Ethics of Perception in Nanocognition (Nanorobot-aided Cognition)

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Slides: http://slideshare.net/LaBlogga

Melanie Swan

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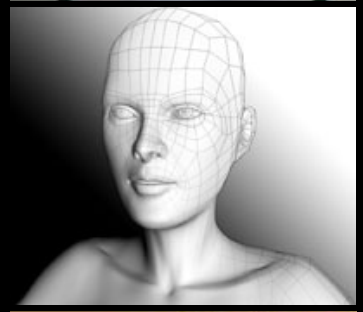
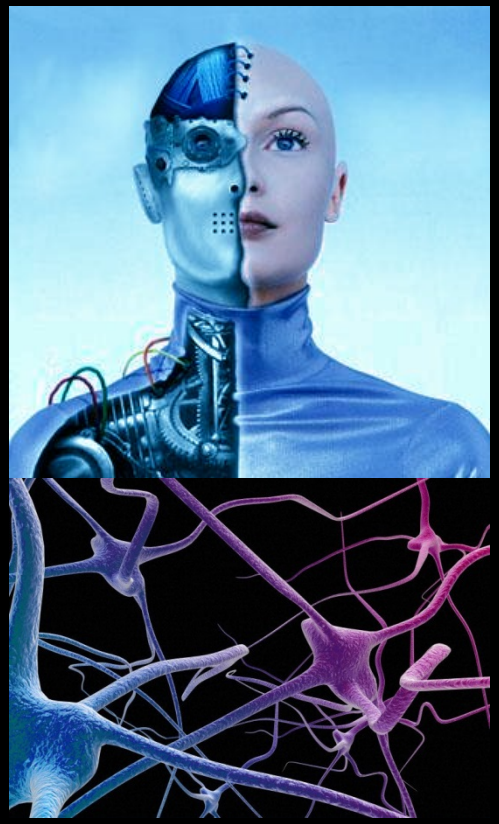
- Work experience: Fidelity, JP Morgan, Arthur Andersen, iPass, RHK/Ovum
- Education: MA Candidate, Kingston University London, MBA Finance, Wharton; BA French/Economics, Georgetown University
- Sample publications: MelanieSwan.com
  - Kido T, Kawashima M, Nishino S, Swan M, Kamatani N, Butte AJ. **Systematic Evaluation of Personal Genome Services for Japanese Individuals.** *Nature: Journal of Human Genetics* **2013**, 58, 734-741.
  - Swan, M. **The Quantified Self: Fundamental Disruption in Big Data Science and Biological Discovery.** *Big Data* June 2013, 1(2): 85-99.
  - Swan, M. **Sensor Mania! The Internet of Things, Wearable Computing, Objective Metrics, and the Quantified Self 2.0.** *J Sens Actuator Netw* 2012, 1(3), 217-253.
  - Swan, M. **Multigenic Condition Risk Assessment in Direct-to-Consumer Genomic Services**. *Genet Med* 2010, May;12(5):279-88.
  - Swan, M. **Engineering Life into Technology: the Application of Complexity Theory to a Potential Phase Transition of Intelligence**. *Symmetry* **2010**, 2, 150:183.

Source: http://melanieswan.com/publications.htm



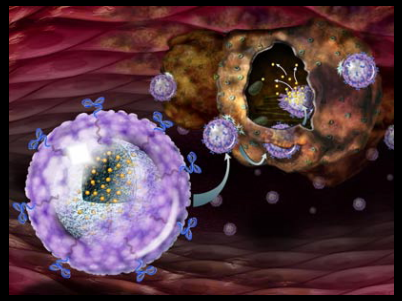
Agenda

- What are Cognitive Nanorobots?
- Cognition: Perception and Memory
  - Henri Bergson
- Models of Ethics
  - 1.0 Traditional
  - 2.0 Immanence
- An Ethics of Perception
  - Machine Ethics Interfaces
  - Killer Apps of Cognitive Nanorobots
- Neural Data Privacy Rights
- Conclusion

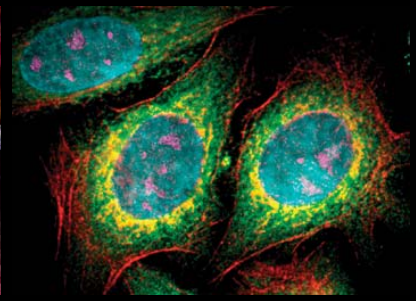


What are Nanorobots?

