UNIVERSITEIT
GENT

Wij en onze hersenen
Pride or prejudice ?

Prof.Dr.P.Santens

Neurologie UZ Gent

Vakgroep H&H, Fac GE

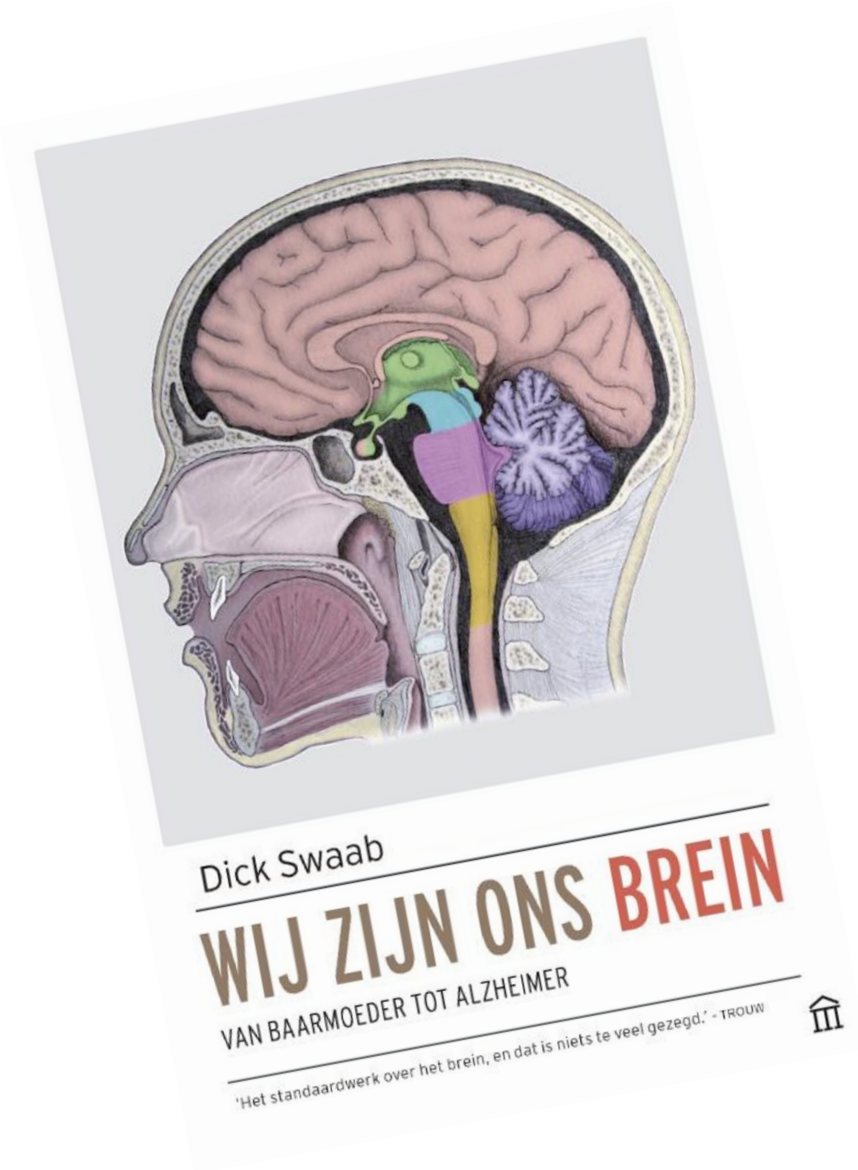
Inhoud van de lezingencyclus

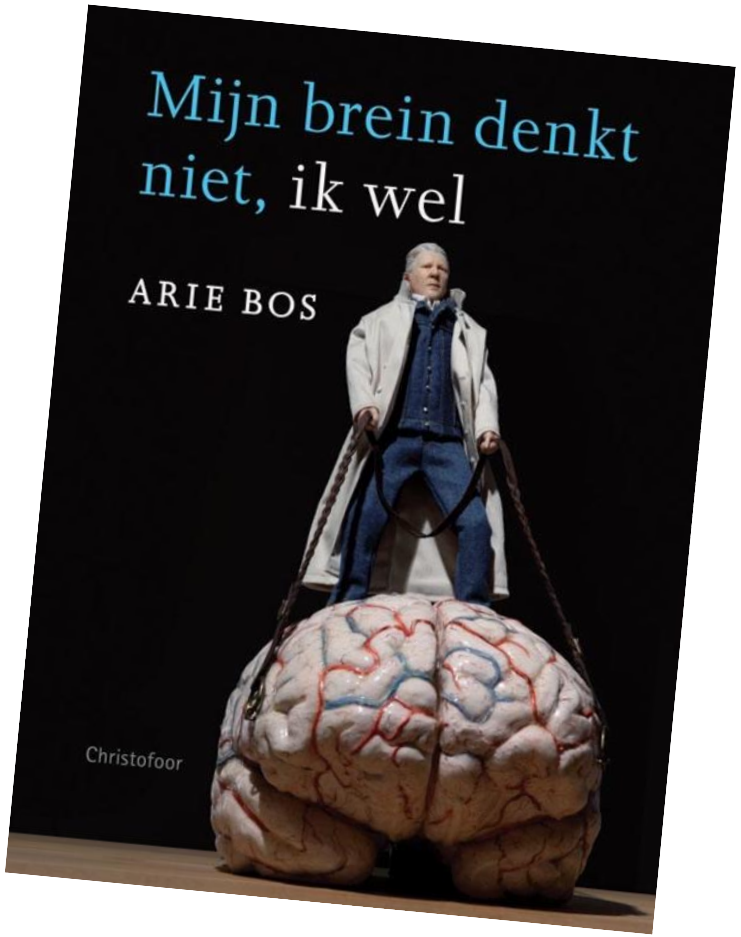
9/10 - De hersenen als dynamisch orgaan: van cel tot netwerk

16/10 - De kwetsbare hersenen: tussen verlies en hoop

23/10 - Zijn wij onze hersenen ? Durf denken, en twijfelen !

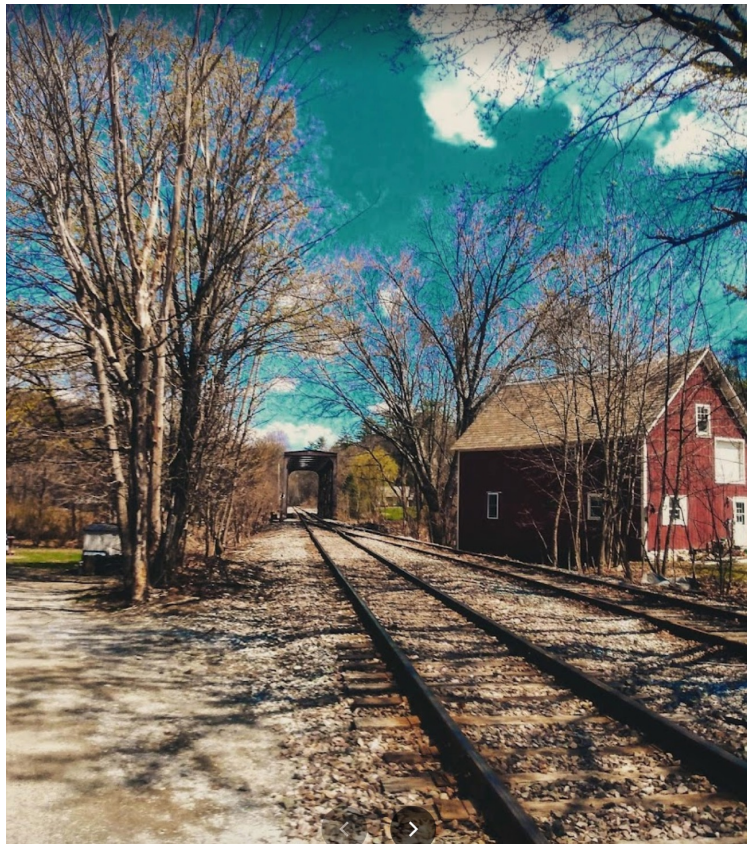
18/10 - Zijn wij onze hersenen ? Durf denken, en twijfelen !



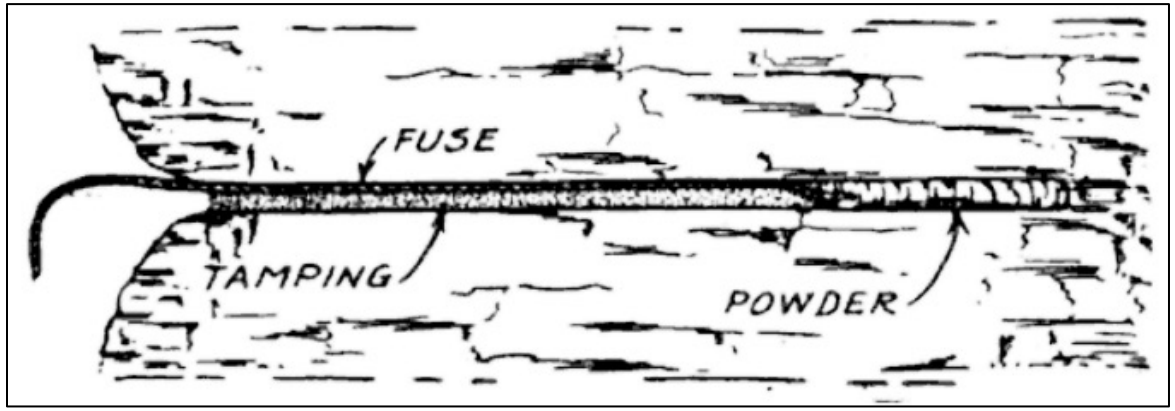


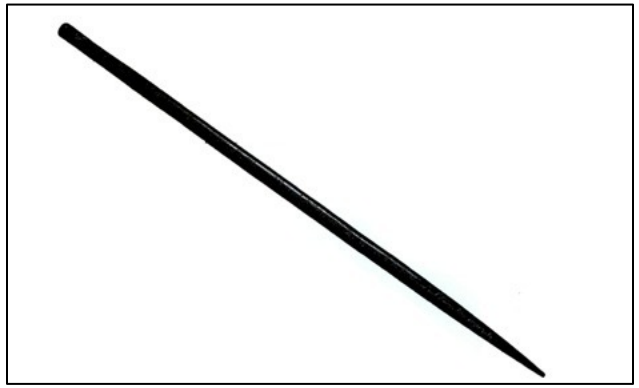
Daar moet ik even...
over nadenken.

