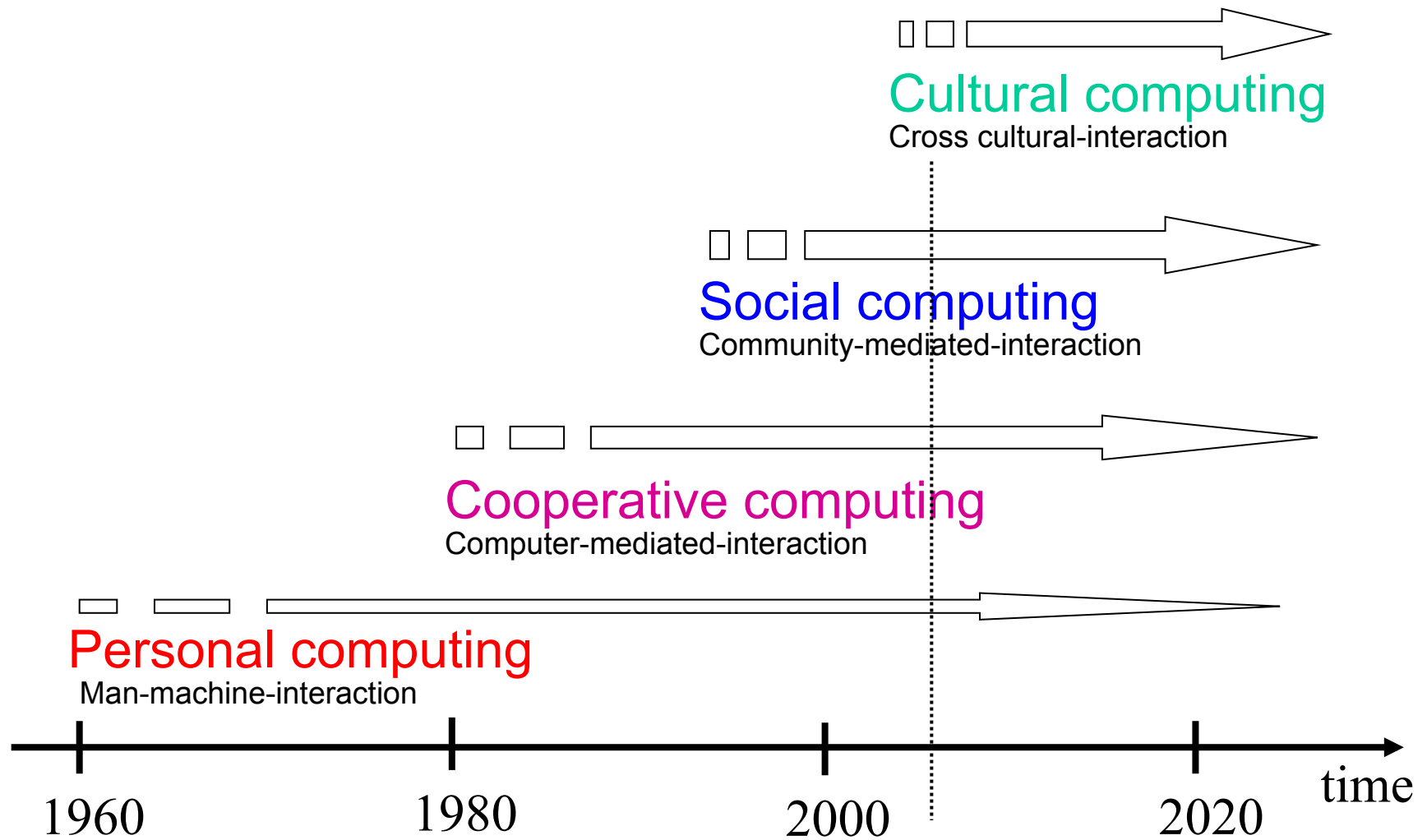
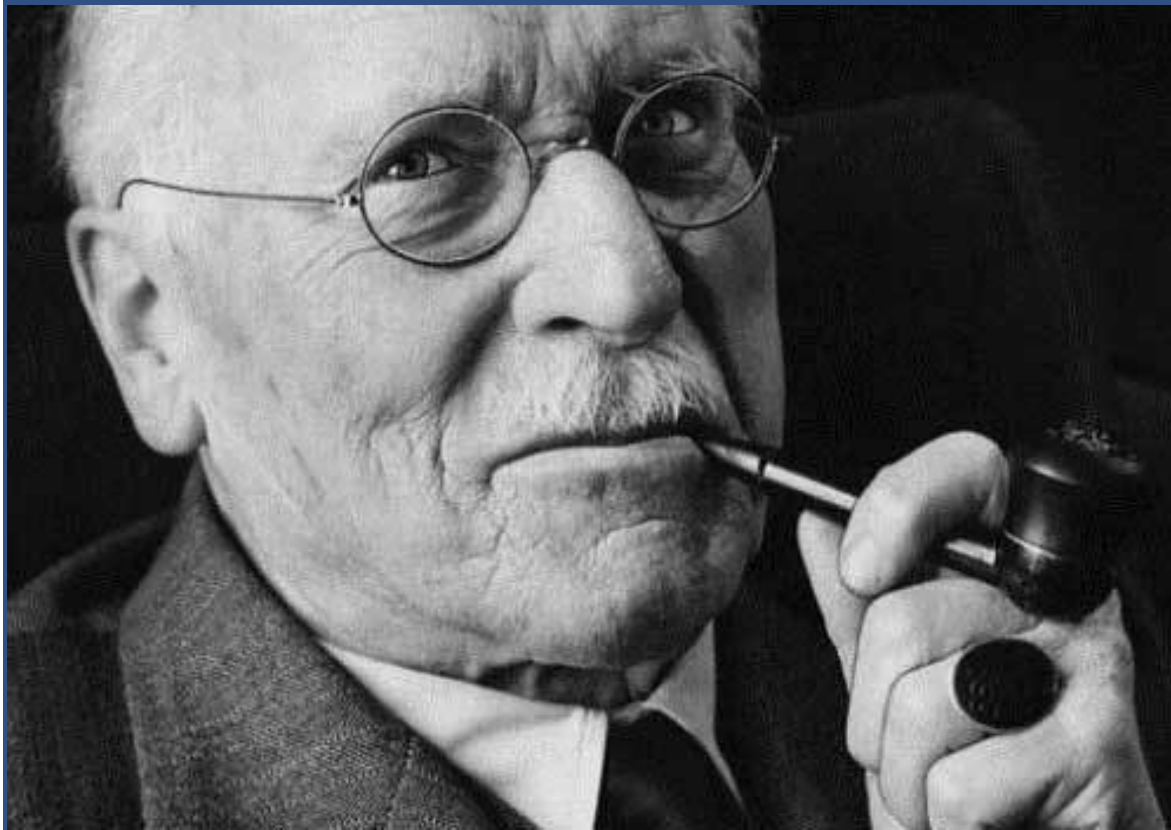