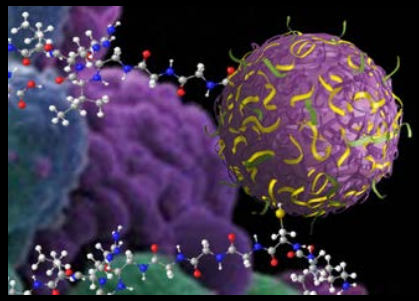
Current Status



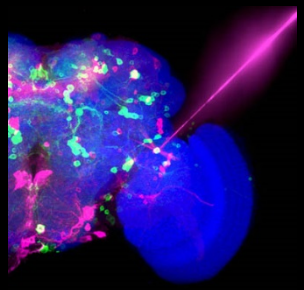
Nanoparticle Drug Delivery



Quantum Dot Dyes



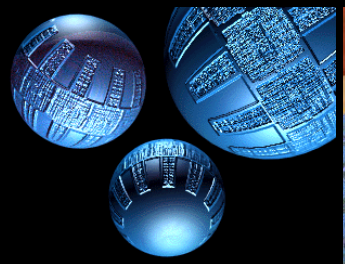
Nanosponge waste soak-up



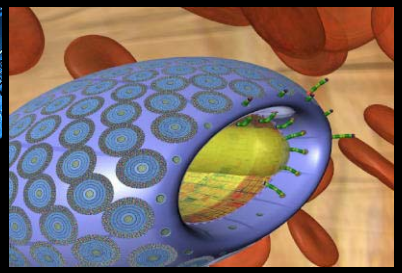
Optogenetics (controlling the brain with light)

