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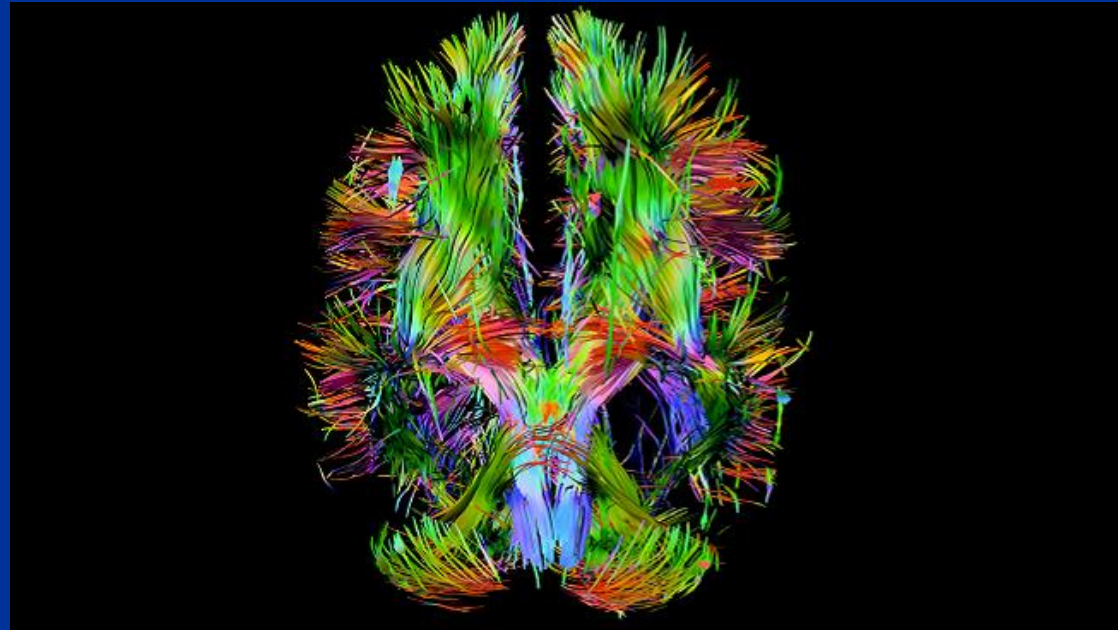
(Plenary)

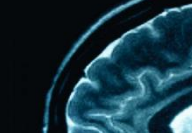
11:50 - 12:10 The Aging Brain, Neuroplasticity, and Cognitive Decline

Neuroplasticity and the aging brain: a neuroethical analysis.



