluminance zone where the motion should appear slowed and the moving square less visible.

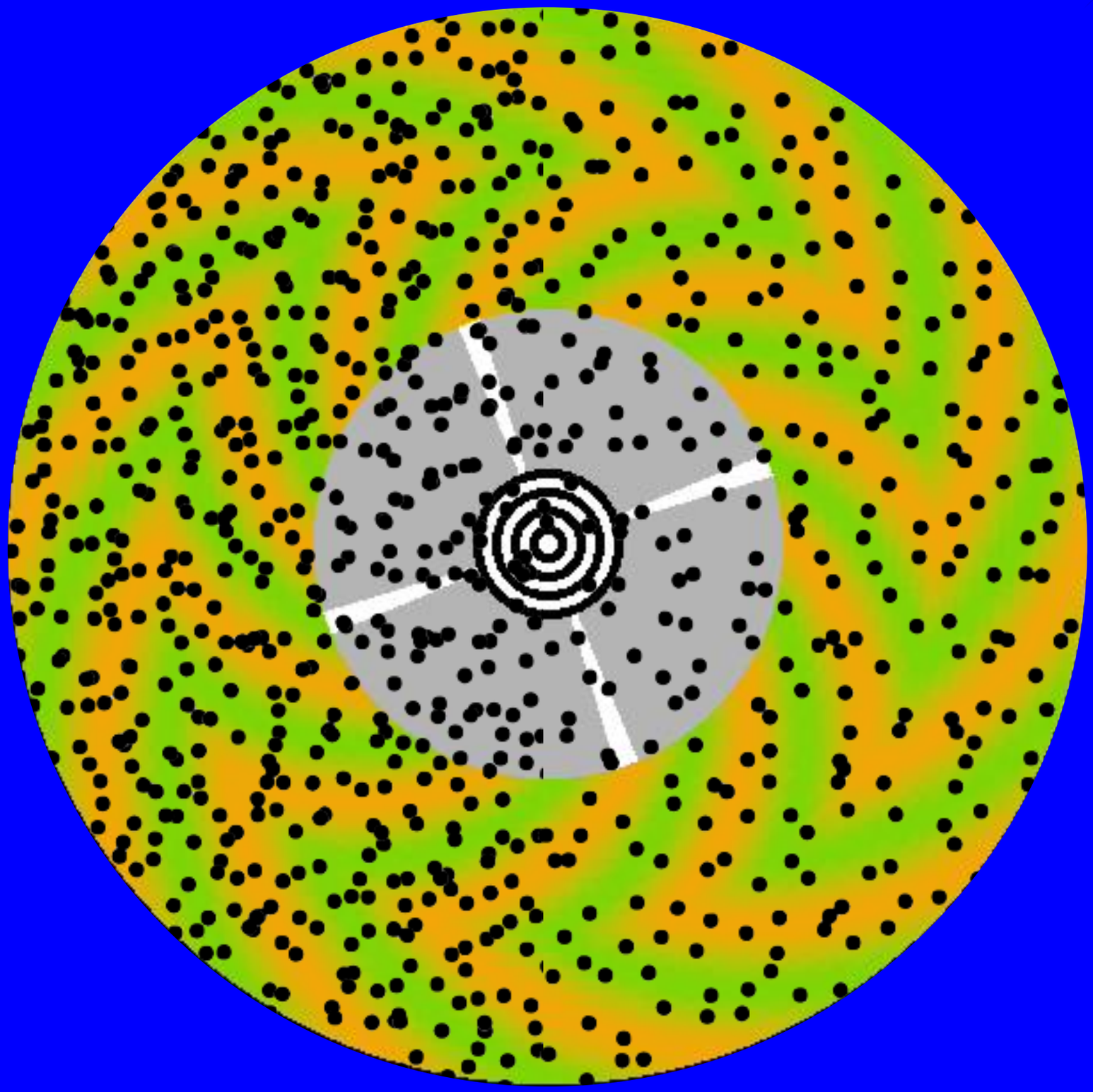


(see video at http://www.youtube.com/watch?v=BgVJY5XF6-M)

Tom predicted then showed that

“a chromatic isoluminant grating, when seen through a snowfall of luminance noise, will cease to move”

