

Evo-devo-psycho: evolution, free energy and attachment

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Plan of talk

- General remarks
- Bowlby and evolution – update
- Universal Darwinism and the free energy perspective
- Implications for psychotherapy

Emma and Charles



Carol Ann Duffy: *Mrs Darwin*

7th April 1872

Went to the Zoo.

I said to Him –

Something about that Chimpanzee over there
reminds me of you.

Huxley and Wilberforce

Wives of great men

WIIRD

Mary Ainsworth and John Bowlby



Dobzhansky, Huxley & the evolutionary triad

- ‘Nothing in biology makes sense except in the light of evolution...[including]... protective strategies’
- The evolutionary triad: **variation, selection, replication**

Huxley's 'Modern Synthesis': Darwin + Mendel + population genetics



Tinbergen's ethological quartet

- Mechanism
- Ontology
- Phylogeny
- Adaptive significance

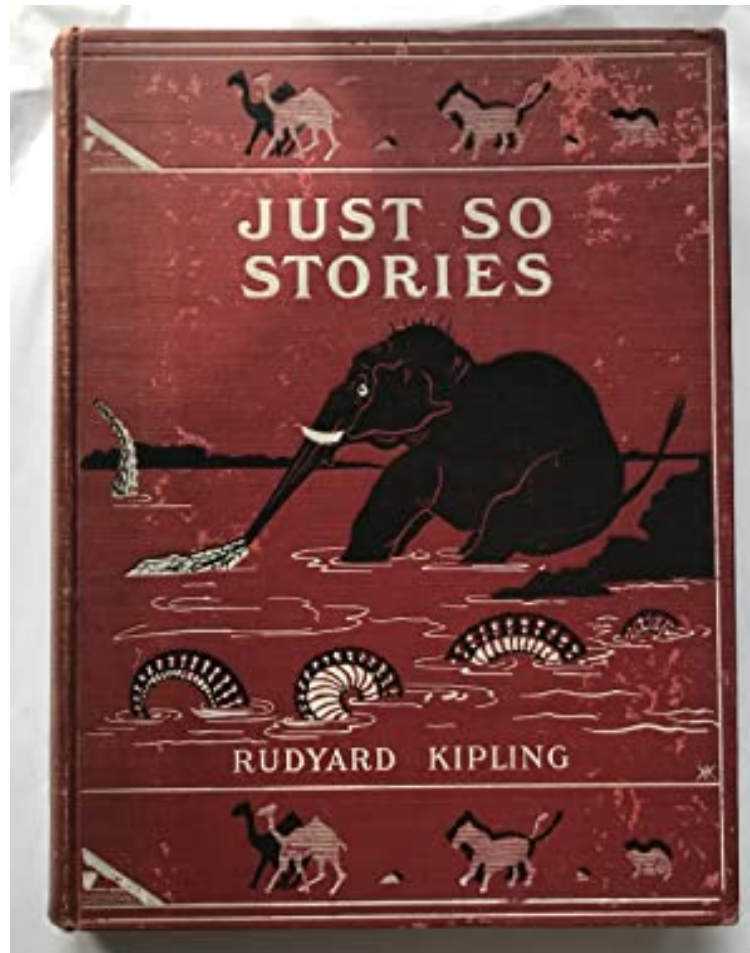


JB's take on Tinbergen

- Mechanism: **Internal Working Models**
- Ontogeny: maternal **sensitivity**
- Phylogeny: 'older wiser' **protection from predation** widespread among mammals
- Adaptive significance: **security** & **psychological immune system**



EP as 'just so' stories



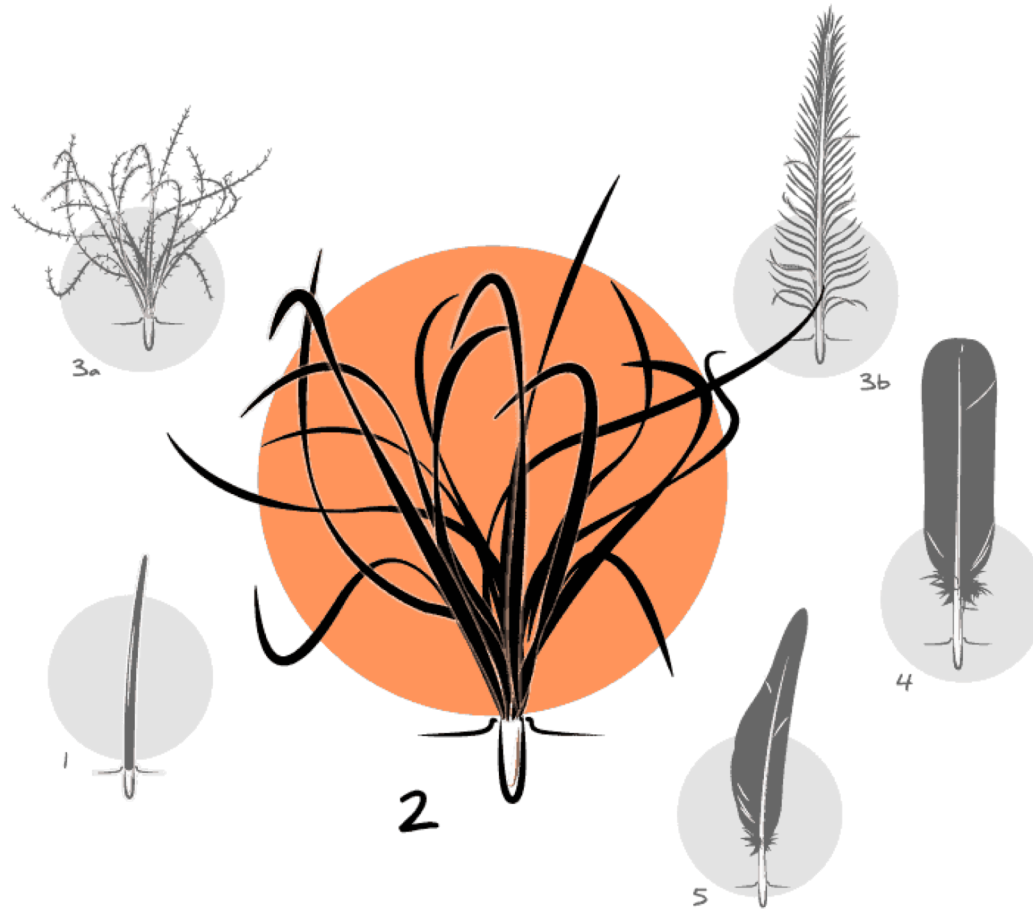
Bowlby/Hinde: 'environment of evolutionary adaptiveness'



