From “embodied” and “extended” cognition, to emotion

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Who am I?

- I am a philosopher of cognitive science
- Main research topics:
  - "4E" cognition: Embodied, Embedded, Enactive, Extended cognition
  - Emotion, Affectivity
  - Phenomenology
- "Empirically minded" philosopher


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Overview

PART I:

- (1) Introduce the idea of "embodied cognition"
- (2) Turn to emotion:
  - Overview traditional accounts of emotion
  - Provide a critique from an "embodied cognition" perspective

PART II:

- (1) Introduce the idea of "extended cognition"
- (2) Turn to emotion:
  - Ask whether and how emotion can be "extended"

PART I

FROM EMBODIED COGNITION TO EMOTION

Embodied cognition

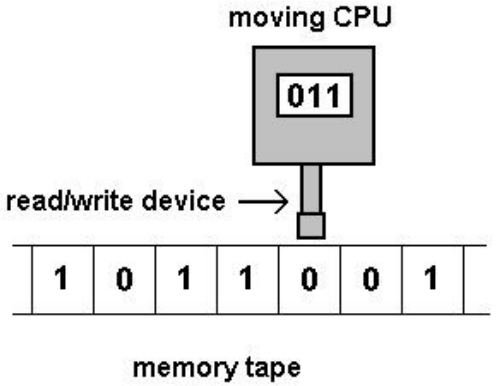
A thriving and much-debated interdisciplinary research area

A VERY brief history of cognitive science…

- Non-embodied approaches:
  - (1) Symbolic approach (1950s – on)
  - (2) Connectionist approach (1980s – on)

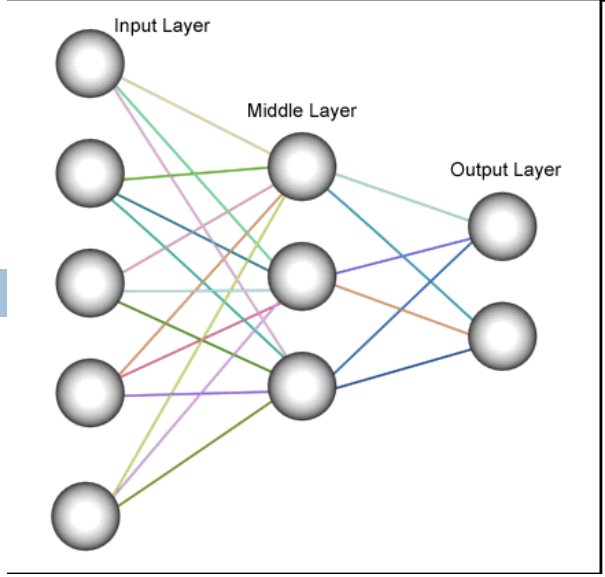
- Embodied approach: from 1990s on
  - Various lines of argument

(1) Symbolic approach



- The mind as a digital computer
  - Mind: Software = Brain: Hardware
- Cognition is the manipulation of symbolic representations according to internal rules (programs)
- Key paper: A. Newell (1980), Physical Symbols Systems. *Cognitive Science* 4: 135-183.

(2) Connectionism



- "Biologically inspired", parallel processing of information
- Cognitive states are patterns of activation of neural networks
- These patterns change depending on input, and on previous activity of the network
- Key text: Rumelhart & McClelland (1985) *Parallel Distributed Processing*. MIT Press (2 volumes).

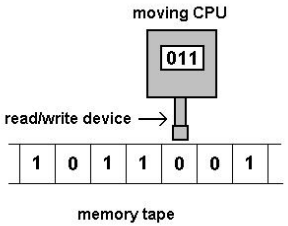
Why "non-embodied"?

In both symbolic and connectionist approaches:

- The body (the organism *minus* the brain) only provides inputs to the cognitive system, and receives outputs from it
- All the "smart stuff" is done by the brain: cognition is centralized

