Affective Systems

Rotterdam, November 11, 2004

What is an “affective system”?

- A fly?
- A dog?
- A software?
- A human?
- An ant?

What is an “affective system”?

- We need a definition of “affect” in order to define affective systems
- “Affect” is often mixed up with other concepts such as emotion, mood, feeling etc.

Definitions of “affect”

- “The conscious subjective aspect of feeling or emotion”
- “The observable emotional condition of an individual at any given time”
- “Generalized feeling tone (usually considered more persistent than emotion, less so than mood). It is the external, observable manifestation of emotion (e.g., flat, blunted, constricted, expansive, labile, etc.)”
- “Emotion, feeling or mood”

Definitions of “emotion”

- “Any strong feeling”
- “Feelings such as happiness, sadness, anger, elation, irritation, etc. The specific definition of emotion is difficult to qualify as it is a completely subjective experience”
- “A psychological feeling, usually accompanied by a physiological reaction”
- “The feeling one experiences in reaction to a person or situation”

The trouble with definitions

- "Part of the problem is that many of the words we use for describing human mental states and processes (including 'emotion', 'learning', 'intelligence', 'consciousness') are far too ill-defined to be useful in scientific theories. Not even professional scientists are close to using agreed definitions of 'emotion'."
(Sloman)

The trouble with definitions

- The concept of emotion is but one of a large family of intricately related everyday concepts, including many affective concepts (e.g. moods, attitudes, desires, dislikes, preferences, values, standards, ideals, intentions, etc.), the more enduring of which can be thought of as making up the notion of a "personality".
- Models that purport to account for 'emotion' without accounting for others in the family are bound to be shallow.
  (Sloman)

Psychological emotion theories

- More than a century now psychologists have busied themselves with emotions
- But the topic has never been a very prominent one
- Modern psychology has defined itself as a science of testing, measuring and statistics
- Because emotions are so subjective, they have been relegated to the sidelines

Four perspectives on emotion

- Darwinian perspective
- Jamesian perspective
- Cognitive perspective
- Social construction perspective

The Darwinian perspective

- The Darwinian perspective views emotions as evolved phenomena with an important survival function
- Darwinians try to pinpoint universal emotions and their expressions
- Prominent names in this field are William McDougall, Robert Plutchik, Paul Ekman, Carroll Izard, Sylvan Tompkins
- Joseph LeDoux also fits into this category

The Jamesian perspective

- The Jamesian perspective is named after William James
- James insisted that it would be impossible to have emotions without bodily changes and that bodily changes always come first
- Antonio Damasio can be classified under this category

The cognitive perspective

- The cognitive perspective assumes that thought and emotion are inseparable
- All emotions are seen as the product of a cognitive appraisal process
- Some well-known researchers are Lazarus, Frijda, Scherer, Roseman, Ortony, Clore and Collins

The social-constructivist perspective

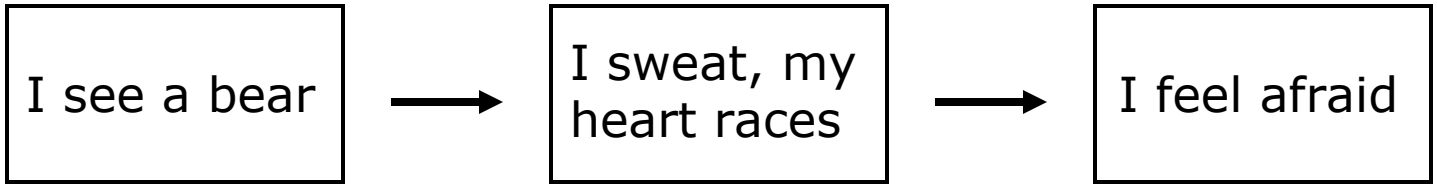
- The Social-constructivist perspective views emotions as cultural products that owe their meaning and coherence to learned social rules
- ”Emotions are not just remnants of our phylogenetic past, nor can they be explained in strictly physiological terms. Rather, they are social constructions, and they can be *fully* understood only on a social level of analysis" (Averill, 1980)

Psychological emotion theories

- Before everything gets too confusing, let’s have a look on some important theories in comparison....