Een 19e eeuws drama in de hersenen : Phineas Gage (1823-1860)



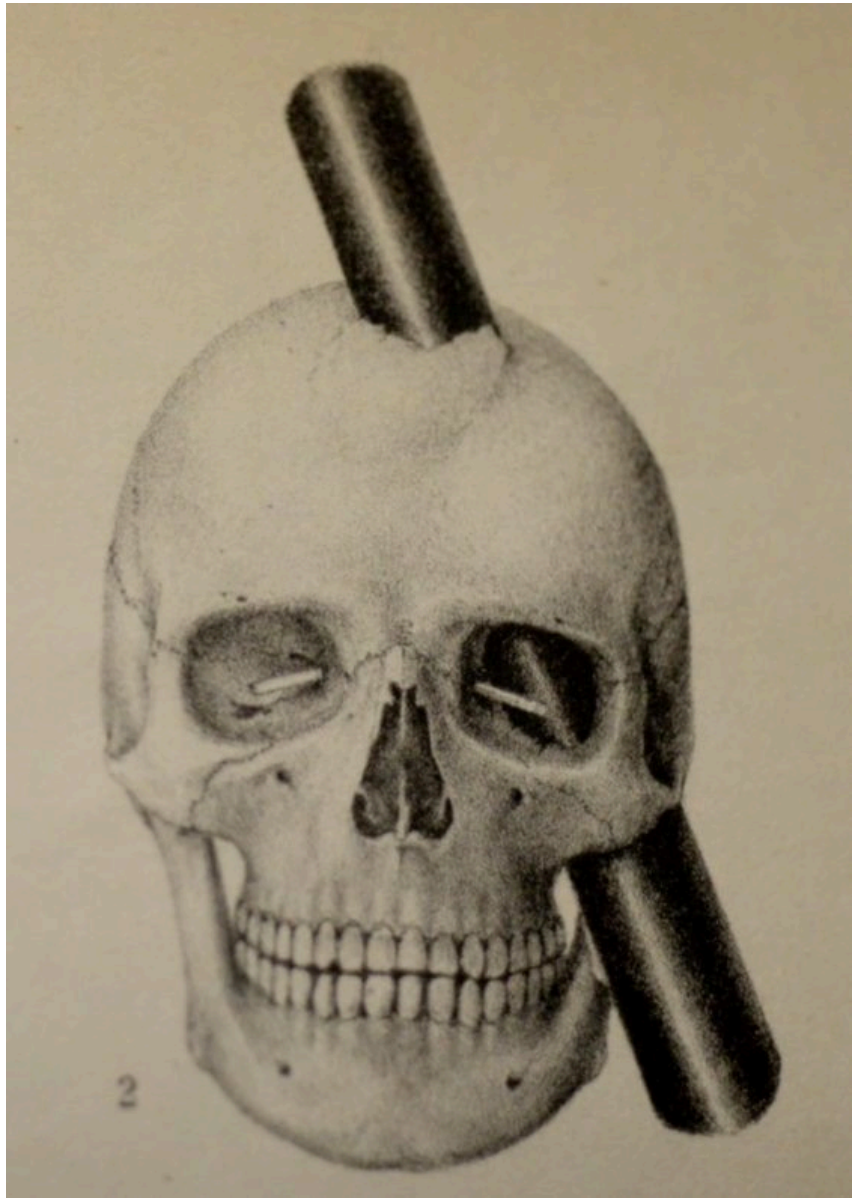
Cavendish, Vermont, USA ; 1848





1.1 m lang
3.2 cm diameter
6 kg zwaar

BRAIN DAMAGE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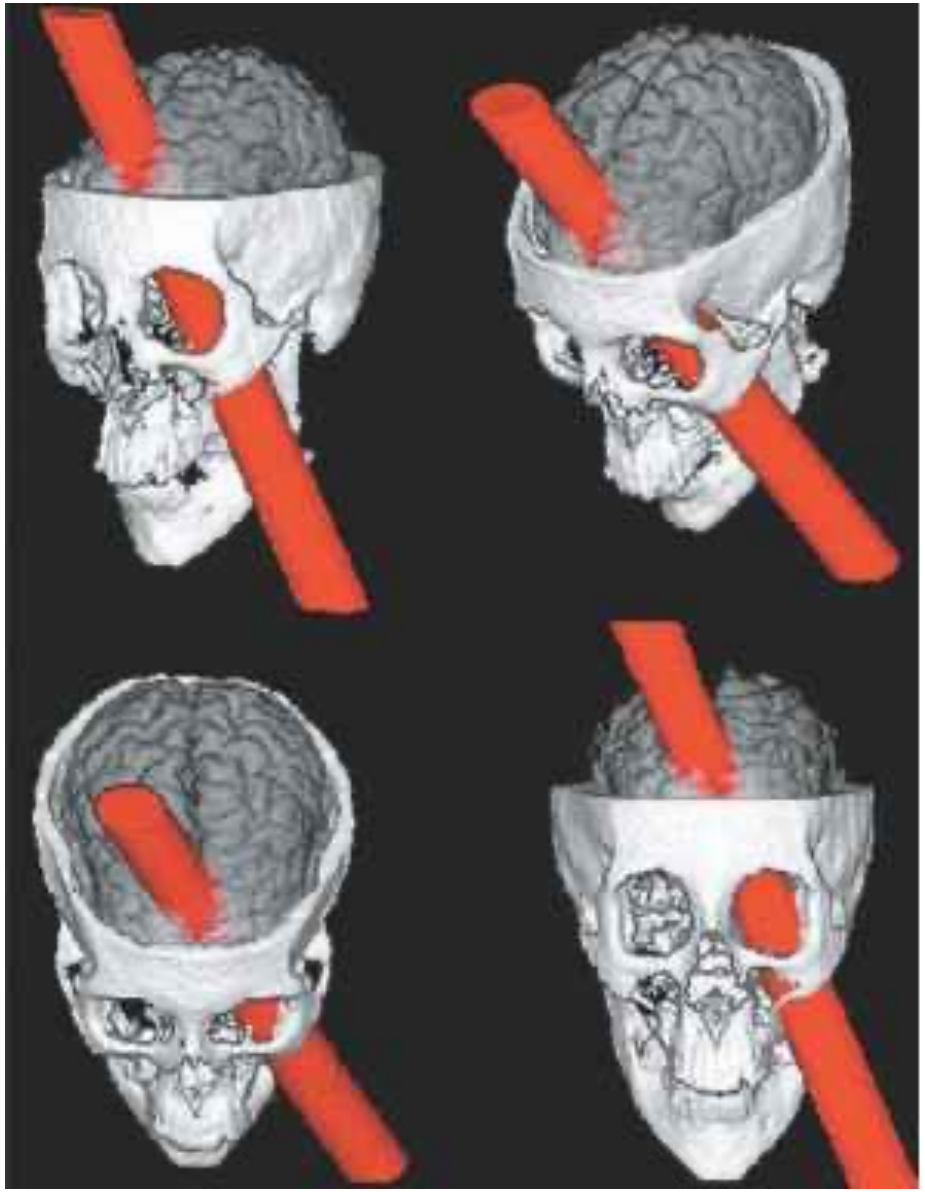
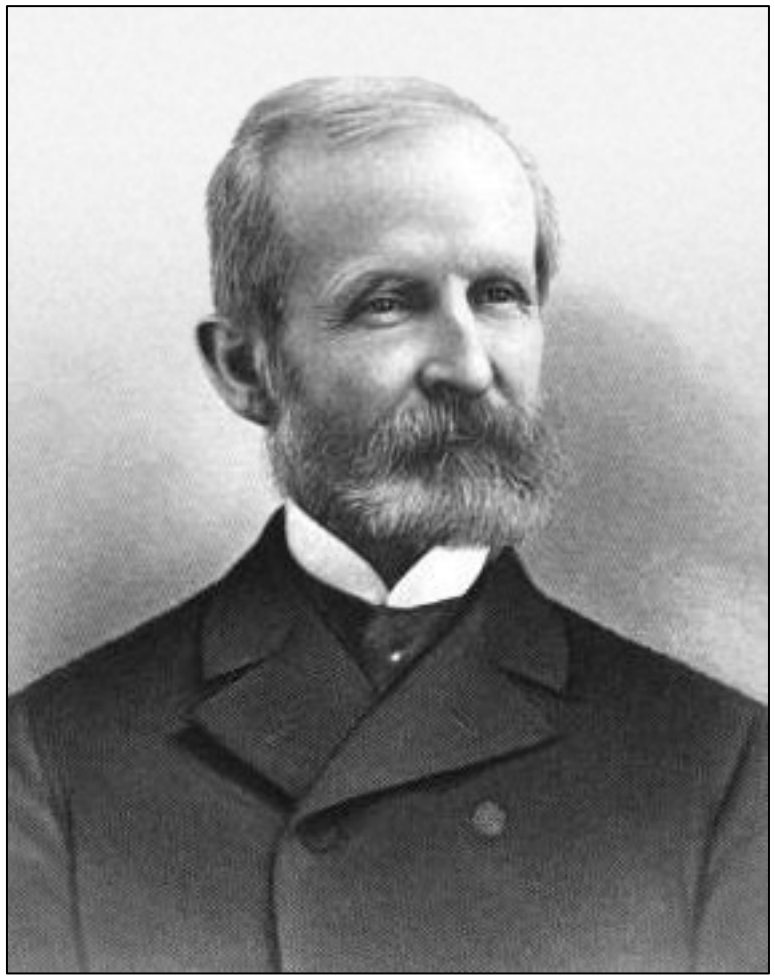
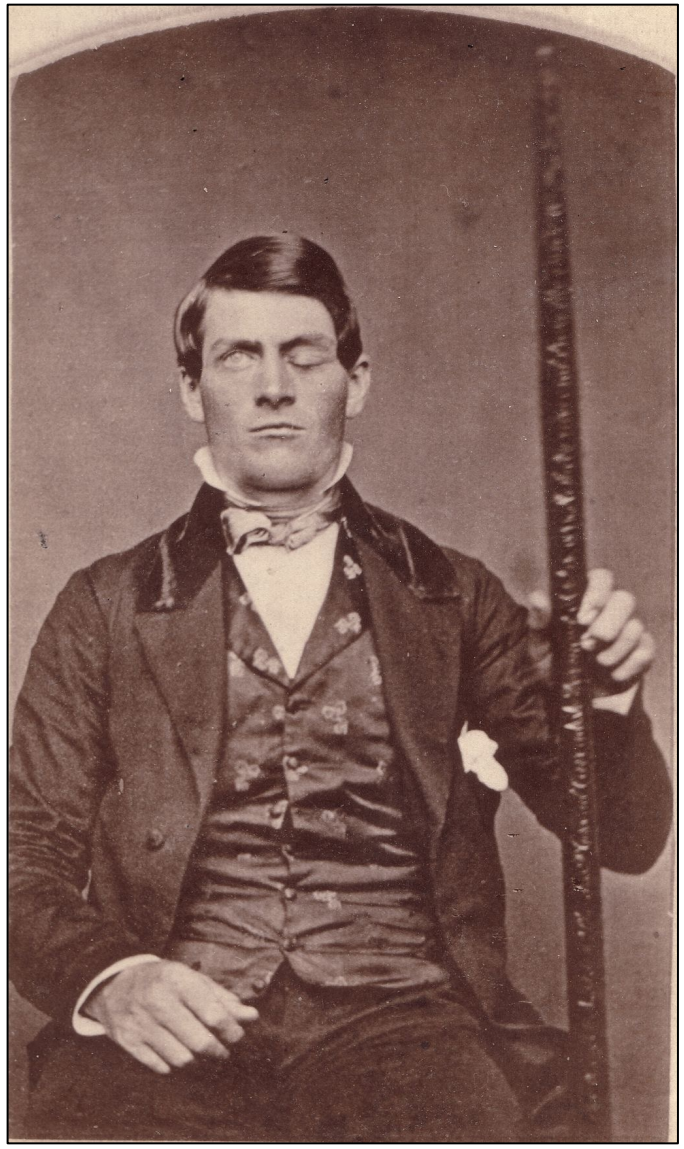




Dr.Harlow

Prof.Bigelow



THE GAGE ACCIDENT
1848
CAVENDISH
Gage Chronology
1823 - 1851
9 Jul 1823 Born, Lebanon (NH)
13 Sep 1848 Injured Cavendish
Nov 1848 Convalescent, Lebanon
Dec 1848 Dr Harlow's First report published
April 1849 Dr Harlow finds Gage "fully recovered"
Mid 1849 Not reinstated on the Railroad
Nov 1849 Studied by Prof. Bigelow, Harvard Univ.
Jul 1850 Bigelow publishes that disturbances of function were "inconsiderable"
Early 1851 Works at Dartmouth Inn, Hanover (NH)
1851 Changes in Gage reported to Amer. Phrenological Journal
Chester
Gage Chronology
1852 - 1860
Sep 1852 (?) Coach Driver in Chile
Jul 1852 (?) Returns to USA (San Francisco) Works as farm laborer
Feb 1860 (?) First epileptic seizure
21 May 1860 Dies. No autopsy or death certificate
23 May 1860 Burial recorded
Nov 1867 (?) Body exhumed & skull sent to Dr Harlow
Jun 1898 Harlow publishes second report. Details behavior changes. Skull & tamping iron donated to Harvard
13 Sep 1998 150th anniversary commemoration in Cavendish
Dr. John Martyn Harlow
One of the most remarkable events in medical history occurred about ¼ mile (1km) from here.
On 13th September 1848, Phineas P. Gage, a railroad construction foreman from Lebanon (NH), suffered massive brain damage when a 3ft 7in (107cm) long, 13¼ Pound (6kg) tamping iron was accidentally blown completely through his head.
Under the care of Dr John Martyn Harlow, the Cavendish physician, Gage soon recovered physically but was mentally greatly changed. Once an efficient and capable foreman, he was now increasingly erratic, irritable and profane. His employers could not reinstate him and his friends observed that he was "no longer Gage".
According to Dr Harlow, Phineas later appeared with Barnum's Museum in New York, worked at the Dartmouth Inn in Hanover (NH), and drove stagecoaches in Chile. He died in San Francisco of epilepsy on 21st May 1860. His skull and the tamping iron are in the Warren Anatomical Museum at Harvard University.
Gage's accident was one of the first documented cases in medicine showing the relationship between personality and the front sections of the brain.
Passage of tamping iron through Phineas Gage's head marked by arrow
Sculptor: Ross J. Bastiaan