Post modern synthesis: Laland's Extended Evolutionary Synthesis (EES)

- **Niche construction:** phenotype-genotype relationship two-way, esp where conspecifics form primary niche
- **Multi-level selection:** within groups, selfishness trumps altruism; between groups, altruism trumps selfishness
- **Life history theory, epigenetics & neuroplasticity:** environment shapes gene expression

From dinosaurs to birds, evolution of feathers



Attachment and EES

Attachment as **culturally transmitted relational platform** via

- Bio-behavioural synchrony (Feldman)
- Shared attention (Tomasello)
- Contingency and marking (Gergely)
- Mentalising and TOM (Fonagy & Bateman)
- Epistemic trust and TTOM (Thinking through Other Minds) = 'borrowed brain' (Sperber)

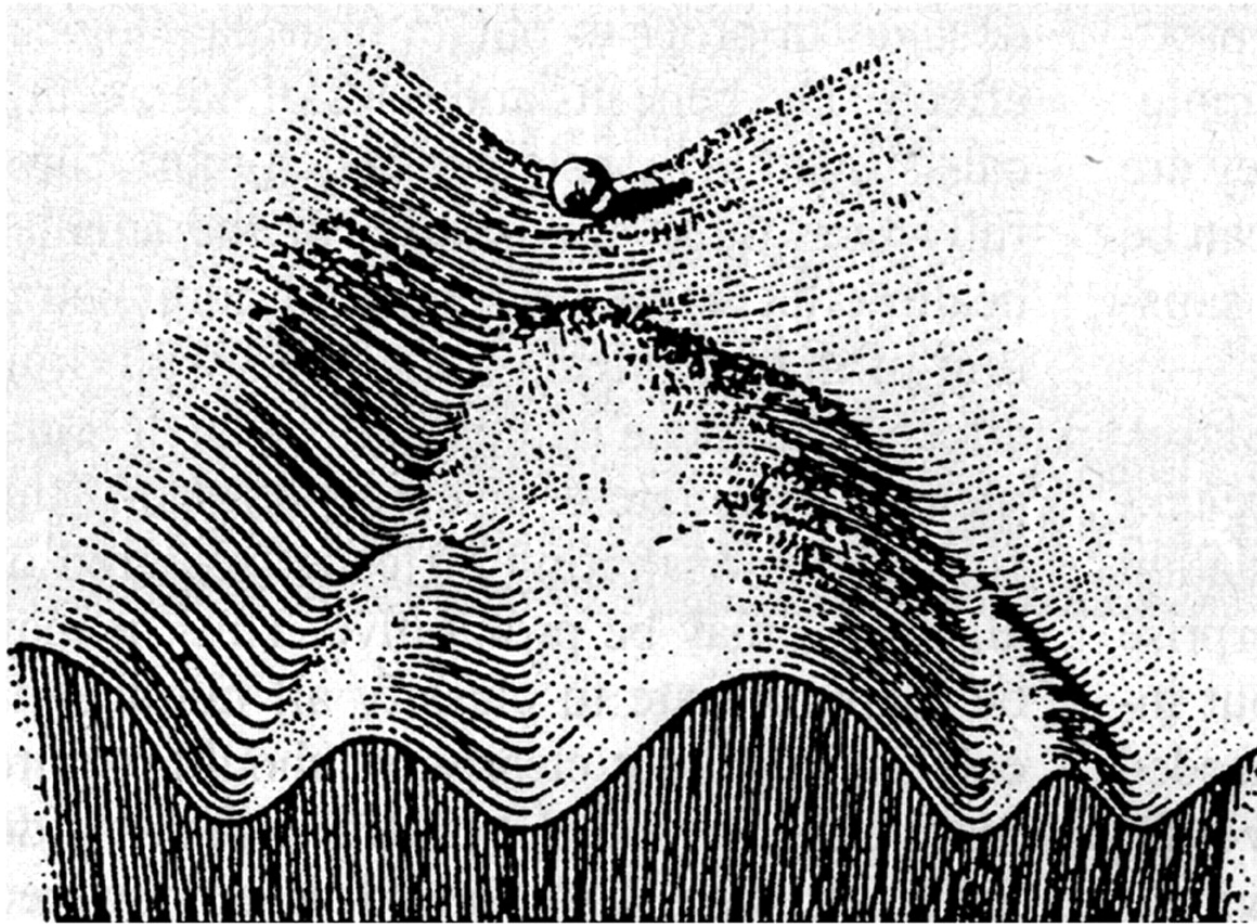
Bowlby draws on Ainsworth: attachment as a relational platform