James-Lange theory

- "My theory ... is that the bodily changes follow directly the perception of the exciting fact, and that our feeling of the same changes as they occur is the emotion."



Cannon-Bard theory

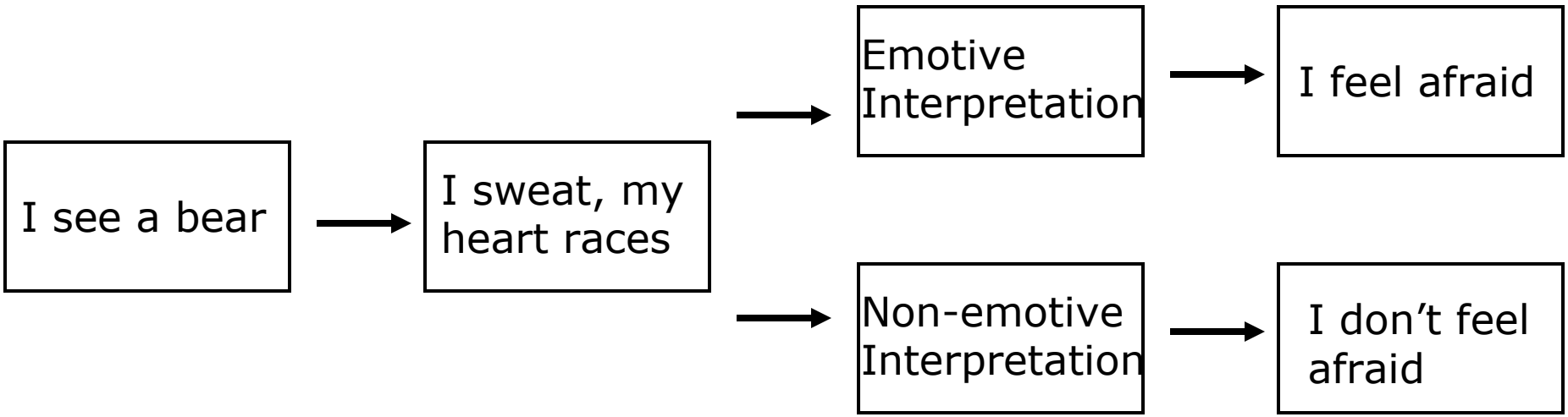
- We feel emotions first, and then feel physiological changes, such as muscular tension, sweating, etc. These we interpret as emotion

Then came the cognitivists...

