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New Chemistry News

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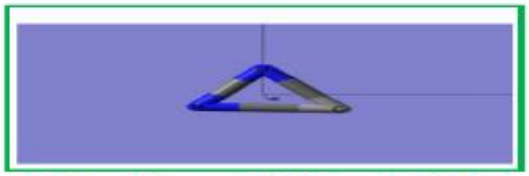

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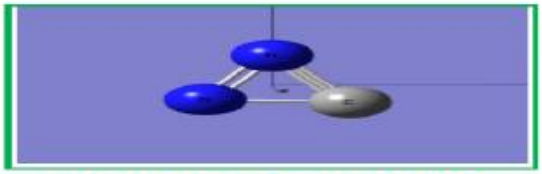

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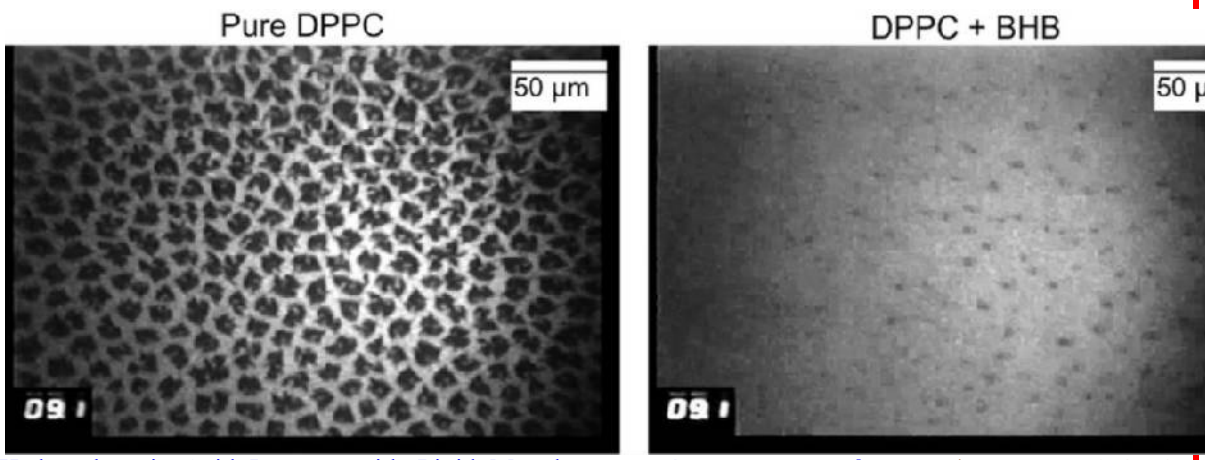

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Object oriented terminology (OOT)

Consciousness

Consciousness concept evolution	[Cultures of human race; Philosophy; religion; Science]
Different aspects of consciousness	[Pain, visual awareness, self-consciousness]
Science	[Physics; Chemistry, Neuro Biology;] ; [Intelligence [Artificial, natural, nature]]
Science of Consciousness	Hypothesis : 🕮 Neuronal processes in head correlate with consciousness with high probability [Crick, Koch, 1998] 🕮 Brain (neurons firing) and consciousness have a relationship 🕮 **Evidence:** Global patients with neurological deficits/diseases offer reasonable scientific verification
Consciousness generation	✓ Involves, low amplitude interactions in the thalamocortical core of the brain ✓ They are widespread, relatively fast

Intriguing questions in Consciousness ? Why does it exist? ? What does it do? ? How could it possibly arise from neural processes in brain?	> Genetic instructions are 🕮 Localized 🕮 Coded in a relatively straightforward manner > Genes influence ! Control complex behavior of a typical mammalian cell

Experience-memory-mind- ….. -complex interactions –consciousness

Experience alone does not produce consciousness

- 🕮 Successful forecasting of a hurricane is based on known current laws explaining partially our universe. Yet, prediction can lessen damage through catastrophic management strategies developed from experience, extrapolation etc. But, one cannot avoid hurricane; leave aside creation of it;
- 🕮 Same analogy applies also to the causal features of consciousness as
  - o Some of components of Consciousness, its effects, perturbed consciousness due to diseases, environment, corrupted thoughts, mind are known in small numbers of humans, animals etc.