Grant Gillett

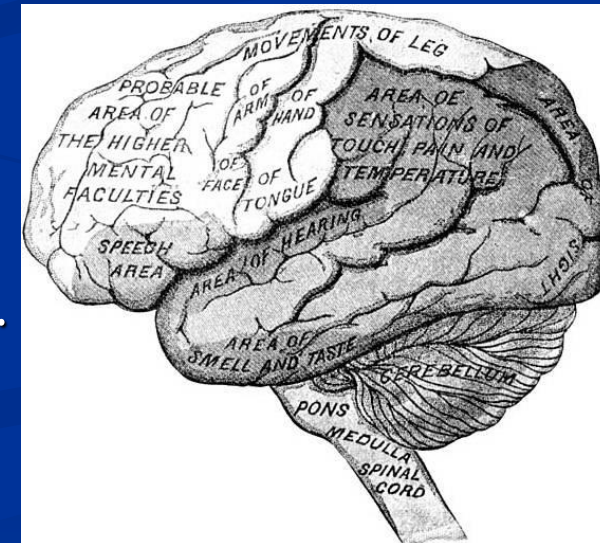


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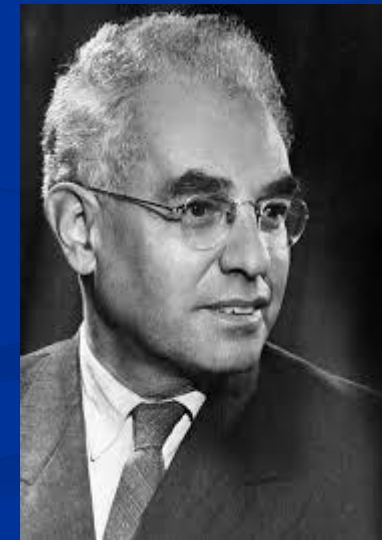
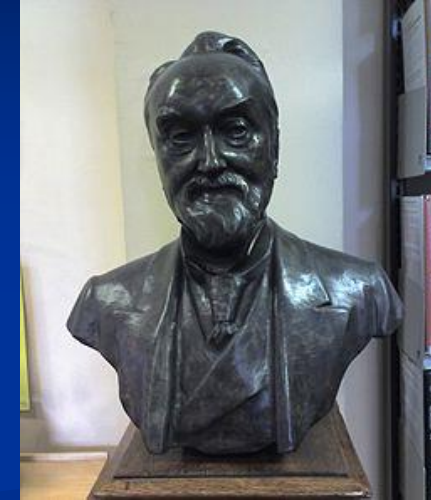
JHJ I: Evolutionary neurology

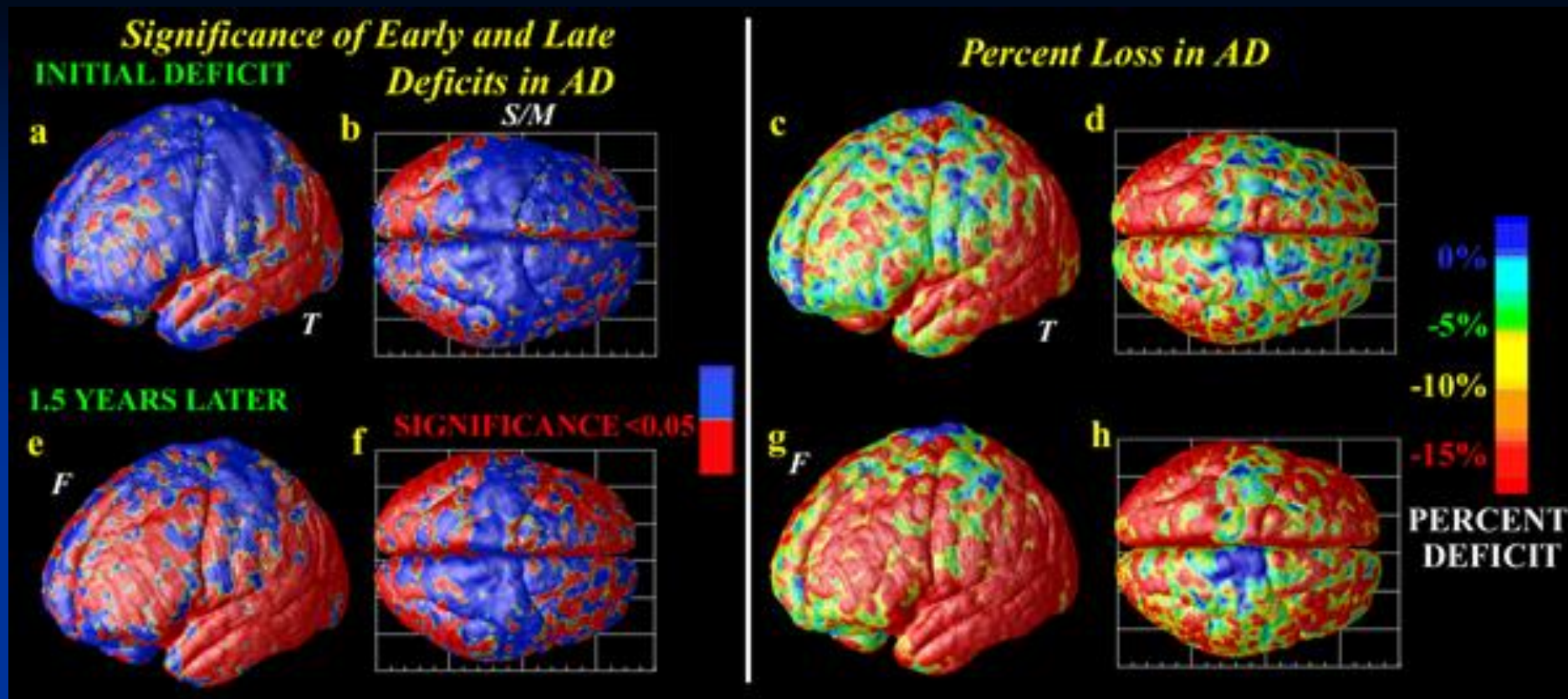
- The integration and coordination of sensori-motor functions as the basis of higher mental life.
- More and more inclusive information gathering so as to represent “impressions and movements of all parts of the body ... in most complex ... combinations ... triply indirectly” (1887, p29).
- Attunement between the organism and the environment with “reservoirs of energy” and “resisting positions” interposed between environmental contingency and organismic response (1887, p32).
- “the whole body is the organ of mind”(1887, 39).
- Neural evolution: neural nets, layers of representational complexification, affordances (Chemero, 2003)