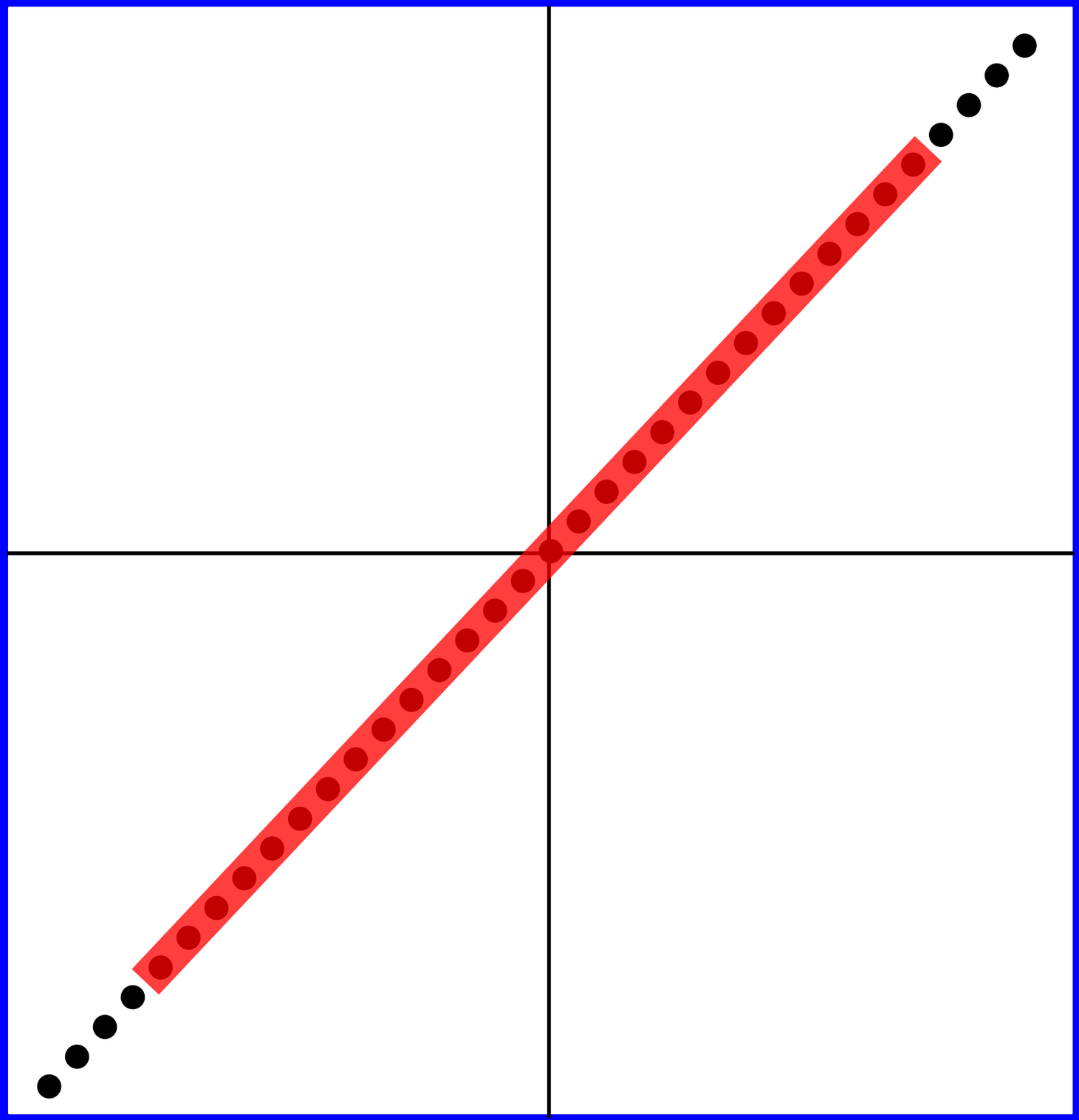
He was right



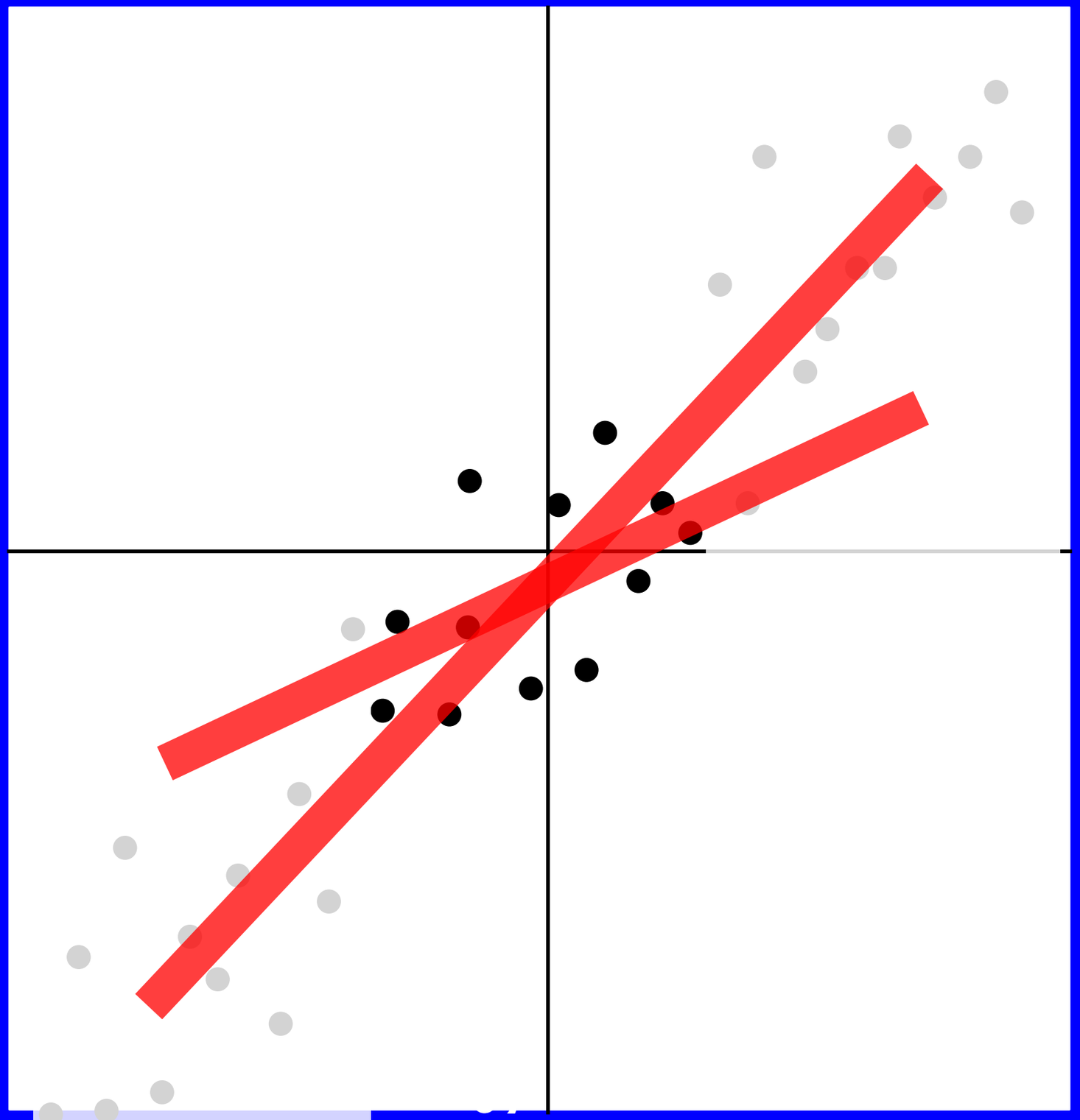
More slowing with overlying luminance noise

(see video at https://www.youtube.com/watch?v=yj5S2FF8ty0)

How does position jitter affect perceived speed?