...the feeding situation...provides an opportunity to gauge a mother's *sensitivity* to her baby's signals, her ability to *time* her intervention to suit his rhythms, and her willingness to *pay heed to his social initiatives*...the way a mother *feeds* her baby...prove(s) predictive of how his *attachment behaviour* is going to develop (Attachment 1971)

Feeding and affect co-regulation



Waddington developmental pathways



Affect regulation

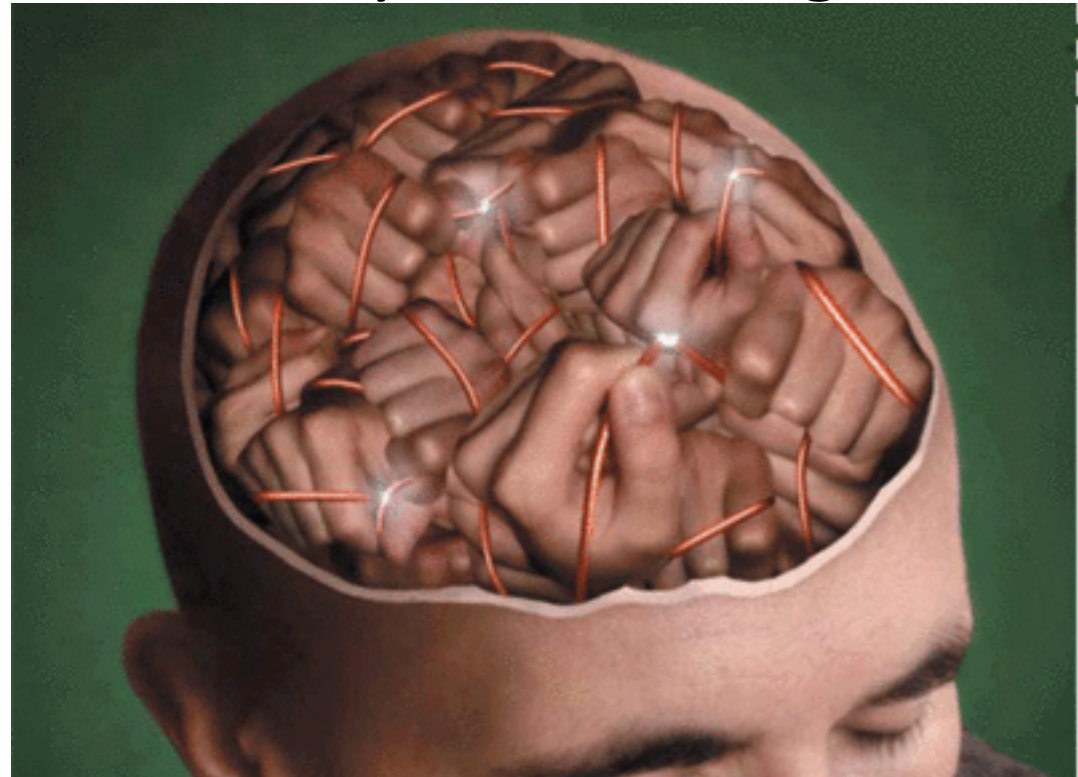
- Feeding provides relational context for *affect regulation* in both children and adults
- Secure: acceptance and non-shame-inducing processing of *negative affect*
- Insecure: painful feelings *repressed* or *unmodulated* – *risk factors* for psychological and somatic disturbance, but...
- ...also *necessary variation* in face of environmental unpredictability

Victor Frankl: context and attachment dispositions



Belsky hypothesis

- *Plasticity* not vulnerability
- In favourable environments plasticity genes confer advantage; in adversity disadvantage



Belsky & Fearon

- **Life history theory**: fast and slow trajectories
- **Security status in Strange Situation at 1yr predicts age of menarche**
- *Relationships* impact on *biology*
- ‘Psychopathology’ may be adaptive to environmental adversity: e.g. early sexual maturity, epistemic hyper-vigilance

Steve Suomi



Suomi et al 2006: gene-culture co-evolution

- *Peer-reared monkeys*: s allele drink more alcohol than l alleles
- *Maternal-reared*: s-ers less alcohol than l counterparts
- Thus s allele significant *risk* factor if P-reared, but *advantageous* for M-reared

Tomasello: human infants v great apes: collaborative exploration

Shared child-care: human 'environment' =
predominantly other humans:

- joint attention,
- proto-conversations,
- turn taking,
- joint intentionality,
- second person perspective,
- shared language

Responsive v Still Face



Schore: Right brain to right brain



Sensitive periods & secure attachment



Van Gogh's first steps (after Millais)



Ostensive communication: the frog in the bucket



Epistemic trust...outsourcing, salience and 'prestige'

i.e. 'you are someone I can rely on to make me
feel safe....

You are friend not foe...

You seem to be able to put yourself in my
shoes...

and therefore I trust the information about the
world you impart to me....

Yes, that's a frog!'