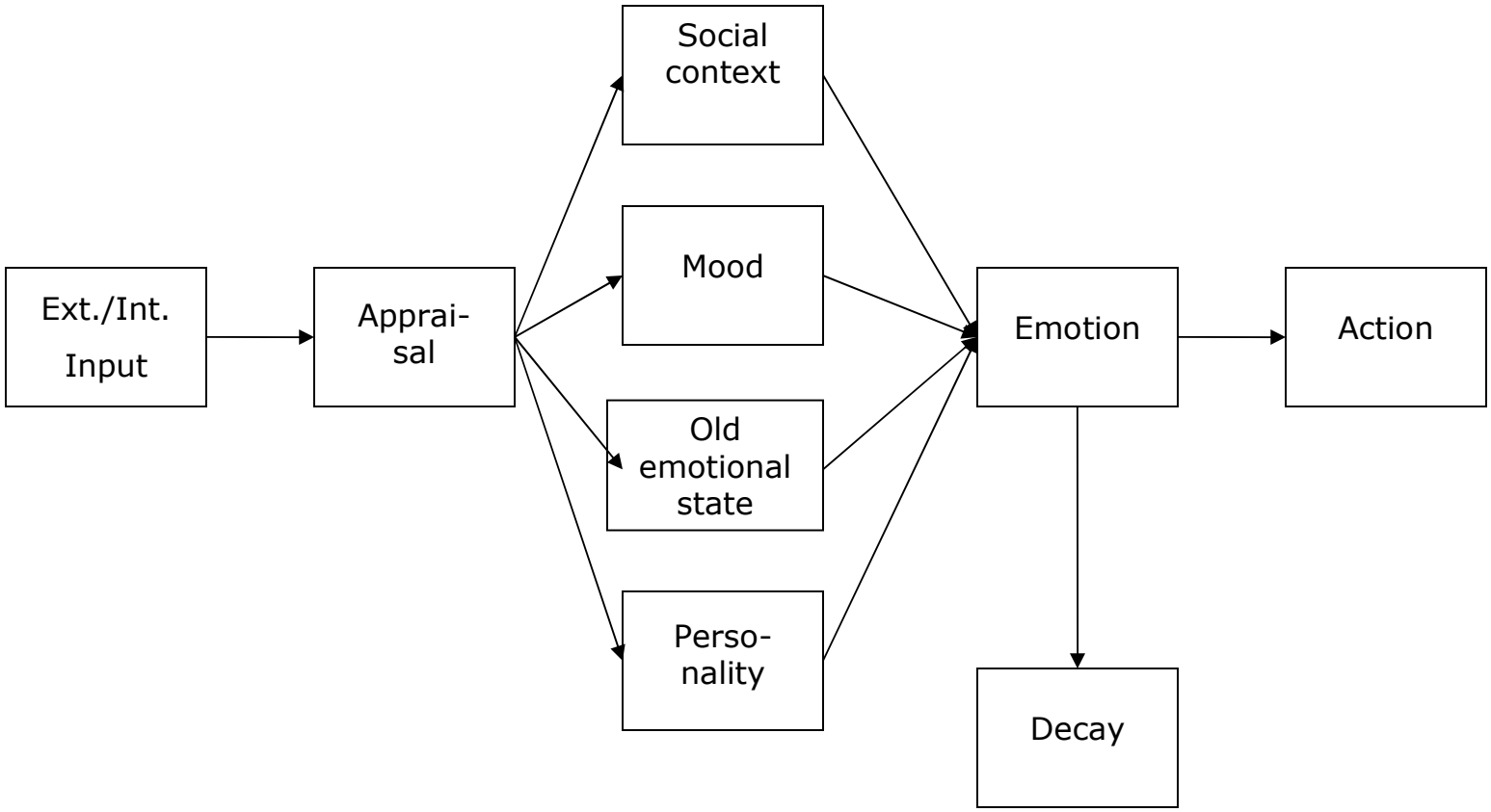
- ... and everything became much more complicated...

Schachter-Singer theory

- Experience of emotion depends on 2 factors:
  - physiological arousal of the autonomic nervous system
  - cognitive appraisal of the physiological arousal
- If that explanation is non emotive then one will not experience an emotion