JHJ II: Coordination/integration & subjectivity

- Brain and cognition: “structures of nervous energy organised according to word meanings” (1878, 323)
- The subjective brain: memory, emotion, and reasoning to enact non-automatic acts of will (1887, 41).
- Memory – past experience, present anticipation, practised schemata.
- Emotion is not essentially individual and is built on resonance with others.
- “higher mental processes & speech activity” (Luria, 1973, 93-4) - an intersubjective (or “objective”) world & norms of reason (Mercier & Sperber, 2011)..

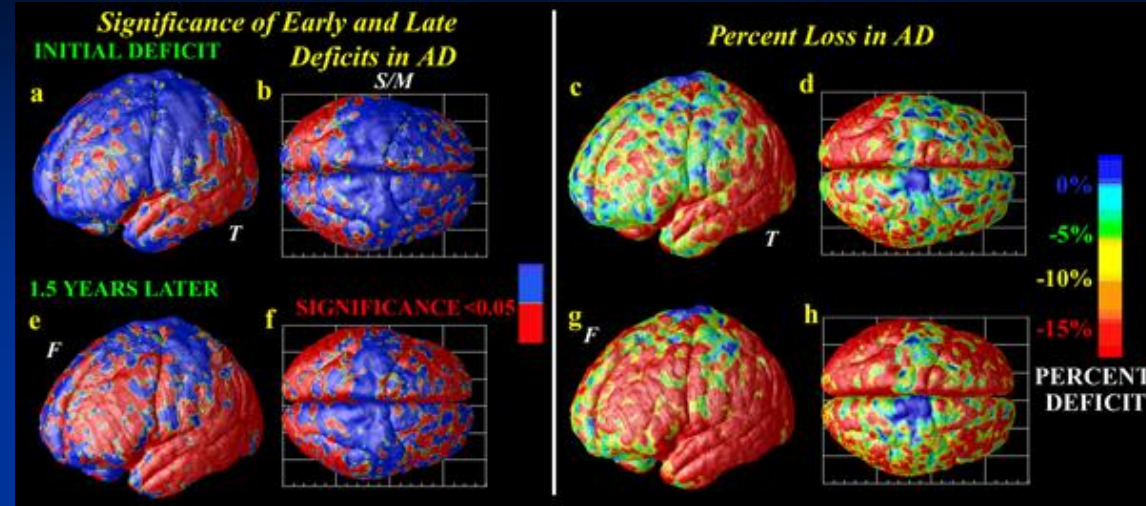




<http://www.nia.nih.gov/alzheimers/publication/2011-2012-alzheimers-disease-progress-report/assessing-risk-factors-cognitive>

A huge loss in association areas and therefore in connectivity in cognitive processing.

