

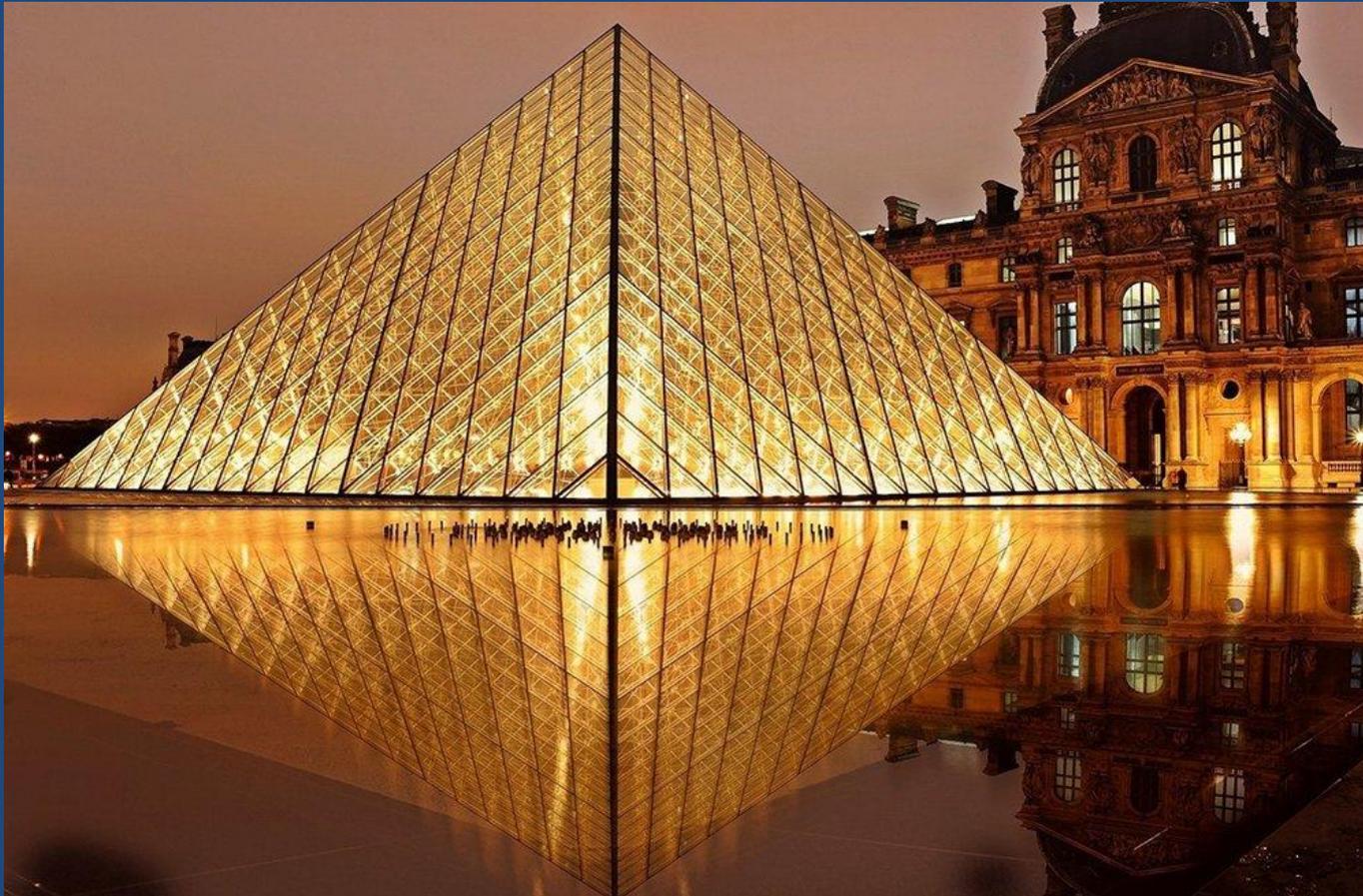


*The contribution of local  
variations in hue or contrast to  
'symmetry of things in a thing'*

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*Perceptual systems are sensitive to symmetry*