Cognitive appraisal theories

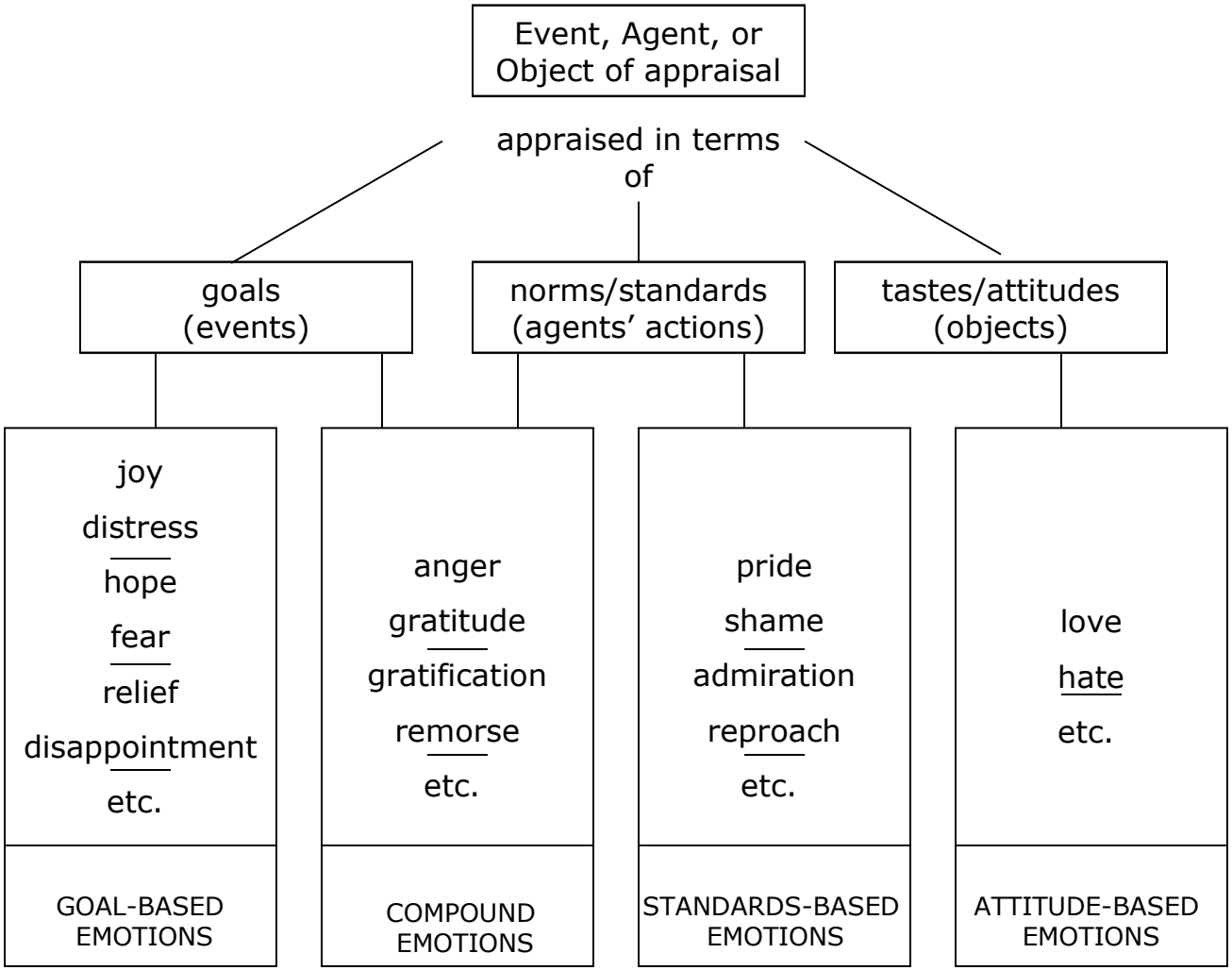


OCC model

- Ortony, Clore and Collins:

  Emotions are *valenced reactions* to events, agents or objects. These events, agents or objects are appraised according to an individual's goals, standards and attitudes