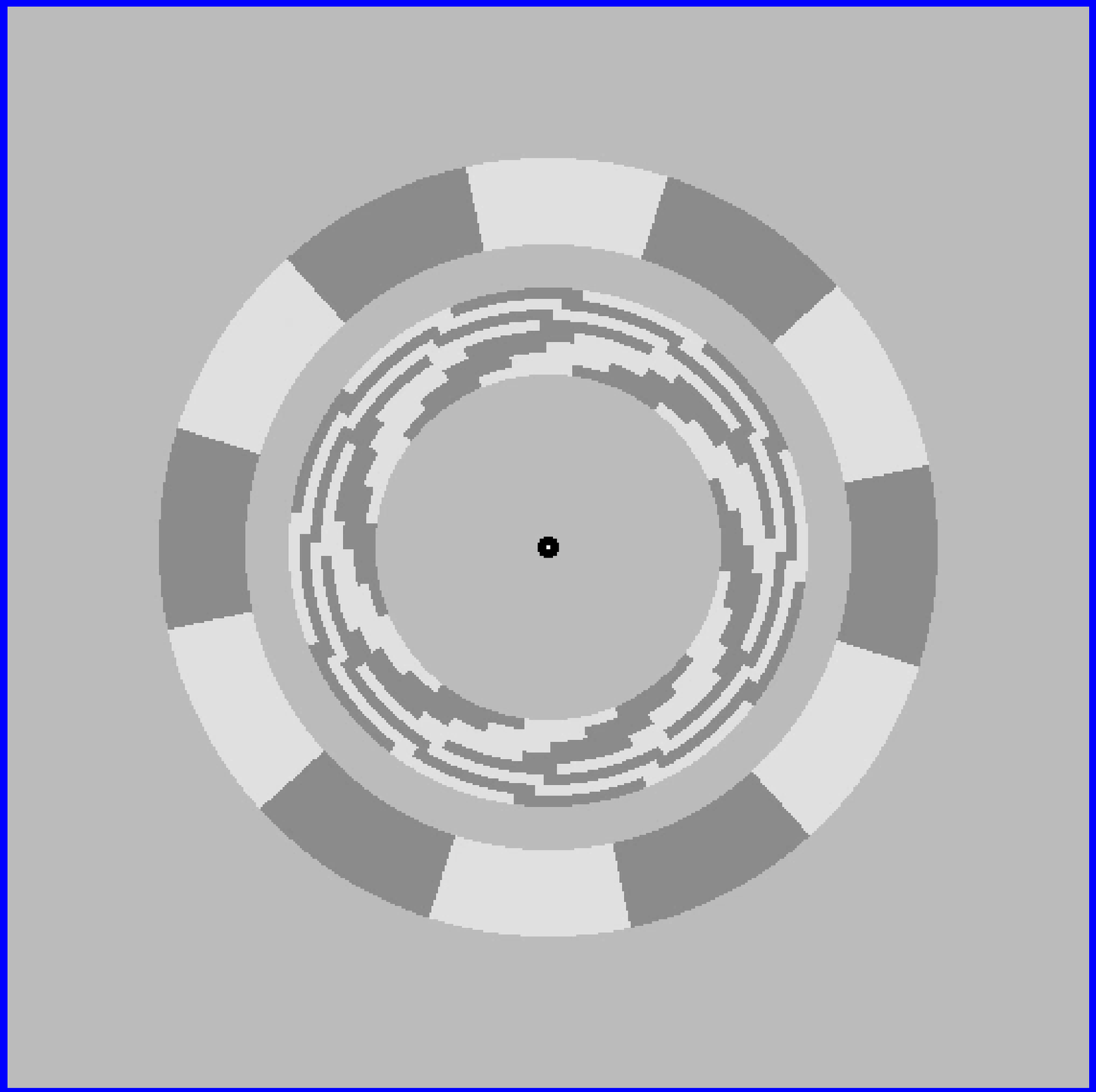
Randomising location will not affect speed unless motion is analysed in a restricted time window



Which is true for physiological motion detectors

(see video at https://www.youtube.com/watch?v=3CpG9utJe6I)

Position jitter masks speed, overall seems slower.



But what about all this jitter? Do people see it?

(see video at https://www.youtube.com/watch?v=VGrXhuj2gzk)

In fact, a number of articles do report the jitter in moving color stimuli.

Vision Res. Vol. 32, No. 3, pp. 483–488, 1992

Absence of Smooth Motion Perception in Color Vision

K. T. MULLEN,* J. C. BOULTON†

Journal of Vision (2008) 8(10):3, 1–8

Alpha band amplification during illusory jitter perception

Kaoru Amano **Derek H. Arnold**
Tsunehiro Takeda **Alan Johnston**

An illusory jitter was seen only in the equiluminant condition, and had a rate of about 10 Hz.