# How to Design for the Unconscious

Matthias RAUTERBERG  
Designed Intelligence Group  
Department of Industrial Design  
Eindhoven University of Technology  
The Netherlands

# Interaction Paradigms in Computing



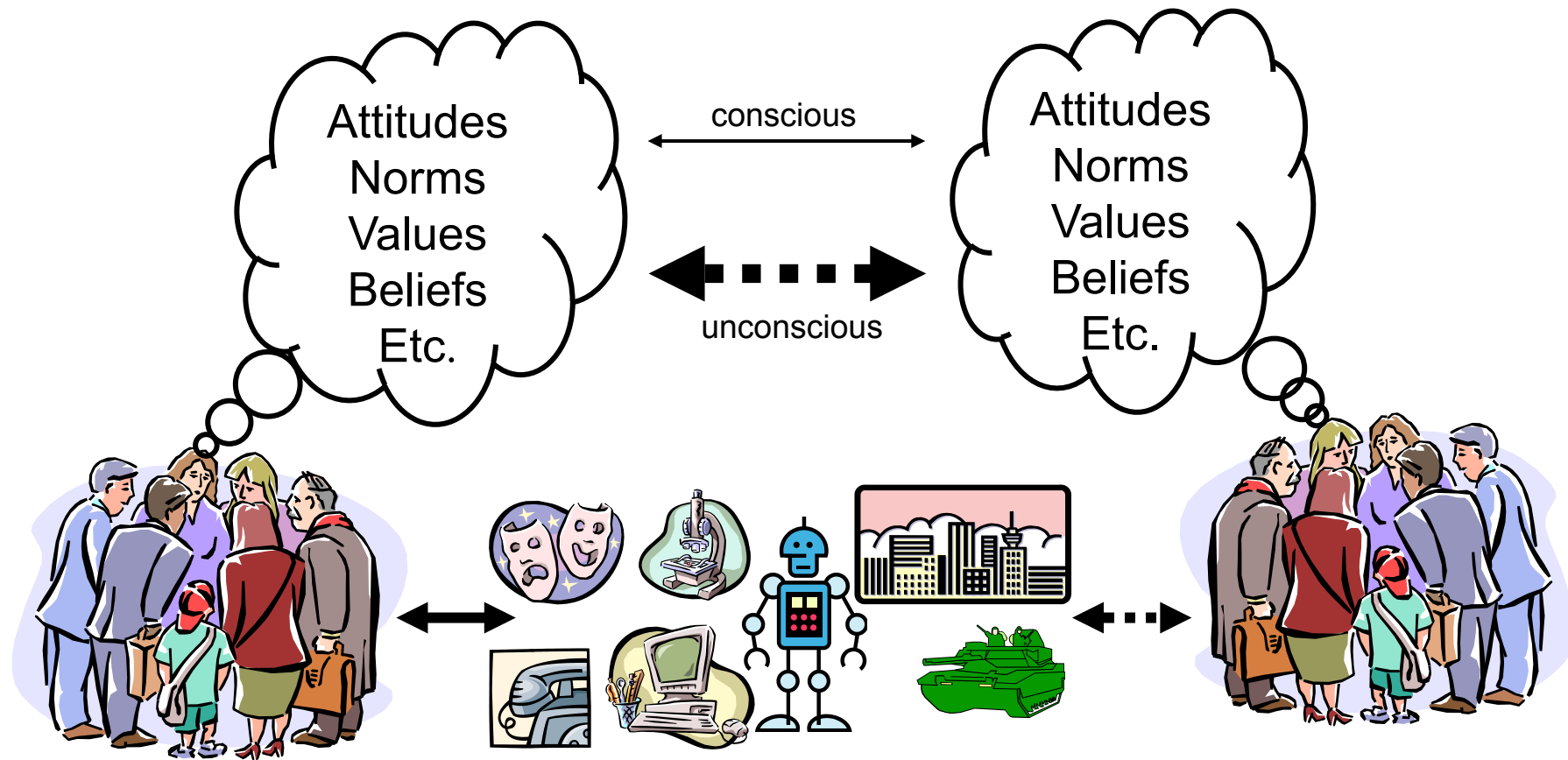


The subliminal aspects of everything that happens to us may seem to play very little part of in our daily lives, but they are the almost invisible roots of our conscious thoughts.