Non-embodied cognition

- In non-embodied approaches, cognition is like a pilot in its ship!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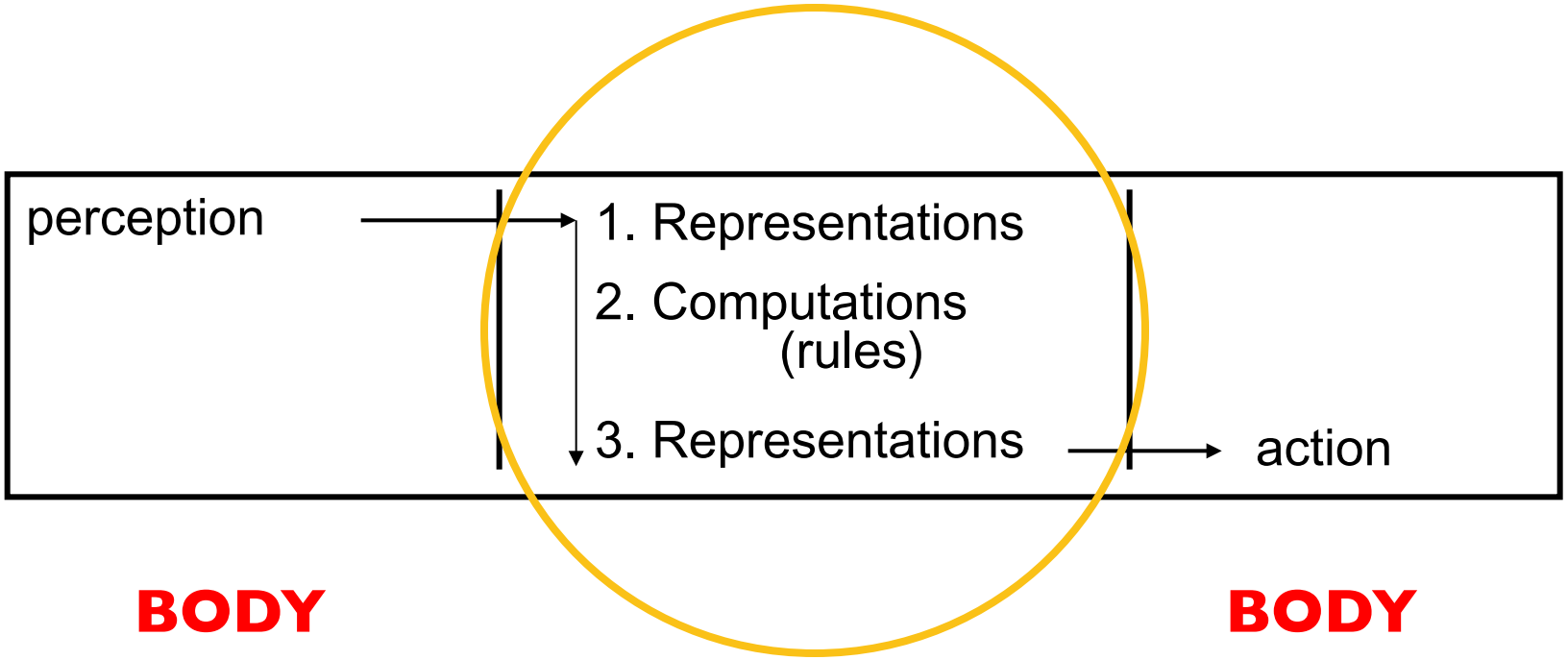
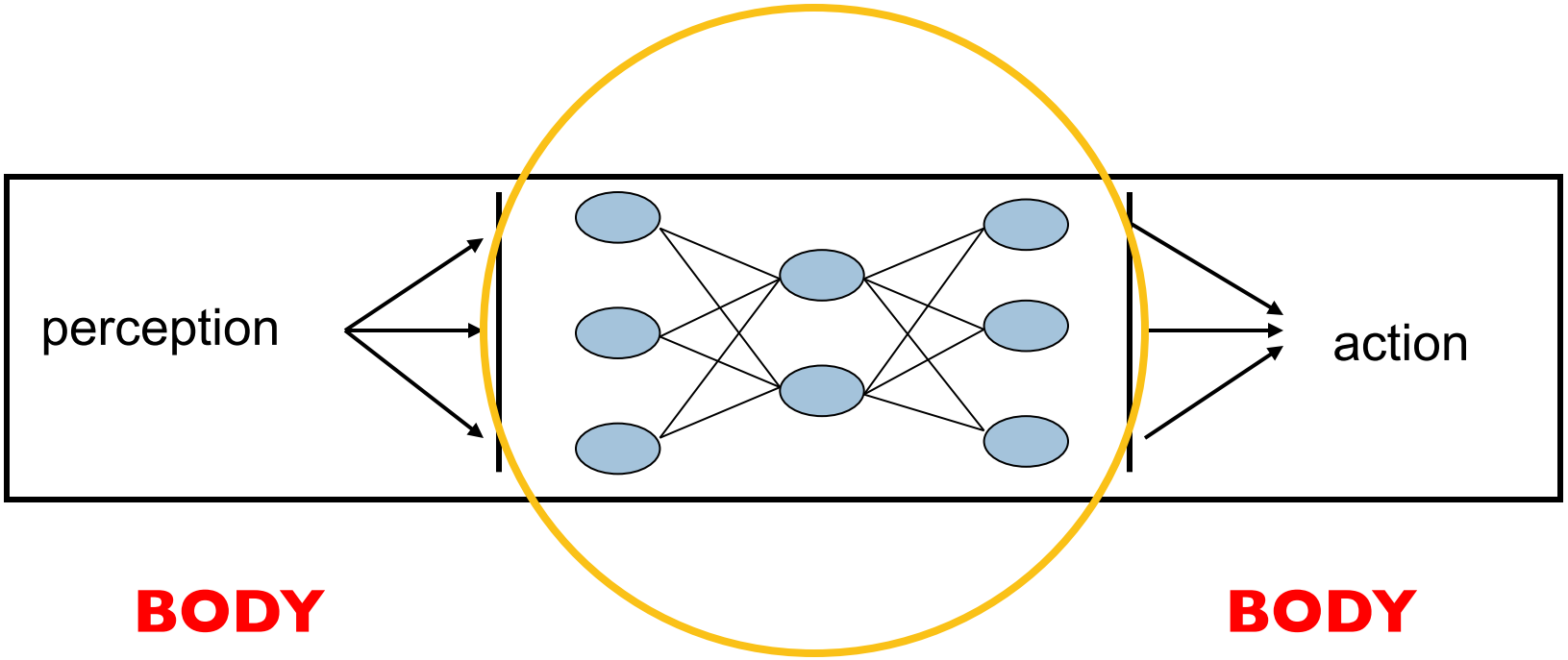

perception
1. Representations
2. Computations
(rules)
3. Representations
action
BODY
BODY
MIND / BRAIN


perception
action
BODY
BODY
MIND / BRAIN

Enter the “embodied approach”

- 1990s: Several works emphasizing the close interrelation of brain, body, and world
- Cognition not regarded anymore as “brain-bound”
- Rather: cognition is realized by complex patterns of interactivity between brain, body, and world
- Cognition is “distributed” over brain, body, and even world

Supporters of "embodied approach"

Interdisciplinary approach

- Philosophy: Andy Clark; Evan Thompson; Shaun Gallagher; Susan Hurley; Tony Chemero; Alva Noë; …
- Cognitive scientists: Eleanor Rosch; Esther Thelen; Francisco Varela; Randall Beer; Rodney Brooks; …

- Several books (ask if you are interested!)

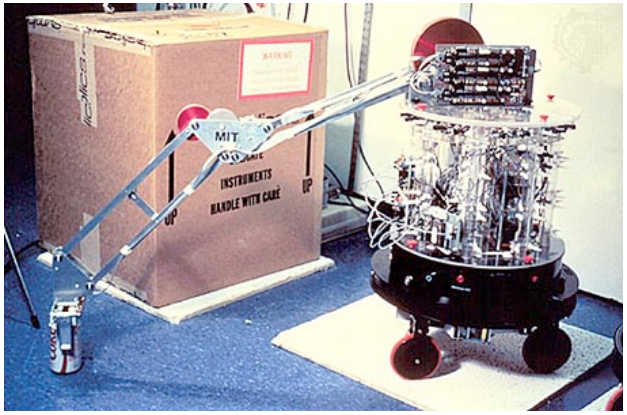
Various “streams”

- Major influences:

- 1) Situated robotics
- 2) Dynamical systems approach to cognition
- 3) Embodied approach to concepts
- 4) Phenomenology

1) Situated robotics

- Rodney Brooks (1991) "Intelligence without representations"
- Herbert: a robot able to pick up cans of coke from a crowded office, without any complicated internal algorithm and representations



- Just different functional levels: camera to detect the object; activates motor system to approach can; activates arm to pick up can; etc.