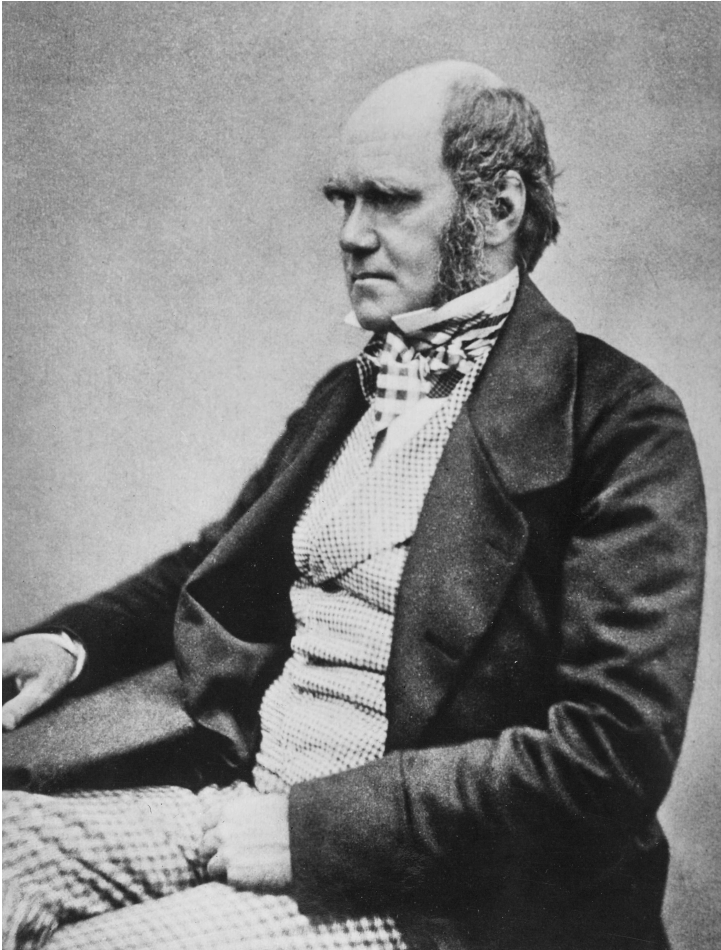
Hybrid animals and epistemic trust



Epistemic trust and attachment

- Children 3-4; Hybrid animal pictures, some absurd; stranger says one thing, mother another
- Secure: trust mum *and* self
- Insecure avoidant: more likely trust stranger
- Insecure ambivalent: more likely trust mother
- Insecure disorganised: trust no one (epistemic hypervigilance)

Principle (evn. by natural selection) v
mechanism (genes): Darwin & Mendel



Freud 1895 ('physics for psychologists') & Friston (free energy) 1995-

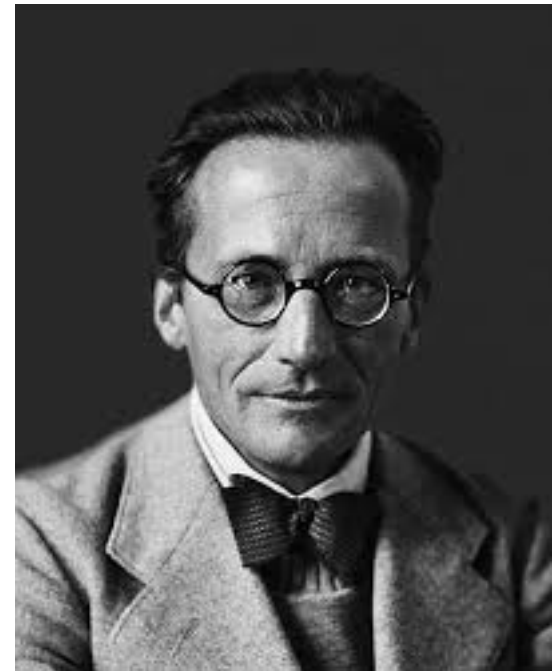


Kandinsky 'composition VII'



Erwin Schroedinger (1887-1961)

- Schrodinger: *life as negentropy* (NE) – contradicts thermodynamics' second law.
- Freud's 'Q' ('Project') becomes libido
- Entropy = 'death instinct'



Edelman, Universal Darwinism & the Bayesian Brain

Friston: the Bayesian brain within its Markov blanket as a Darwinian machine

- Top-down prediction = variation
- Bottom-up environmental feedback = selection
- Agency and generative model revision = replication