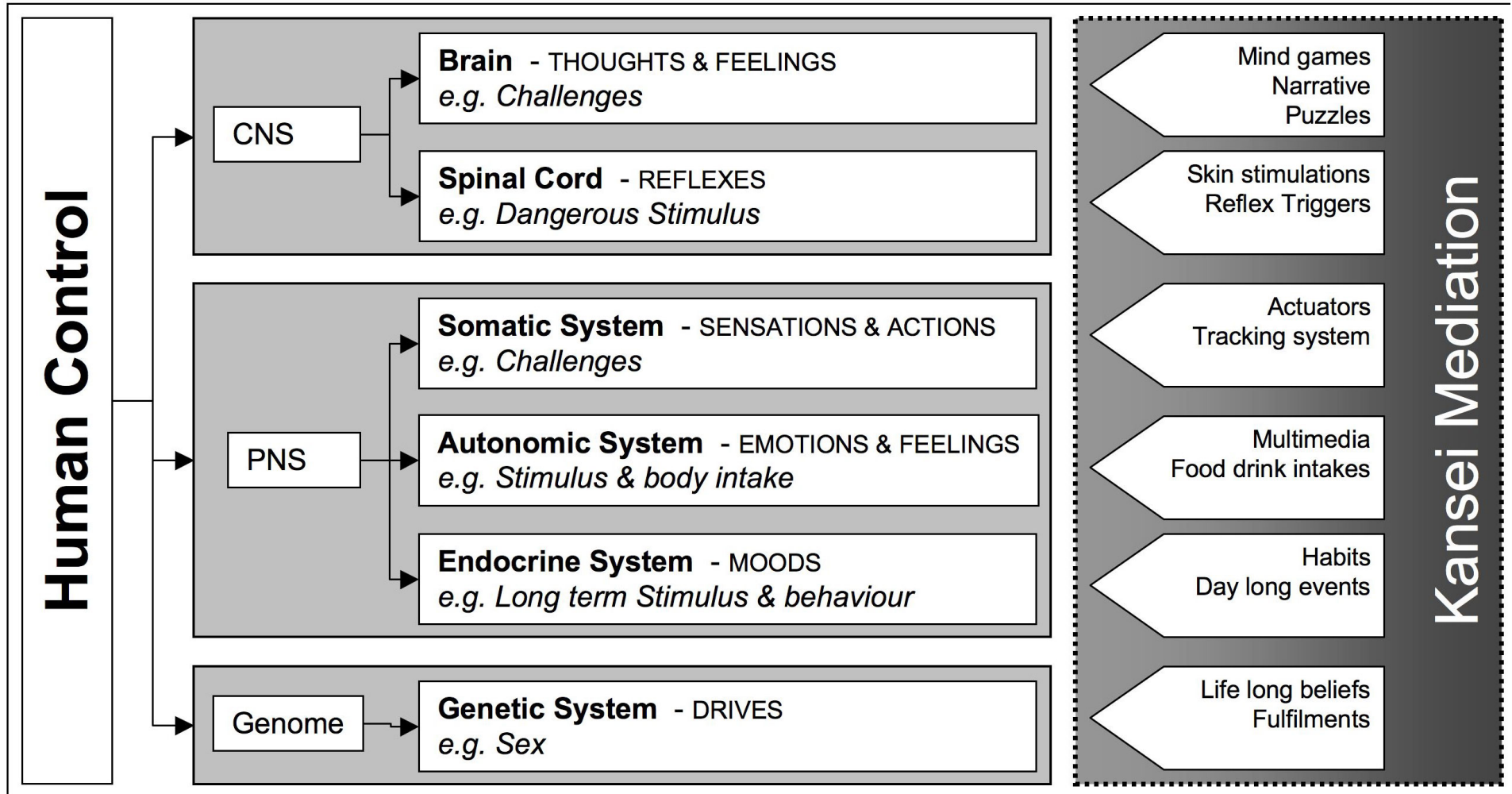
Carl Jung 1875-1961

Founding father of modern psychology.

