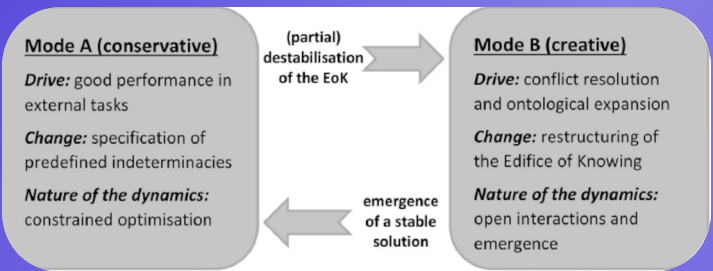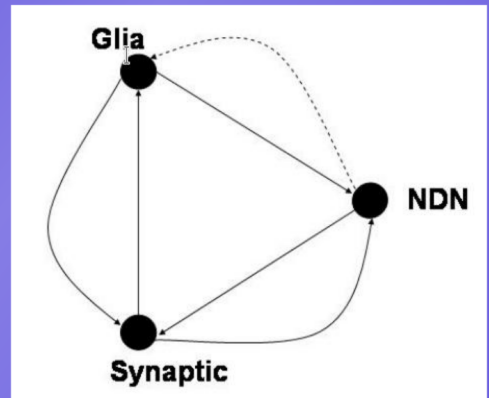## DEFINING INTELLIGENCE.

As per Denizhan (2023), any intelligent system needs to be able to generate new unforeseen models to cope with "unmodelled regimes" of interaction with environment. Since such unmodelled regimes are unforeseeable, they cannot be preprogrammed or accounted for in the phase space of the given system by its construction. Intelligence here, thus, refers to ability to switch from a conservative mode A where the preexistng models suffice, to a creative mode B where new models can be created in a process called "ontological expansion".

Mode A (conservative)	(partial) destabilisation of the EoK →	Mode B (creative)
Drive: good performance in external tasks		*Drive:* conflict resolution and ontological expansion
Change: specification of predefined indeterminacies		*Change:* restructuring of the Edifice of Knowing
Nature of the dynamics: constrained optimisation	← emergence of a stable solution	*Nature of the dynamics:* open interactions and emergence

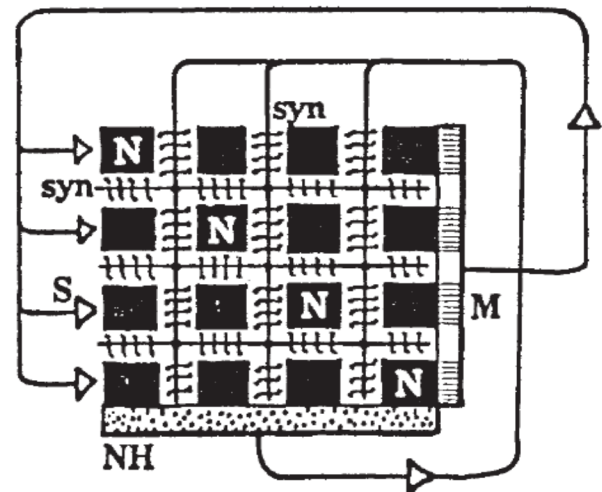# Cybernetic Materials for Theory of
Intelligent Systems

TANGLED HIERARCHY OF INFORMATION TRANSMISSION

Tangled hierarchy (Hofstadter, 1999) refers to a hierarchy of information flow which feeds itself back across "semiotic levels". Different from ordinary feedback loops, such a kind of feedback cuts across the substrate-expression distinction.

Primary example is the transcription from DNA for protein production where DNA determines the cellular apparatus used to transcribe while the cellular apparatus is the one which transcribes leading to a level-crossing of information flow across multiple levels.

By Denizhan's definition of intelligence, intelligent systems necessarily have the ability to modify their phase space, which is only possible by "cross-levelled" or "tangled" feedback as it constitutes the ability to reconfigure/restructure operational substrate in response to its environment.

- Denizhan (2023). Intelligence as a border activity between modelled and unmodelled.
- Hofstadter (1999). Godel, Escher, Bach: The Eternal Golden Braid.
- Kercel (2004). The role of volume transmission in an endogenous brain.
- Von Foerster (1974). Cybernetics of Epistemology.

From Kercel (2004). Above figure represents the morphological relationships between transmission processes in the CNS. Non-synaptic diffusion neurotransmission (NDN) updates the morphology of the synaptic neural network. Similarly, synaptic activity is observed to update the intercellular volume and the morphology of NDN receptors. Glia activity updates both NDN and synaptic morphology. Synaptic activity updates glia morphology.

From von Foerster (1974). Flow of signals in the nervous system from the sensory surface (S) via bundles of nerves (N) and synaptic gaps (syn) to the motor surface (M), which, in turn changes the stimulus distribution along the sensory surface; and, on the other hand, the signal flow from the neuro-hypophysis (NH), whose activity modulates the composition of the steroids in the synapses, hence, the operational modalities within the various bundles of neurons.