“Gage was not Gage anymore”

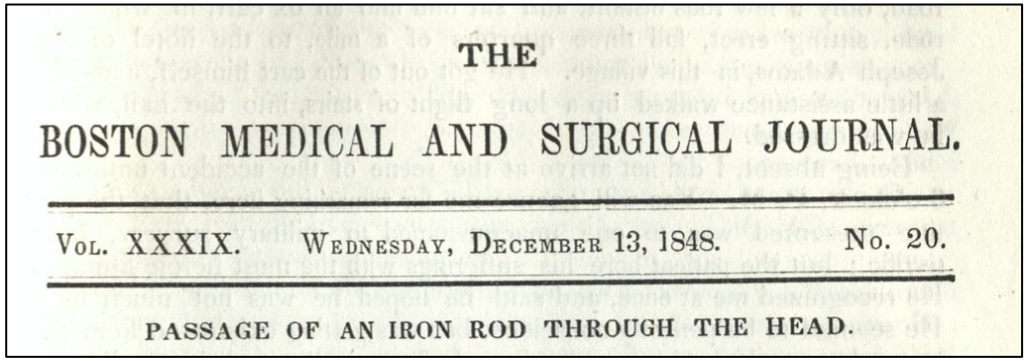
We are well acquainted with several of the leading men in the village where the above occurrence took place, and have been assured by them that the statement relative to the wound and recovery is correct. But that there was no difference in his mental manifestations after the recovery, is,

We have been informed by the best authority that after the man recovered, and while recovering, he was gross, profane, coarse, and vulgar, to such a degree that his society was intolerable to decent people. Before the injury he was quiet and respectful. If we remember correctly, the iron passed

and VENERATION, which left these organs without influence in his character, hence his profanity, and want of respect and kindness; giving the animal propensities absolute control in the character. The above report probably alludes to *Intellectual* “perceptions,” while it erroneously uses the word *mental*, which involves all the faculties, the feelings as well as the intellect.

Schedel, door familie geschonken aan Dr.Harlow

Later geschonken aan Warren Anatomical Museum, samen met de staaf



THE

BOSTON MEDICAL AND SURGICAL JOURNAL.

VOL. XXXIX. WEDNESDAY, DECEMBER 13, 1848. No. 20.

PASSAGE OF AN IRON ROD THROUGH THE HEAD.

Bedenkingen en vragen

- Wie is de echte Phineas Gage ?
- Waar in de hersenen bevindt Phineas Gage zich ?
- Had Phineas Gage na zijn ongeval nog de mogelijkheid om over zijn beslissingen en gedragingen een vrije keuze te maken ?
- Wat zou ons idee zijn als we een vergelijkbare verandering veroorzaken door het implanteren van een elektronisch apparaat in de hersenen ?

Een drama in de 21° eeuw: de zaak R.Hardy

- 55 jarige man
- Ziekte van Parkinson sinds 41j
- Bekentenissen
  - Moord op 2 vrouwen
  - Een beschieting van een slachtoffer
  - Twee moordpogingen
- Levenslange celstraf

De zaak R.Hardy

- Voorgeschiedenis van middelenmisbruik (alcohol en cocaïne)
- Problematische sexuele relaties met dominant gedrag
- Behandeld met dopaminerge medicatie voor ziekte van Parkinson

- Misdaden:
  - Goed voorbereid en uitgestippeld plan
  - Extra inname van cocaïne voor de moorden
  - Perverse sexuele moord, video-opnames
  - Bij arrestatie bekentenis van verdere plannen

De zaak R.Hardy

Sexuele sadistische seriemoordenaar

Hypersexualiteit door antiparkinsonmedicatie
Impulscontrole stoornissen
Inadequate follow-up van behandeling

Strafwetboek, artikel 71

Er is geen misdrijf wanneer de beschuldigde of de beklaagde op het tijdstip van de feiten leed aan een geestesstoornis die zijn oordeelsvermogen of de controle over zijn daden heeft tenietgedaan [...] of wanneer hij gedwongen werd door een macht die hij niet heeft kunnen weerstaan.

Table 2 Some impulse control disorders (ICD) and compulsive behaviors that are potential side effects of dopaminergic therapies

Impulse control disorders	Examples
Pathologic sexuality	Inappropriate sexual demands toward spouse or strangers
	Uninhibited lewd behavior
	Exhibitionism
	Compulsive masturbation
	Flagrant promiscuity
	Soliciting prostitutes
	Obsession with pornography (e.g., Internet)
	Frequenting telephone or computer sex chat lines
	Gender identity disorders (transvestitism)
	Pedophilia
Pathologic gambling	Casino gambling (slot machines, poker, blackjack, table games)
	Horse racing (live or off-track)
	Computer gambling venues
	Excessive lottery ticket purchases
	Risky investments (day trading, uncovered options trading)
Excessive spending	Purchasing large quantities of unneeded or unnecessary merchandise
	Excessive and reckless generosity
Eating disorders	Binge eating
Compulsive behaviors	
Punding	Intense time-consuming preoccupation and fascination with seemingly meaningless rituals or stereotyped activities (e.g., arranging and rearranging objects)
Hobbyism	Intense time-consuming preoccupation with specific hobbies or activities (e.g., endlessly working on projects or hobbies, computer addiction)
Walkabout	Excessive aimless walking or driving
Dopamine dysregulation syndrome	An addiction-like overuse of dopaminergic medication above and beyond the need to control parkinsonian motor symptoms and despite harmful side effects (e.g., dyskinesias, psychosis, aggressive behavior)

Moorden/fysieke agressie in het kader van de ziekte van Parkinson zijn zeer zeldzaam

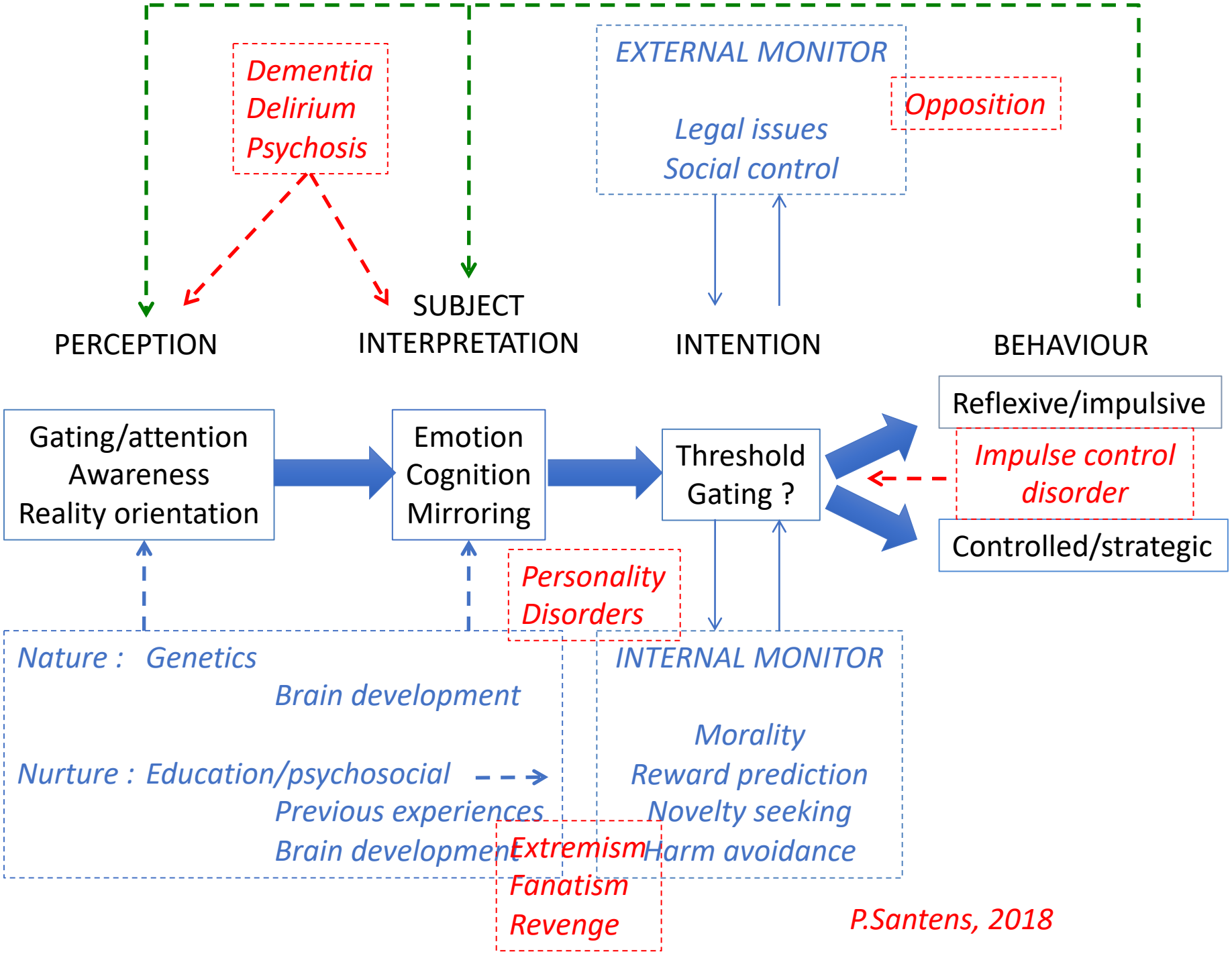
-1 casus met mesaanval in episode van verwardheid
-1 casus van agressie naar dieren toe
- Sporadische casussen van agressie niet-gerelateerd

VIEWPOINT

Crime and Parkinson's: The Jury Is Out

P. Santens, MD, PhD,[1]* M. De Letter, MSc, PhD,[1] A.J. Lees, MD, FRCP,[2] P. Krack, MD,[3] O.A. van den Heuvel, MD, PhD,[4] and B.R. Bloem, MD, PhD[5]