2) Dynamical systems theory

- Just main ideas:
  - Cognition is a *process* that unfolds over *time*
  - There is no central "control system"
  - Cognition "emerges" from the real-time interactivity of brain, body, and world; intelligent behavior appears without having been programmed into it

- Port & van Gelder (1995) (eds.) *Mind as Motion*. MIT Press.
- Thelen & Smith (1994) *A dynamic systems approach to the development of cognition and action*. MIT Press.

3) Embodied approach to concepts

- G. Lakoff & M. Johnson: everyday metaphors reveal the body-based nature of concepts

- Example: "Argument is WAR"
  - Your claims are **indefensible**
  - He **attacked every weak** *point* in my argument
  - His criticisms were **right on target**
  - I **demolished** his argument
  - I've never **won** an argument with him

- Key text: Lakoff & Johnson (1980), Conceptual metaphor in everyday language. *Journal of Philosophy 77* (8): 453-486.

4) Phenomenology

- Classic phenomenologists: Husserl (1859-1938), Heidegger (1889-1976), Sartre (1905-1980), Merleau-Ponty (1908-1961), others…
- Goal: to describe "phenomena": what appears or "is given" in experience…
- … without theoretical preconceptions and assumptions

4) Phenomenology

- Merleau-Ponty: especially important reflections on the body
- The *lived body*, or "body proper": the body not as a physical object, but as experienced from the first-person perspective, "subjectively"
- **Body-as-subject**, vs. body only as a object

4) Phenomenology

- *Phenomenology of Perception* (1945): perception is not a matter of passively representing the external world

- Perception is a bodily activity: it is something we do as embodied agents, and is closely interconnected with action and motivation

- "Every perceptual habituality is still a motor habit"

  - (More recent: Alva Noë (2004) *Action in Perception*)

Further information

- To learn more about the field of embodied cognition: http://plato.stanford.edu/entries/embodied-cognition/

- To learn more about the phenomenology of Merleau-Ponty: http://www.iep.utm.edu/merleau/

What about emotion?

- Introducing emotions: https://www.youtube.com/watch?v=TJxKvwMIVtA

- English words for emotions: anger, fear, happiness, sadness, disgust, surprise, guilt, shame, embarrassment, pride, jealousy, envy…

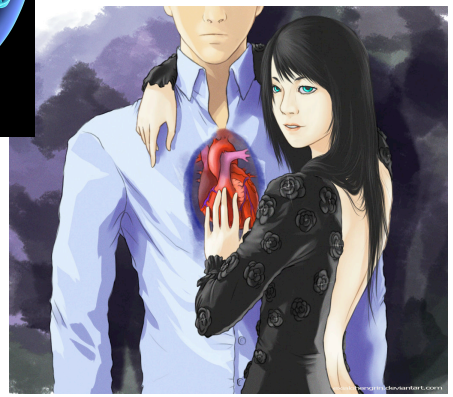
- Emotions = not just *feelings*, if by "feeling" you mean the subjective experience of sadness, happiness, etc.

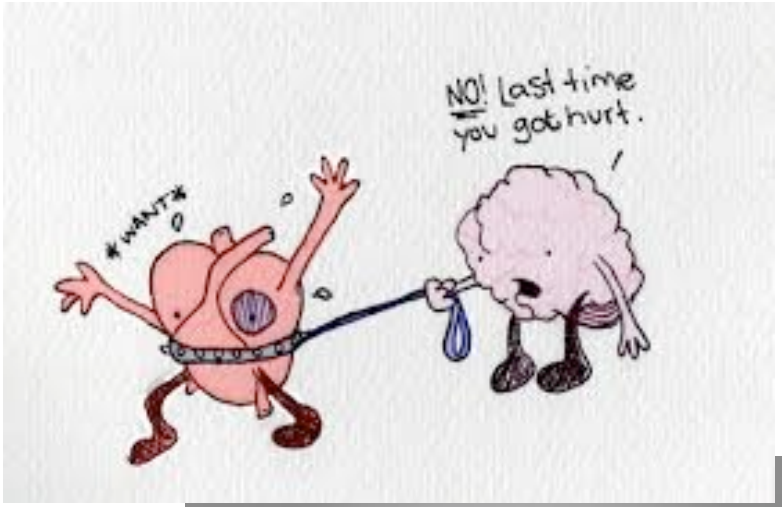

Designwar.net

無表情	笑顔	怒り	悲しみ
			
泣く	照れる	焦る	驚く
			
受け	攻め	好きな〇〇の前	嫌いな〇〇の前
			

"Folk" view of emotions (in Western thought)

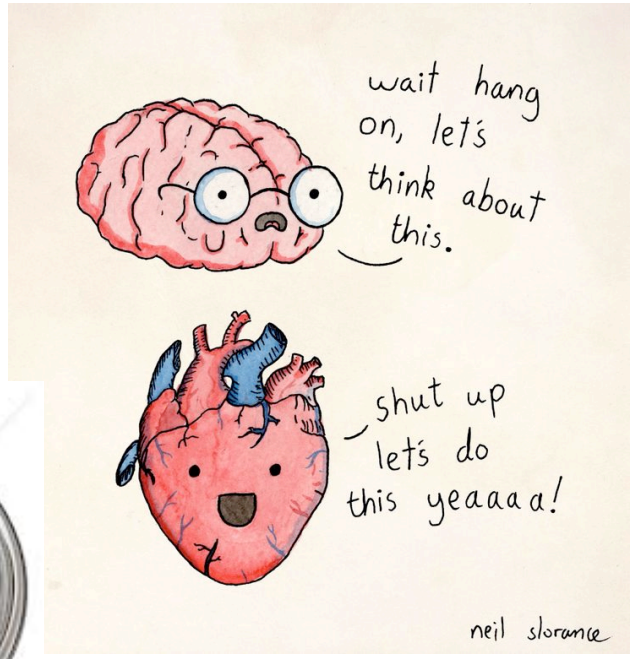
- Opposed to reason (intellect, knowledge, cognition, rational understanding, judgment)
- Passive (also called "*passions*"), outside our control
- Accompanied by bodily changes
- → Head/heart distinction

