Large-Scale Brain Modeling

Jerome Swartz

The Swartz Foundation

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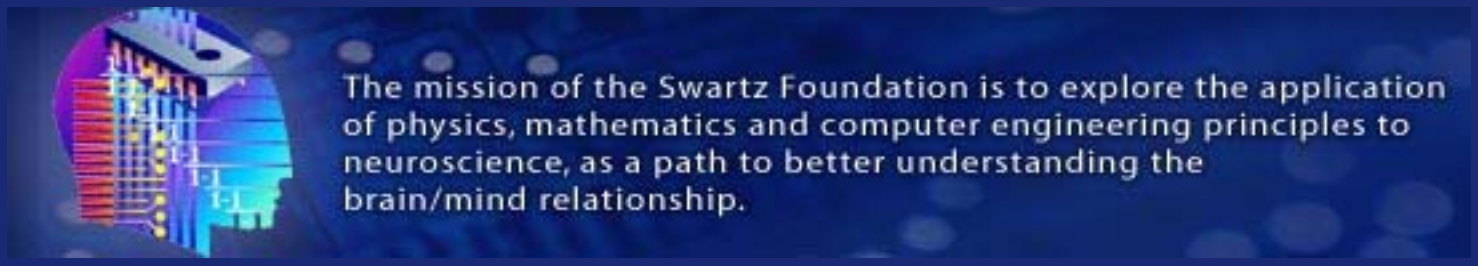


Why model the brain ?

- Science IS modeling
- Models have power
  - To explain
  - To predict
  - To simulate
  - To augment

… the next research frontier

- Brains are active and multi-scale / multi-level
- The dominant multi-level / multi-layer model…

Computers

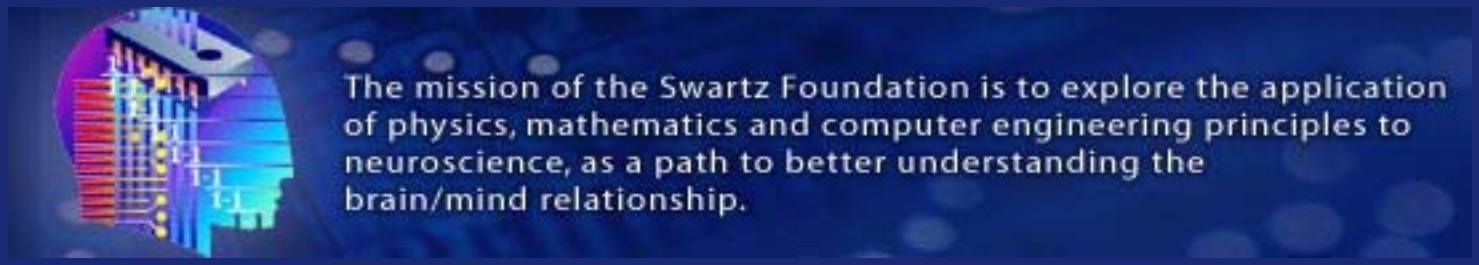
- Physical and logical level hierarchy – “brain stack”
  - Physical / implementation levels
  - Logical / instruction levels

Brains are not computers …

- But they are supported by the same physics
  - ✓ Energy conservation
  - ✓ Entropy increase
  - ✓ Time direction
- And by the same logic…implemented differently
  - – Low speed, parallel processing hardware model (not software)