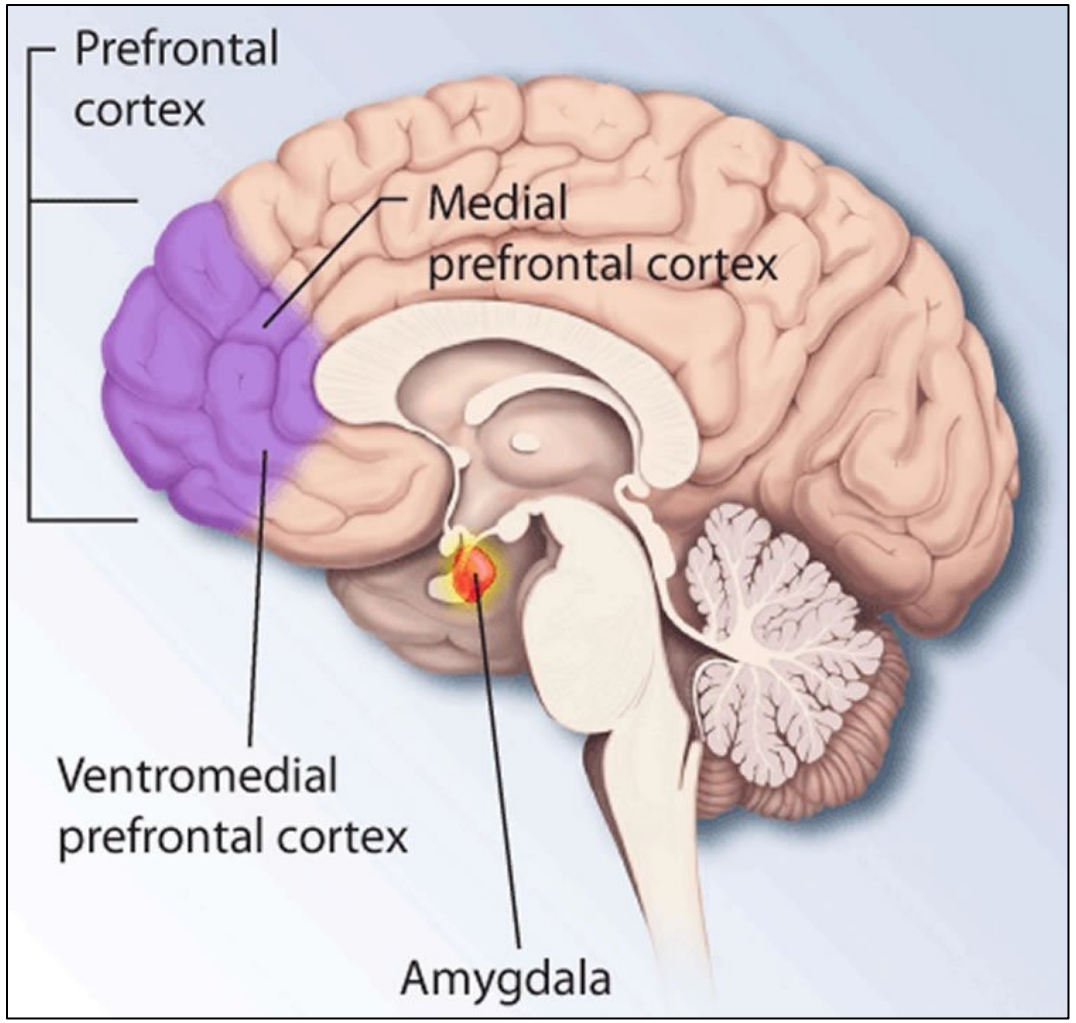
[1]*Ghent University, Faculty of Medicine and Health Sciences, Ghent, Belgium*
[2]*The National Hospital, London, UK*
[3]*Neurology Division, Department of Clinical Neurosciences, University Hospital of Geneva, Geneva, Switzerland*
[4]*Department of Psychiatry and Department of Anatomy & Neurosciences, VU University Medical Centre, Amsterdam Neuroscience, Amsterdam, The Netherlands*
[5]*Radboud University Medical Centre, Donders Institute for Brain, Cognition and Behaviour, Department of Neurology, Nijmegen, The Netherlands*


Dementia
Delirium
Psychosis
EXTERNAL MONITOR
Opposition
Legal issues
Social control
PERCEPTION
SUBJECT
INTERPRETATION
INTENTION
BEHAVIOUR
Reflexive/impulsive
Gating/attention
Awareness
Reality orientation
Emotion
Cognition
Mirroring
Threshold
Gating ?
Impulse control
disorder
Controlled/strategic
Personality
Disorders
Nature : Genetics
Brain development
Nurture : Education/psychosocial
Previous experiences
Brain development
INTERNAL MONITOR
Morality
Reward prediction
Novelty seeking
Harm avoidance
Extremism
Fanatism
Revenge
P.Santens, 2018

Bedenkingen en vragen

- Wie is de echte R.Hardy?
- Kan R.Hardy een vrije keuze maken om agressie en moorden te stoppen
- Wat zou u vinden van een behande dat R.Hardy deze impulsen niet mee

De “vrije wil” in de neurowetenschappen



1. Amygdala
   - Toekennen van emotionele betekenis aan prikkels, aangeboren of aangeleerd
   - Emotionele geheugen
   - Betrokken bij angst, agressie, drift,…
   - Directe respons

2. Ventromediale prefrontale cortex
   - Toekennen van emotionele betekenis aan gedachten, herinneringen, fantasieën
   - Lokken respons uit wanneer deze in WG worden gebracht

Heeft een psychopaat een ”vrije keuze” ?

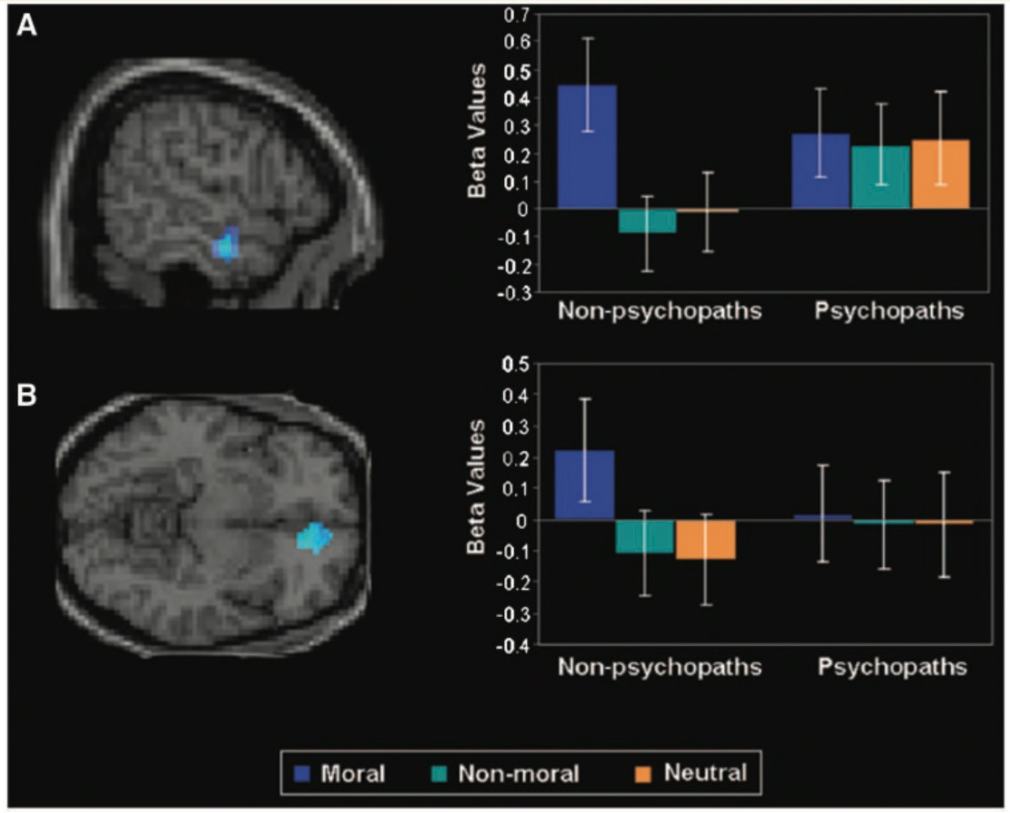


Figure 1 Analyses of brain activity during moral picture viewing showed a significant interaction between psychopaths/non-psychopaths and moral versus non-moral and neutral picture viewing in the anterior temporal cortex (**A**) and in ventromedial prefrontal cortex (**B**). This finding indicates that non-psychopaths showed a significantly greater moral than non-moral and neutral picture distinction in these regions, whereas psychopaths did not. Error bars are standard errors. (Copyright © 2010 by the American Psychological Association. Reproduced with permission from Harenski *et al.*, 2010. The use of APA information does not imply endorsement by the APA).

The Journal of Neuroscience, August 22, 2007 • 27(34):9141–9145 • 9141

Brief Communications

To Do or Not to Do: The Neural Signature of Self-Control

Marcel Brass[1,2] **and Patrick Haggard**[3]
[1]Max Planck Institute for Human Cognitive and Brain Sciences, 04103 Leipzig, Germany, [2]Department of Experimental Psychology, Ghent University, 9000 Ghent, Belgium, and [3]Institute of Cognitive Neuroscience and Department of Psychology, University College London, London WC1N 3AR, United Kingdom

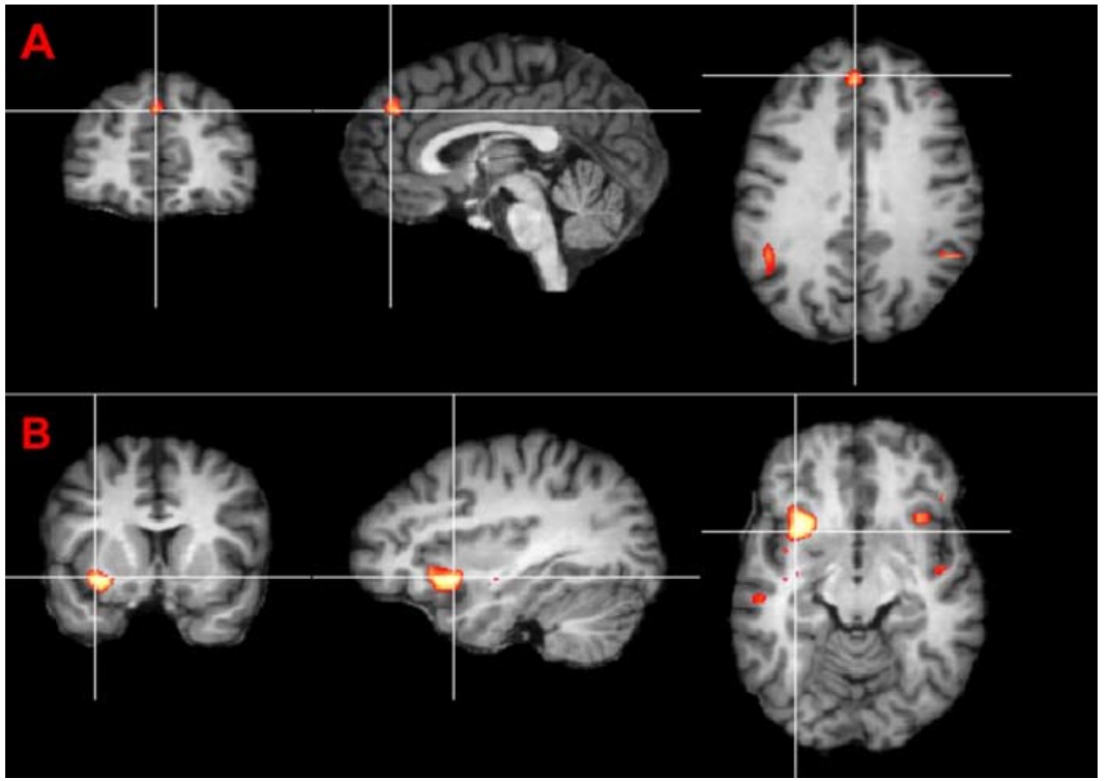
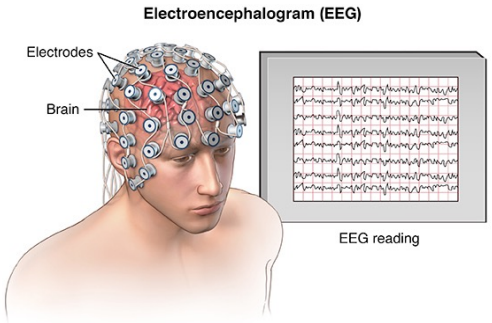
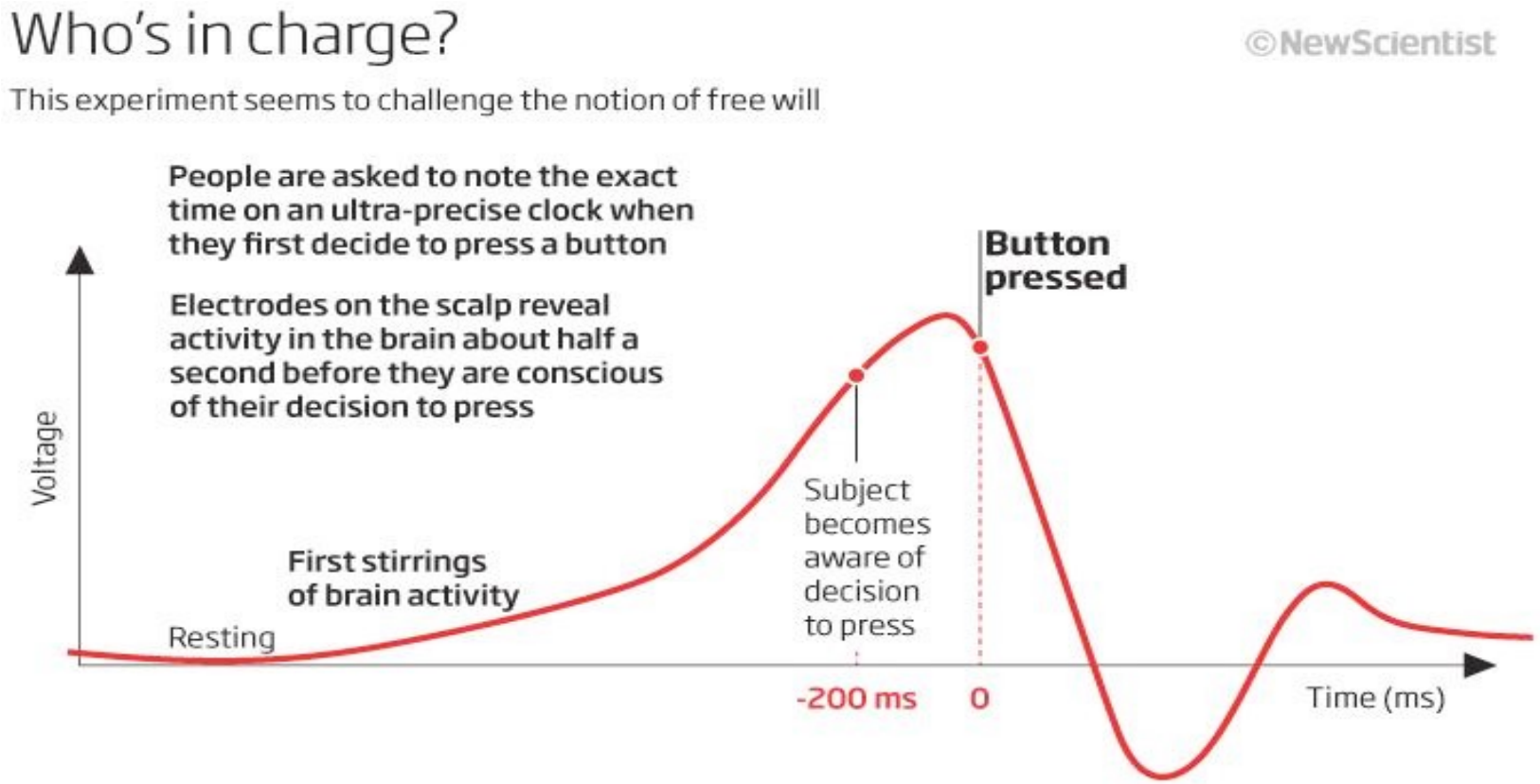