Externally-read neural dust brain sensors

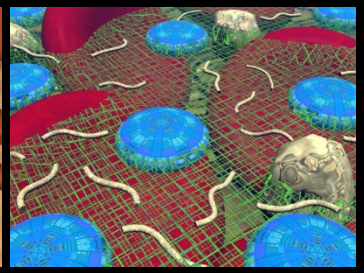
Future Possibilities



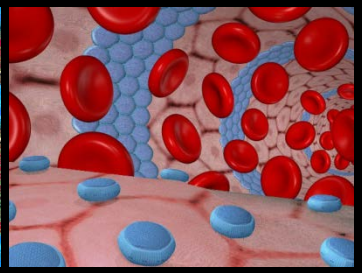
Respirocytes



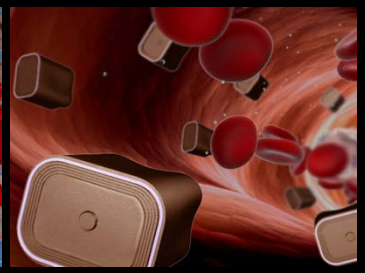
Microbivore



Clottocytes



Artery cleaners

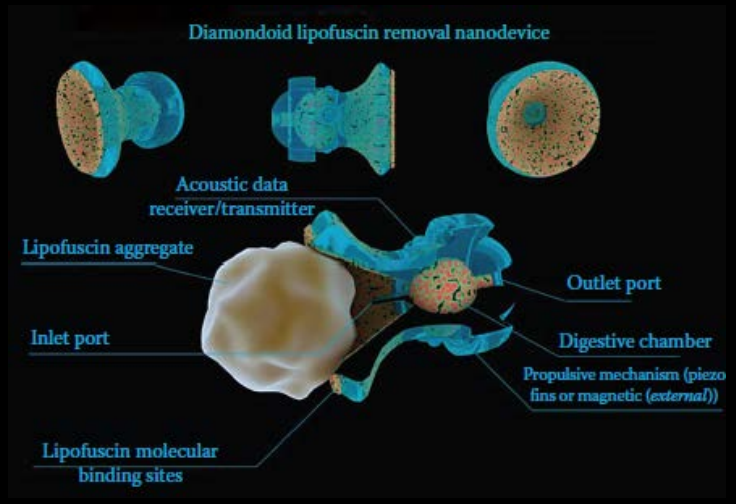


Chromallocytes

Future possibilities: Freitas, R Jr. Nanomedicine, Volume IIA: Biocompatibility. 15.3.6.5 Biocompatibility with Neural Cells. http://www.nanomedicine.com/NMIIA/15.3.6.5.htm

What are Cognitive Nanorobots?

- Analog to Medical Nanorobots
- Applications
  - Drug delivery, diagnostics
  - Clean-up, waste removal
  - Augmentation of perception, reasoning, memory
- Biocompatibility of medical nanorobots with neural cells
  - Mechanical
  - Physiological
  - Immunological
  - Cytological
  - Biochemical



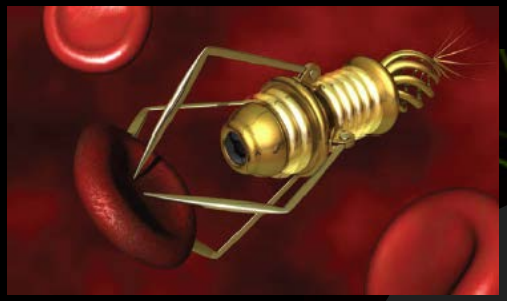
Defuscin diamondoid nanodevices removing neuronal lipofuscin[1]

[1]*Boehm F, Nanomedical Device and Systems Design: Challenges, Possibilities, Visions, 2013.*