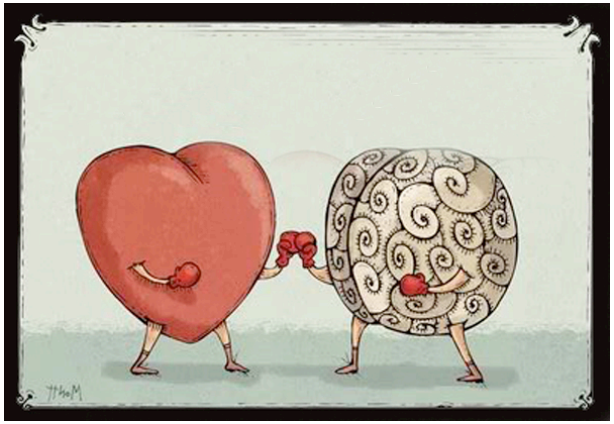




Stop thinking so much
head vs. heart
and go where your

heart takes you





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Contemporary affective science

- Today, the dominant view in affective science emphasizes that **emotions *include* cognitive states**

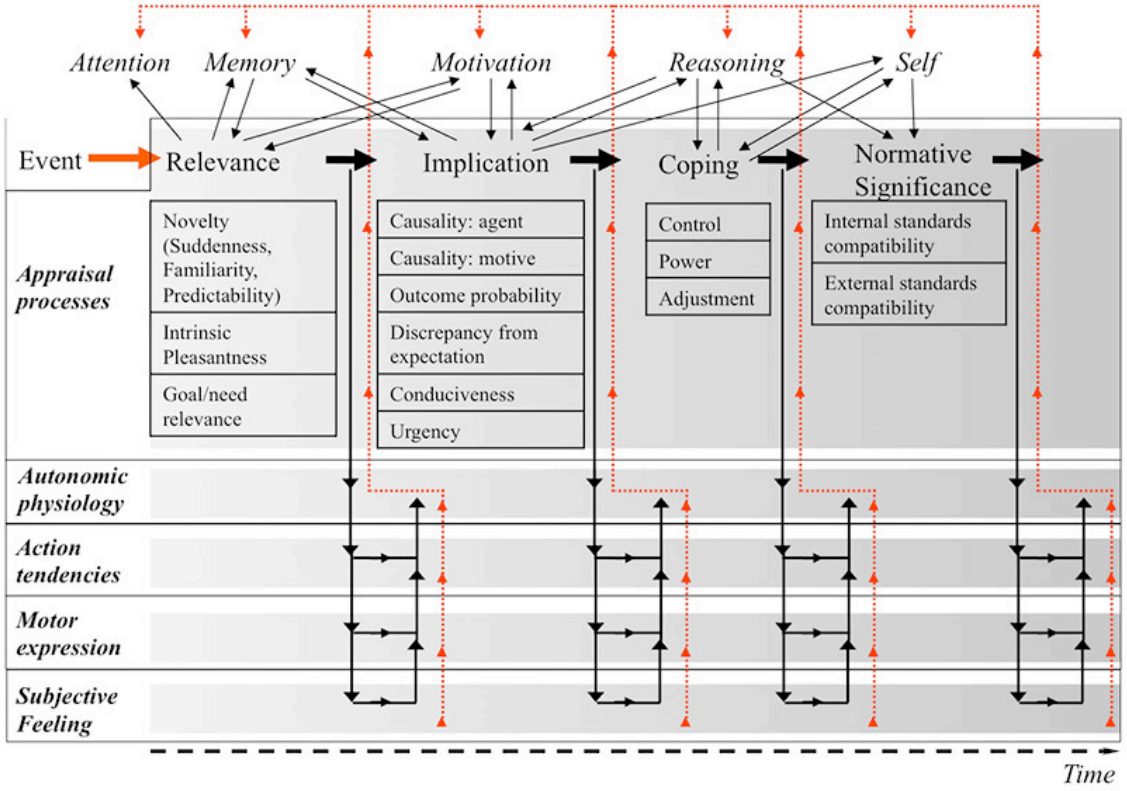
- Specifically: emotions include **evaluations** or "**appraisals**"
  - Fear includes/is the evaluation that something is dangerous
  - Sadness includes/is the evaluation that something has been lost
  - …

- During an emotion, the body *responds* to these evaluations

The componential approach

- Influential approach in psychology: emotions are made of different *components*:
  - Cognition (appraisal)
  - Action readiness
  - Action, behaviour
  - Expression (facial, vocal, bodily)
  - Autonomic arousal
  - Feeling

One example…



Klaus Scherer's Component Process Model

- The cognitive process of "appraisal" determines changes in the rest of the emotion system

NB

- From the “embodied cognition” perspective, this view of emotion is inaccurate
- It splits emotions into two parts:
  - The central, cognitive, non-embodied one
  - And the bodily one, which is entirely guided by the cognitive one
- In other words, it assumes a non-embodied and centralized view of cognition

An embodied critique

From an embodied-mind perspective, emotions are not “split” in 2 parts in this way.

Rather: brain and body are deeply integrated, and emotions are best understood as patterns of activity of this integrated system.

Briefly

- Three main considerations:
- 1) Phenomenologically, there is no clear distinction between "appraisals" and bodily feelings
- 2) At the brain level, there is no clear distinction between cognition and emotion
- 3) The brain is complexly interrelated with the body

1) Phenomenological considerations

- Let us consider the *experience* of undergoing an emotion
- Exercise: remember/imagine having an emotion (choose the one you prefer)
- Now think of whether and how "evaluation" is part of this experience
- Is the experience of evaluating separate from the emotion?

1) Phenomenological considerations

- Example: being afraid upon meeting a bear in the forest

1) Phenomenological considerations

- It is **not** like this:
  - First, I "cognitively experience" the bear as dangerous
  - Then, I feel fear and run away
- Rather: the bear *looks scary* to me from the start
- There is no separate moment of "cognitive evaluation", which then initiates a sequence of other events

1) Phenomenological considerations

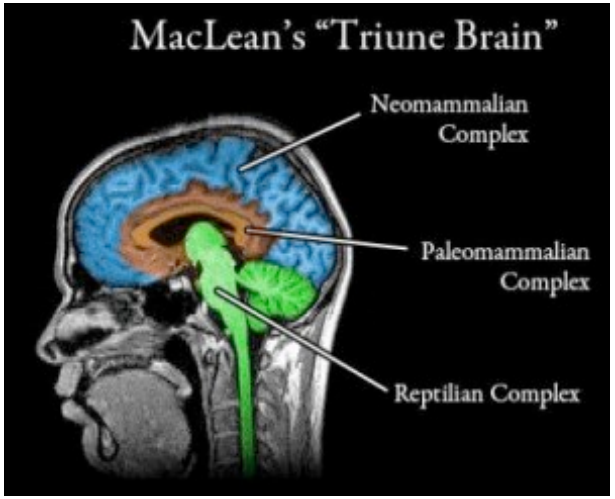
- I may feel my **body** when I'm scared:
  - Legs shaking
  - Hands trembling
  - Heart beating very fast