Figure 2. ***A***, Activation in the dFMC for the contrast of inhibition versus action trials. The *z*-map is thresholded at $z > 3.09$ ($p < 0.001$). ***B***, Activation in the left anterior ventral insula for the contrast of inhibition versus action trials.

Maar wie of wat beslist er eigenlijk ?

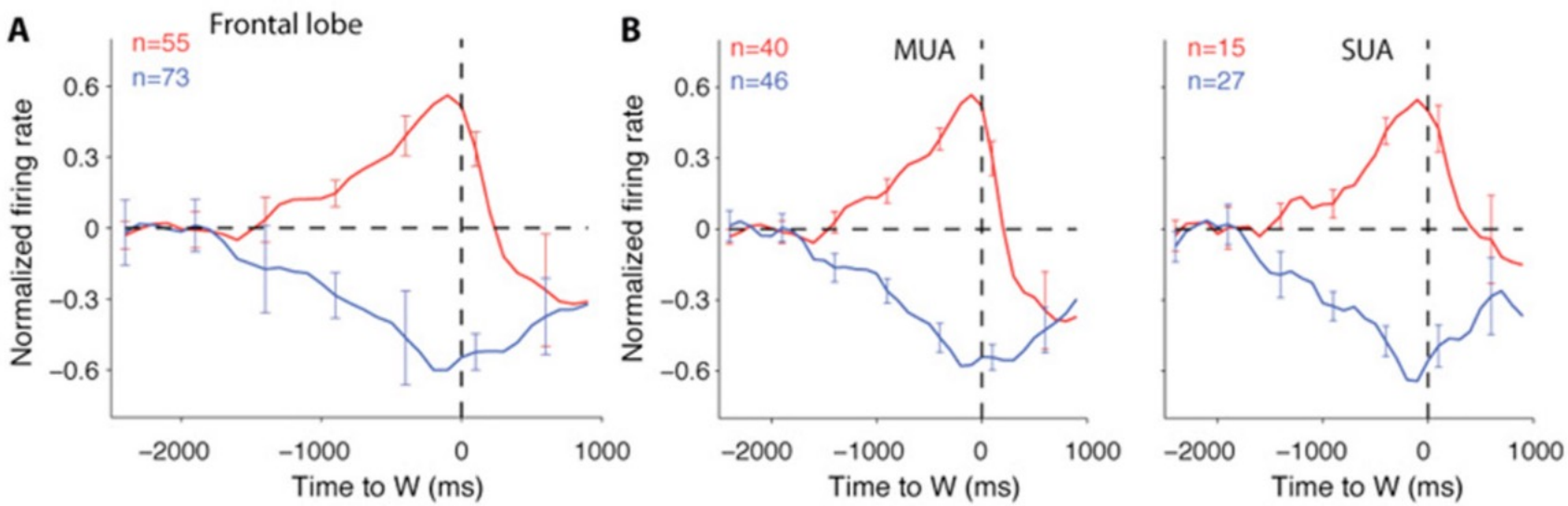




Published in final edited form as:
Neuron. 2011 February 10; 69(3): 548–562. doi:10.1016/j.neuron.2010.11.045.

Internally generated preactivation of single neurons in human medial frontal cortex predicts volition

Itzhak Fried[1,2], **Roy Mukamel**[1], and **Gabriel Kreiman**[3]



SOS: Het “redden” van de vrije wil !

- Bestaat er een vorm van intentionaliteit die niet gepaard gaat met hersenactiviteit (voorafgaand aan de hersenactiviteit) ? Bestaat er een “ghost in the machine” ?
- De experimentele conditie creëert voor proefpersonen al een vorm van intentionaliteit, inherent aan het experiment zelf.
- Is er eerder een probleem met het concept “bewustzijn”? Gaat het om onbewuste processen ? Is bewustzijn iets wat traag en progressief opbouwt en die we dus oppikken pas nadat het ”bezig” is ?
- Kunnen we dergelijke experimentele condities überhaupt gebruiken om de vrije wil te bestuderen ?

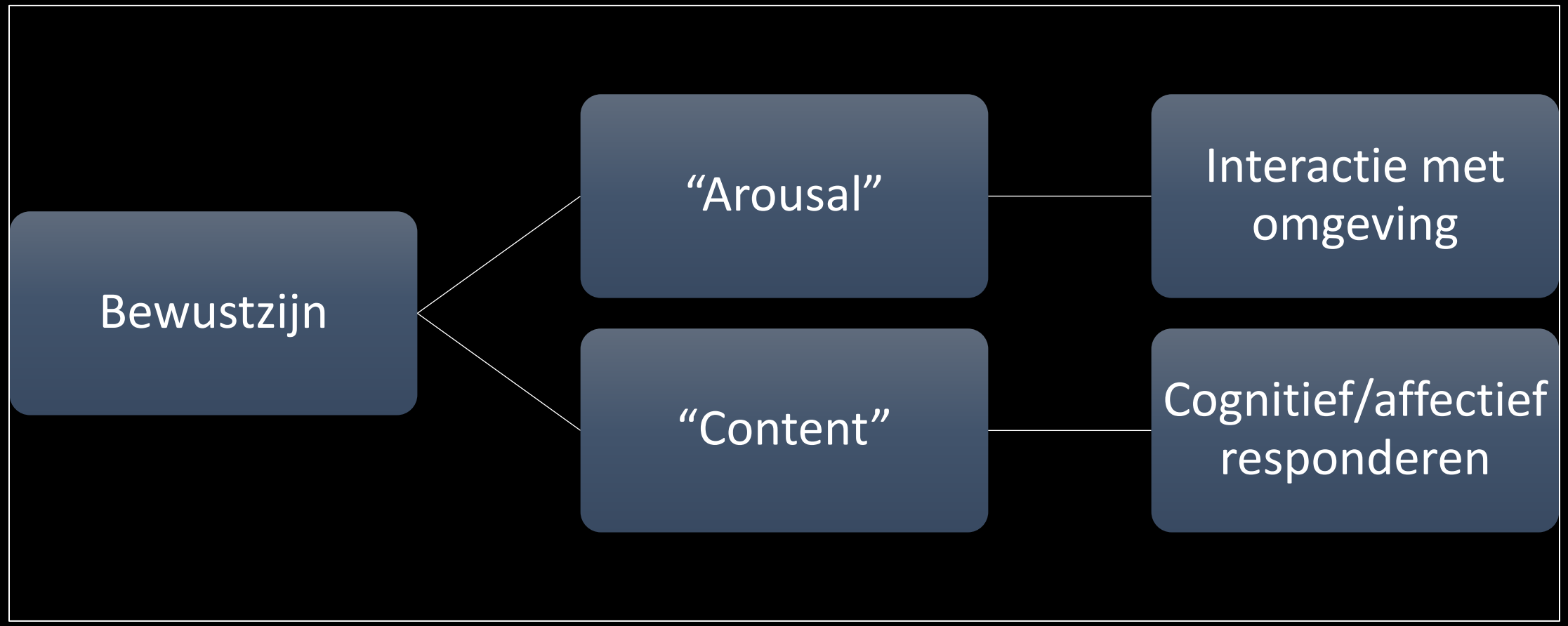
Wat is het bewustzijn ? Hoe kunnen we het onderzoeken ?

- Onderzoek van patiënten met een verminderd bewustzijn, of een “veranderd” bewustzijn.

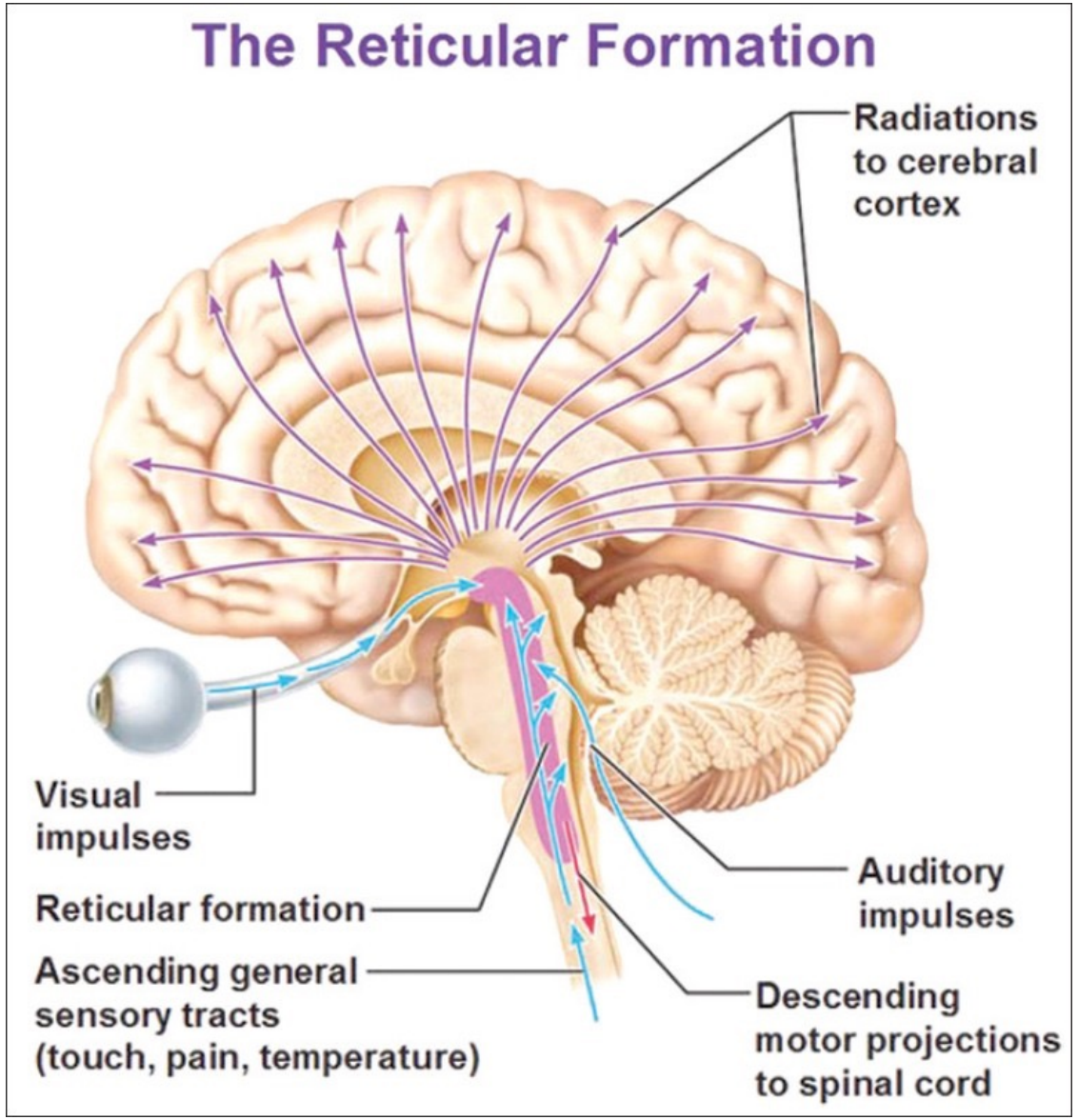
- Experimentele onderzoeken bij normale proefpersonen of patiënten.