Consciousness	It is everything of one's experiences. Examples are 🔔 Tune stuck in the head 🔔 Sweetness of chocolate mousse 🔔 Throbbing pain of a toothache 🔔 Fierce love for one's own child 🔔 Bitter knowledge → all feelings will end
Consciousness	Human perception of what passes in his own mind, or awareness of an external object or something within oneself (Wikipedia) 🕮 visual scene → seen by eyes ! The brain needs to form a conscious representation. This is a slower and subjective process ! Usable for many different actions or thoughts
Consciousness	It is not a thing but a process 🕮 Mathematical: discrimination in the N dimensional space N: Different neuronal groups that are active in the dynamic core at any given time with varying 🕮 Ability to ! Perceive relationship between one's self and environment ! Ability to process, store and act on information gathered from the external environment ! Be aware of things 🕮 Causal for emergence of cognizance beyond knowledge 🕮 Consciousness emerges from ! Underlying processes over life time ! No divine interventions
Consciousness	**Subjective experience** 🔔 "What it is like" To 🔔 Perceive a scene 🔔 Recognize a face 🔔 Hear a sound 🔔 Reflect on experience itself (Tononi et al., 2016a). Tononi G, Boly M, Massimini M, Koch C (2016)
Consciousness	Feeling ! Whether an experience is pleasant or unpleasant ! Help to judge whether other individuals are suffering

Consciousness	Information (reduction of uncertainty among a number of alternatives) (brain) + consolidation +Subjective experience + emotions → Consciousness (Cick--1995- SciAmer)

In and out of (Human) Consciousness

? What is consciousness? ? What is not consciousness ? ? Attention with consciousness ? Attention without consciousness ? What is unconsciousness?	? Conscious perception versus unconscious perception ? Conscious action versus unconscious action

? Does consciousness exist in all life forms

Human beings; animals [dolphins; monkeys; [dog; cat; rat;] ;]; birds[parrots]; flies[honeybees]; plankton [phyto-; zoo-;], virus; uni-cellar lifeforms

? What is equivalent to consciousness in non-life forms

? Brain constructs a scene/face/incident through complicated route in dream. How significantly different if Consciousness component is present?

Consciousness
! Humans
! Animals
! Non-Life
! Universal

Categories	[Emotional; self-; visual] Consciousness
Self-consciousness	🕮 Self-referential aspect of consciousness — Difficult to study self-consciousness in a monkey
Consciousness	[Wakefulness (level of consciousness) awareness (content of consciousness)]

Unconscious action	Information is localized to the specific sensory motor system involved typing fast, It is automatic action
Conscious action	Brain has access to that information.

Consciousness	unresponsive subjects ; responsive subjects ; [during anesthesia during complex partial seizures] [wakeup, sleep [REM, NREM], dream, deep sleep, Coma] engagement of various cognitive processes, [attention, decision-making, and reporting] Consciousness [presence; absence] Presence of consciousness across different Physiological or pathological states

Consciousness $$	

Existence	Yes, Exists
Location	Where is it present in human body? {Brain; } Claustrum; [cortex, [prefrontal, Frontal ; medial-temporal]
DNA	Conscious perception, experience, complex intrinsic integration (mixing)
Genesis	Do some nerve cells vibrate at some magical frequency? Do some special "consciousness neurons" have to be activated? In which brain regions would these cells be located?
Origin, sustenance	How it starts? How maintained?
Get affected?	What are pathological factors affect consciousness
Artificial Consciousness	Does it exist ?
Propagation	Does it also be transmitted to progeny like genetic material? Is consciousness transferable from one human to another human (like blood, organs etc.) ?
Local/global	Is there anything like Universal consciousness? If so can a human tap that/ and can he merge his with Universal

Termination
Does Consciousness die with ?
? Brain death
? Death of individual
? Cell death

Consciousness correlates with
! Degree of complexity of any nervous system
> Deals more slowly with broader, less stereotyped aspects of the sensory inputs (or a reflection of these in imagery)
> Takes time to decide on appropriate thoughts and responses

consciousness	- Science based theories lack the explanation of the subjective experience, while - Phenomenology based theories lack the objective experience. A combination of both disciplines can bring a compelling inter-disciplinary correlation explaining the 'How' and 'Why', ✓ Deals with both the subjectivity as well as the objectivity of a consciousness experience

Perception	Seeing	We experience visual sensations, Such as that of vivid blue
	Hearing ineffable sound	Unhappiness
	Vision/sound Smile of a baby	Sparkle of happiness
	Thought of an intense pain	Agony

Consciousness

Easy (Soft) problem

- ? How can a human subject discriminate sensory stimuli and react to them appropriately?
- ? How does the brain integrate information from many different sources and use this information to control behavior?
- ? How is it that subjects can verbalize their internal states?

