Human Brain Project

From the experimental bench to the platforms: providing/using data and models

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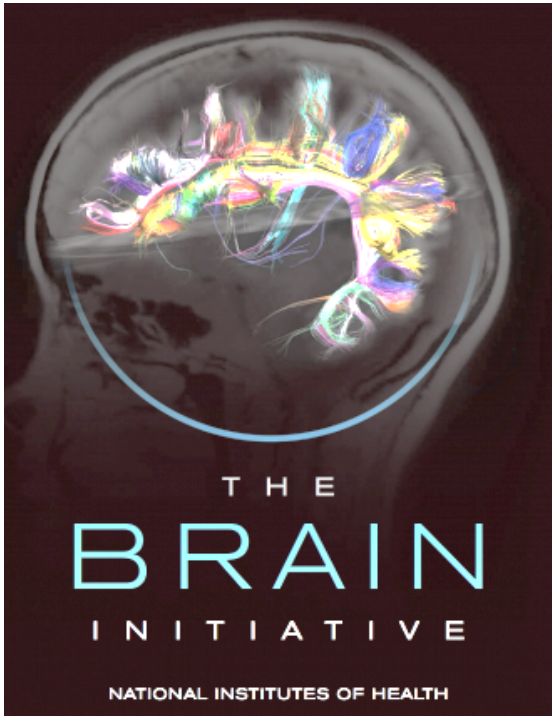
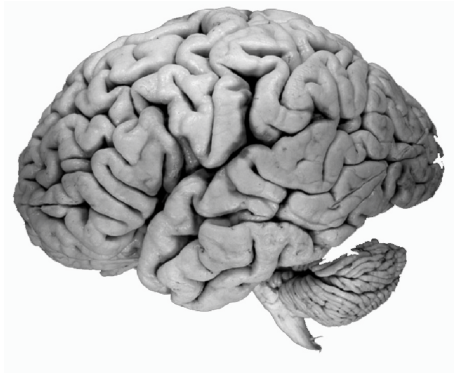
1. Why having the HBP at all when we can do our own good research independently or in small collaborative consortia?



- NEED
- POSSIBILITY



China Brain Project
Japan/MINDS
Korean Brain Inititiative
Brain Canada
Australia Brain Alliance
Israel Brain Technologies

ALLEN INSTITUTE *for*
BRAIN SCIENCE

Human Brain Project

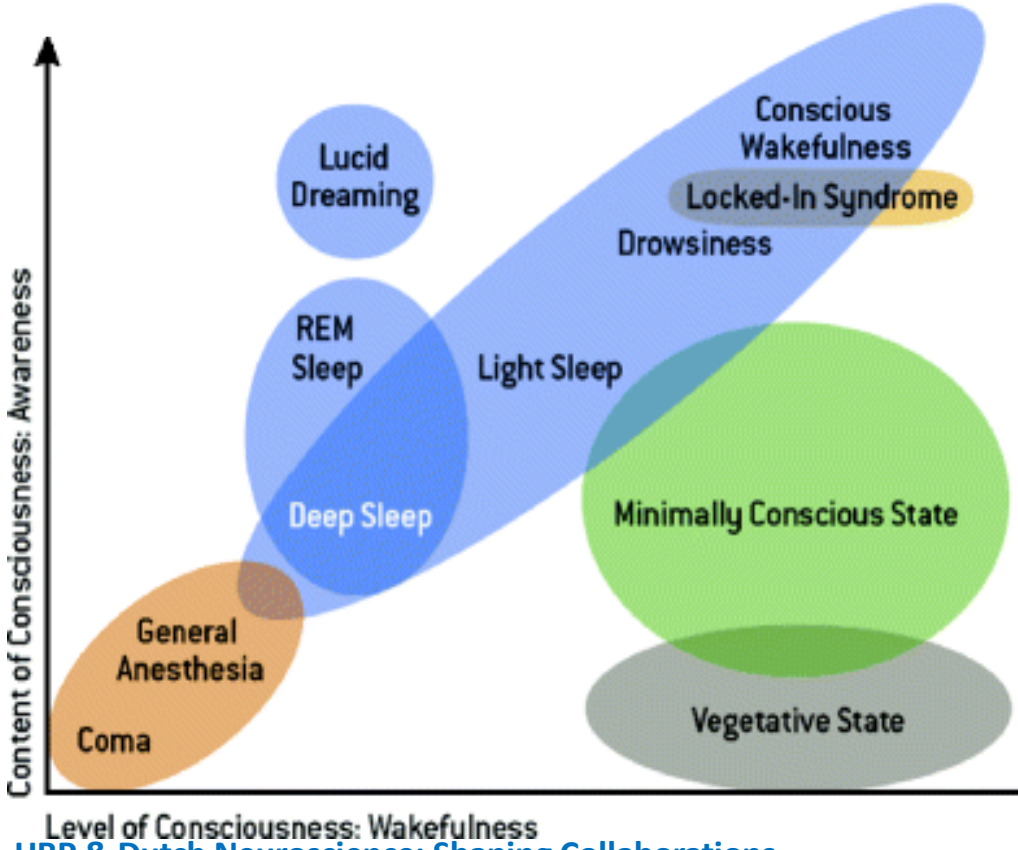
Elon Musk's brain-computer interface company raised $27 millionand is looking for plenty more

