

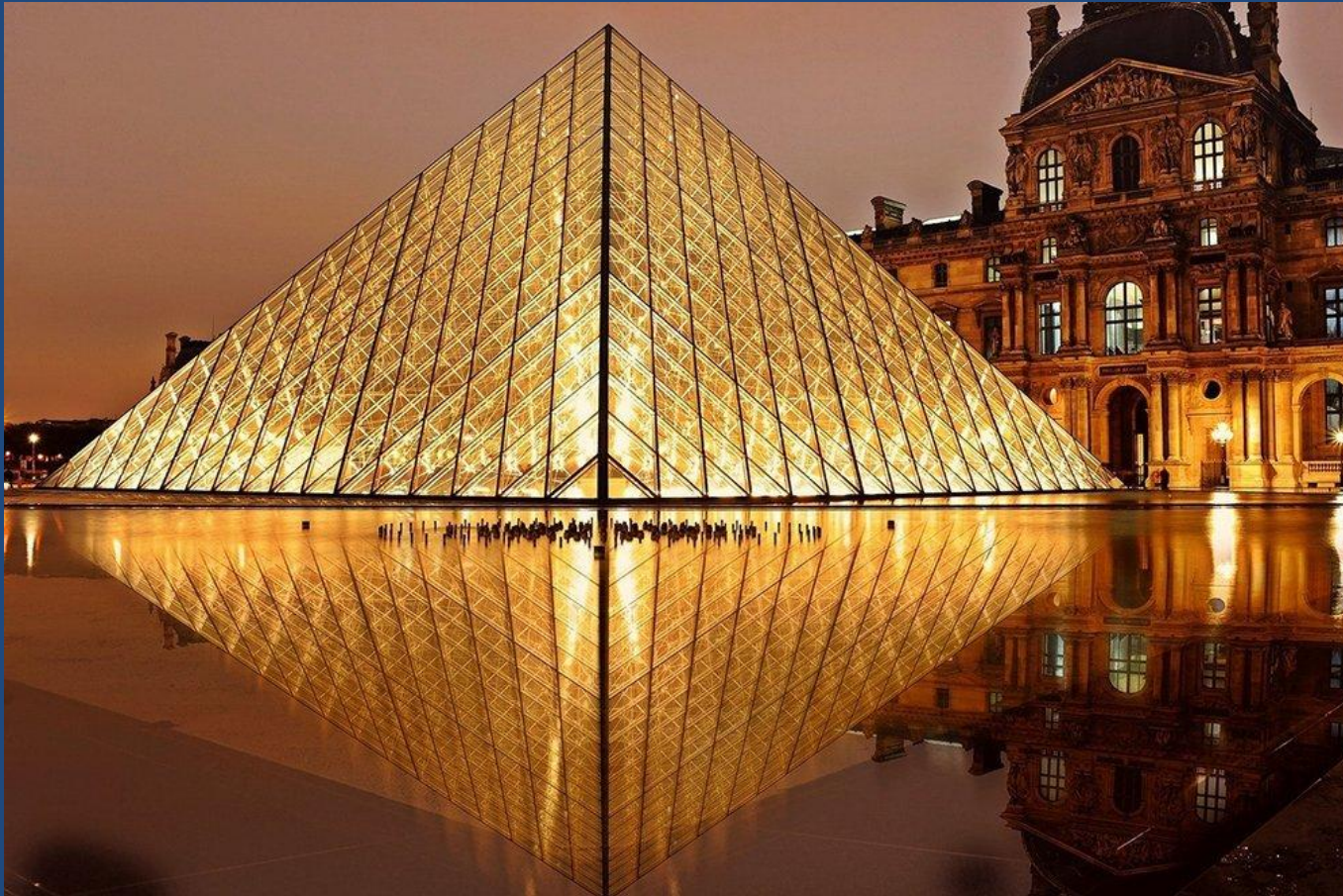


*The contribution of local
variations in hue or contrast to
'symmetry of things in a thing'*

