

The Role of Information-Driven Interactions in Double-Aspect Theory of Information

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Introduction

The concept of information applied by Chalmers (1996) in his **Double-Aspect Theory** of Information has much in common with **Shannon's theory** (1948). This leads to several problems such as the following:

- It leads to panpsychism.
- It just explains simple perceptual experiences.
- The thesis is unable to give an appropriate account for the unity of consciousness.

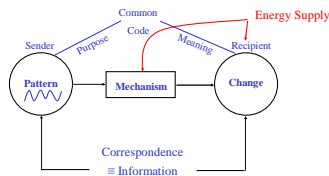
Toward solving the problems and to gain better explanatory accounts for different conscious experiences, instead of Shannon information, I project a new concept of information called pragmatic information.

Pragmatic Information

Kueppers (1990), Roederer (2003)

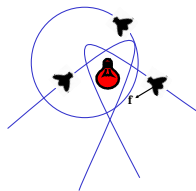
Two Different Classes of Interactions

1. **Information-Driven Interactions** (living systems)



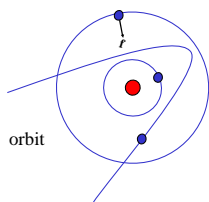
Example: Insects in orbit around a light source

Light emission
|
Pattern detection
|
Pattern analysis
|
Muscle activation



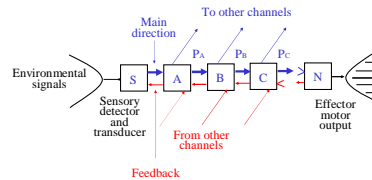
2. **Force-field driven Interactions** (abiotic systems)

- The concept of force (or force field) is responsible for the change.
- The change will always depend on some "initial conditions."
- The changes that occur in two interacting bodies are coupled energy-wise.



Example: Satellites in orbit around a central body

Short & Long-Term Memory and Thinking According to Pragmatic Information



S: A sensor converting physical signals into neural impulses.

A, B, C, ...: Sequential stages, where one neural activity pattern P is converted into another.

Short-Term Memory: Persistence of neural activity patterns specific to a given sensory stimulus for several seconds after the original stimulus has disappeared.

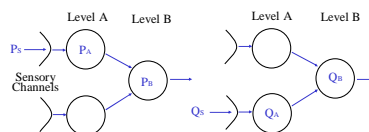
Long-Term Memory: The ability of being triggered much later by activity in some "upstream" stages.

Memory Recall: Patterns P_A, P_B, \dots being reconstructed without the corresponding full external input P_S .

Thinking: The act of information recall, alteration, and restorage without any external input.

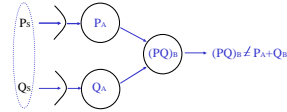
Learning and Associative Memory

1- Before learning



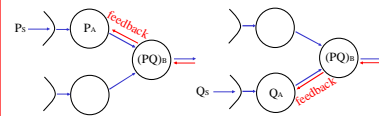
Two nearly simultaneous input patterns P_S and Q_S , e.g., the visual image of an object and the acoustic pattern of its name, respectively.

2- During learning



Repeated simultaneous input patterns P_S and Q_S gradually change hardware in B; a new response pattern $(PQ)_B$ to pair of stimuli emerges.

3- Response in B after learning



Common response pattern $(PQ)_B$ can be elicited by either sensory P_S or Q_S .

A Crucial Question

Why Isn't Brain an Equivalent of a Computer?

Computers are so primitive when it comes to processing complex analog **pragmatic information**.

Brain is so slow in handling digital **Shannon information**.

Conclusions

Replacing Shannon information with pragmatic information would provide a more natural ground for double-aspect theory. Pragmatic information just occurs in living systems, thus escapes from panpsychism. The combination would construct a powerful theory, explaining different experiences while considering the phenomenal not to be reducible to physical.

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