- Easy problems are by no means trivial

Hard problem

- ? How physical processes in brain give rise to subjective experience.
- Cannot be solved now with today's science, tools, theories etc.
- ! Not unsolvable; They can be solved with great toil in future

Hard problem Can be decomposed into

- ? Why do we experience anything at all?
- ? What leads to a particular conscious experience (such as the blueness of blue)?
- ? Why are some aspects of subjective experience impossible to convey to other people (in other words, why are they private)?

Categories of Consciousness

Quantum	Consciousness	Supports objective experience of consciousness ➔ Reduces to existence ➔ creation of a conscious moment through a computational event [(Hameroff and Penrose 2014)]
Subjective	Consciousness	✓ known as qualia or the "hard" problem of consciousness ! subjective consciousness is supernatural, mysterious, mystical and totally phenomenal
Objective	Consciousness	✓ Can be understood from a mechanistic point of view, - Problematic as factors that influence it are many
Phenomenal	Consciousness	It is an experience of consciousness, feelings, emotions or qualia (Block 2007). It is a hard problem
Access	Consciousness	Purely mechanistic or cognitive; that which is measured
Higher order	consciousness	Liberates imagination and opens thought to the vast domains of metaphor. It can even lead to a temporary escape
Primary	consciousness	Ability to generate a mental scene in which a large amount of diverse information is integrated for the purpose of directing present or immediate behavior The four requirements of primary consciousness ▶ Perceptual categorization ▶ Development of concepts ▶ Value-category memory ▶ reentrant processes

Evolution of understanding of Consciousness

Consciousness research	Considered as	
Last century	Philosophical problem	
1950s	Scientific issue	Tools are inadequate
1970s	Started probing	AI tools, theorical/experimental neurobiology, brain surgery
2000-	Viable theories	Explanations; finding gaps, holes, newer perceptive

Sentience

🕮 18th century philosophers	🕮 To distinguish the ability to think from the ability to feel
🕮 Modern Western philosophy	Ability to experience sensations
🕮 Eastern philosophy	🕮 Metaphysical quality of all things that require respect and care
🕮 Now	🕮 Capacity to feel, perceive or experience subjectively

Theories Consciousness

- Integrated information theory (IIT)
- Global Neuronal work space (GNN)
- Neural Darwinism
- The dynamic core hypothesis (TDCH)
- Field
- Future_ultimate_theory

- Science based theories lack the explanation of the subjective experience, while the
- Phenomenology based theories lack the objective experience.

> **Remedy:** combination of both disciplines can bring a compelling inter-disciplinary correlation explaining the 'How' and 'Why', which would deal with both the subjectivity as well as the objectivity of a conscious experience

Neural correlates of consciousness (NCC) ((Crick and Koch, 1990), Koch et al., 2016).

- Minimal neural mechanisms jointly sufficient for any one conscious percept.

Full (Union of all content-specific) NCC

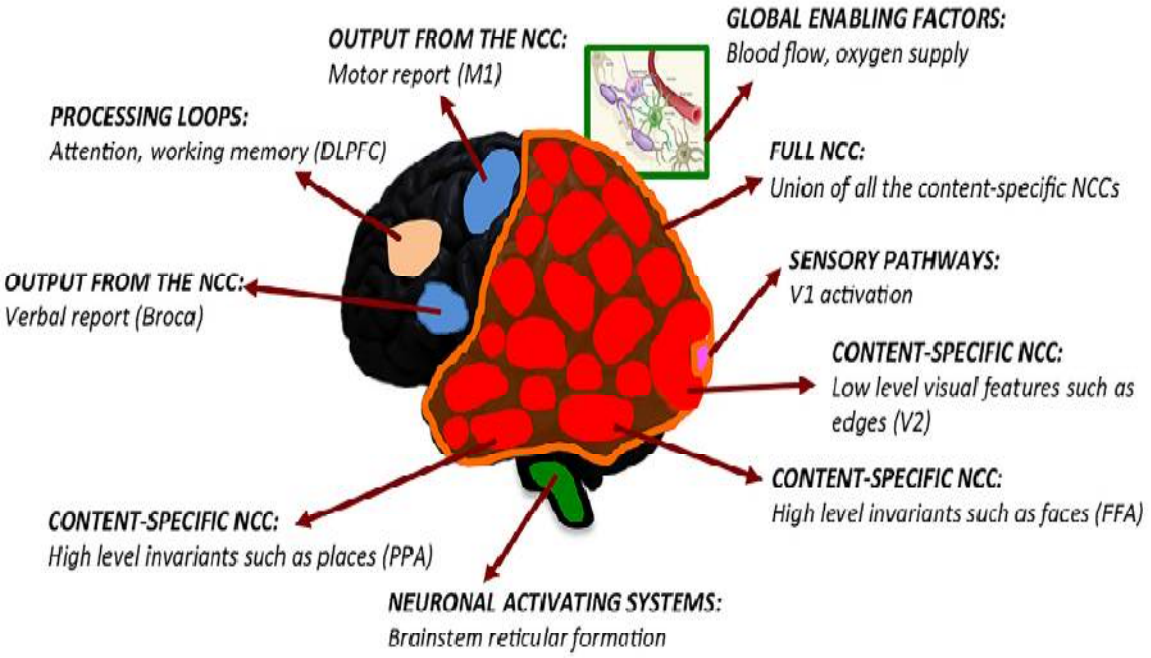
Experimentally, the full NCC can be identified by comparing conditions where