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*Perceptual systems are sensitive
to symmetry*



Symmetry

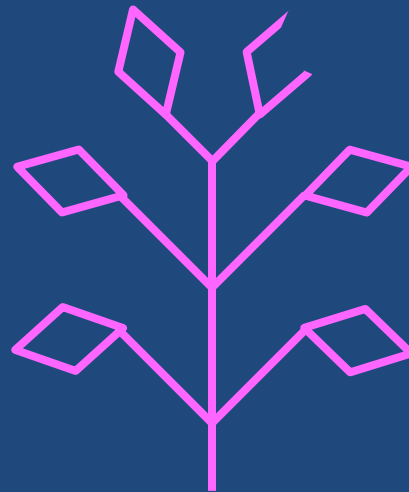
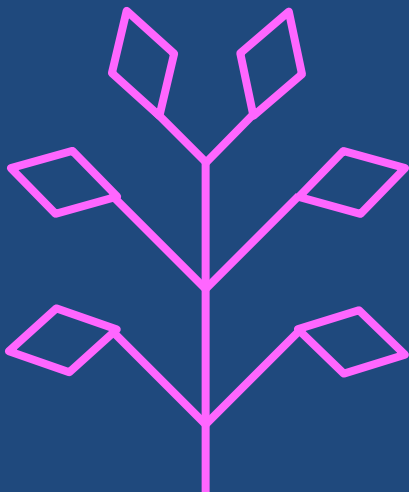
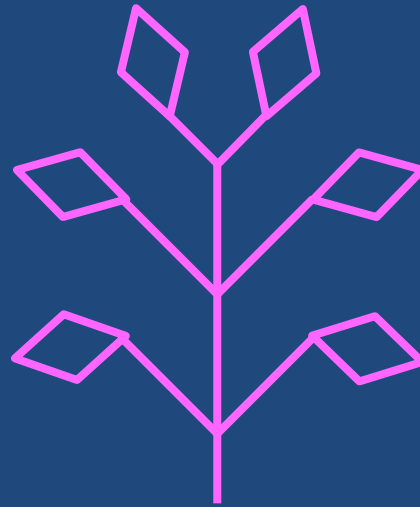
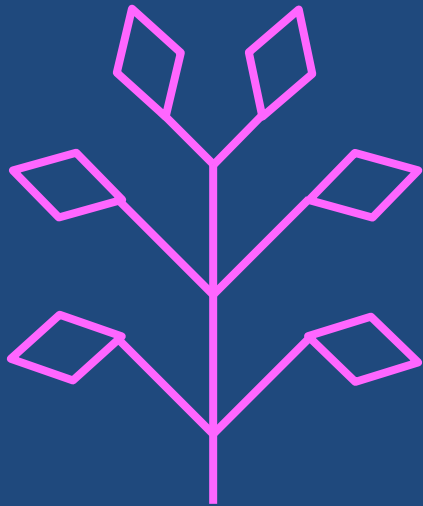
is mathematically defined

reduces uncertainty in complex systems

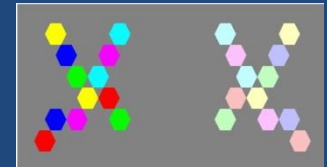
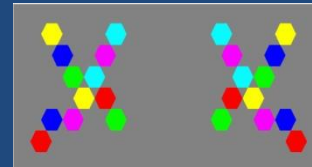
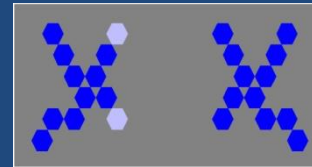
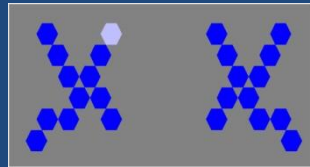
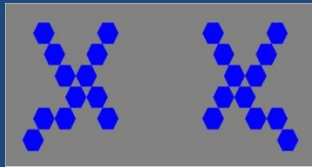
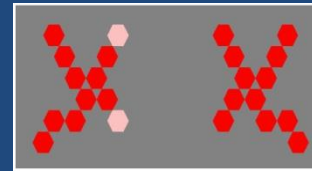
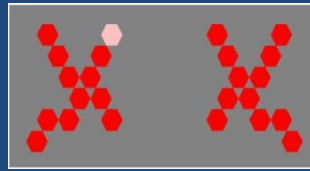
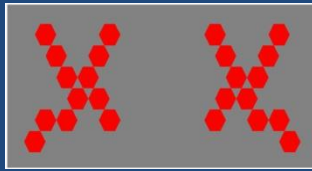
is present in nature and