# *Symmetry*

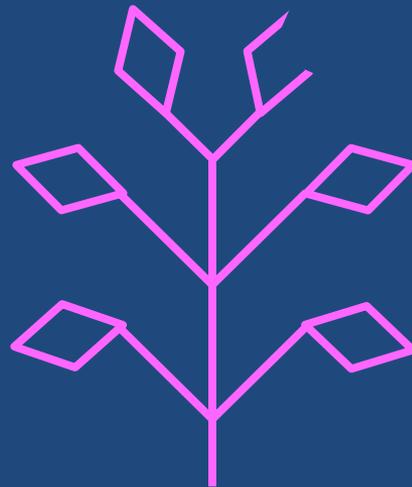
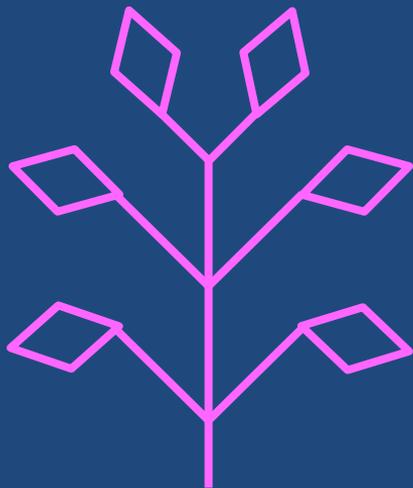
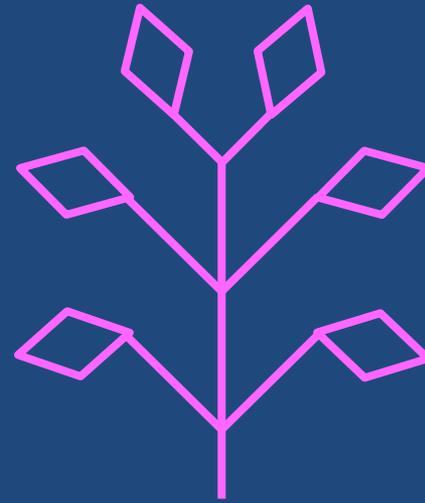
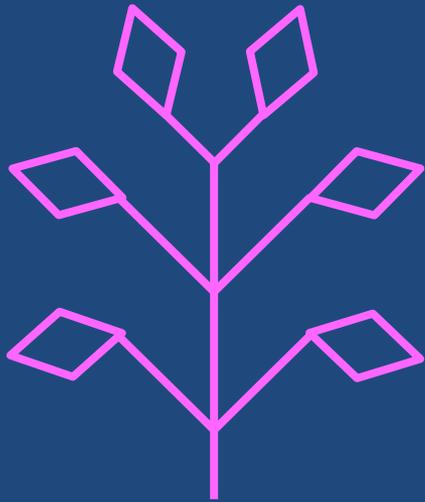
*is mathematically defined*

*reduces uncertainty in complex systems*

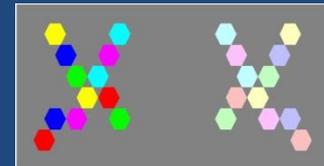
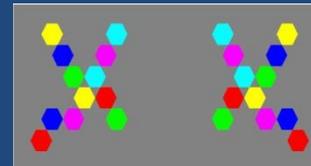
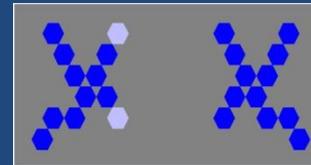
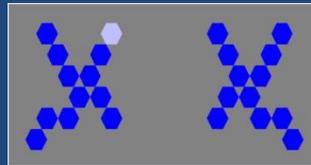
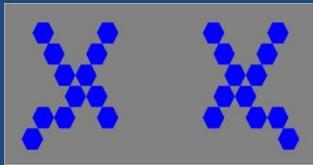
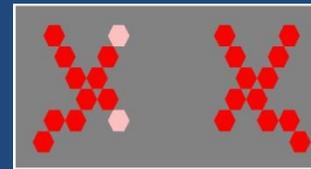
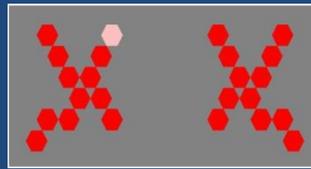
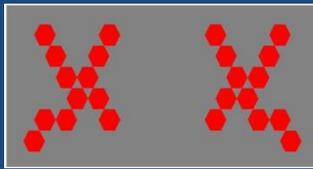
*is present in nature and*