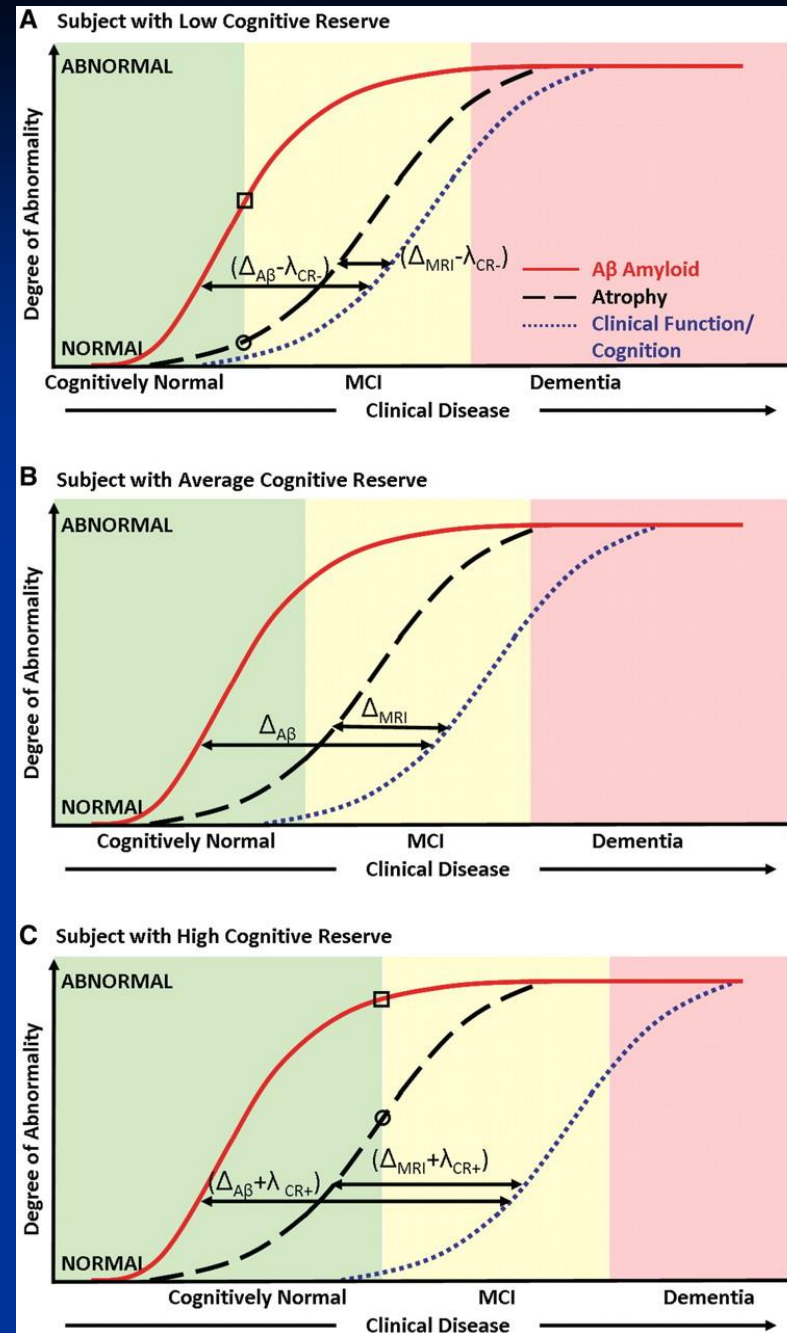
Neuroplasticity and aging I. Brain and cognitive reserve (BCR).



- There is a huge loss in the association areas of the brain and the connecting subcortical regions
- BCR enhances neurogenesis in areas such as the hippocampus and the striatum where new connections are promoted as a result of experience. (Nithianantharajah & Hannan, 2009, *Progress in neurobiology*)
- The Scaffolding Theory of Aging and Cognition: “the cognitive processes ... engage more flexible and individually varied mechanisms” (Goh and Park, 2009 *Restorative Neurology and neuroscience*)