- Consciousness as a whole is present versus absent
  - Dreaming versus dreamless sleep
- Various unusual states
  - Hypnotic state
  - Lucid dreaming
  - Sleep walking

The dynamic core hypothesis (TDCH)

- Extension to Edelman's original theory of ND

Neural correlates of consciousness (NCC)



- V1: Primary visual cortex; V2: secondary visual cortex; A: parahiocampal place area; M1: primary motor cortex
- Low-level visual features, faces, or places within consciousness.
- Level of global enabling factors of consciousness (green): [Energy source [blood flow; oxygen supply], neuronal activating systems [brainstem reticular formation]]

Riddles awaiting a final word with scientific accuracy and natural experience	
Pessimistic scientists	Consciousness is inaccessible
Wetness of water	? **Hypothesis:** Wetness is a consequence of intermolecular interactions (mostly hydrogen bonding) ! Two or three molecules of H2O are not wet ! Wetness emerges with gazillions H2O molecules together at the right temperature and pressure
Laws of heredity	! Emerge from the molecular properties of DNA, RNA and proteins
Mind	! Arise out of sufficiently complex brain processes → theater of one's subjective experience.
Consciousness	! Accumulation of several conscious perceptions, brain integration, interaction of nets of complicated neural nets of several parts of brain, … of a genius to dullard through a common man

Thermostat	Embodies some information	Is it conscious? No

Cognitive functions	Attention, working memory, task execution	Is it conscious? No

Future_ultimate_theory

- ✓ To explain/predict conditions for a
- ? Physical system (complex circuit of neurons or silicon transistors, uni-cellular-to-humans-through-every life/non-life form) has experiences, pools-up consciousness
- ? ….

Knowledge	Components	Features
Deeper level of knowledge	[Energy; atoms; genes]	▪ Increasing differentiation; ▪ Reaching more and more fundamental level

Human life	
Life	Arises from coordinated interactions (physics-based, chemical, physico-chemical, biological) between moieties consisting of chemical elements across the periodic table. The physical, chemical and bio-chemical (macro, nano-, micro) processes in varying spatio-temporal/energy scales inside body (cells to organs) and outside (physical environment) over widely varying time scales (pico-,micro- milli, sec and minutes-to-hours)
Humans	[Body; Brain; Mind; Consciousness]

End-of-Life	[Physical, brain, cell]
Death	If an individual sustains 🕮 Irreversible cessation of circulatory and respiratory functions or 🕮 Irreversible cessation of all functions of the entire brain, including brain stem
Species (with life and without life Known to science on earth) under extraordinary conditions Establishing that they experience life is a grave challenge to the clinical arts. Think of an astronaut adrift in space, listening to mission control's attempts to contact him. His damaged radio does not relay his voice, and he appears lost to the world. This is the forlorn situation of patients whose damaged brain will not let them communicate to the world—an extreme form of solitary confinement	
Body-Brain-Mind-Consciousnes	

Mind	> It is like a (clean) slate or empty space (vessel) at birth (tabula rasa) i.e. in spatio-temporal domain > Derives everything from outside sensations > With learning, ideas are populated continuously by experience, reflection and association > Everyday objects viz. machines, implements, animals or people; discipline dependent (mathematics, Chemistry), discipline independent (meta-logic), religious (ideas of God, spirit), government imposed (justice), science (self) are accumulated i.e. None of ideas are not innate. ? How the mind carries out these tasks/transformations/consolidations had been a mystery [even for Descartes, Hobbes et al. Locke postulated that God had superadded active forces to brain matter] ? How mere brain matter could think, reason or speak was inexplicable even for combination of mechanics and chemistry of the day.