*dependent on functional properties of biological vision*

*What is « symmetry of things in a thing »?*

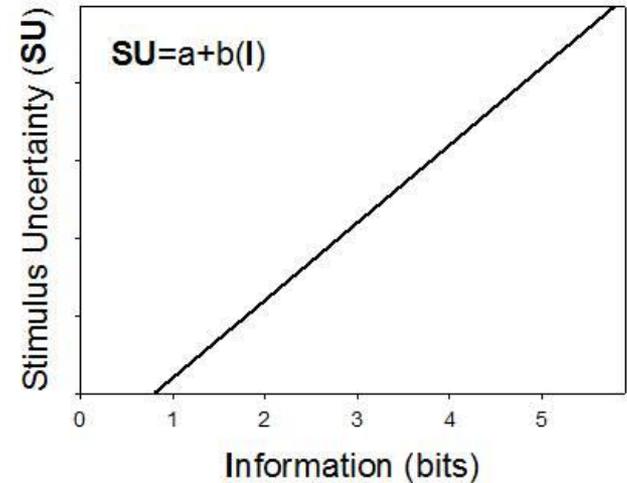


« Symmetry of things in a thing » as a perceptual variable: *color as a test case*

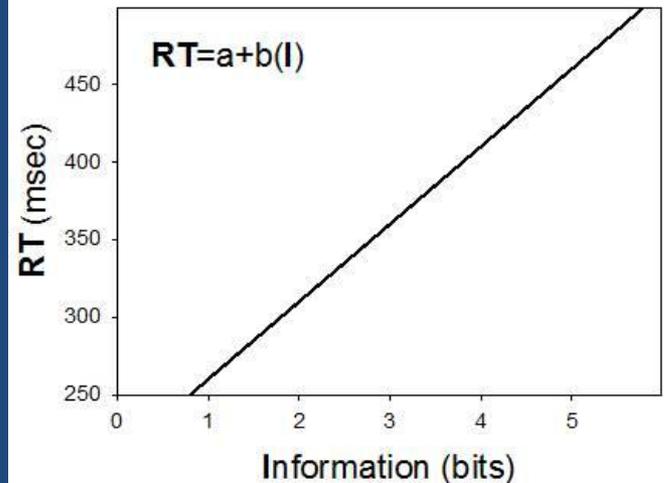


# Insights from Information Theory

*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

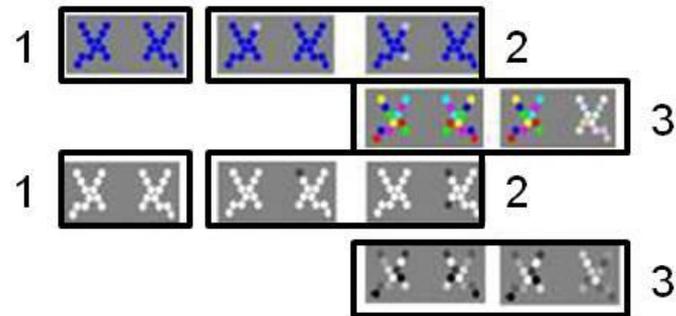
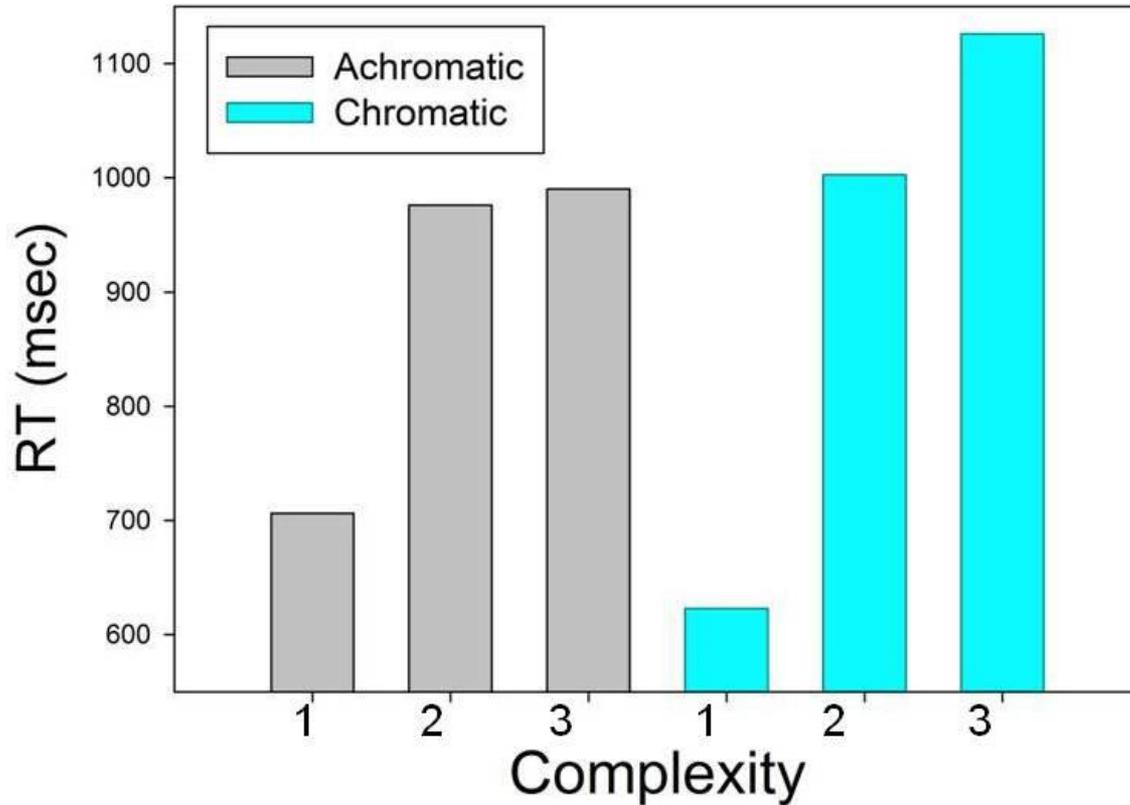
The *statistical analysis* corresponds to a Cartesian design plan *Complexity<sub>5</sub> x Color<sub>2</sub> x 15*, with *5 levels* of the '*Complexity*' factor and *2 levels* of the '*Color*' factor.