The research must be multi-level… both scientific and mathematical

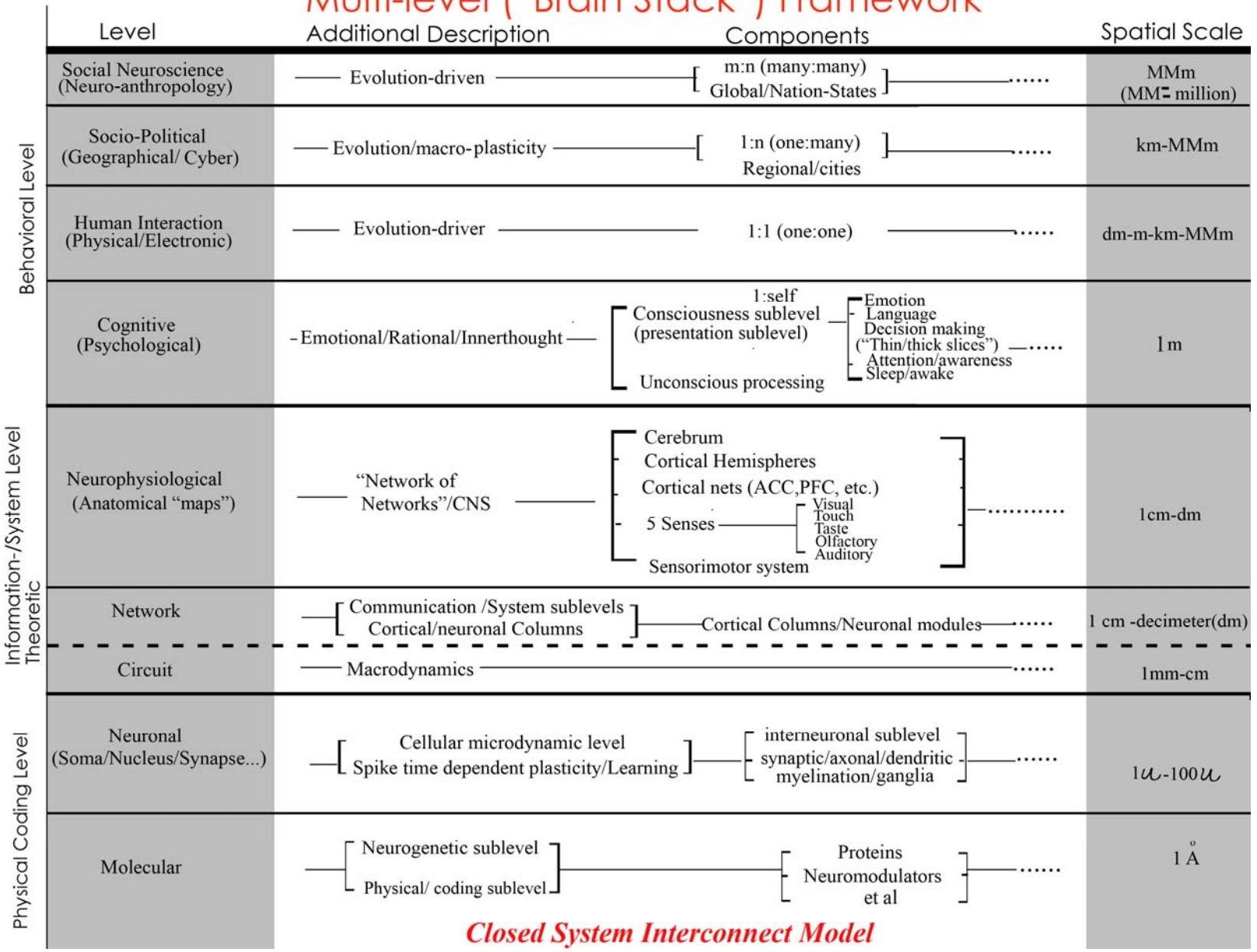
- To understand both theoretically and practically how brains support
  - Behavior
  - Experience
- To model brain / behavior dynamics as *Active, require*
  - Better behavioral measures and modeling
  - Better brain dynamic imaging measures
  - Better brain ←→ behavior analysis



The research must be multi-level… both scientific and mathematical

- Collaboration is needed
  - Across spatial scales
  - Across time scales
  - Across measures
- Current field borders should not remain boundaries…*curtail Scale Chauvinism*

Multi-level ("Brain Stack") Framework



Banbury Conference, Spring ‘07

Proposed topic

“UNCONSCIOUS MENTAL PROCESSING”

(Behavioral psychology / comp neuro modeling)