	(Human) Senses & sense organs
Human senses	[Vision; Hearing; Smell; Taste; Touch]
Human input (sense) organs	[Eyes; ears; Nose; Tongue; Skin]
Human output (sense) organs	Speech organs, or articulators (mouth, tongue etc.)
Functional range of sense organs	Vision : [visible region (350-700nm of Electromagnetic spectrum] Hearing (Audible : [20 Hz to 20 kHz (frequency cycles per second) [0 to 80 dB (decibels); (loudness i.e. Resulting change in air Pressure] Smell : [1 trillion scents] Tastes : [sweet, sour, bitter, salty; umami or savory taste]

Universe: [Energy; → Matter; → Life ← ←]

Universe	[Visible; invisible] [origin; evolution [yester_ years, now, Future]]
Visible	[Energy; material [matter; antimatter]]
Matter	[atoms; molecules [in Nature; man_made]]
Molecules	[Nature_made; synthetic_mimicking natural; exotic]
Materialistic	[Life; non-life;]

Laws of spatio-temporal phenomena (in Universe) prosed (by Human experts)

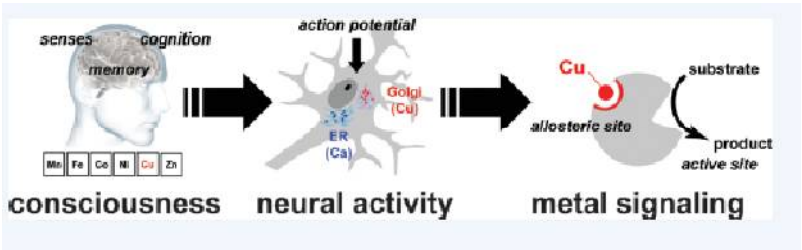
Laws	Level
Physics	[Classical, Quantum , Nano]

Space-Time	Space (3D-), Time(1D-)
ST-matter (or phenomenon)	ST(4D-)-(molecule to macroscopic moiety)
Consciousness research support paradigms	[Quantum Physics, Mathematical Logic, Philosophy, Biology, Psychology] → known/unexplored/unknown arenas of consciousness → construction of reality
Chemical	[Nano-; microscopic; macroscopic] [gas, solvent, solid matrix] static/dynamic laws
Biological	Structure-function-stability of components as well as whole --- a single live-species
Future	New ones for unaccounted behavior after applying existing ones
New paradigm	Standard model comprising existing ones and additional ones