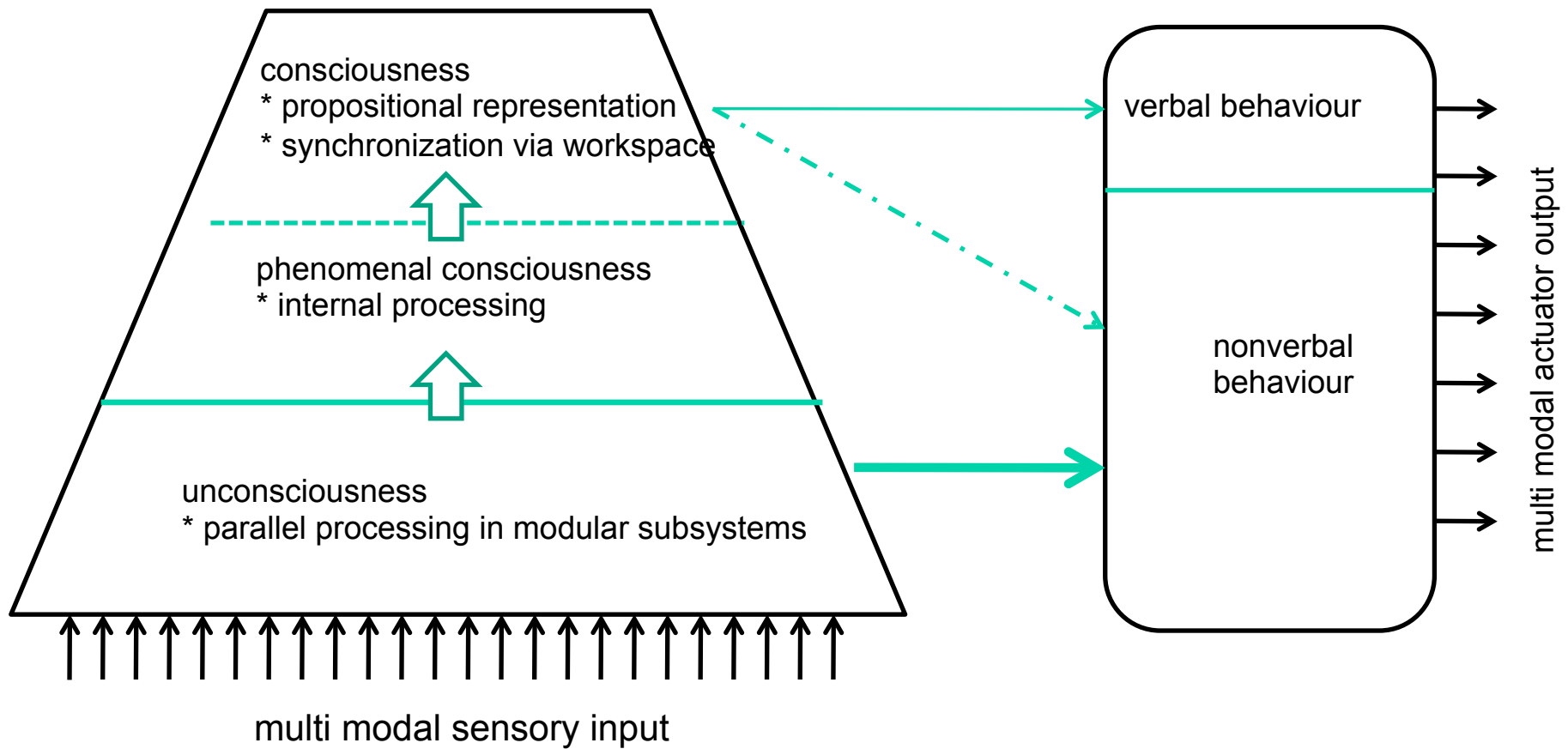
# Cultural & Society



**REF:** Rauterberg M. (2008). Hypercomputation, unconsciousness and entertainment technology. In: P. Markopoulos, B. De Ruyter, W. IJsselsteijn, R. Duncan (eds.) *Fun and Games 2008* (Lecture Notes in Computer Science, vol. 5294, pp. 11–20), Heidelberg: Springer. **[IF=0.361]**



**REF:** Salem B., Nakatsu R., Rauterberg M. (2009). Kansei experience: Aesthetic, emotions and inner balance. *International Journal on Cognitive Intelligence and Natural Intelligence*, vol. 3, no. 2, pp. 18-36. [IF=3.154]