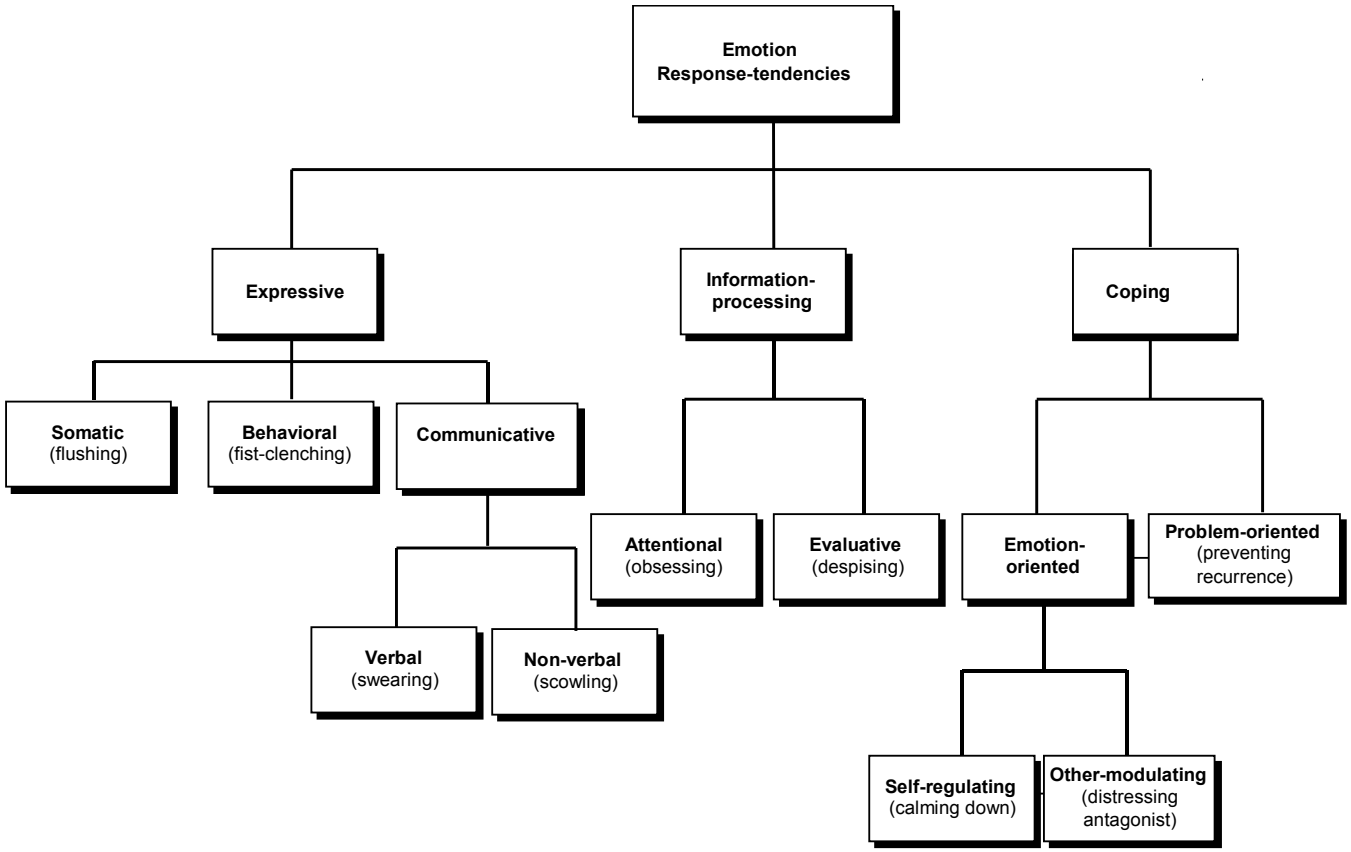
OCC model


Event, Agent, or Object of appraisal
appraised in terms of
goals (events)
norms/standards (agents' actions)
tastes/attitudes (objects)
joy
distress
hope
fear
relief
disappointment
etc.
anger
gratitude
gratification
remorse
etc.
pride
shame
admiration
reproach
etc.
love
hate
etc.
GOAL-BASED EMOTIONS
COMPOUND EMOTIONS
STANDARDS-BASED EMOTIONS
ATTITUDE-BASED EMOTIONS

As if this wouldn’t be enough...

- ... the emotional response is just as complicated to calculate...

Emotional response taxonomy



Models based on OCC model

- Bates and Reilly - TOK
- Elliott - Affective Reasoner
- Van Kesteren et al. - SHAME
- Bazzan and Bordini - IPD
- Egges et al. - OCEAN and OCC
- Prendinger and Ishizuka - SCREAM
- Mourao and Paiva - AUMC
- and many, many more...

Other cognitive models

- Scherer
- Frijda
- Pfeifer
- Toda
- Dörner
- Velásquez
- Canamero
- et al.

One of the key questions:

- Do emotions need a body.....
- ... or can a disembodied entity be emotional?

Psychologists and others

- It is interesting that most psychologists don’t concern themselves with this question
- They go on to try to define and classify emotions, e.g. discussing at length if “surprise” is an emotion or not
- So it is mainly left to philosophers and neurologists and engineers to discuss the concept of emotion

Psychologists and others

- In fact, most of the renewed interest in emotions is not due to psychologists, but to neuroscientists and software/hardware engineers trying to build an intelligent system (agents/robots)

Aaron Sloman's model

- Aaron Sloman is a philosopher at Birmingham University
- For many years now, he has been proposing a radical re-thinking of how we view emotions
- He is convinced that an intelligent system does not need a body to be emotional

Aaron Sloman's model

- Sloman says: We need to talk about "information-using systems"
- What are information-using systems?
  - They acquire, store, manipulate, transform, derive, apply information.
  - The information must be expressed or encoded somehow, e.g. in simple or complex structures – possibly in virtual machines.
  - These structures may be within the system or in the environment.
  - The information may be more or less explicit, or implicit.