dependent on functional properties of biological vision

What is « symmetry of things in a thing »?

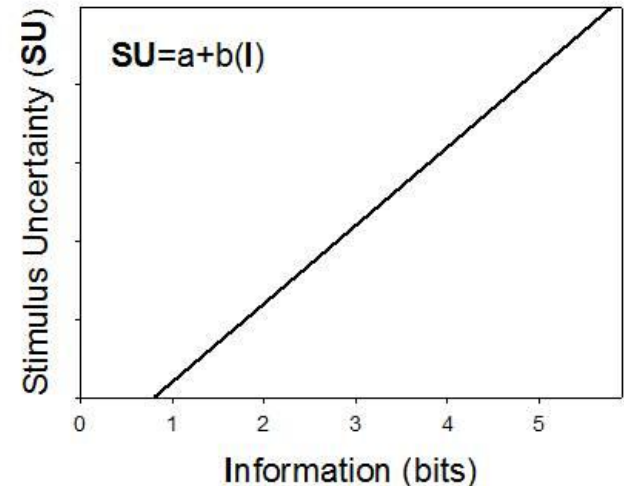


« *Symmetry of things in a thing* » as a perceptual variable: *color as a test case*

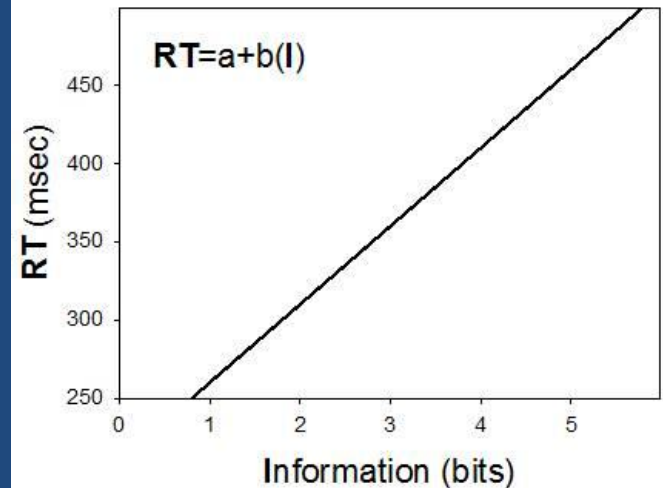


Insights from Information Theory

Shannon & Weaver, 1949



Hick, 1952



Hick's law presumes a direct relationship between RT and sensory system uncertainty (SU), where RT increases linearly with amount of transmitted information/stimulus uncertainty.

Psychophysical RT Experiment

- *the mirror-symmetrical shape pairs presented in random order on the computer screen*
- *subject (N=15) has to decide as quickly as possible whether or not shapes are symmetrical by pressing a specific key (1='yes'; 2='no')*
- *each individual RT to a stimulus is computed by the CPU in terms of the time between image onset and keypress*



Data Analysis

With *26 images* per individual session, *two repeated sessions* per participant, and *15 participants*, a total of *780 choice response time data* were recorded in the experiment