NEWS
FACEBOOK WANTS TO READ YOUR MIND.
Giraffe Social Media

2. Does this mean that independent research, small groups, individual drive and intellectual curiosity should be erased in favour of some kind of "industrial, top down-organized neuroscience"?

3. Can collaborative neuroscience (+platforms) in HBP allow us to reach objectives that we cannot reach on our own?

WP 2. Networks underlying brain cognition and consciousness



- How does the network transition between states?
- Are they linear/non linear transitions?
- What are the markers?
- How is network complexity changing?
- What are the mechanisms?
- Can we induce exogenously those transitions?
- How do we model the different states?
- What constraints do they impose on network?
- How is processing in the different states?
- How is plasticiy in those states?
- How to model plasticity during sleep?
- What are the behavioral /cognitive correlates?

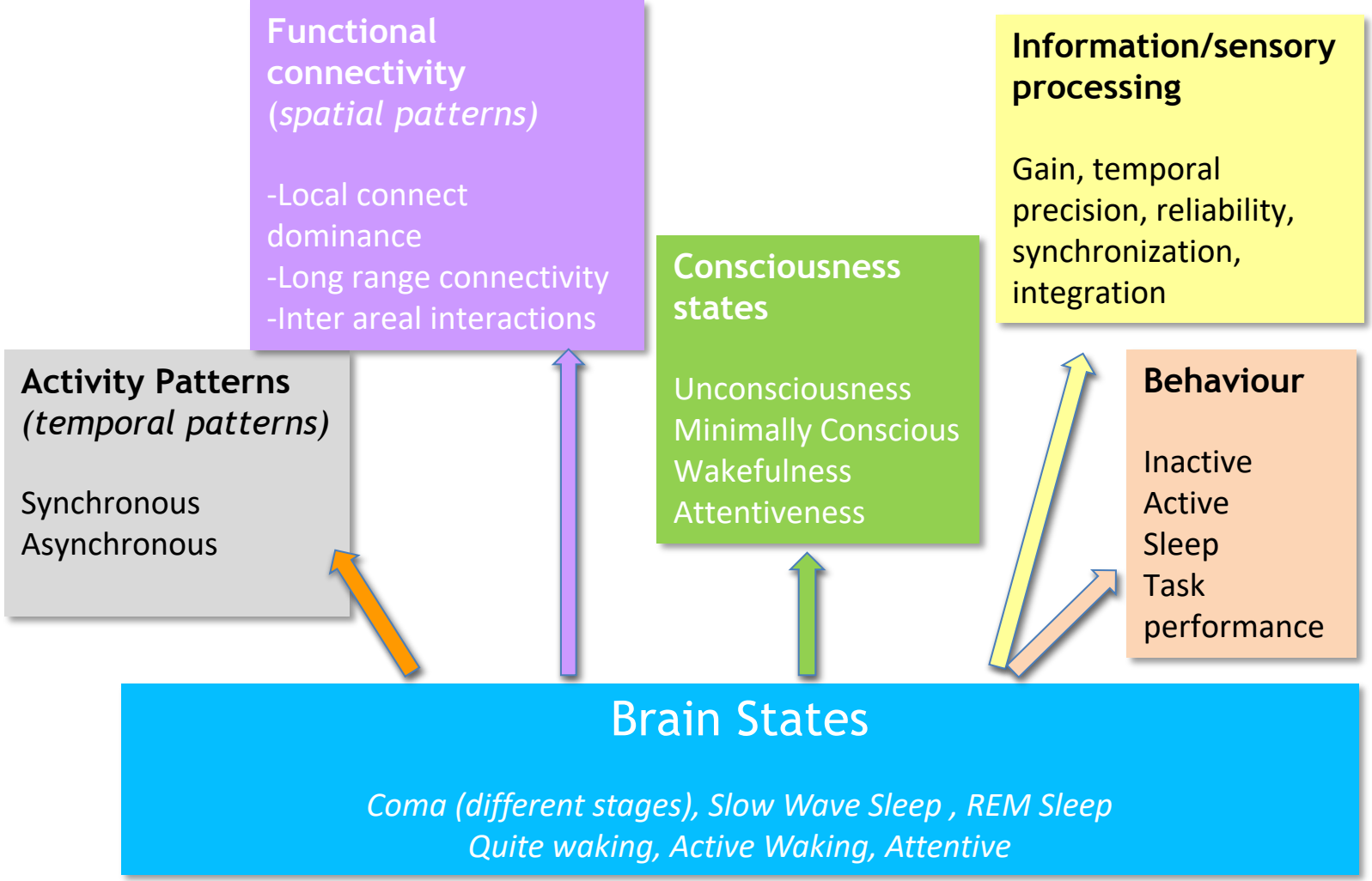
RELEVANCE FOR BASIC RESEARCH, COMPUTATIONAL NEUROSCIENCE AND CLINICAL VALUE (diagnoses, treatment)

Thalamo-cortical

Brain stem

Vegetative = Unresponsive wakefulness syndrome

Co-funded by the European Union


Functional connectivity
(spatial patterns)
-Local connect dominance
-Long range connectivity
-Inter areal interactions
Information/sensory processing
Gain, temporal precision, reliability, synchronization, integration
Consciousness states
Unconsciousness
Minimally Conscious
Wakefulness
Attentiveness
Activity Patterns
(temporal patterns)
Synchronous
Asynchronous
Behaviour
Inactive
Active
Sleep
Task performance
Brain States
Coma (different stages), Slow Wave Sleep , REM Sleep
Quite waking, Active Waking, Attentive