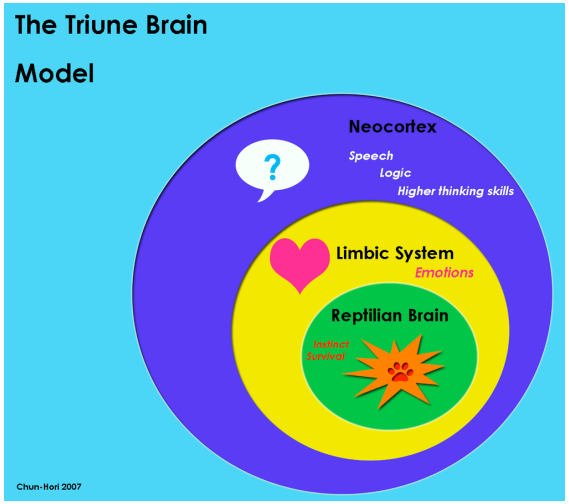
- These bodily feelings do *not* come after the evaluation of the bear as "dangerous"

- Rather: they are part of my overall experience of the bear as dangerous

2) Cognition and emotion in the brain

- Traditional picture:
  - Emotion: limbic system (especially amygdala)
  - Cognition: cortex





2) Cognition and emotion in the brain

- Challenges to this picture
  - **M. Lewis (2005)**: appraisal (evaluation, perception, attention) and emotion (arousal, action tendencies, feelings) overlap largely at the brain level
    - *Amygdala*: involved in evaluation as well as memory, action tendencies, arousal and attentional orientation
    - *Anterior cingulate cortex*: is involved in planning and attentional orientation as well as emotional feelings
    - Neural systems in the *brainstem* and *hypothalamus*: mediate autonomic and endocrine activity to maintain the organism's internal equilibrium or homeostasis, contribute to emotional feelings, enhance attention and prepare for action.

2) Cognition and emotion in the brain

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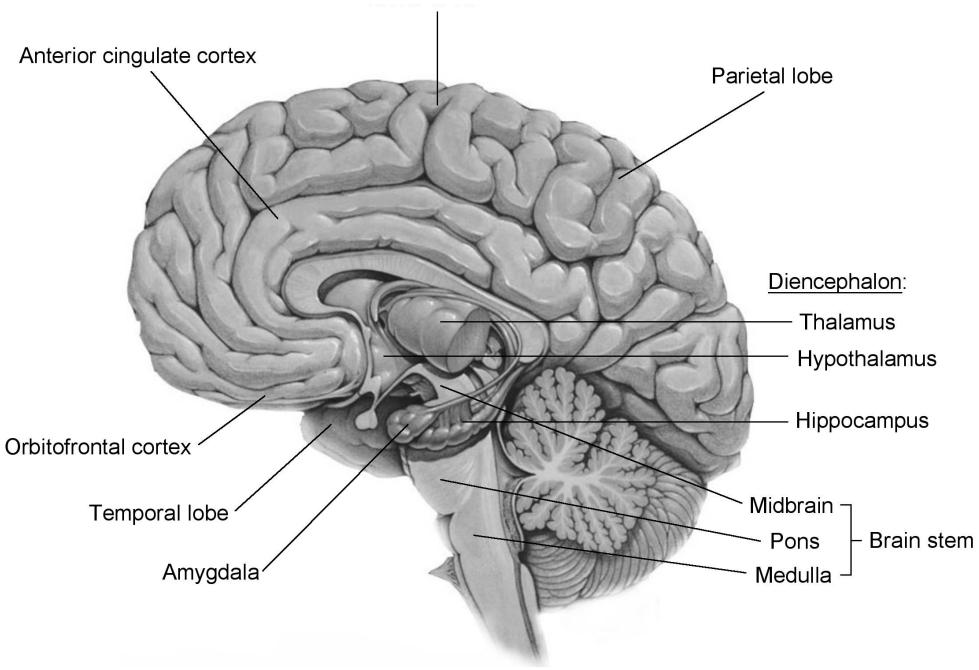
  - **M. Lewis (2005)**: appraisal (evaluation, perception, attention) and emotion (arousal, action tendencies, feelings) overlap largely at the brain level



2) Cognition and emotion in the brain

- Challenges to this picture
  - **M. Lewis (2005)**: appraisal (evaluation, perception, attention) and emotion (arousal, action tendencies, feelings) overlap largely at the brain level
  - Don **Tucker** (2005): "[a]pparently, psychological function and physiological function are not aligned in any simple harmony, at least not in the way we approach them in psychological theory. The conclusion, then, must be unsettling for psychologists. Whereas the separation of emotion and cognition seems to be obvious to a functional analysis, the complexity of interactions among multiple systems, for arousal, for specific action tendencies, or for more general attentional and memory biases, leads to great difficulty in saying what is cognition and how it differs from emotion."

2) Cognition and emotion in the brain

- **Pessoa** (2008: 148): "parcelling the brain into cognitive and affective regions is inherently problematic, and ultimately untenable"

- Amygdala: not a "fear module", but also critical for attention, associative learning, value representation, decision-making

- Prefrontal cortex: increasingly segmented: ACC, orbitofrontal, VPC; even lateral prefrontal cortex sensitive to emotional character of stimuli in working-memory task