Cognitive Nanorobotics

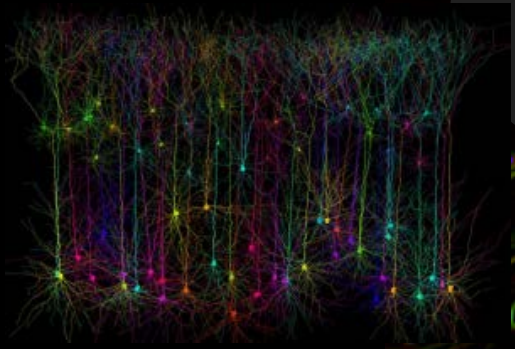
An integration of disciplines

Nanorobotics

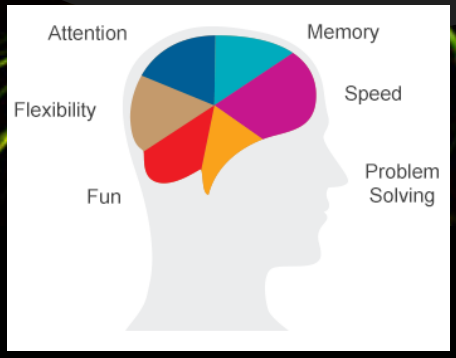


Wearable Computing

Cognitive Nanorobotics



Neuroscience

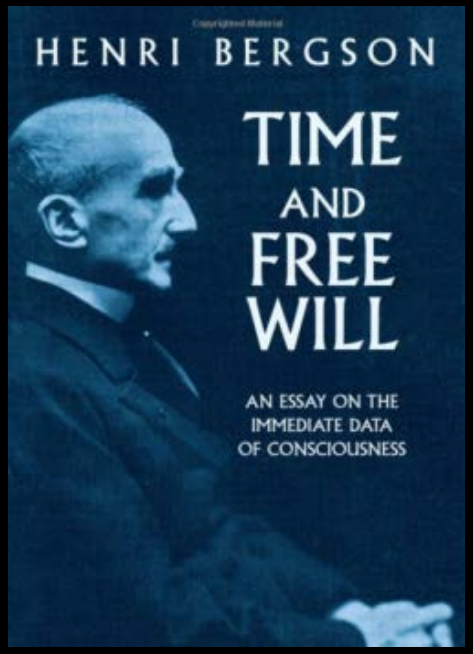


Cognitive Enhancement

Brain-computer Interfaces

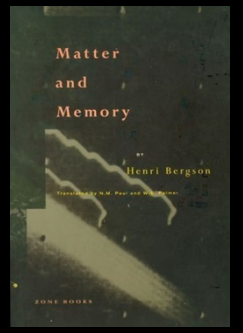
Cognition: Perception and Memory

- No one accepted theory of perception[1]
  - Prevailing: sense-datum, adverbial, intentionalist, disjunctivist
- Henri Bergson (1859-1941)
  - Mathematician, quantum mechanics predictor
- Doubling (quantitative-qualitative)
  - Time, intensity, state, memory
  - Self, consciousness
- Time: clock time (quantitative), inner experience (qualitative, duration)
- Free will over determinism
  - Tune in to duration, spontaneity

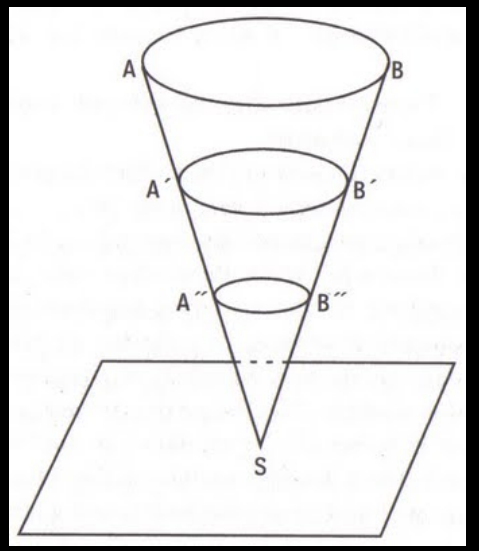


[1]*Stanford encyclopedia of Philosophy, http://plato.stanford.edu/entries/perception-problem/*

Perception and Memory



- Images exist outside the body as part of objects, not as part of brain structure (per Kant)
- The body does not create or store images but ***selects*** them to materialize per stimulus
- No mind-body dualism
  - Perception and memory are an interactive process of the body and mind
- Memory cone (dynamical operation of memory)
  - S: current moment of stimulus/perception
  - AB: pure memory
  - S-AB: perception S triggers accessing of pure memory AB to materialize an image that moves down the cone for action in the present
- ***How*** memory is accessed not ***where*** it is stored
- Exercise: memory retrieval