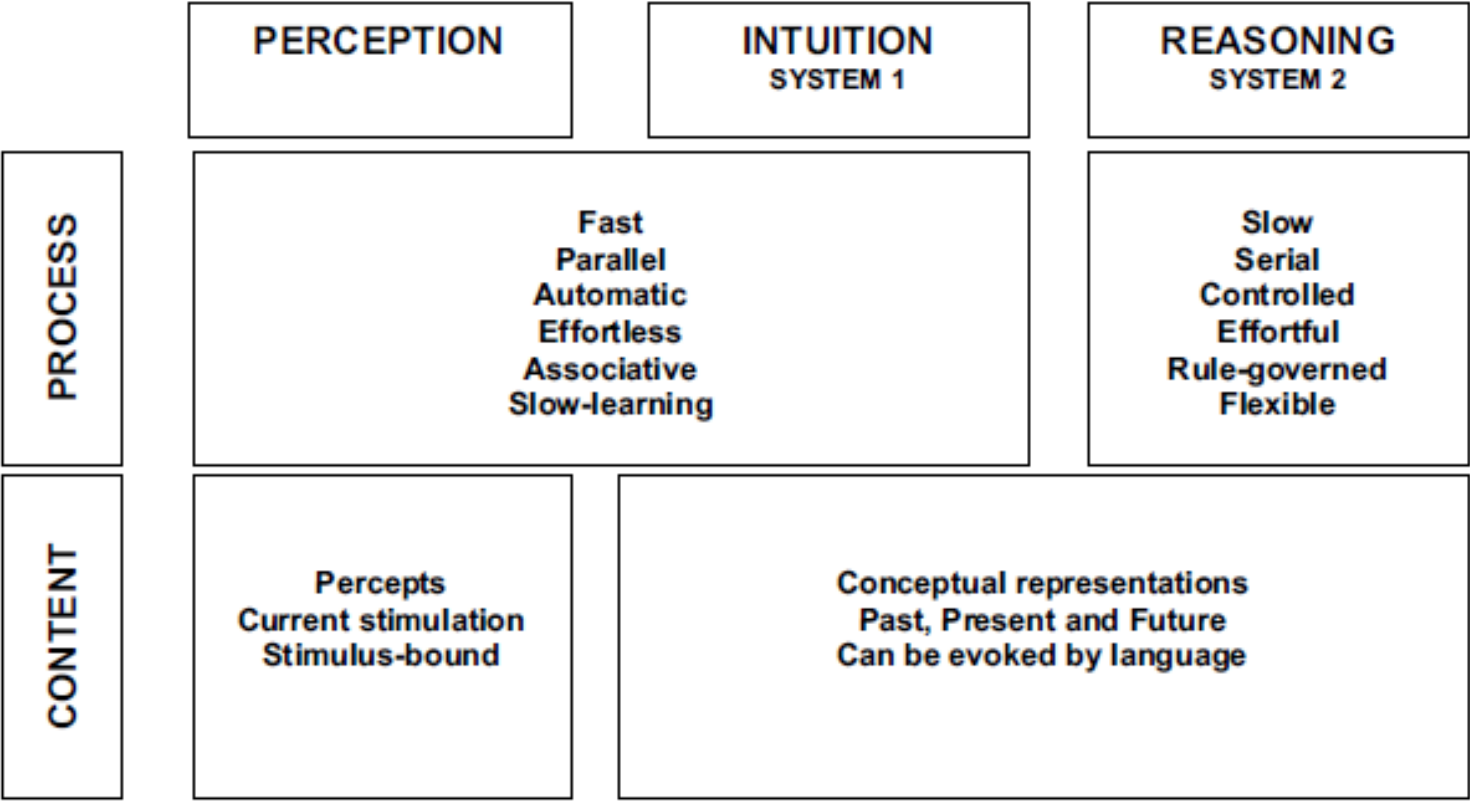


**REF:** Hofmann W., Wilson T. (2010). Consciousness, introspection, and the adaptive unconscious. In: B. Gawronski & B. K. Payne (Eds.), *Handbook of Implicit Social Cognition: Measurement, Theory, and Applications* (pp. 197-215). New York: Guilford Press.



**Daniel KAHNEMAN**

Map of Bounded Rationality: A Perspective on Intuitive Judgement and Choice .  
Nobel Prize, 8 December 2002



**REF:** Kahneman, D. (2003). Maps of bounded rationality: A perspective on intuitive judgment and choice. In T. Frangmyr (Ed.), *Les Prix Nobel 2002* [Nobel Prizes 2002]. Stockholm, Sweden: Almqvist & Wiksell International.  
 Note that this chapter has two sections: the first is an autobiography (with a eulogy for Amos Tversky), and the second is a transcript of his Nobel lecture, which is what the title refers to. The autobiographical portion has been republished as: Kahneman, D. (2007). Daniel Kahneman. In G. Lindzey & W.M. Runyan (Eds.), *A History of Psychology in Autobiography, Volume IX* (pp. 155–197). Washington, DC: American Psychological Association.

# How to relate consciousness and unconsciousness?

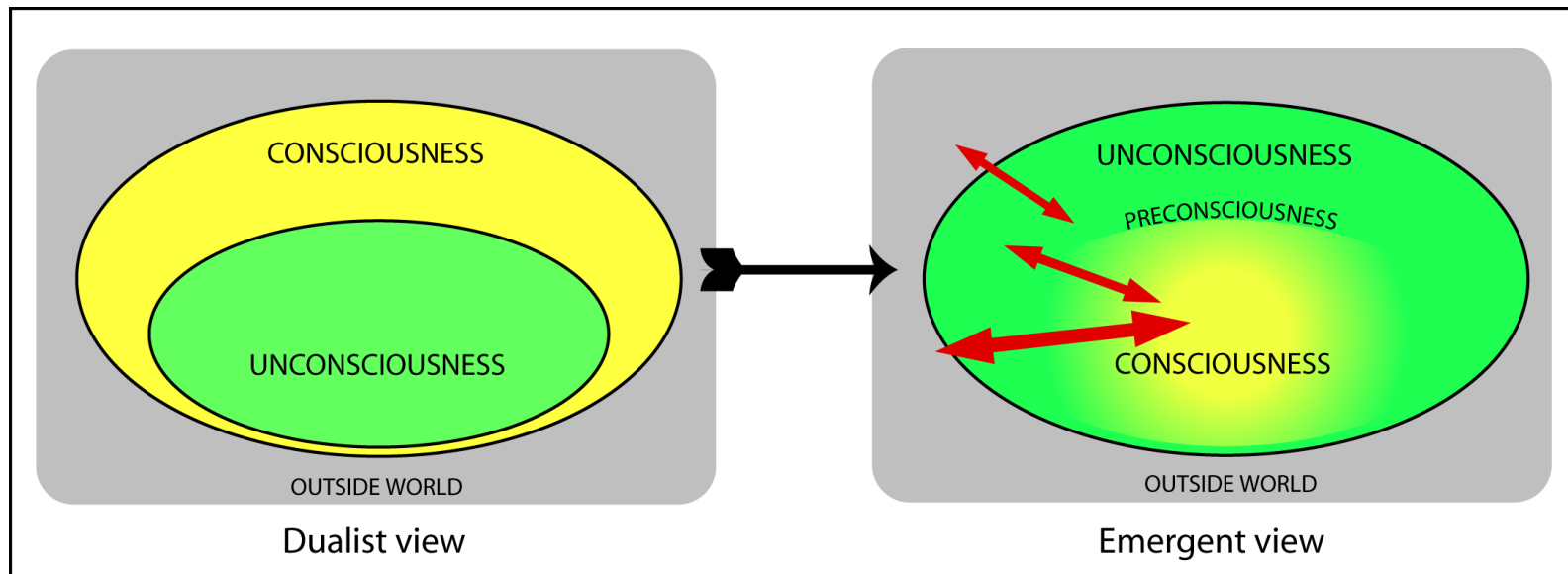


Ryohei NAKATSU

**ATR** Advanced  
elecommunications  
Research Institute International



**TU/e**



REF: Nakatsu, R. (2002). What is the ultimate form of communication? *Artificial Life and Robotics*, vol. 6, no. 4, pp. 210–214. [IF=0.486]





Sandy PENTLAND



### Business results



### Brain Structure & biology

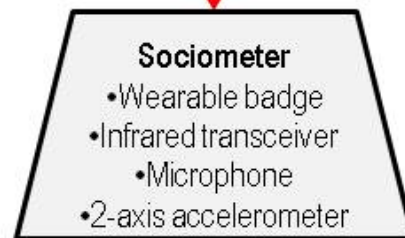
- Subcortical structures, assessing brains' attention and orienting systems
- Cortical mirror neurons
- State of autonomic nervous system
- Measure of integration within brain's action sequence control system