Proverbs 19:21: *'Man proposes, God disposes'* Thomas A Kempis version



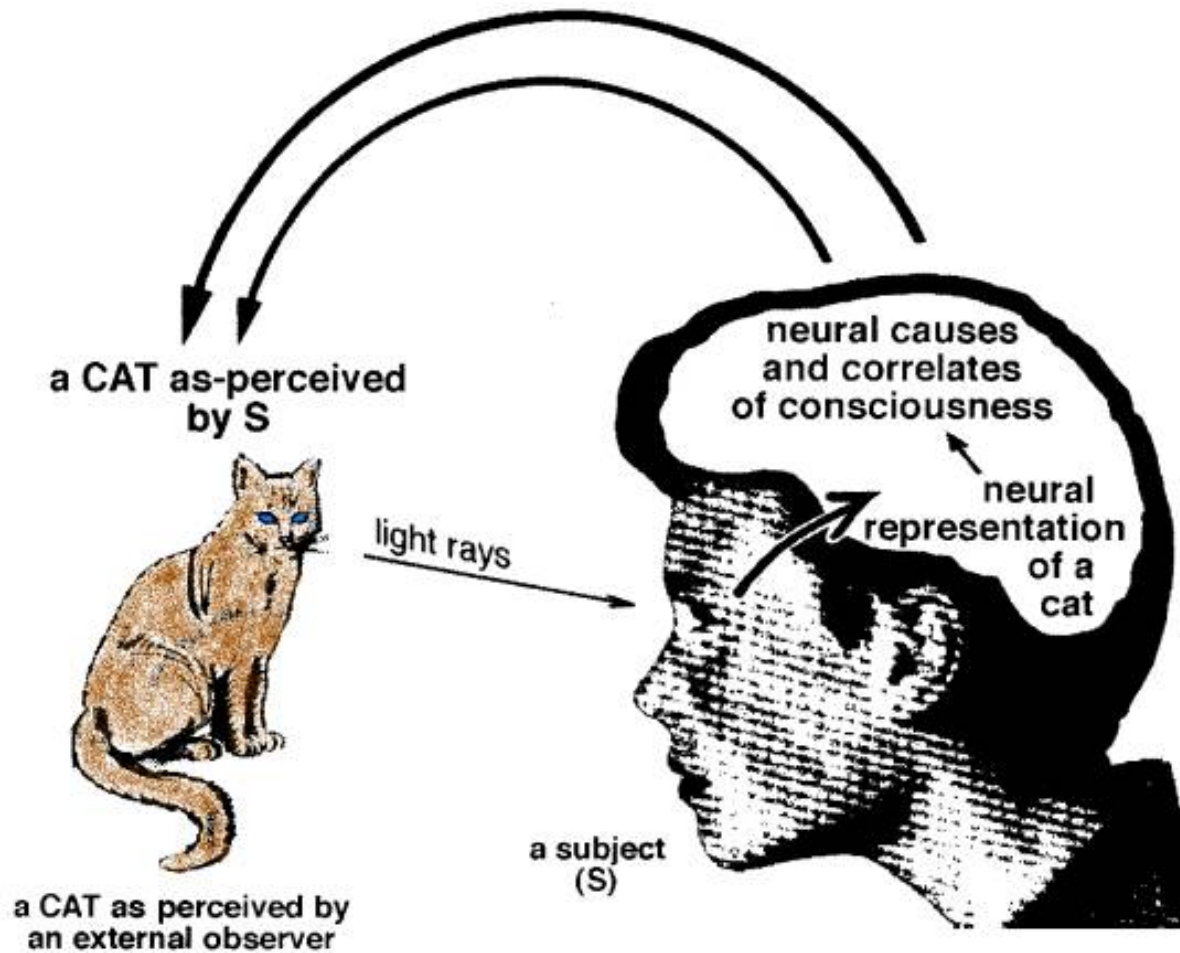
'Bottom up'

- The mind is bombarded with sensations,
- from exteroceptors ('five senses') telling us about the outside world...
- and interoceptors (gut, heart, proprioception etc) about the 'inner' world...

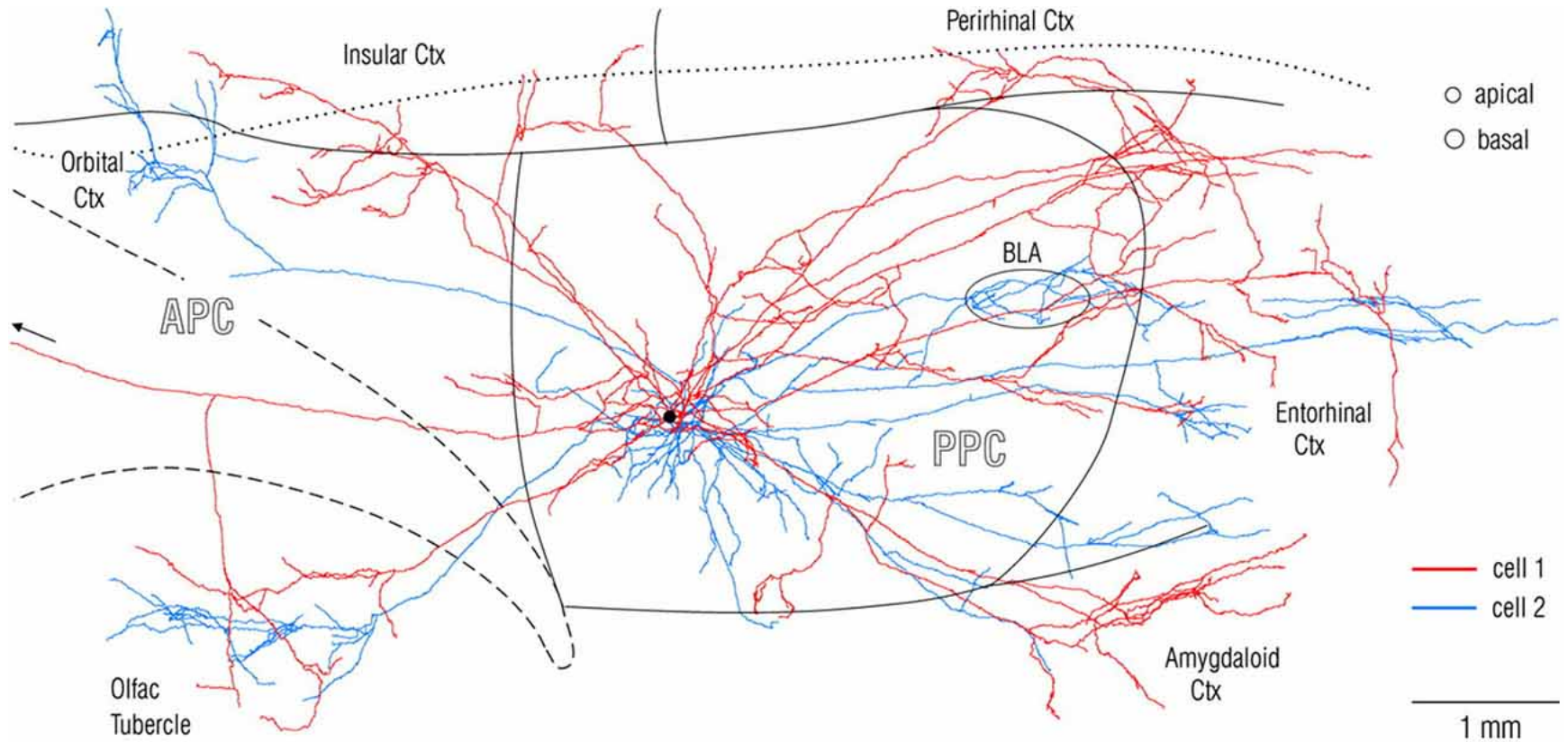
'Top-down'