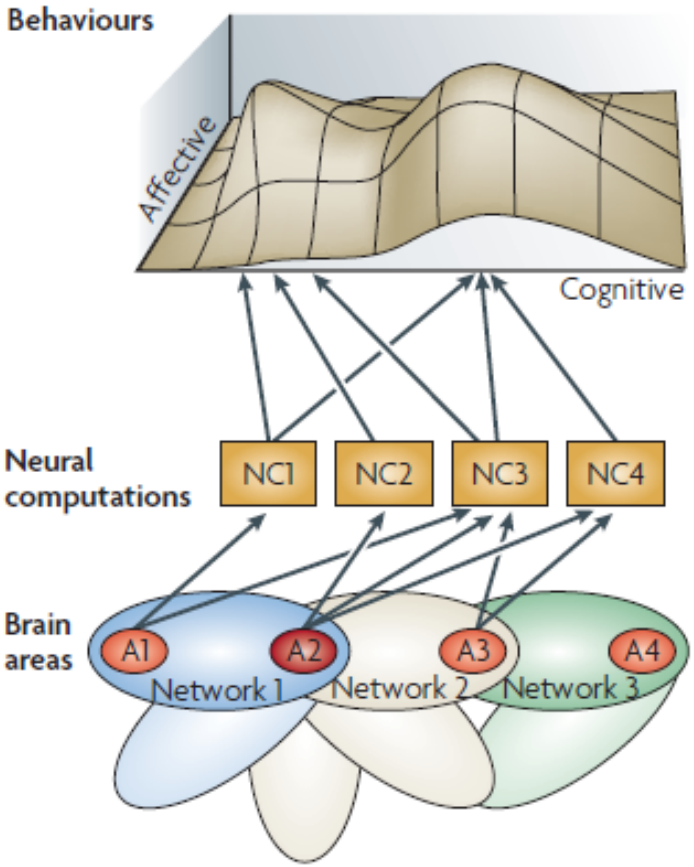
2) Cognition and emotion in the brain

- **Pessoa** (2008: 148): "parcelling the brain into cognitive and affective regions is inherently problematic, and ultimately untenable"

- The brain is a complex system that cannot be broken down into parts with dedicated functions

- Rather, different functions depend on different modes of self-organization of distributed neural processes (see also Freeman; le Van Quyen; Swanson; others)

2) Cognition and emotion in the brain



From Pessoa (2008)

Ultimately Pessoa's proposal is to view emotion and cognition as interdependent dimensions of behavior resulting from the activity of a variety of brain areas, none of which is intrinsically either emotional or cognitive, but rather all of which contribute to behavior differently depending on the broader neural context in which they happen to participate.

See also: Pessoa, L (2013). *The Cognitive-Emotional Brain: From Interactions to Integration*. MIT Press.

3) Brain-body integration

- Where does the brain stop and the body begin?
  - Neural structures in the body (peripheral nervous system: somatic, autonomic, enteric)
  - Brain activity includes chemical activity (neurotransmitters, neuromodulators), which is influenced by chemical activity in the rest of the organism (chemical signals carried by the bloodstream; blood-brain barrier)
    - Nervous-chemical-immune system: one complex system (psycho-neuro-immunology)

3) Brain-body integration

- Not all chemical activity is represented in the brain:
  - "the brain is not likely to predict how all the commands—neural and chemical, but especially the latter—will play out in the body, because the play-out and the resulting states depend on **local biochemical contexts** and on **numerous variables within the body itself which are not fully represented neurally**. What is played out in the body is constructed anew, moment by moment, and is not an exact replica of anything that happened before" (Damasio 1994)

3) Brain-body integration

- Given this complex interconnectivity, how can we draw a clear line between the "cognitive brain" (or part of the brain), and the "emotional heart"?

- Or between "cognitive appraisal" and "bodily arousal" in emotion?

- **Should we draw such a line? If yes, *why* exactly?**

Take-home message

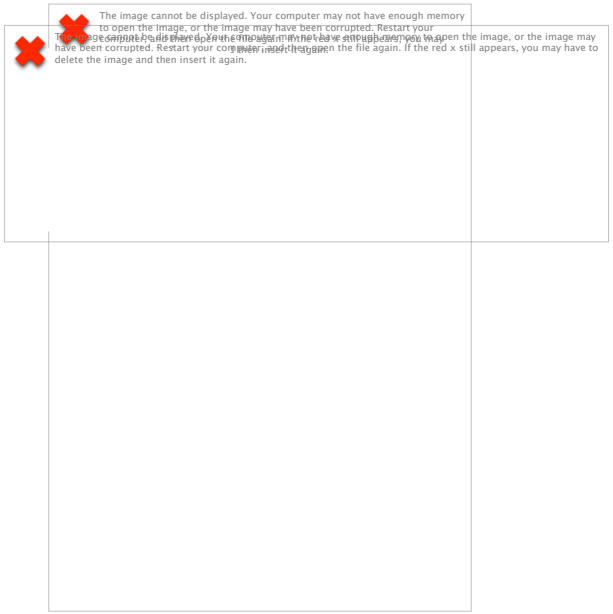
1. Integration of cognition and emotion at brain level
2. Integration of brain and body

These two points undermine the idea that "appraisal" is a separate and entirely "heady" component of emotion that drives the organism

Concluding proposal

- There is no clear separation between the cognitive and bodily component in emotion
  - Neither at brain & even organism level
  - Nor at the experiential level
- The two are very deeply integrated

Towards an integrated conception



You might want to discuss later:

- What is an emotion? How does it relate to cognition?
- What is the place of the body in emotion?
  - Do we need to feel the body to experience an emotion?
  - Do emotions have to involve with some change in the body?
- What is the relation between *evaluating* something as e.g. scary, and *feeling* fear?

PART II

FROM EXTENDED COGNITION TO EMOTION

- Embodied approach to cognition: The physical basis of cognition is not just the brain, but includes the body
- NOW: some philosophers claim that the physical basis of cognition goes even *beyond* the whole organism
- It includes also parts of the **world**
- "4E" cognition: cognition Embodied, Embedded, Enactive, **Extended**

Plan

- Introduce the “extended-mind” view
- Some objections and replies
- To think about: can *emotion* be extended?

The extended mind

Clark & Chalmers (1998)