### Human Honest Signals (unconscious)

- Influence
- Mimicry
- Activity
- Consistency

### Measurement / Physical Behaviors

- Causing other to match speaking pattern
- Reflexive copying of smiles, etc.
- Increased activity level indicates interest/excitement
- Emphasis and timing: focus or variability



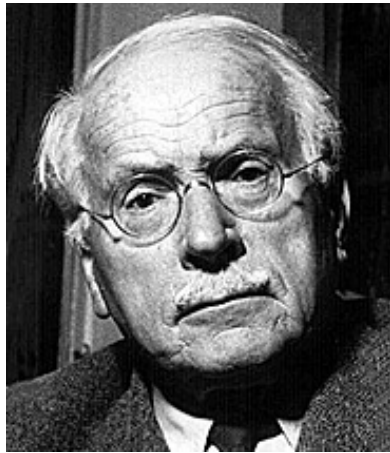
**HONEST SIGNALS**  
 HOW THEY SHAPE OUR WORLD

ALEX (SANDY) PENTLAND

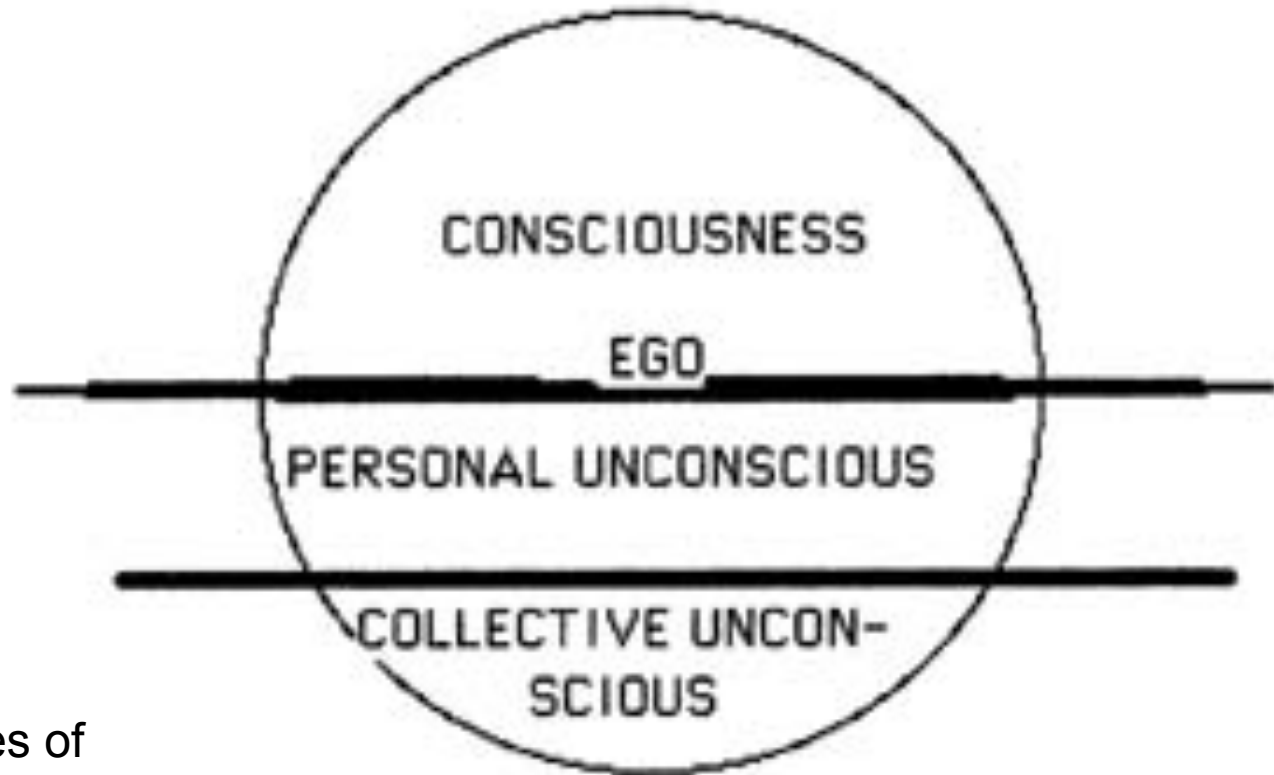
"A technology poised to change the world."  
 Technology Review



Waiming Mok's interpretation of "Honest Signals" article by Alex (Sandy) Pentland and Tracy Heibeck in SMR, Fall 2008. There is no validation with authors. Interpretation has Copyright © 2008 by Waiming Mok.