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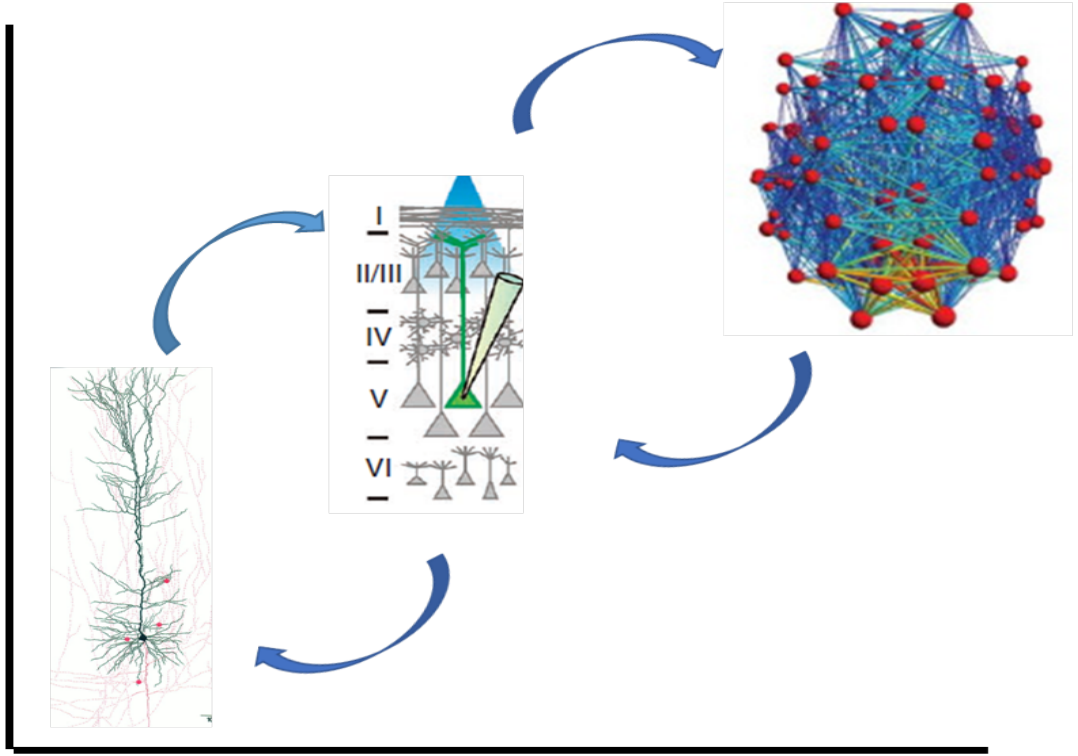
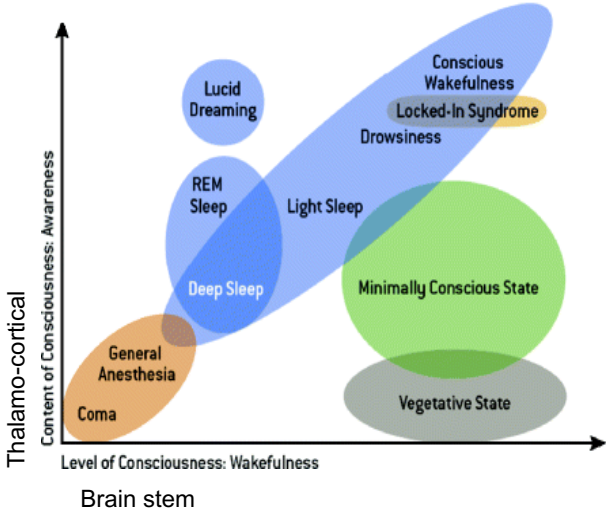




- Multiscale
- Multi-species
- Multi-technology
- Experimental data and computational modelling
- Multiscale modelling
- (from cell to full brain)