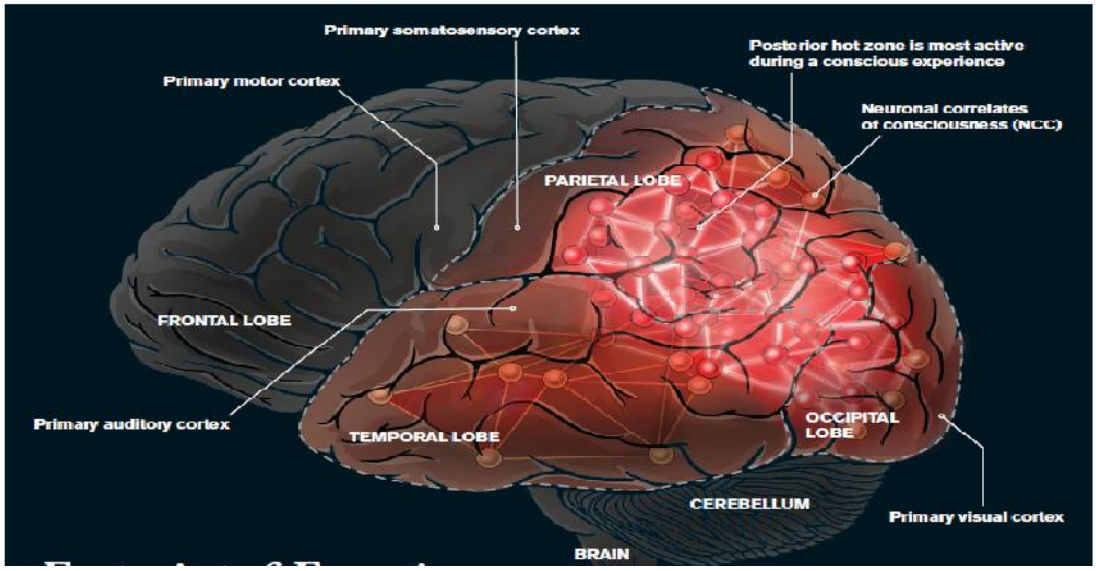
(Human) brain & Anatomy

	Major parts of brains
Celebrated cerebral cortex	🕮 Outer surface of the brain 🕮 It is a laminated sheet of intricately interconnected nervous tissue, The size and width is like a 14-inch pizza. 🕮 Two of these sheets, highly folded, along with their hundreds of millions of wires—the white matter—are crammed into the skull
Frontal cortex	✓ Crucial for intelligent behavior and cognitive control ▪ Its involvement in consciousness remains a matter of debate (Koch et al., 2016)
Posterior cortex	Hot zone resides 🕮 Origin of almost all conscious experiences o Perception Ex: images of Trump or Clinton