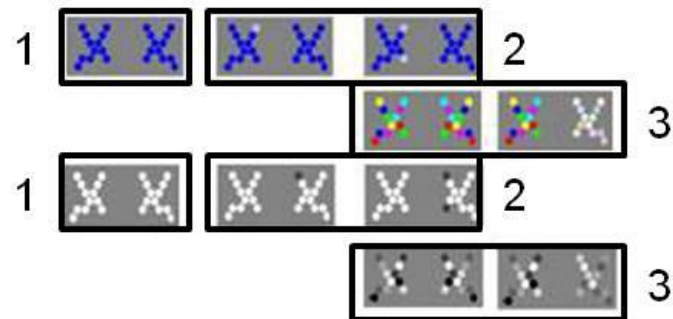
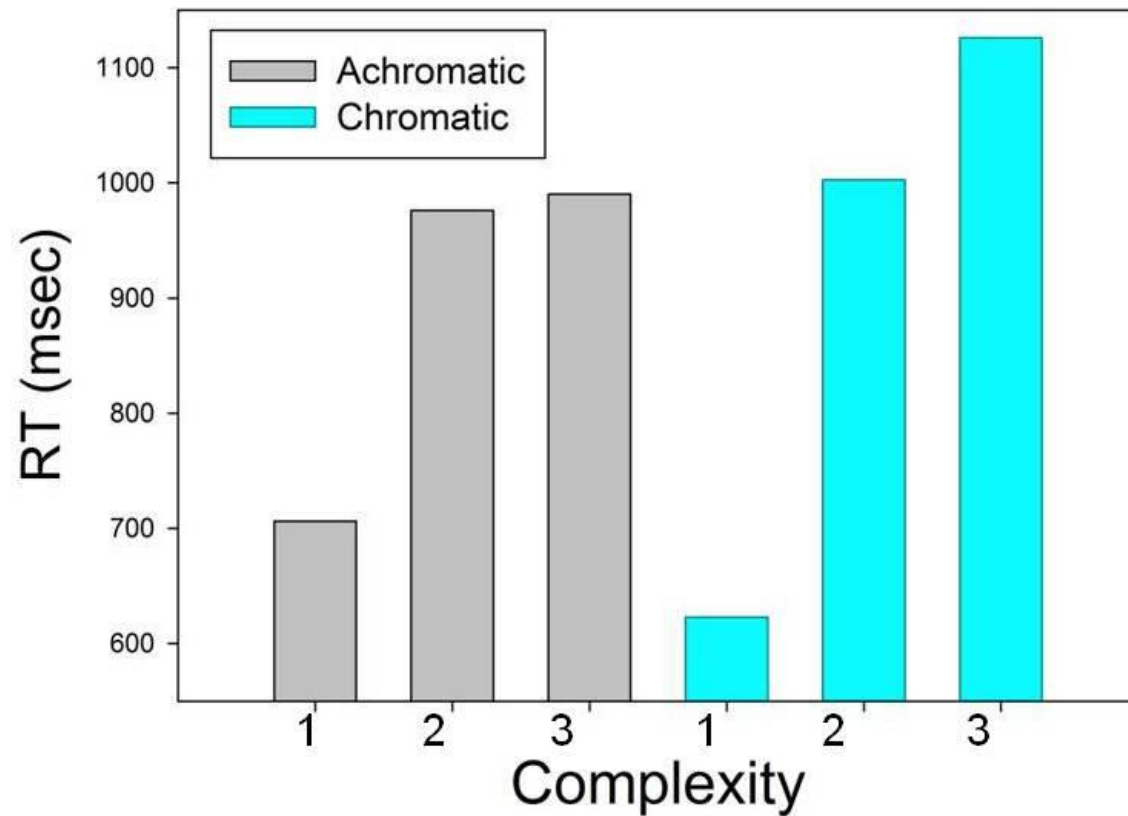
The *statistical analysis* corresponds to a Cartesian design plan *Complexity₅ x Color₂ x 15*, with *5* levels of the '*Complexity*' factor and *2* levels of the '*Color*' factor.

With *15* individual average RT per factor level, we have a total number (N-1) of *149* degrees of freedom (*DF*).