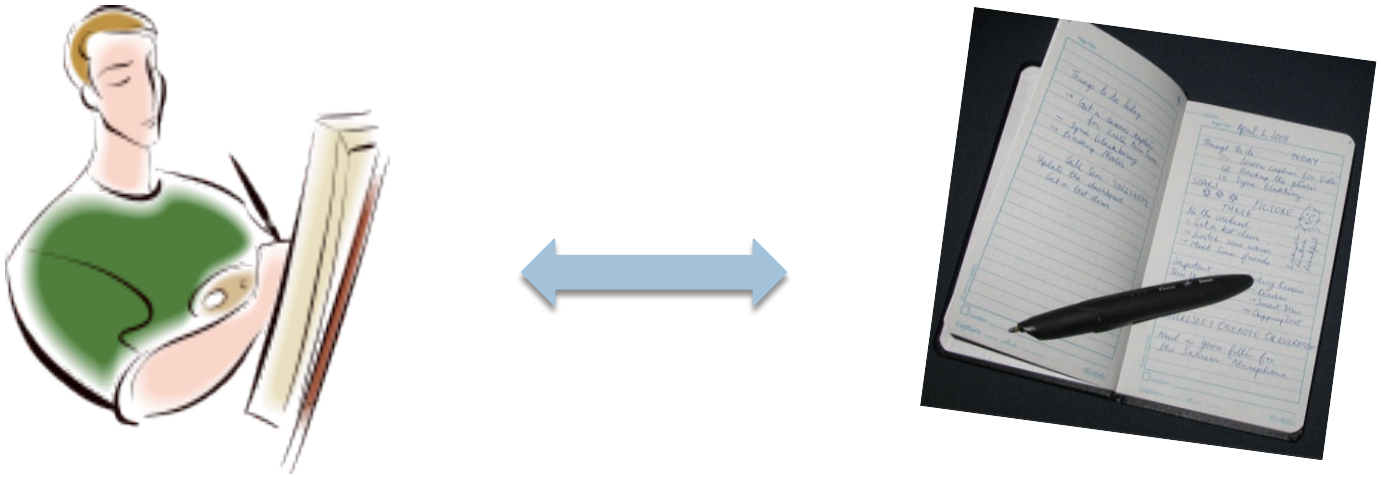
- "Where does the mind stop and the rest of the world begin?"
- Their response:
  - the mind does not stop at the brain; it does not stop at the body either
  - sometimes, the mind includes parts of the world

The central example

- Inga & Otto (imaginary people)
- Inga is a healthy adult
- Otto has Alzheimer. He writes information in his notebook that he does not want to forget. He looks at his notebook whenever he needs to retrieve the information

Coupling

- Otto and his notebook are "coupled" = they influence one another



The central example

- One day, Inga and Otto hear about an exhibition at the Museum of Modern Art
- Inga remembers where the Museum is, and goes to see the exhibition
- Otto does not remember where the Museum is. He looks at his notebook, finds the Museum's address, and goes to see the exhibition

Functional equivalence

- Otto-plus-notebook is *functionally equivalent* to Inga
- Clark & Chalmers wrote: "For Otto, his notebook plays the role usually played by a biological memory"
- Usual role (function) of biological memory: to provide information when needed in order to guide behaviour
  - In Inga: her brain plays this role
  - In Otto: his notebook plays this role

Clark & Chalmers' moral

- "When it comes to belief, there is nothing sacred about skull and skin. What makes some information count as a belief is the role it plays, and there is no reason why the relevant role can be played only from inside the body"

- Because what matters is the *role* something plays in cognition, and not what something *is made of* (neurons, paper, physical symbols), we should say that Otto's notebook is **part** of his memory

Clark & Chalmers' conclusion

- Inga's memory remains inside her head
- Otto's memory "extends" over his notebook
- More precisely, *the physical basis* of Otto's belief about the Museum's address includes his notebook

Something to think about

- Before hearing about the extended-mind view, had you ever asked yourself "where is the mind"?
- Does this question make sense to you? If yes, can you explain why? If no, why not?
- Do you agree with C&C that Otto's memory includes his notebook? Provide reasons for your answer (whatever that is)
- NB: Extended-Mind view is NOT about **consciousness**… do you think consciousness can be "extended" along similar arguments?

Some objections & replies

Objection 1: causation vs. constitution

- The "causal-constitution" fallacy (Adams & Aizawa):

- We need to distinguish between what *causes* changes in the mind, and what *constitutes* the mind
- Otto's notebook influences, causally, what is in Otto's mind, but is not *part* of it
- The brain only possess cognition; it possesses cognition "intrinsically"

Reply to objection 1

- This objection *presumes* that cognition is in the brain
- It draws a "magical boundary" around the brain, claiming that there is where cognition is
- The extended-mind view aims to "free ourselves" from the prejudice that the physical basis of the mind is the brain only

Objection 2

- Otto's external memory (the notebook) is *too different* from Inga's internal memory:
  - Information is accessed very differently
  - Otto cannot "forget" things in the same way as Inga does
- So we cannot say that Otto's notebook and Inga's biological memory play the same role

Reply to objection 2

- It's true that in terms of fine detail, Otto and Inga are quite different
- But these differences are not very important… What matters is that both Otto and Inga are able to retrieve the same information and guide their behavior accordingly
- This is enough to make Otto's and Inga's memory systems "functionally equivalent"

(2) The case of emotion

- Debate on extended-mind thesis is silent about emotion
- The extended-mind thesis is also known as “Hypothesis of Extended Cognition” (HEC)
- → Can **emotions** extend into the world?

A first impression: this is crazy!!

- It may seem even stranger to talk of extended *emotions*!
- Emotions involve changes in the body, and feelings of these changes
- So they remain very much "inside" the organism
- They may not be in the brain only, but at least they seem to stay within the skin!

Sterelny (2010) for example:

- "it is hard to credibly imagine Otto keeping his **preferences** in his notebook, representing the information that he is gay, or that he **likes** blonds. … The notebook might be an external belief store, but not an external store of **lusts, longings, hopes** and **preferences**"

- "The notebook might of course be an external cue, a prompt that allows Otto better access to his **internal, embodied wants and desires**. But it cannot substitute for those internal states, for these have a **phenomenological, embodied** component"

My suggestion: not so crazy after all…

- Remember earlier: emotions have co*gnitive* aspects
- So perhaps we can extend emotions by extending at least their cognitive aspects!

An example

- Eve keeps a diary in which she writes every evening
- She often complains about her parents, writing down things like: “my father does not care about me”; “my mother always criticizes me”; “my brother is very selfish”
- Writing and reading these thoughts makes her feel resentful
- In particular, *the act of writing helps Eve to articulate, clarify and structure her thoughts*
- Without this process, Eve would not be so resentful