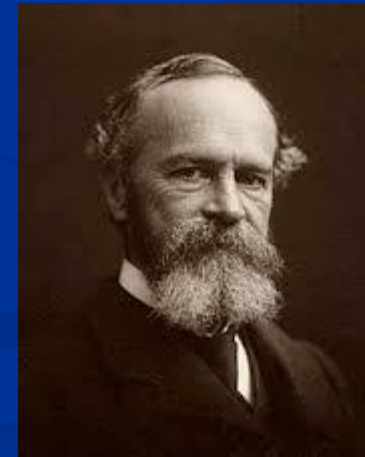
Neuroplasticity and aging II. Brain and cognitive reserve (BCR)

- “There are numerous examples in the literature of neuroimaging data interpreted as evidence of neuroplasticity across a range of behavioural or environmental manipulations ... particularly increased functional connectivity.” (Smith, 2013, *Dialogues in Clinical neuroscience* 13; 3-5.)
 - SSRI
 - DBS (in limbic circuits)
 - Increased complex mental activity (Valenzuela and Sachdev, *Psych med.* 2006)
 - Physical activity and diet (Brunner, *Neurobiol. of Aging*, 2005)
 - Life-style choices, education , leisure pursuits (Whalley et al, *Aging Research Review*, 2004)



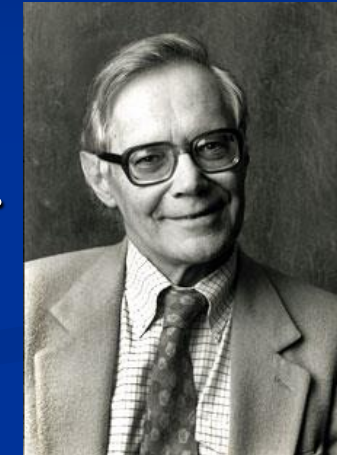
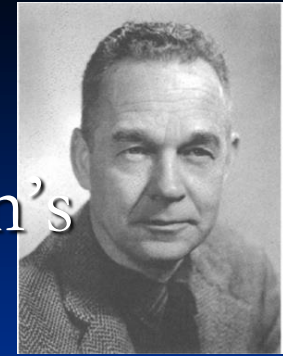
Autopoiesis and neuroplasticity.

- Theory of Neuronal Group Selection (TGNS)
 - Development –experience and affordances.
 - (Hebbian) selection of supra-neuronal structures.
 - re-entry - signalling between the resulting maps
- James: attention - “taking possession by the mind, in clear and vivid form, of one out of ... several possible objects or trains of thought.” (1992,141)



Ecological Psychology

- Neisser, (ex J.J. and Eleanor Gibson's ecological theory of perception) an holistically apprehended flow of haptic information (1976)
 - Perceptible objects and events are meaningful ... afford various possibilities for action, carry implications about what has or will happen, belong to a larger context, possess an identity that transcends their simple physical properties. These meanings can be, and are, perceived. (p71)
- A “hodological map” - the cognition of a being-in-the-world-with-others..



Autopoiesis I.

■ Three tenets:

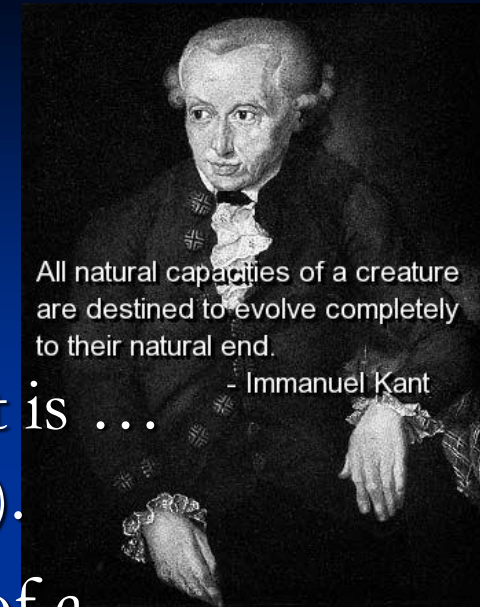
- (1) understanding the complex interplay of brain, body and world requires ... nonlinear dynamical systems theory;
- (2) traditional notions of representation and computation are inadequate;
- (3) traditional decompositions of the cognitive systems into inner functional subsystems or modules ... are misleading. (Thompson and Varela, 2001)