- Abstracte extrapolaties vanuit natuurwetenschappen of vanuit de filosofie

De klinische benadering

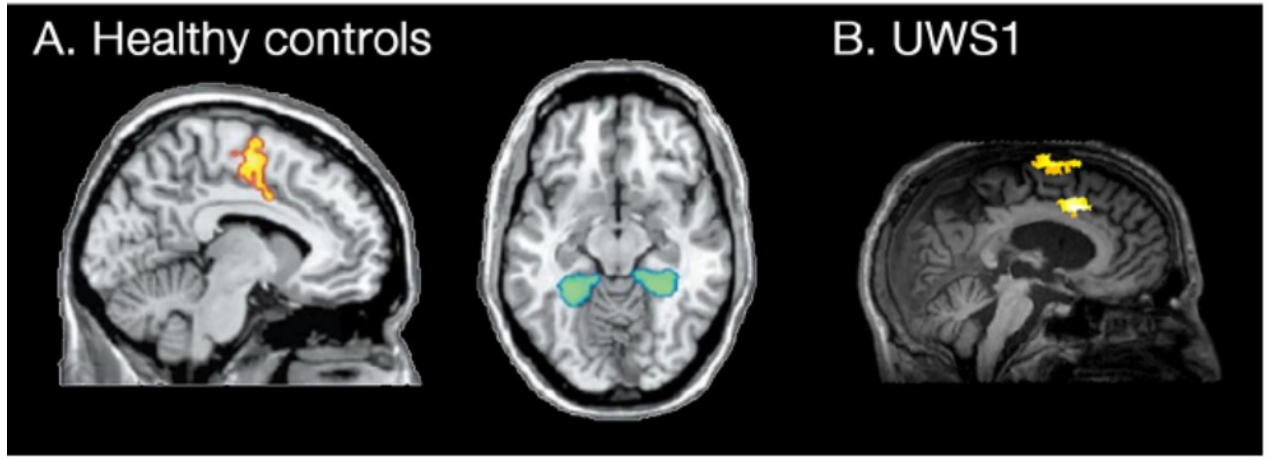


Anatomische correlaten

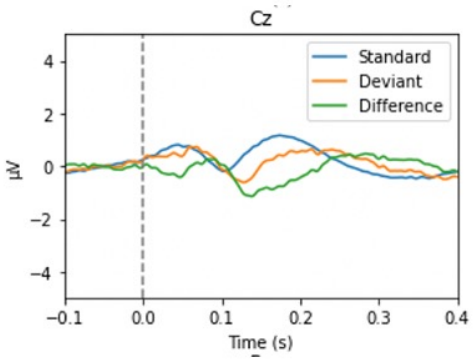


Klinische toestanden van gestoord bewustzijn

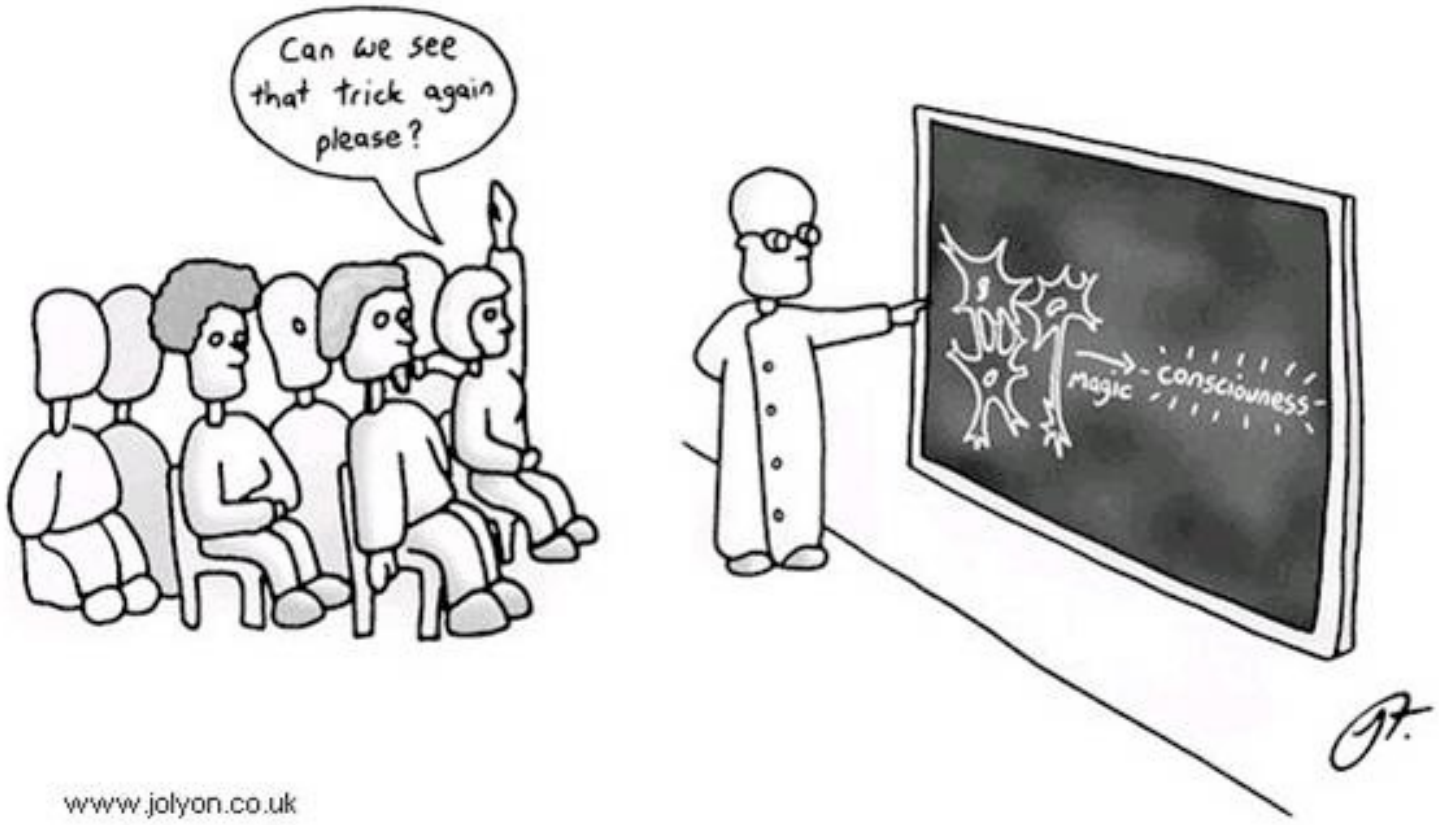
- Coma
- (Persisterende) vegetatieve status
- Unresponsive wakefulness
- Minimally responsive/conscious state



Syllable in healthy controls
MMN



Experimenteel onderzoek van het bewustzijn
“The hard problem”

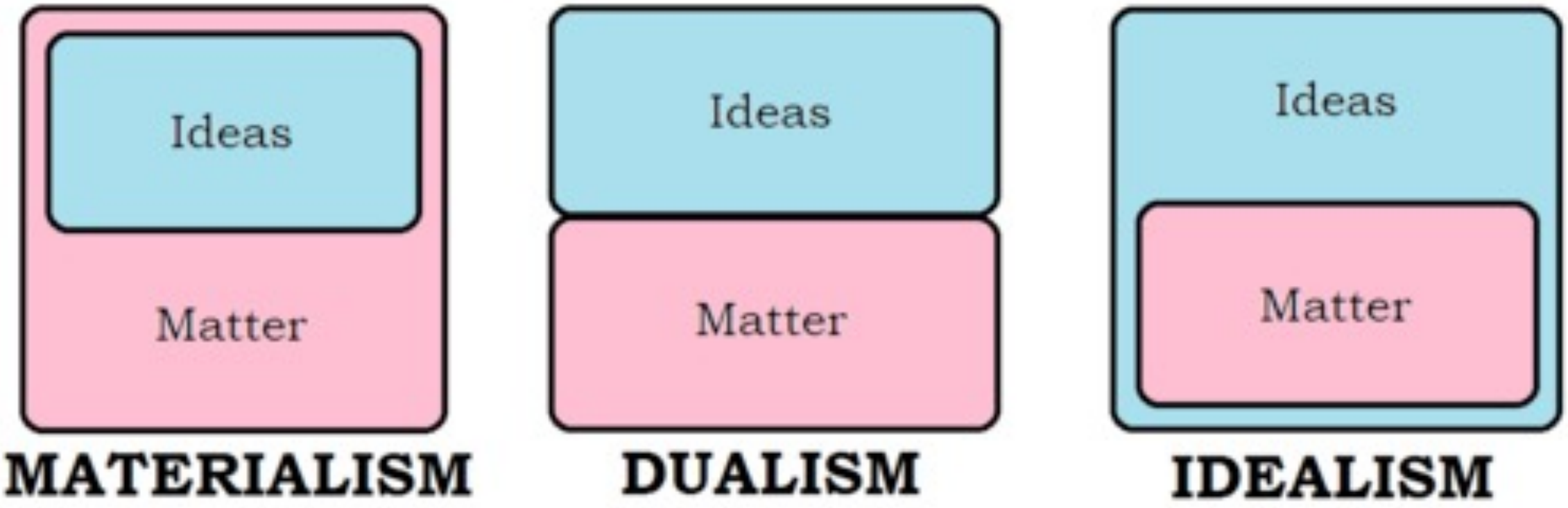


“easy” vs “hard” problemen

- Easy:
  - Beschrijven van neurale interacties en activiteiten
  - Aantonen van anatomische correlaten
  - Toepassen in specifieke situaties van klinische stoornissen