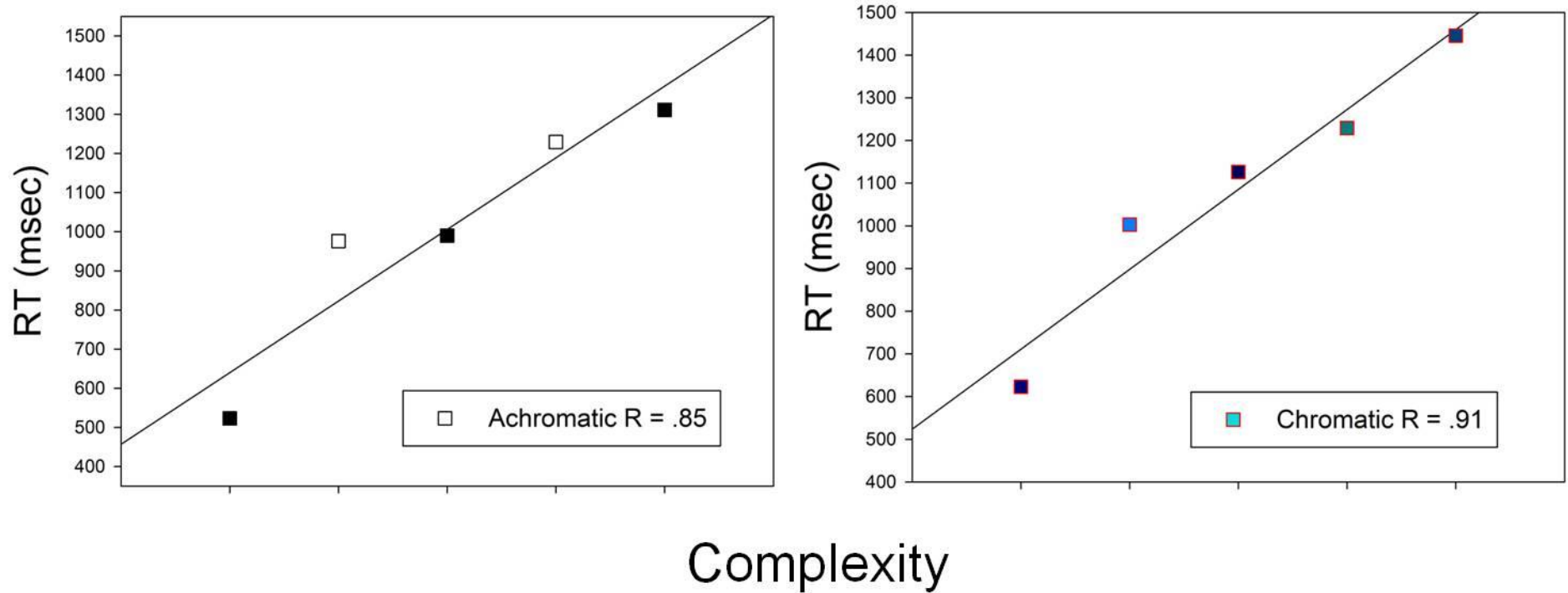
Results

2-way ANOVA	Factor	DF	F	P
	COMPLEXITY	4	62.28	<.001
	COLOR	1	1.58	NS
	INTERACTION	4	6.89	<.05

Results



Results



Conclusions

- *Local color or contrast variations* are shown to *disturb* « symmetry of things in a thing » in *mathematically symmetrical* stimuli
- This observation can be interpreted in terms of increasing *perceptual complexity* with increasing local color variations
- Increased perceptual *complexity increases stimulus uncertainty*, as consistently reflected by the observed increase in RT as a direct consequence of *Hick's Law*.

Related previous work

*Dresp-Langley B. Affine Geometry, Visual Sensation, and Preference for “Symmetry of Things in a Thing”. **Symmetry**. 2016; 8: 127.*

*Dresp-Langley B, Wandeto JM. Human Symmetry Uncertainty Detected by a Self-Organizing Neural Network Map. **Symmetry**. 2021; 13(2):299.*