- The brain 'makes sense' of this by...
- drawing on pre-existing models ...
- ..to make a probabilistic estimation of its salience/affordance, and...
- Minimises discrepancies between input and models...
- so as to eliminate 'surprise or 'free energy', aka entropy

Visual system: 'top down' (perception) meets 'bottom up' (sensation)



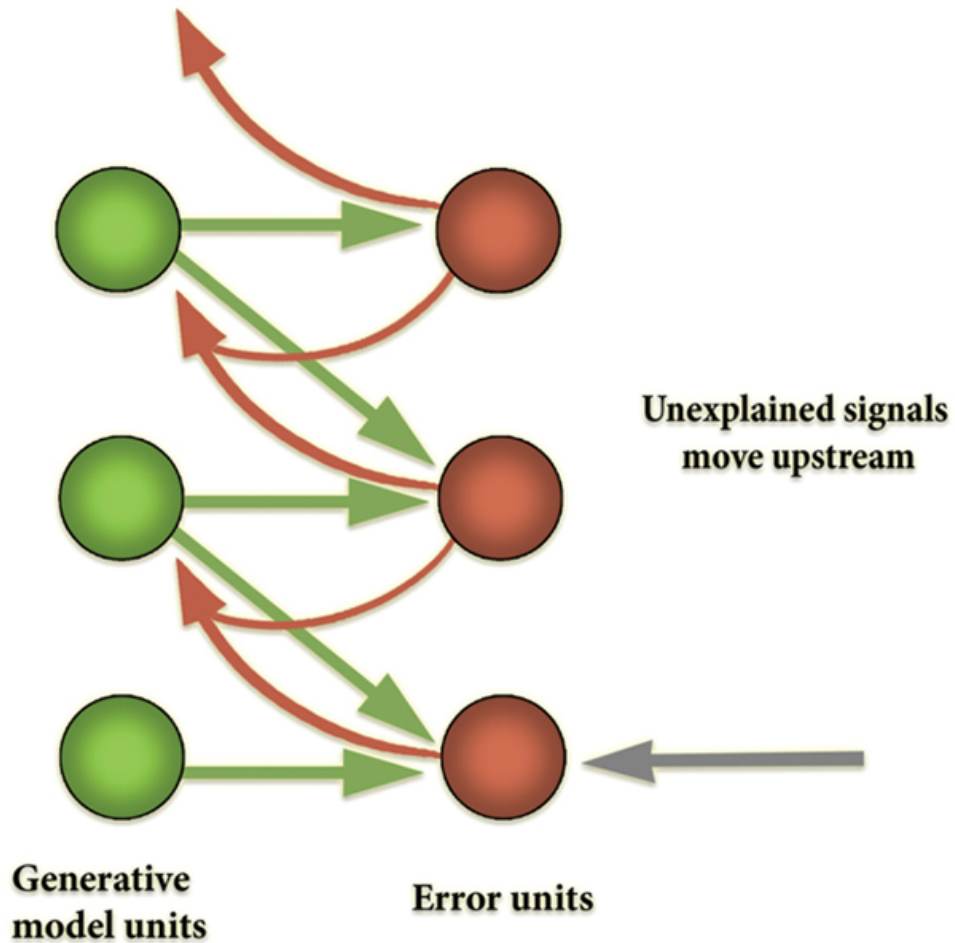
More top down fibres to visual system than bottom up



We create our own worlds: a Gogh jigsaw



Hierarchical free energy minimising



'Duets for one'



Two person neuroscience

- Frith: Signal detection more efficient with two than one observer
- ‘we-go’/’two-getherness’
- ‘Borrowed brain’
- Schore: R Brain-R Brain entrainment
- Feldman: biobehavioural synchrony (newborn) leading to ‘dyadic reciprocity’ (toddler)

Coan et al (2006)

- fMRI study; subjects in scanner; mild shock with anticipation
- 3 conditions: alone; husband's hand; stranger's hand
- Linear inverse relationship between marital quality and fMRI patterns of arousal and use of self-oriented strategies