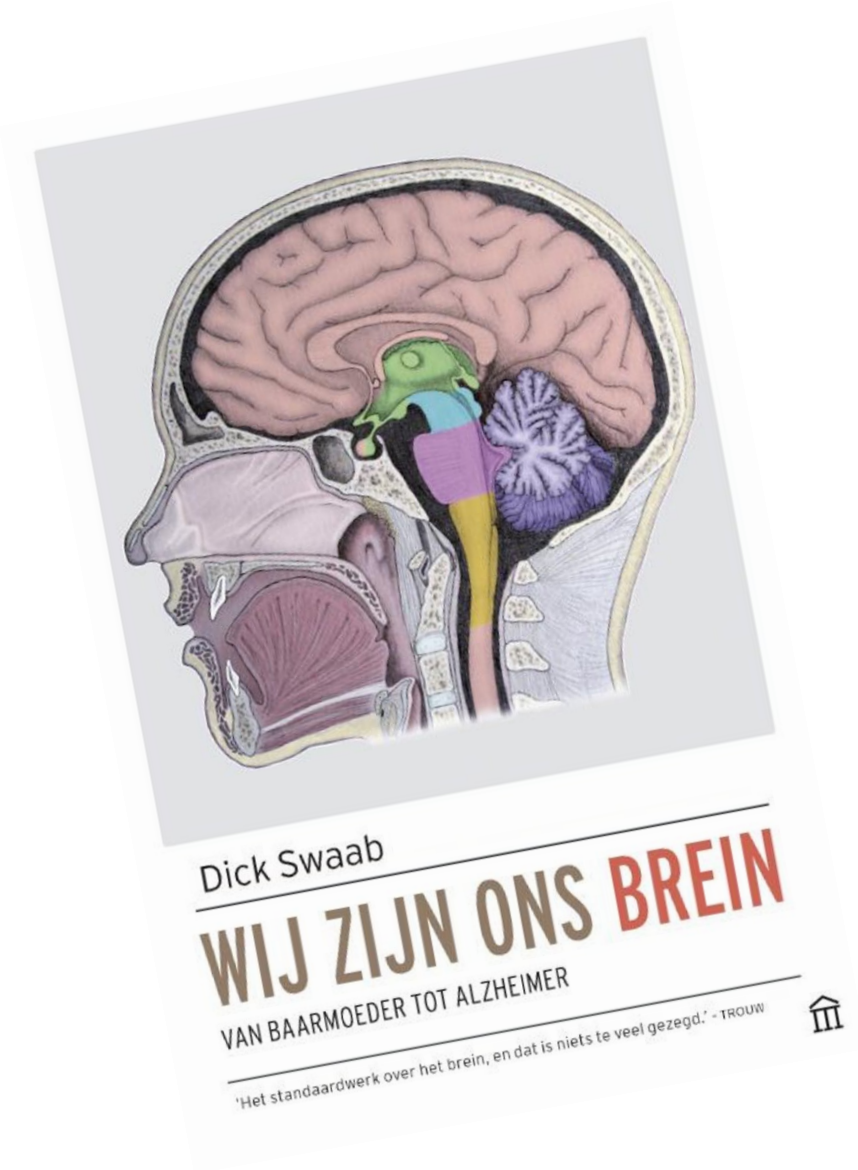
- Hard:
  - Waarom voelt iets zoals het voelt ? Hoe voelt het om zichzelf te zijn?
  - Individuele ervaring van fenomenen
  - “Qualia”

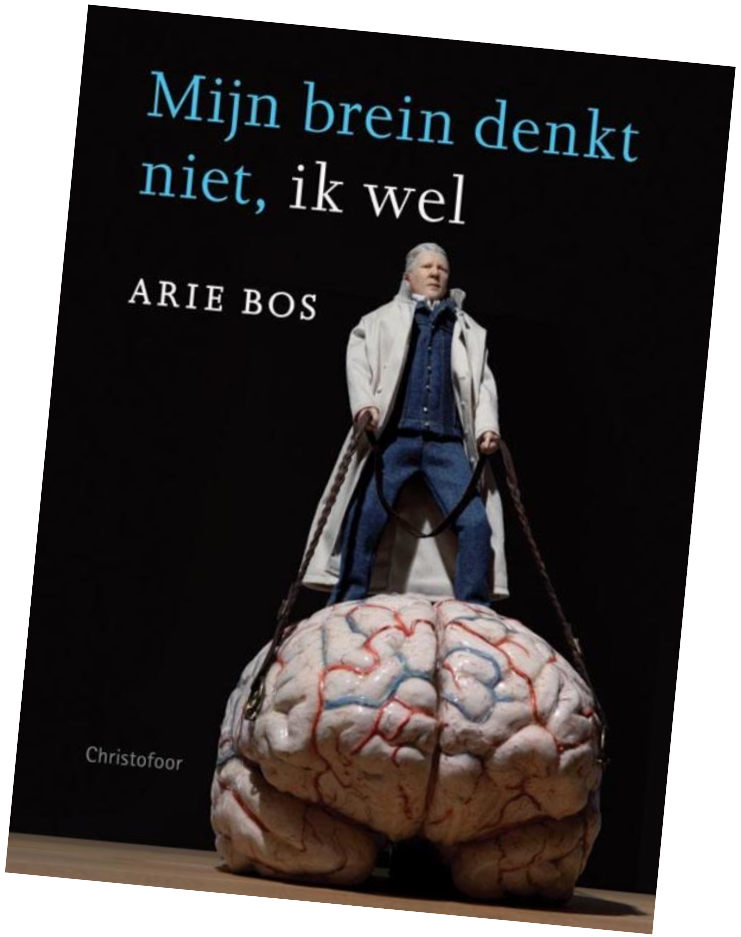
Wat zijn onze vertrekpunten voor het denken over bewustzijn?



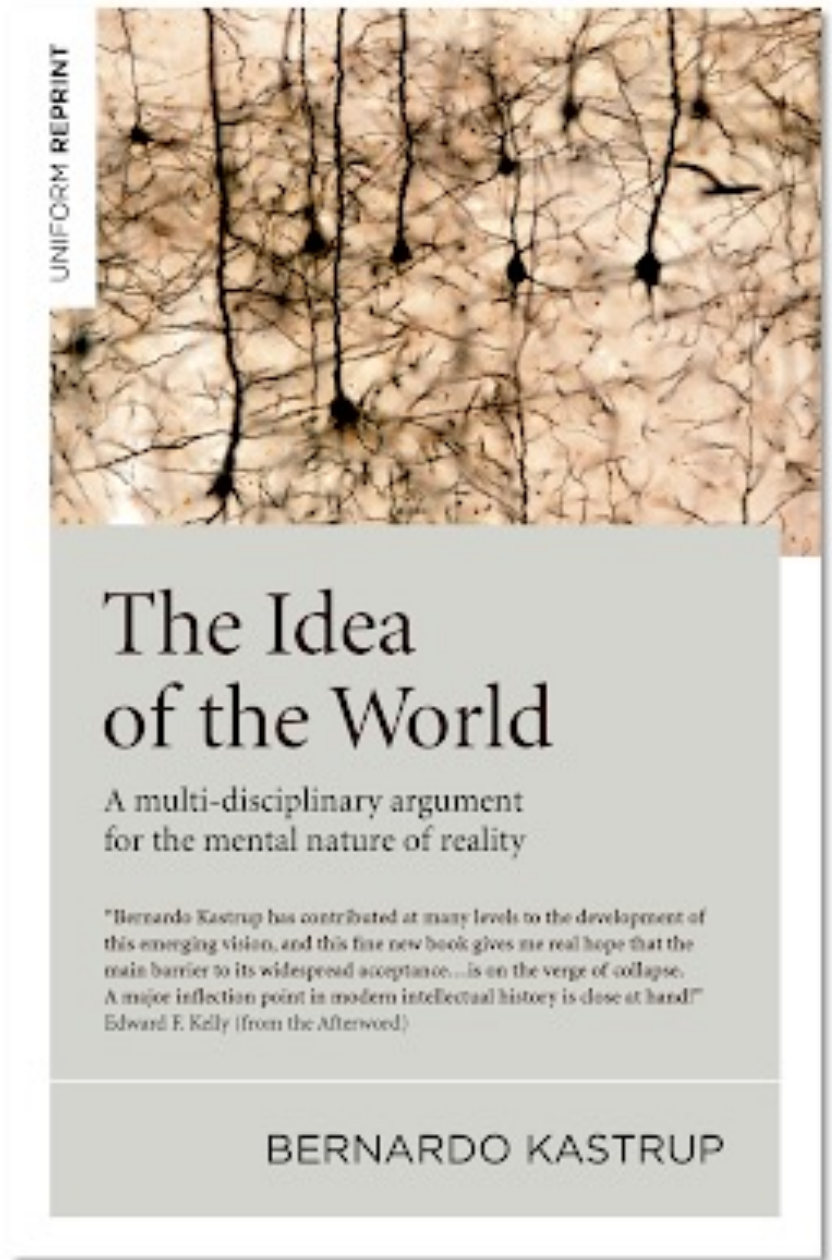
Wat zijn onze vertrekpunten voor het denken over bewustzijn?

18/10 - Zijn wij onze hersenen ? Durf denken, en twijfelen !





Pim van Lommel
Eindeloos bewustzijn
EEN WETENSCHAPPELIJKE VISIE OP DE
BIJNA-DOOD ERVARING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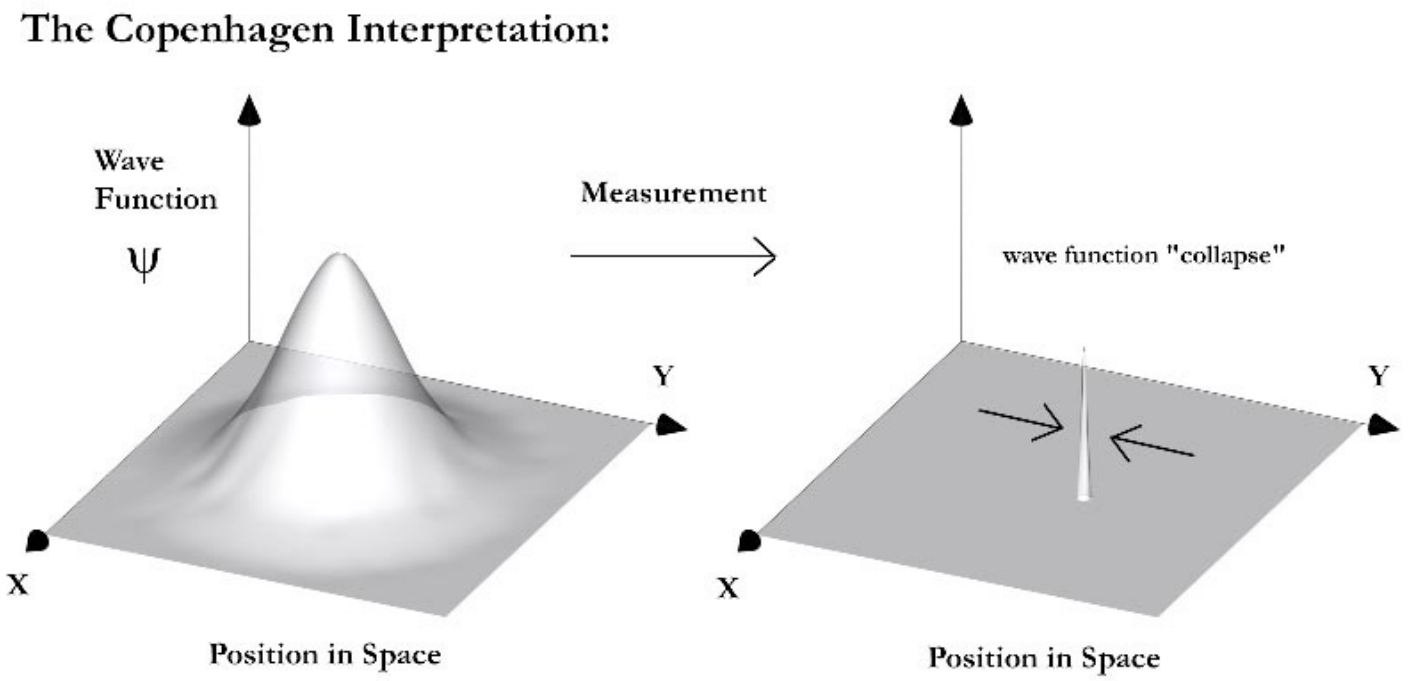
A multi-disciplinary argument for the mental nature of reality
"Bernardo Kastrup has contributed at many levels to the development of this emerging vision, and this fine new book gives me real hope that the main barrier to its widespread acceptance...is on the verge of collapse. A major inflection point in modern intellectual history is close at hand!"
Edward F. Kelly (from the Afterword)
BERNARDO KASTRUP