Claustrum-lesions

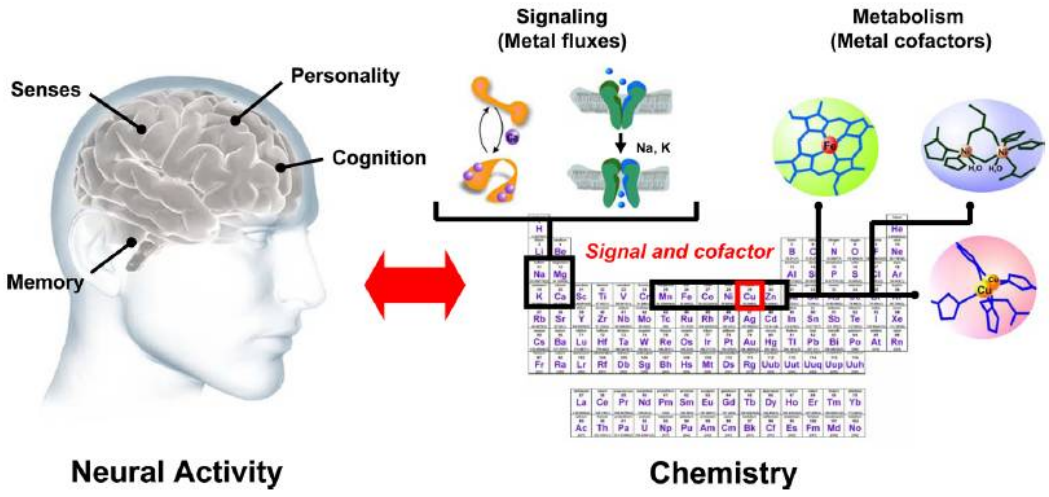


Human brain

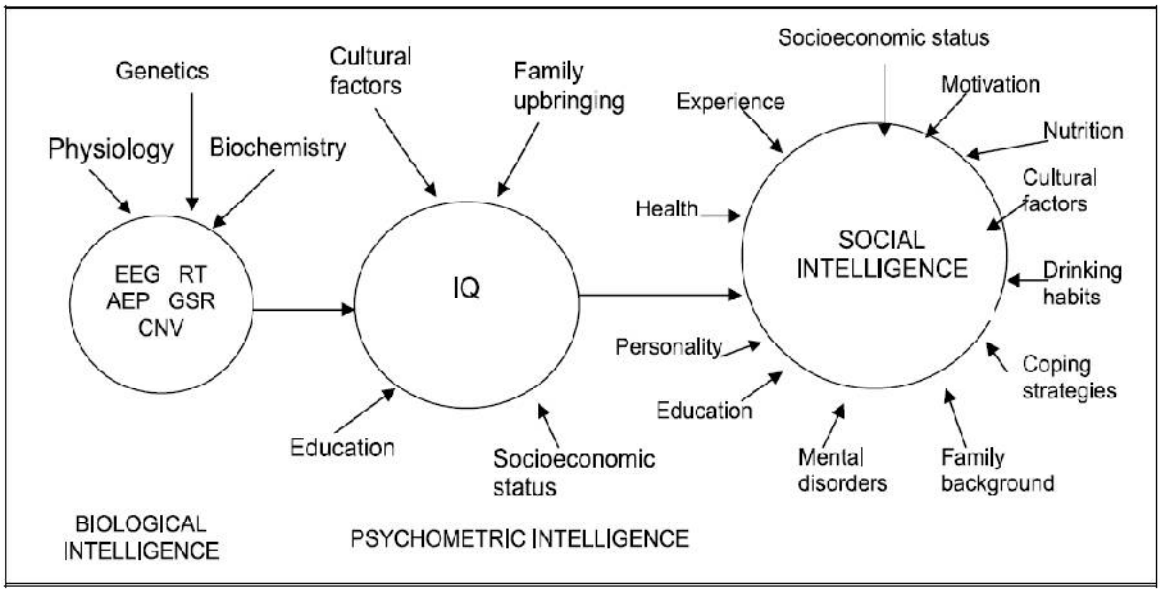


Neural activity

Chemistry aspect



Eysenck's perspective of three different conceptions of "intelligence"



Diseases, Surgerical intervention of brain & consequent malfunctions in memory, recognition, sensory output (un)conscious actions and consciouness

Brain	Surgery	Consequences
Frontal lobe	Loss of a portion to remove tumors or to ameliorate epileptic seizure	- Lack of inhibition of inappropriate emotions or actions, motor deficits, or - Uncontrollable repetition of specific action or words
Posterior cortex	Removal of even small regions	Loss of entire classes of conscious content: patients are unable to - Recognize faces - See motion, color or space - Perceive sights, sounds - Grasp other sensations

Brain as a whole can be considered an NCC,-- it generates experience, day in and day out.

Organ	Consequences of impairment	Yet, not affecting
✓ spinal cord a foot-and-a-half-long flexible tube of nervous tissue inside the backbone with about a billion nerve cells.	victims suffer - with paralyzed legs, arms and torso - from inability to control their bowel and bladder, - due to loss of bodily sensations.	✓ Continue to experience life in all its varieties ✓ They see, hear, smell, feel emotions ✓ Remember as much as before the incident that radically changed their life.

Cerebellum

Location	"little brain" underneath the back of the brain
# neurons	69 billion (most of which are the star-shaped cerebellar granule cells) four times more than in the rest of the brain combined
Age of circuits in living species:	Most ancient brain circuits in evolutionary terms
Type of neurons	Purkinje cells, which possess tendrils that spread like a sea fan coral and harbor complex electrical dynamics
Type of neural circuits	Feed-forward circuit: one set of neurons feeds the next, which in turn influences a third set no complex feedback loops that reverberate with electrical activity passing back and forth Each one operates in parallel, with distinct, non-overlying inputs and output, controlling movements of different motor or cognitive systems. They scarcely interact.
Function	functionally divided into hundreds or more independent computational modules

Function

Internal	External
It is involved in > Motor control > Posture > Gait > Fluid execution of complex sequences of motor movements	Playing the piano Typing Ice dancing Climbing a rock wall— all these activities involve the cerebellum.

➔ Consequence → No contribution to consciousness

Organ	Consequences of impairment	Yet, not affecting
Cerebellum	! What happens to consciousness if parts of the cerebellum are lost to a stroke or to the surgeon's knife? Very little! ✓ Cerebellar patients complain ✓ Loss of fluidity of piano playing ✓ Keyboard typing	✓ Never lose any aspect of their consciousness. > They hear, see > Feel fine > Retain a sense of self > Recall past events and continue > Project themselves into the future
	🕮 Even being born without a cerebellum does not areciably affect the conscious experience of the individual	

Essential (Necessary) features of neural nets (charge circuitary) to be a significant contributory component to consciousness

- Feedback loops
- Complicated connectivity at different inputs/outputs/intermediate layers of modules
- Dynamic connectivity and flow of information (data)
- Sufficient time for interaction, integration, retention (with due respects to plasticity/ stability dilemma)

Ex: consciousness emerges from thalamocortical system

- ➔ Thalamocortical system interacts with itself just like functional cluster
- ➔ Strong mutual interactions among a set of neuronal groups over a period of hundreds of milliseconds → (results in) → A functional cluster (Edelman & Tononi, 2000, p. 139)

Not sufficient conditions for emergence of consciousness

- Just uniform and parallel modules & connections (Ex: batteries may be connected in parallel, series)

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