Handholding Task



Partner

Handholding



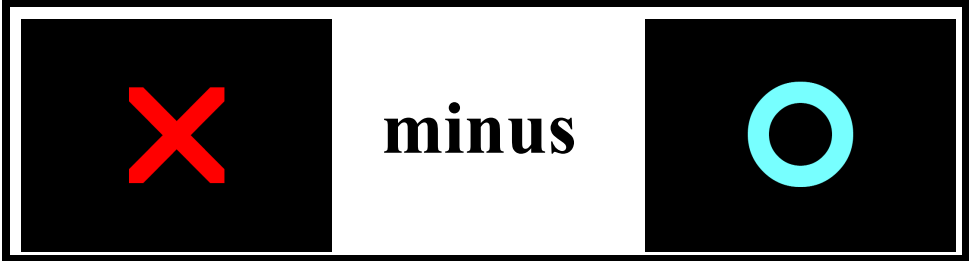
Stranger

Handholding



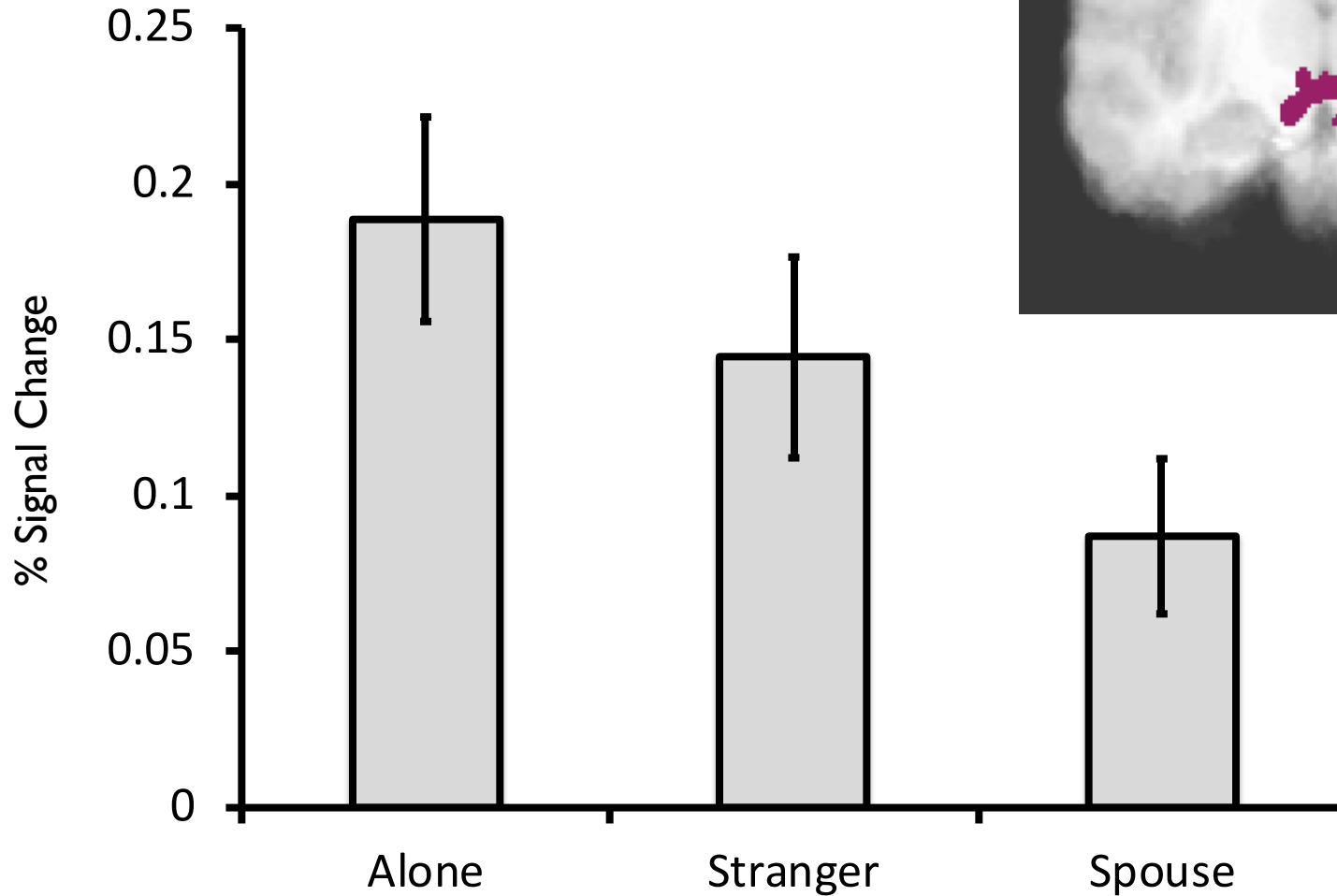
No

Handholding



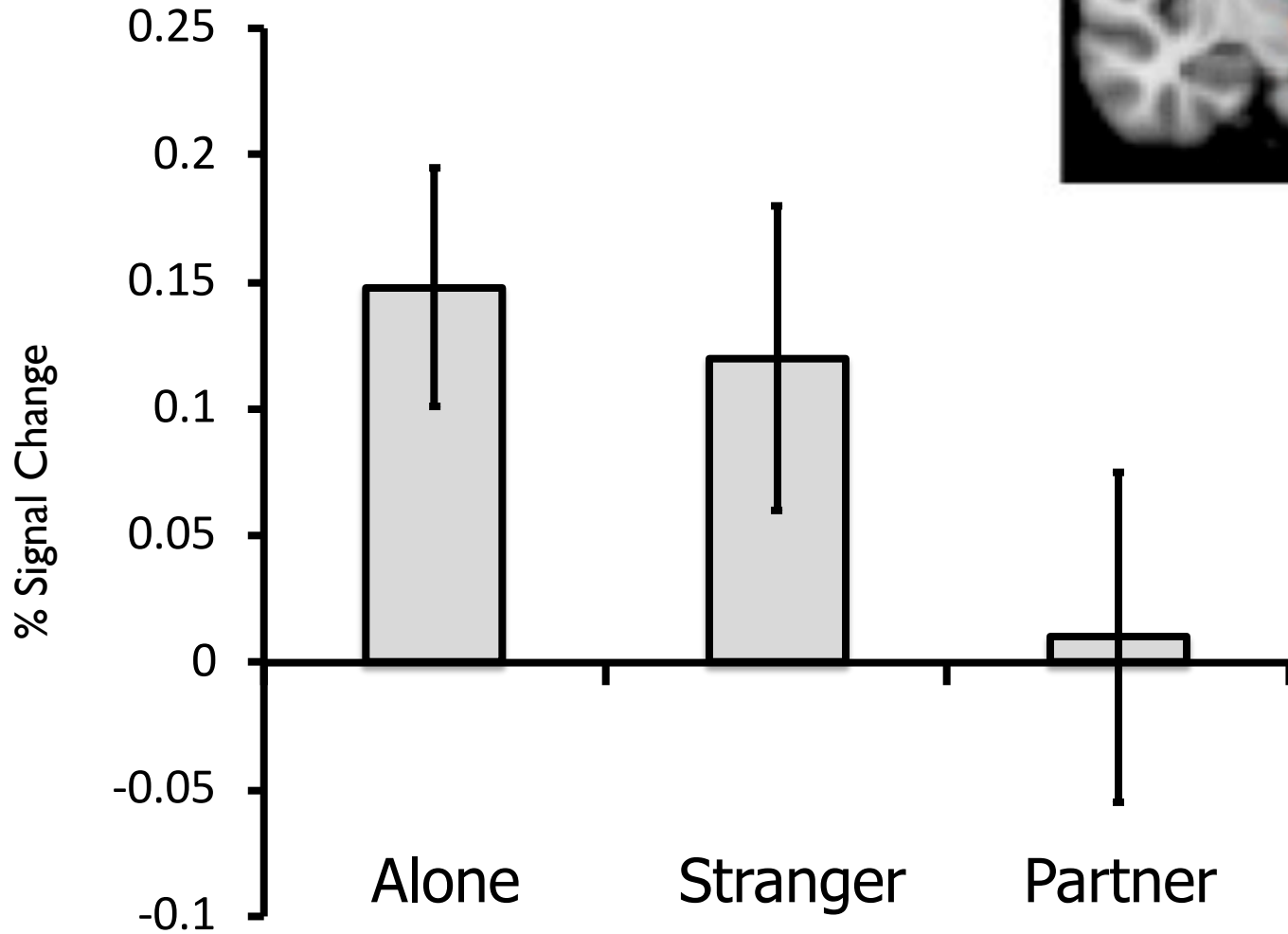
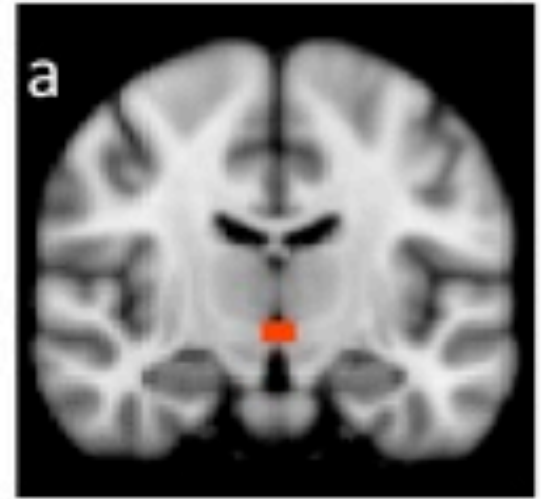
Hypothalamus

- $F(2,27) = 4.31, p = .02$
- “HPA-Axis”; Immune function



Hypothalamus

- $F(2,42) = 4.05, p = .025$
- “HPA-Axis”; Immune function





Coan's query

- 'The dog that didn't bark in the night'
- 'Shared load' = affect co-regulation
- 'Bottom-up' *collaborative* Prediction Error Minimisation
- No free energy, no worries!
- i.e. secure attachment as shared niche construction

Psychopathology: e.g. Disorganised attachment and BPD



Disorganised attachment (D) as BPD precursor

- Epistemic hypervigilance
- Secure Base figure often the very source of threat: approach/avoidance dilemma (Main/Hesse theory)
- Threatened child resorts to pathological self-soothing, e.g. dissociation, bizarre posturing, repetitive self-injury.
- D rare in non-clinical populations, but common where SES, and/or history of physical/sexual abuse or neglect

Fostering Universal Darwinism in the consulting room

- **‘Variation’**: counterfactuals aka imagination; dream analysis; attending to interoceptions