■ Self-organization and emergent processes at multiple levels ... upward and downward causation ... including that of conscious cognitive acts in relation to local neural activity. (T & V, 2001, 421)



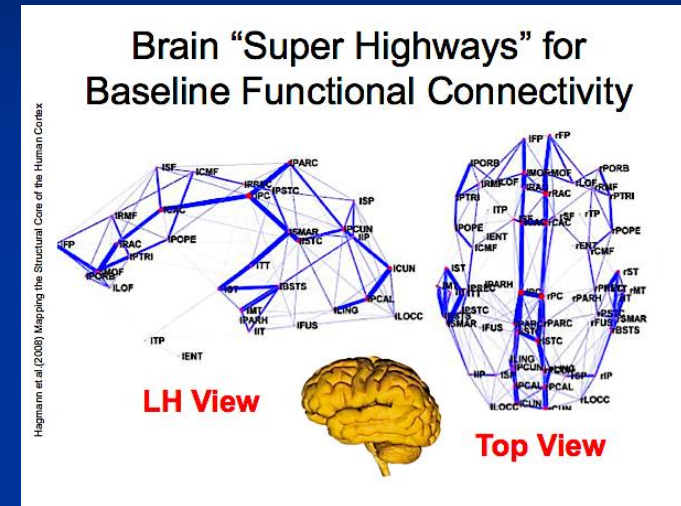
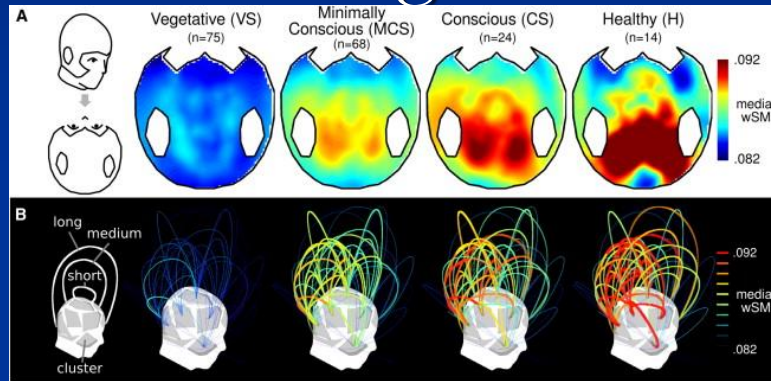
Autopoiesis II.

- “Kant: “natural purposes”:
 - “a thing exists as a natural purpose if it is ... both cause and effect of itself”(CJ, 217).
 - “parts should so combine in the unity of a whole that they are reciprocally cause and effect of each other’s form”(219-220).
 - a caveat : it must take shape “without prejudice to the principle of mechanical causality”(226) through which alone nature can be “mechanically considered ... subject to observation and experiment”(231).



Brain connectivity & consciousness

- “The soul is its objects” (Aristotle) connected by human dealings with them.



- Being conscious of X = integrating/globally broadcasting information as patterns of neural excitation associated with X (Dehaene et al, 2001; King et al, 2013). WMSI. (Weighted Mutual Symbolic Information.)

Ribot: “Le moi c’est une coordination.” (JHJ, 1887, 35)

Shared Circuits of cognition



- The shared circuits model (SCM) – a multi-layered system of mirroring, inhibition, prediction, simulation, and off-line integration.
- Language as triangulation, mimicry, top down restructuring using semiotic markers.
- Propositionising = self declaration + explicitation
> an entrée into a highly mental world of argument about action and a sharing of perspectives.

Con-scio-us-ness and co-constructing the imaginary.

- A creature of biology (flesh) and word
 - *Zoon logon echon* (Heidegger)_{H25}
- A creature who develops resources to bridge between the world of flesh and the mirror world of speech and value.
- Multiple associations serially activated in response to a given stimulus array to extract the various patterns of significance one has learned to detect and use in adaptation (active intellect).
- The mental work of being an engaged human being who lives a story.