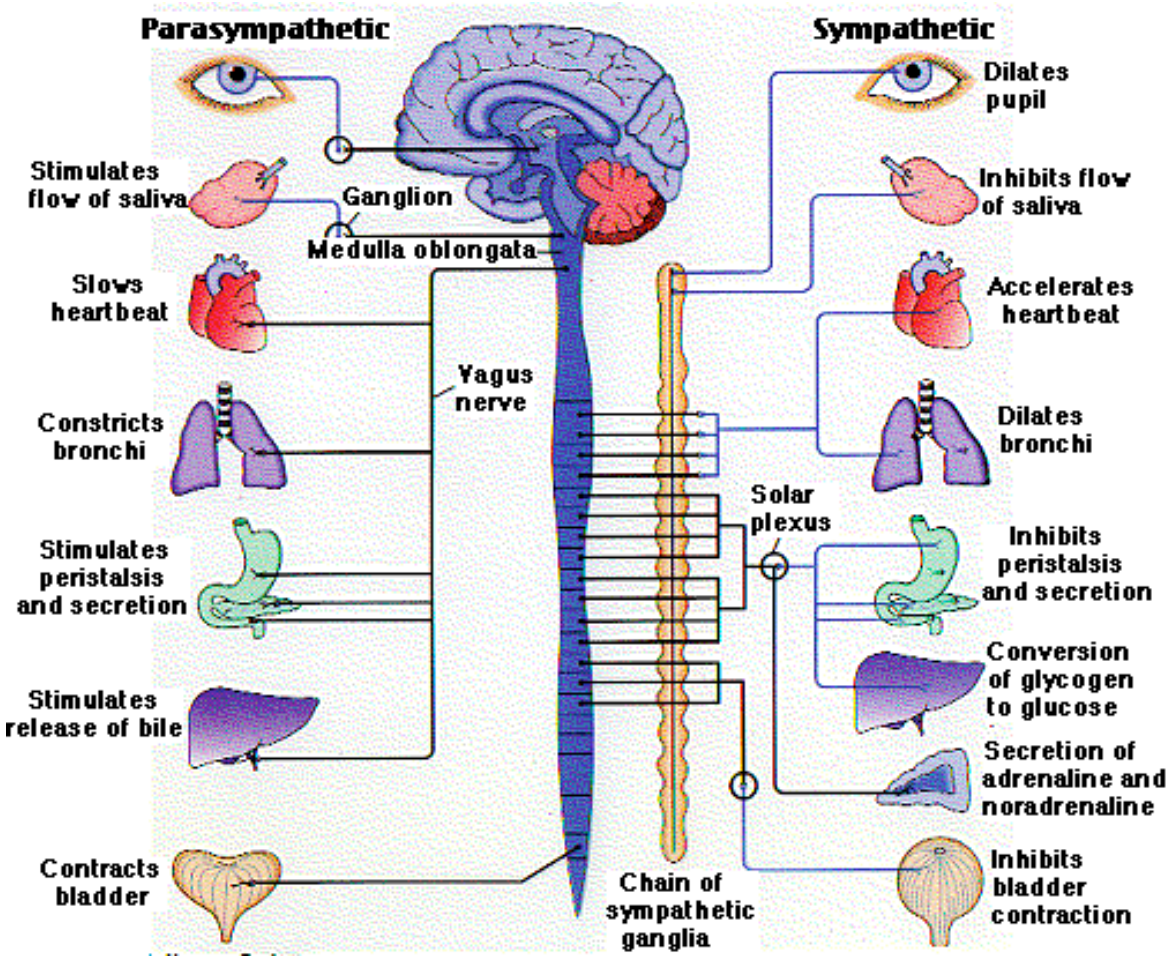
Something to think about

- Are you convinced that this example illustrates an "extended emotion"? In particular, an "extended resentment"?
  - If you think "yes", why so? If you think "no", why not?
- Can you think of other examples that might illustrate an "extended emotion"? If so, which ones?
- Or is the whole idea of extending the mind, including cognition, a silly one? If so, why?

More thoughts…

- May emotions be extended in some other way?
- What about the *bodily* aspects of emotion? Such as the activity under the control of the Autonomic Nervous System (ANS)?

Autonomic nervous system



Extending the physiological components of emotion

- Some people already have artificial devices inside their bodies that regulate the activity of organs under the control of the ANS
- E.g.: pacemaker: regulates heart rate
- The activity of the pace maker is thus arguably already part of an emotional episodes
- If it were "outside" the body, it would not make any significant conceptual difference!

What about the *experiential* component?

- Emotions are importantly often *felt*
- Can *feelings* be extended? What could this even mean?
- The idea: can the physical basis of emotional feelings go beyond the brain and the body?
- **Hard question!!**
- Because there is no definitive account of the relation between the physical world and consciousness…
- Depending on one's theory of this relation, one will answer the question about whether emotional feelings can extend differently

What about the *experiential* component?

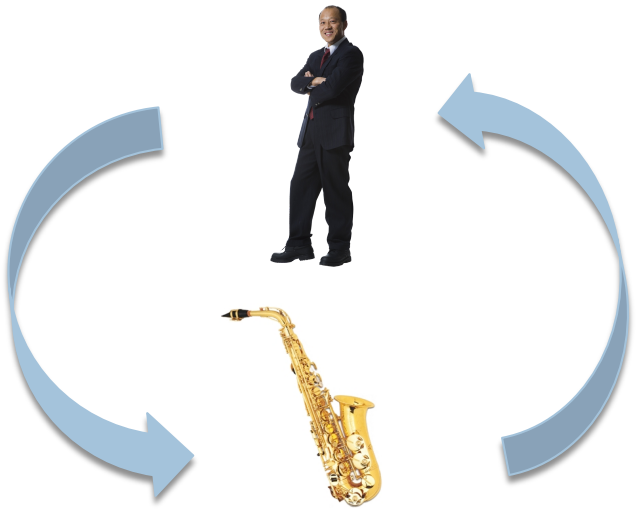
- However: external resources may be necessary to *explain* the character of emotional feelings

- Example: a (solo) Jazz improviser, grieving at the loss of his best friend

What about the *experiential* component?

- Before he plays, he feels grief in a certain way
- As he picks up the instrument, how he feels influences what he plays, which influences what he feels and plays next, and so on
- The musician and the instrument become "coupled" and this coupling enables the musician to undergo a specific experience that unfolds over time

- Even if one is resistant to the proposal that the physical basis of the emotion/mood includes not just the person's brain and body, but also the instrument…
- … still, in order to explain how a certain emotion/mood occurs, it seems necessary to look at the looping effects between musician and instrument



- In sum, it looks like affective states can be (at least partially) "extended" along similar arguments for the extension of cognition
  - Cognitive and physiological aspects of affectivity

- Pending question: what about the feeling component? And more generally what about consciousness? Can it be extended?

Final point about complexity

- General message of this and previous lecture/part:

- The causal interrelations within the brain, and between brain, body, and world, are complex
- Characterized by reciprocal influences, unfolding over time

- We need to keep this complexity in mind when making claims about "where" the mind (including consciousness) is, and about which parts of the complex organism-world system "are responsible" for, or even "sufficient" for, certain mental functions


That's all Folks!

THIS IS THE END… for now!