(1875-1961)



After 1910 the discoveries of

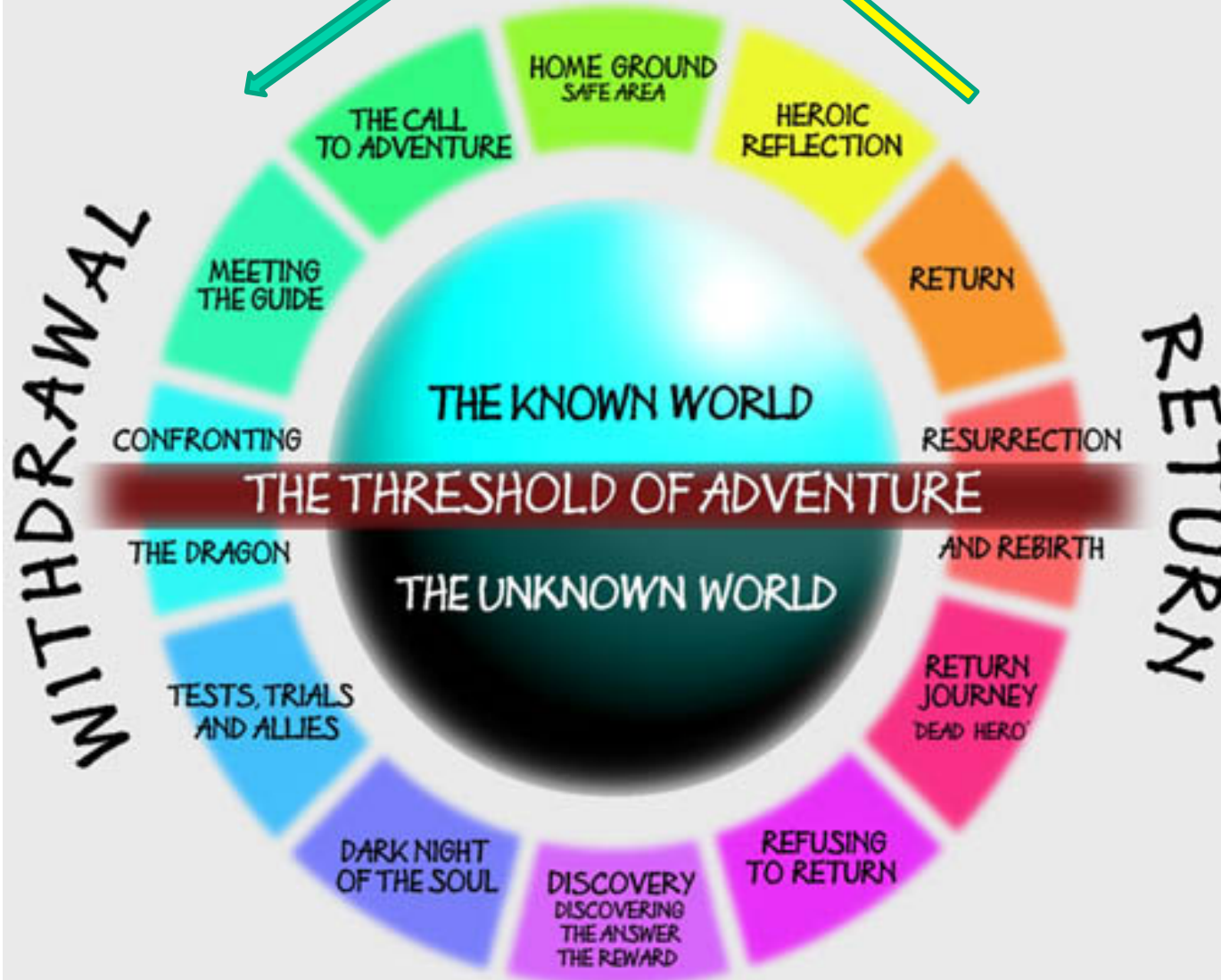
## **Carl Gustav JUNG**

about the *collective unconscious* and the related *archetypes* were challenging.

Jung dreamt a great deal about the dead, the land of the dead, and the rising of the dead. These represented the unconscious itself -- not the "little" personal unconscious that Freud made such a big deal out of, but a new *collective unconscious* of humanity itself, an unconscious that could contain all the dead, not just our personal ghosts. Jung began to see the mentally ill as people who are haunted by these ghosts, in an age where no-one is supposed to even believe in them. If we could only recapture our mythologies, we would understand these ghosts, become comfortable with the dead, and heal our mental illnesses.

# THE HERO JOURNEY

A JOURNEY OF TWELVE STAGES



# ARAS

THE ARCHIVE for RESEARCH  
in ARCHETYPAL SYMBOLISM

REF: Campbell J. (1949/2008). *The hero with a thousand faces*. Princeton University Press.

# Do archetypes have an effect on humans?



A collaborative project between two PhD students



Leonid IVONIN

- Processing of physiological signals and application of data mining methods
- Development of technical infrastructure for the experiments
- Sensing application (ArcheSense)