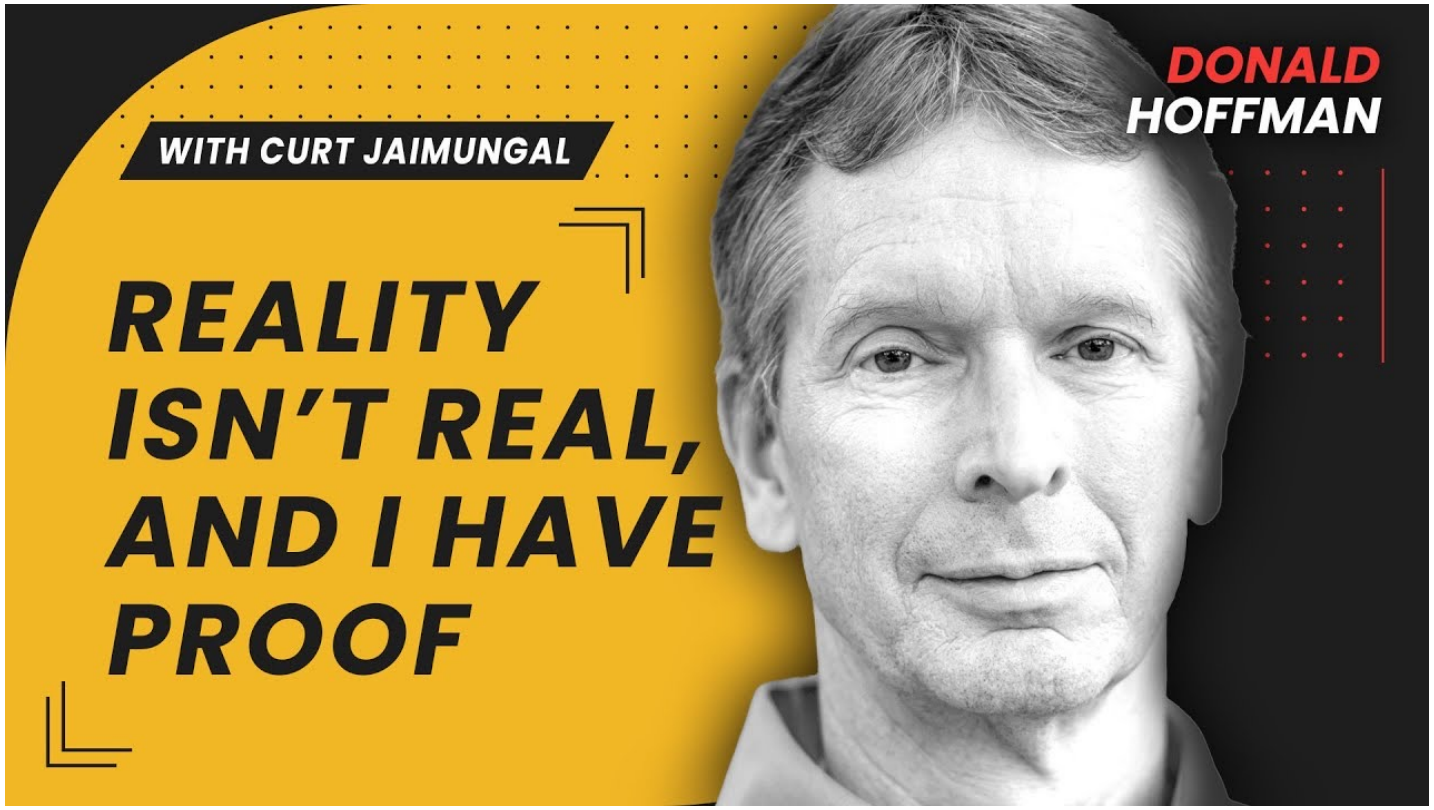
The human universe: Does consciousness create reality?

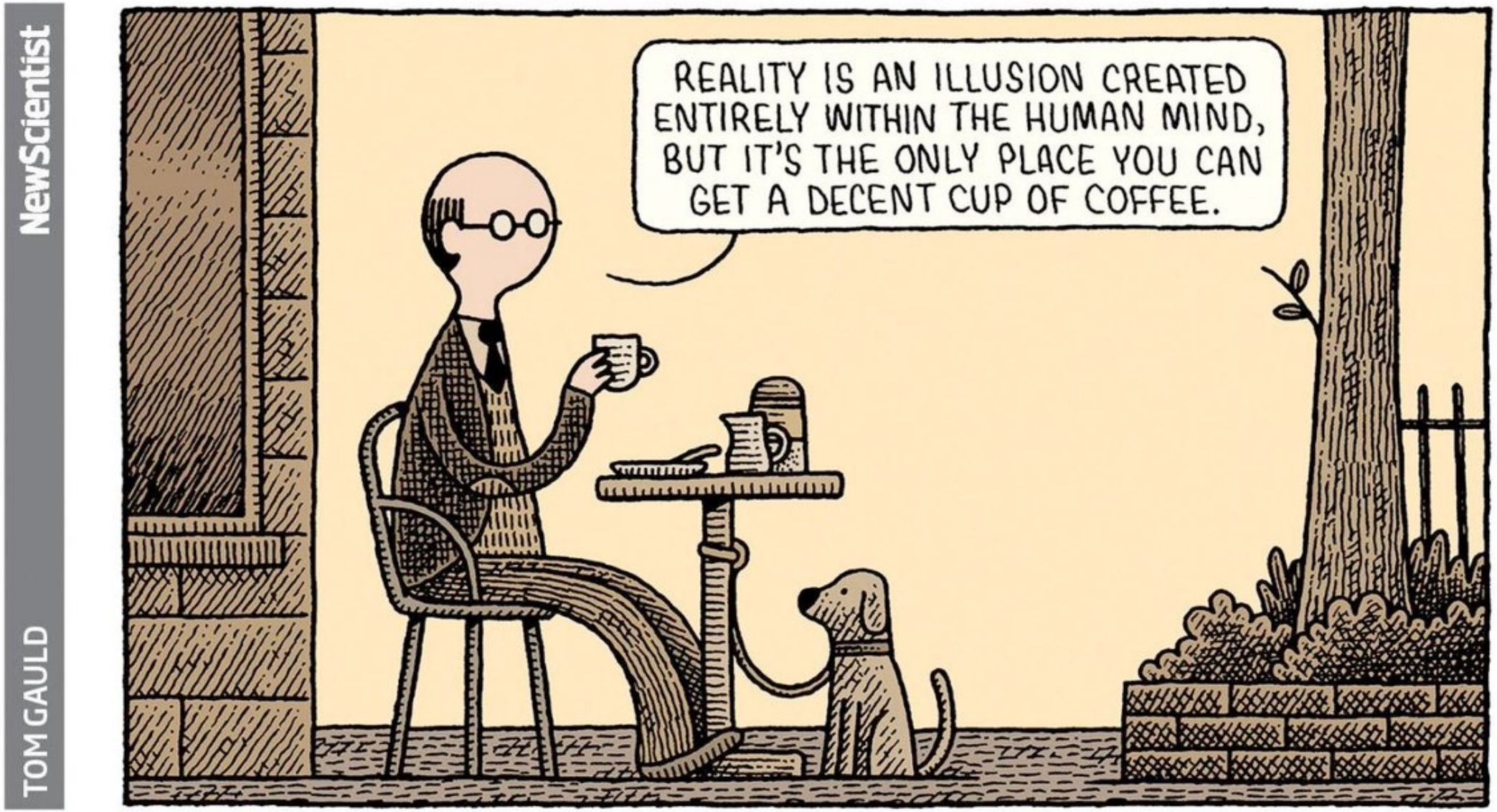
While not a complete figment of our imagination, the universe may only become real because we're looking at it

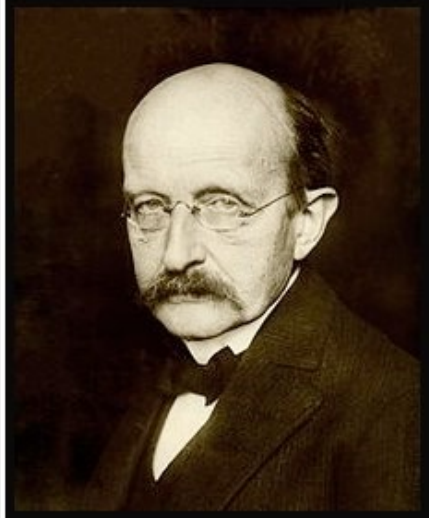
Quantumfysica en bewustzijn: de Kopenhagen interpretatie



De realiteit
als
voorstelling ?




NewScientist
TOM GAULD
REALITY IS AN ILLUSION CREATED ENTIRELY WITHIN THE HUMAN MIND, BUT IT'S THE ONLY PLACE YOU CAN GET A DECENT CUP OF COFFEE.



I regard consciousness as fundamental. I regard matter as derivative from consciousness. We cannot get behind consciousness. Everything that we talk about, everything that we regard as existing, postulates consciousness.

(Max Planck)

Consciousness cannot be accounted for in physical terms. For consciousness is absolutely fundamental. It cannot be accounted for in terms of anything else.

— *Erwin Schrodinger* —

AZ QUOTES

I think the brain is essentially a computer and consciousness is like a computer program. It will cease to run when the computer is turned off. Theoretically, it could be re-created on a neural network, but that would be very difficult, as it would require all one's memories.

— *Stephen Hawking* —

Are zombies possible? They're not just possible, they're actual. We're all zombies. Nobody is conscious — not in the systematically mysterious way that supports such doctrines as epiphenomenalism. *It would be an act of desperate intellectual dishonesty to quote this assertion out of context!

(Daniel Dennett)

izquotes.com

De maakbare mens
Tussen fictie en fascinatie

What is the mind? No matter.
What is matter? Never mind.

- Homer Simpson

boardofwisdom.com

UZ GENT

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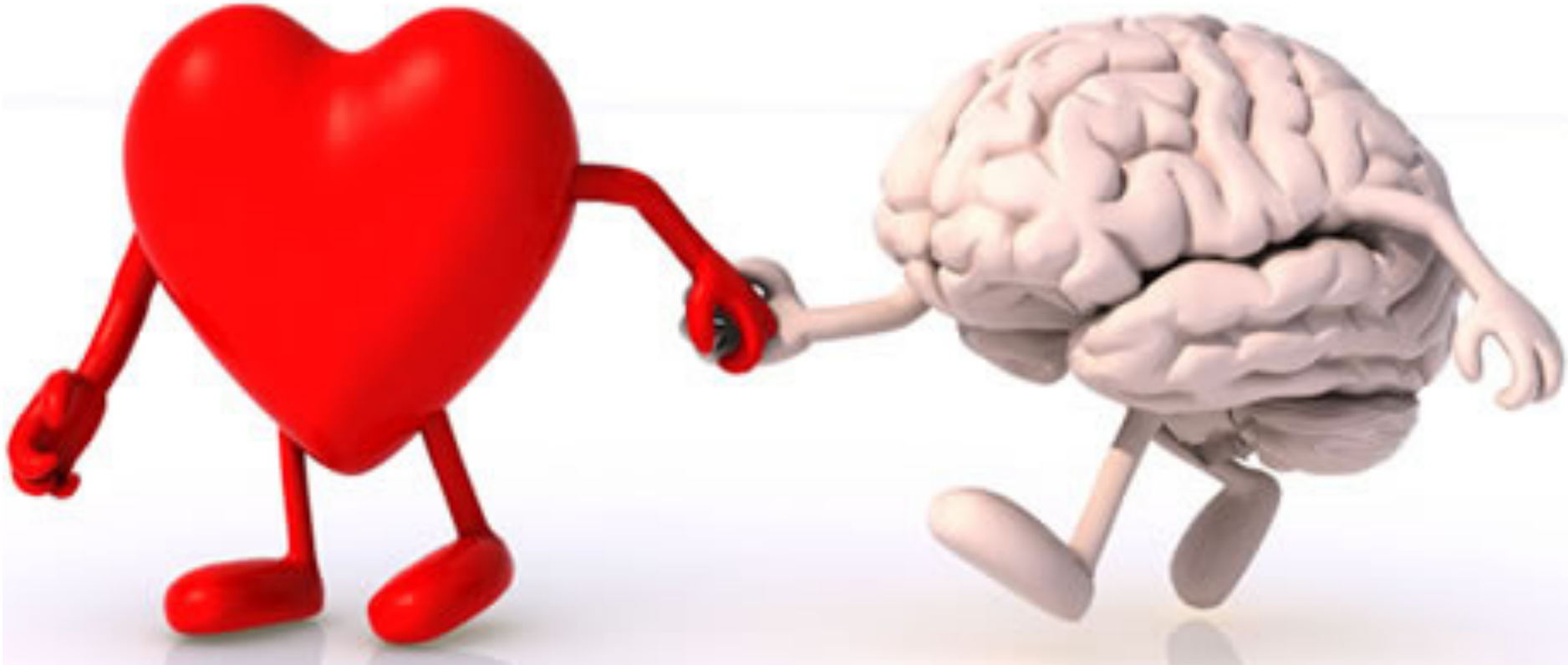

Dank je wel !