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

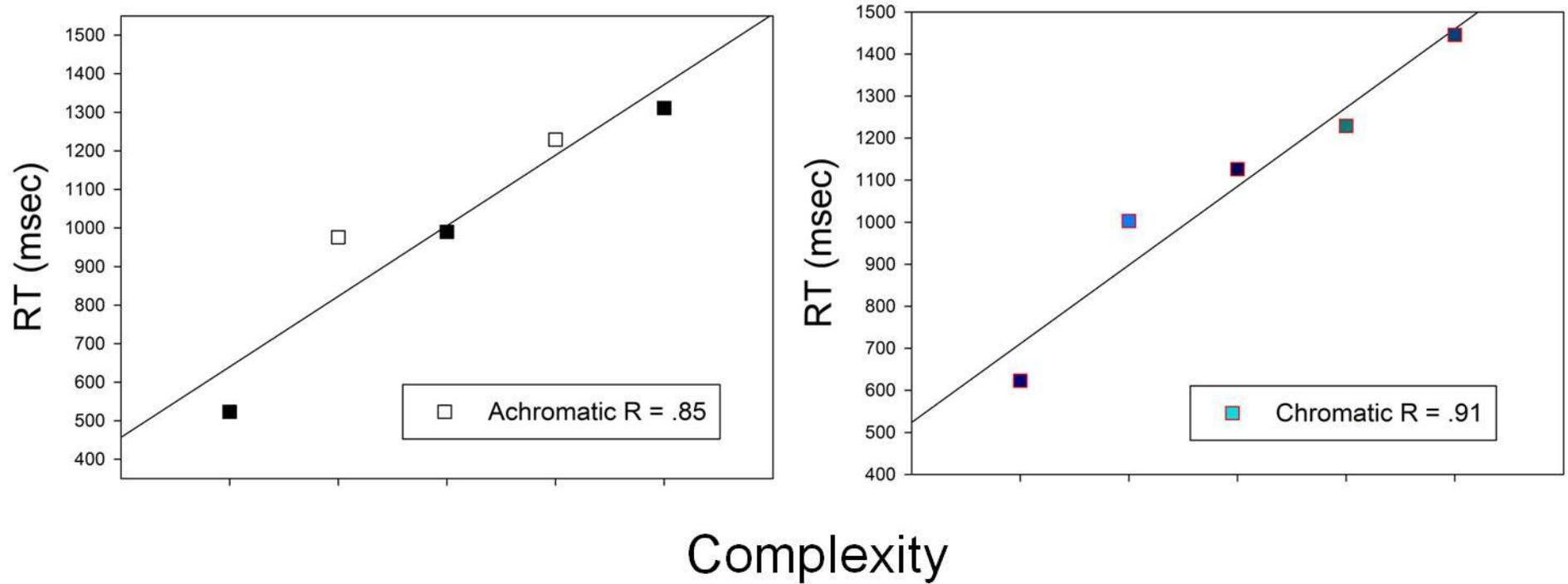
# Results

<b>2-way ANOVA</b>	<b>Factor</b>	<b>DF</b>	<b>F</b>	<b>P</b>
	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.*