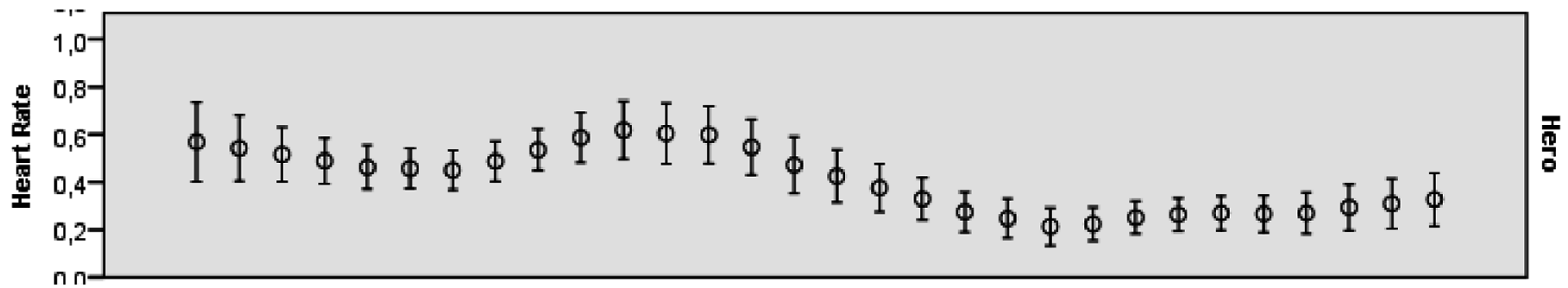
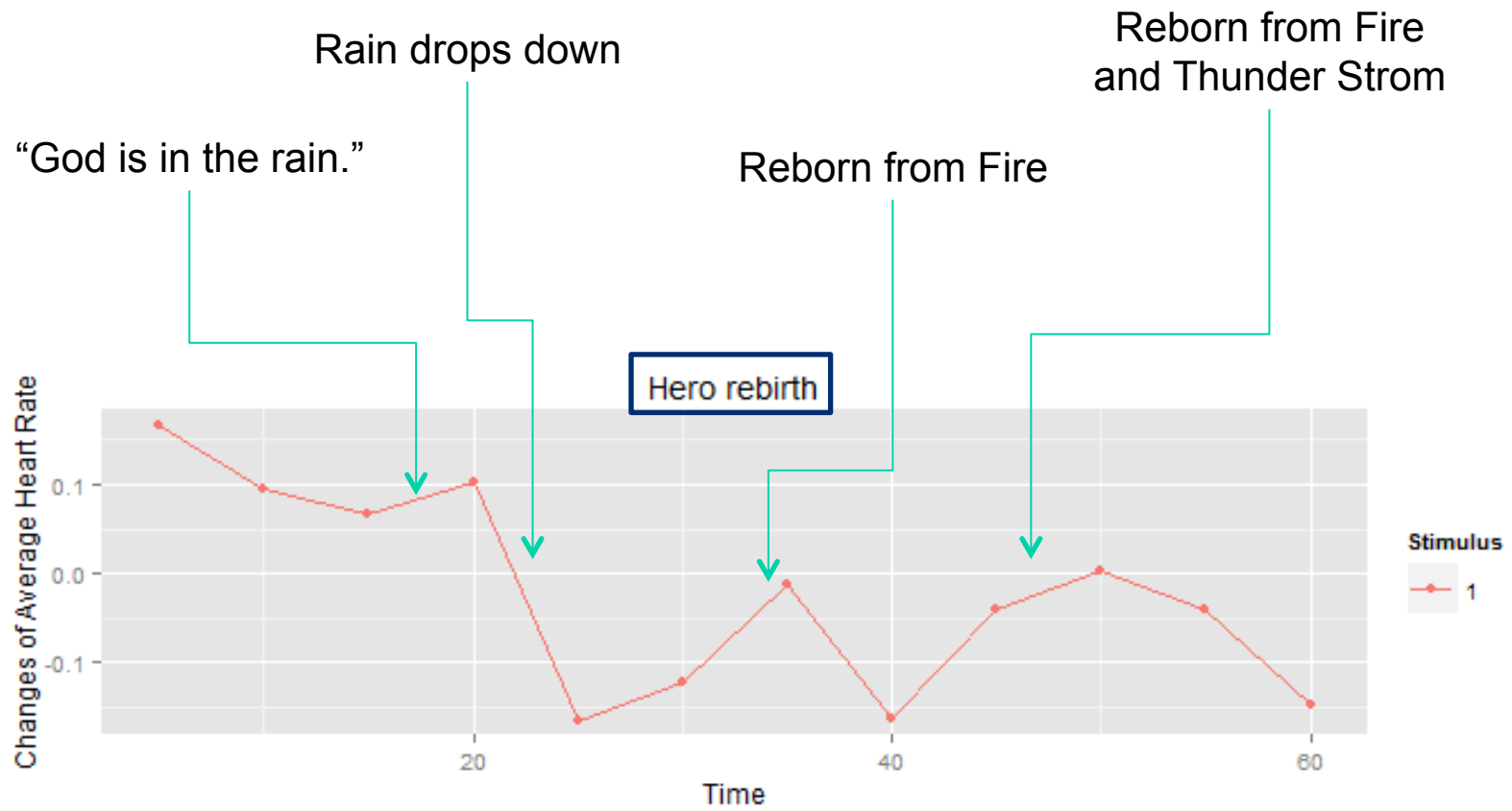
Huang-Ming CHANG

Shared activities

- Generation of ideas
- Statistical analysis
- Writing of articles
- Identification, selection, and preparation of audiovisual stimuli for elicitation of psychological states
- Selection of appropriate questionnaires
- Moodboard application (ArcheBoard)







# Study - results

Comparison of the classification accuracy achieved using the self-report questionnaires and the physiological data (**between-subject** classification).

	Categories of the film clips	Number of states	Self-reports	Physiological data
Archetypes	Anima, hero departure, hero initiation, hero rebirth, hero return, mentor, shadow	7	28.0	36.7
	Anima, hero departure, mentor, shadow	4	42.0	53.3
	Anima, hero initiation, mentor, shadow	4	43.1	57.1
	Anima, hero rebirth, mentor, shadow	4	38.4	52.9
	Anima, hero return, mentor shadow	4	40.6	56.1
Explicit emotions	Active-pleasant, active-unpleasant, neutral, passive-pleasant, passive-unpleasant	5	50.4	50.7
	Active-unpleasant, neutral, passive-pleasant, passive-unpleasant	4	64.9	57.2

**Classification methods:** k-nearest neighborhood (kNN), support vector machine (SVM), naïve Bayes, linear discriminant analysis (LDA), and Adaptive Boosting with decision trees (AdaBoost). Only the best accuracy is reported.

**REF:** Ivonin L., Chang HM., Díaz M., Català A., Chen W., Rauterberg M. (2015). Traces of unconscious mental processes in introspective reports and physiological responses. *PLOS ONE*, vol. 10, no. 4, e0124519 (pp. 1-31). [IF=3.197]

Thank you for your attention.

A door opens for new design challenges...