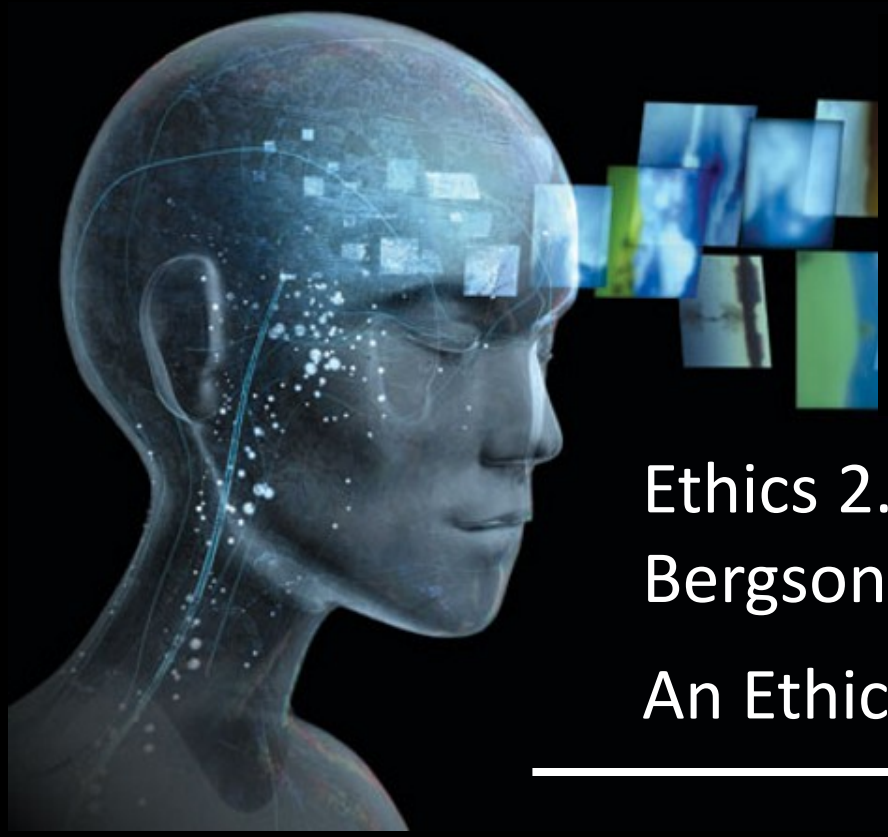


Bergson Memory Cone

Source: Bergson, Matter and Memory.

Models of Ethics

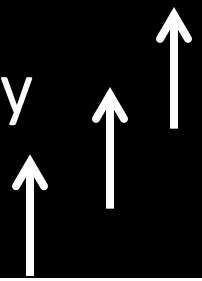
- Act-based (right act with right motive)
  - Categorical Imperative (*always* right/wrong) (Kant)
  - Utilitarianism (outcome maximization) and Consequentialism (end justifies means) (Bentham, Mill)
- Agent-based
  - Virtue ethics: role of character (Aristotle, Aquinas)
  - Dispositionism: individual traits predict behavior
- ★ Situation, context, and ecosystem-based (1968)
  - Situationism: social context produces behavior
  - Ethics of Care (Gilligan): morality arises from interaction



Rethinking Ethics

Ethics 2.0: Unbounded Upside, Bergsonian doubling, affirmatory

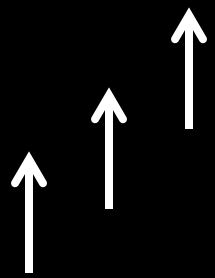
An Ethics of Immanence



Baseline

Ethics 1.0 Best scenario: regain baseline of pre-specified ideal, undoubled, negative

An Ethics of Impossibility



Immanence: in philosophy, where everything comes from within a system, world, person, as opposed to transcendence where there are externally-determined specifications

Ethics 2.0: An Ethics of Immanence

- Bergson (*Free Will and Time; Matter and Memory*)
  - Direct contact with the real, true duration
- Heidegger (*Being and Time; Building, Dwelling, Thinking*)
  - A conscious authentic life
  - Dwelling meaningfully as human implacement, being 'in' place, as an extension of identity
- Foucault (*Discipline and Punish, Power-Knowledge*)
  - Power: omnipresent micropower relations, biopower and self-disciplinary power
- Deleuze (*Anti-Oedipus, A Thousand Plateaus*)
  - Non-fascist life, desiring-production
  - Thinking and life, plane of immanence

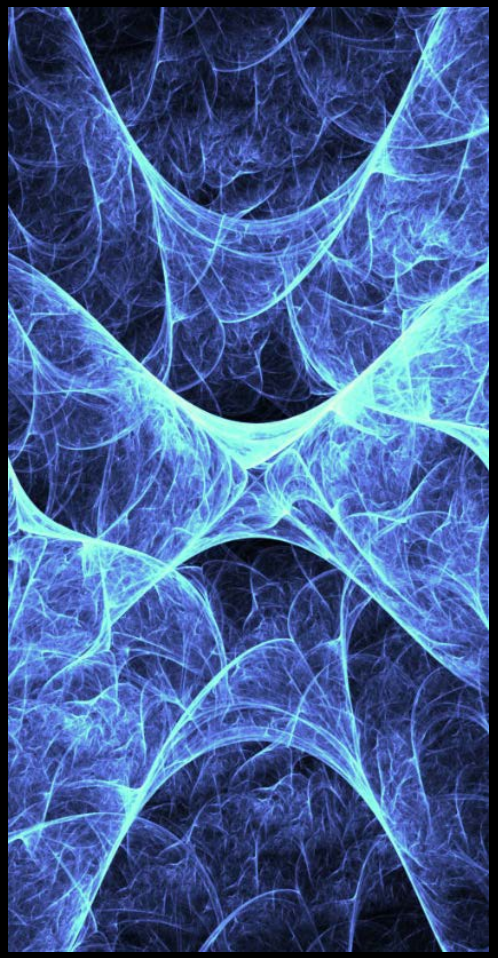
Machine Ethics Interfaces: Connecting Perception to Ethics