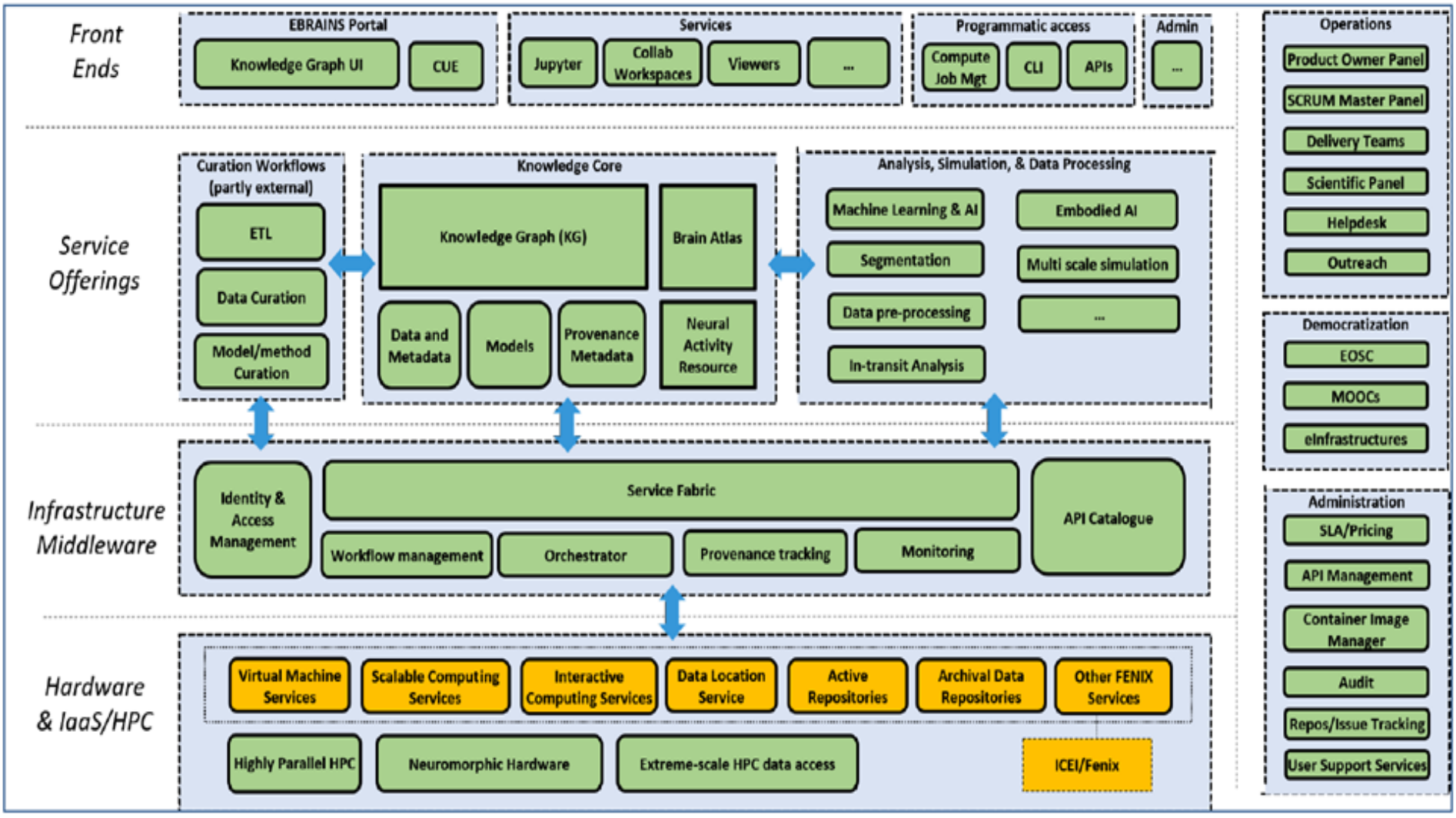
Human Brain Project

Large collaborative papers, “live papers”

Multiscale investigation of brain states

Multisensory integration for object representation and recognition

Feedforward and feedback interactions for perception


Front Ends
EBRAINS Portal
Knowledge Graph UI
CUE
Services
Jupyter
Collab Workspaces
Viewers
...
Programmatic access
Compute Job Mgt
CLI
APIs
Admin
...
Operations
Product Owner Panel
SCRUM Master Panel
Delivery Teams
Scientific Panel
Helpdesk
Outreach
Service Offerings
Curation Workflows (partly external)
ETL
Data Curation
Model/method Curation
Knowledge Core
Knowledge Graph (KG)
Brain Atlas
Data and Metadata
Models
Provenance Metadata
Neural Activity Resource
Analysis, Simulation, & Data Processing
Machine Learning & AI
Embodied AI
Segmentation
Multi scale simulation
Data pre-processing
...
In-transit Analysis
Democratization
EOSC
MOOCs
eInfrastructures
Infrastructure Middleware
Identity & Access Management
Service Fabric
Workflow management
Orchestrator
Provenance tracking
Monitoring
API Catalogue
Administration
SLA/Pricing
API Management
Container Image Manager
Audit
Repos/Issue Tracking
User Support Services
Hardware & IaaS/HPC
Virtual Machine Services
Scalable Computing Services
Interactive Computing Services
Data Location Service
Active Repositories
Archival Data Repositories
Other FENIX Services
Highly Parallel HPC
Neuromorphic Hardware
Extreme-scale HPC data access
ICEI/Fenix

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THANK YOU!

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