"no need to postulate a lack of colour input to motion detecting units," said Tom

In our work together we showed that even subjects who saw no colour following cortical damage could see the motion of colour gratings.

articles

Complete sparing of high-contrast color input to motion perception in cortical color blindness

Patrick Cavanagh[1], Marie-Anne Hénaff[2], François Michel[2], Theodor Landis[3], Tom Troscianko[4] and James Intriligator[5]

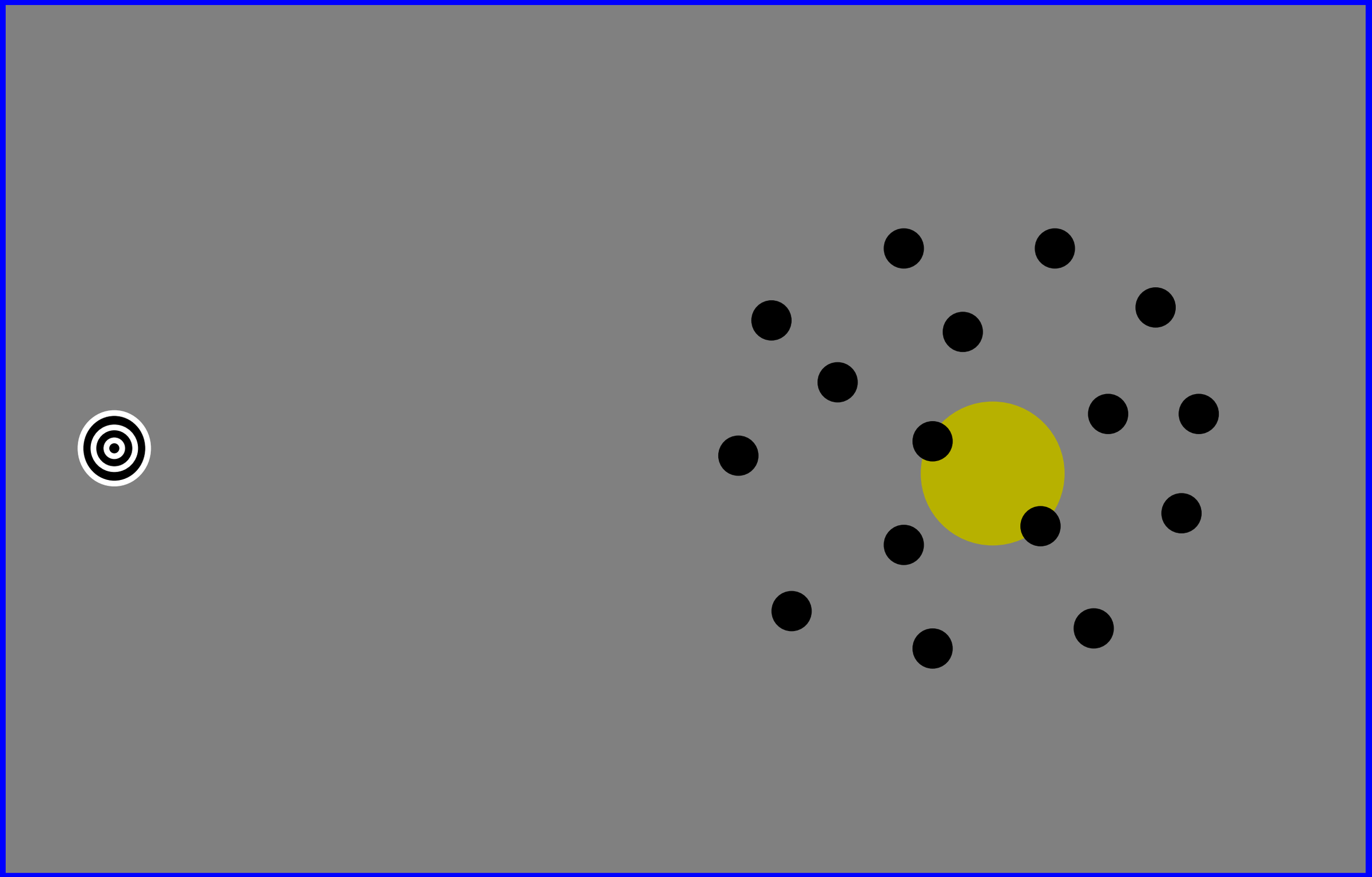
Position jitter should also affect position

High uncertainty means colour stimuli defer to luminance stimuli for position

Many subsequent studies demonstrated this:

Motion capture
Position capture during pursuit

Motion capture: Fixate the bull’s-eye. The yellow disc will appear to move in step with the black dots



(see video at https://www.youtube.com/watch?v=Bz6Exbcx8yo)

Position capture: Follow the moving dot. The colour gratings may appear to keep up

(see video at https://www.youtube.com/watch?v=SJvEG-WNkNs)

Position jitter at equiluminance is the cause of slowed motion

High uncertainty also means colour stimuli defer to luminance stimuli for position

Thanks Tom