- Already exist by default
- Ethics and Perception become a feature choice with selectable parameters
- ‘Objective’ reality as an input?
  - Ethics of Reality
  - Non-reality is more ethical?
- UX issues with mediating perception
  - Fourth-person perspective

UX = user experience

Killer Apps of Cognitive Nanorobotics

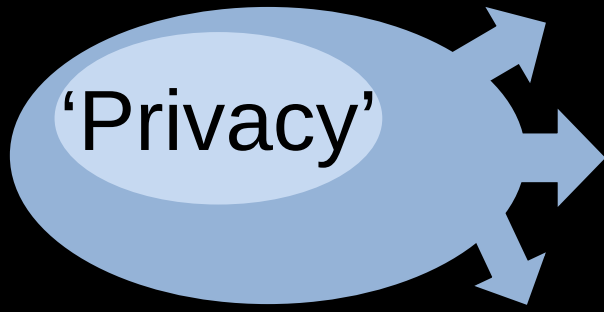
- Bias reduction
  - Overconfidence, loss aversion
- Memory management
  - Accessing and blocking
- Value system, desires elicitation and optimization
- Perceptual enhancement
  - Subjective experience enhancement
  - Multiple realities
- Individual and group POV HUDs



POV HUDs = point of view heads-up displays

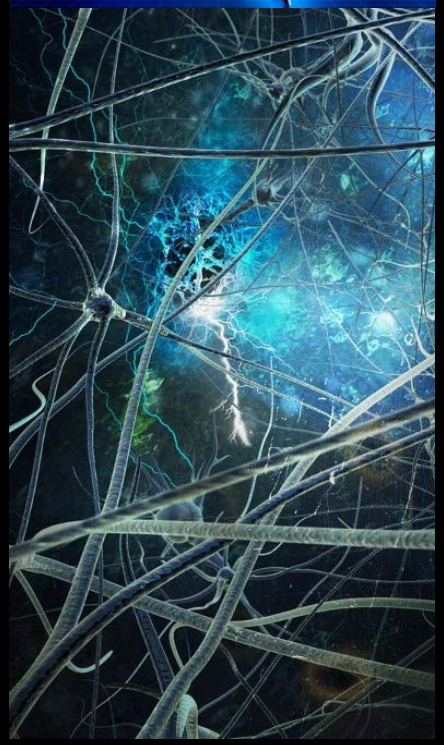
Neural Data Privacy Rights

- Neural data streams
  - Cerebral activity (EEG, fMRI, PPG, TMS)
  - Eye-tracking, affect, mental state
  - Wearables, sensors, IoT, biometric, social media
- Practical impossibility of privacy
  - Ownership and access
  - Transmission, sharing, permissioning
  - Neuroethics, neuroexpression, neurodiversity, neurocommunications
- Precedent (personal data)
  - Genomic, medical, census, financial



Conclusion - Cognitive Nanorobotics

- Progression of ethics paradigms
  - Ethics of the future: immanence
- Overt consideration of machine ethics interfaces and modules
- Neural data privacy rights



Our attunement to technology as an enabling background helps us see the possibilities for the true meaningfulness of our being - Heidegger

Source: Heidegger, M. The Question Concerning Technology, 1954.

Thank you!

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