- **‘Selection’**: agency; explore the unexpected so that it becomes less surprising, esp via ‘transference’
- **‘Replication’**: foster and validate new generative models and routines

‘Pressing pause button’ = disentangle
topdown/bottomup automaticity



BPD and 'earned security'

- Gradual establishment of epistemic trust
- Borrowed brain: tolerate and explore ambiguity
- Manageable chaos
- Extend top down models
- Listen better to bottom up interoceptions
- Adaptation to wider range of self-other niches

Mentalising: niche co-construction

- Therapy as *in vitro* mentalising arena: playing the 'intimacy game' 'hands up'



Summary: Darwinian roots and branches

- From selective advantage of attachment as security provision in hostile environments...
- ...to attachment as basis for
 - Niche co-construction
 - Affect co-regulation
 - Thinking Through Other Minds
 - Consciously directed cultural evolution

Resilience



Thanks for invitation and listening...

- If you want slides
- J.a.holmes@btinternet.com
- Or more on Attachment and psychotherapy:
Holmes, J. & Slade, A. (2017) *Attachment in Therapeutic Practice* (SAGE)
- Or on Friston and psychotherapy:
- Holmes, J. (2020) *The Brain has a Mind of its own: attachment, neurobiology and the new science of psychotherapy* (Confer Books)7)