Aaron Sloman's model

- "A feature of ordinary language that can confuse discussions of information-processing is that we normally think of information as something that is true or false: e.g. information about when the train will arrive
- Much information is control information which instead of being a potential answer to a question about what is the case is a potential answer to a question about what to do (or not do)"

Aaron Sloman’s model

- Having motives, having preferences, having values, having attitudes, all involve control information – but there’s no reason to regard them all as ‘emotions’.

Aaron Sloman’s model

- Sloman proposes to take a “design-oriented” stance, which means to construct an intelligent system with all the components it needs to survive
- Some of these components are what he calls “control structures”
- These control structures serve to interrupt an ongoing task and to concentrate the system’s attention on urgent business
- This is something one might call “emotion”

Aaron Sloman's model

<table>
<tr><th>Perception</th><th>Central Processing</th><th>Action</th></tr>
<tr><td rowspan="4"></td><td>Meta-management
(reflective processes)
(newest)</td><td rowspan="4"></td></tr>
<tr><td>Deliberative reasoning
(„what if" mechanisms)
(older)</td></tr>
<tr><td>Reactive mechanisms
(oldest)</td></tr>
<tr><td></td></tr>
</table>

Aaron Sloman's model

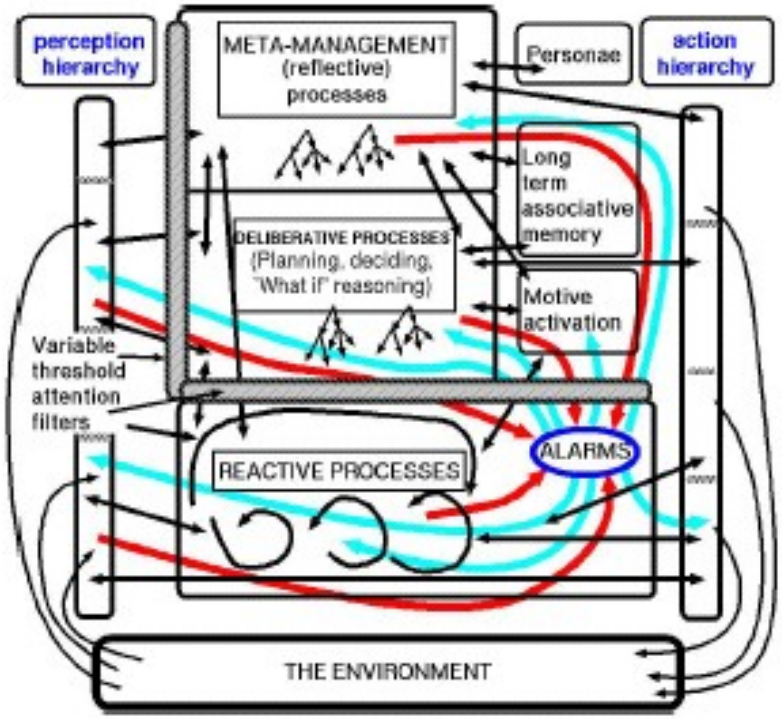


Figure 3: The H-CogAff architecture. The central layer relates to different functional layers in perception and action hierarchies. Not all possible links between boxes are shown. Meta-management may be able to inspect intermediate states in perceptual layers, e.g. sensory qualia.

Aaron Sloman's model

- Many different kinds of emotional states can be based on such an alarm system, depending on what else is in the architecture
- Don't confuse the alarms (and emotions they produce) with the evaluations that trigger them, or the motives, preferences, policies, values, attitudes that have different sorts of functional roles – different sorts of control functions

Where does that leave us?

- We have a lot of theories about what emotions are but not one universally agreed upon definition
- We have a number of models pretending to equip an intelligent system with emotions
- We have two basically opposite positions about the need to have a body to feel emotions

Where does that leave us?

- Over the last 15 years, we have not seen *real* progress regarding the definition, the function and the modeling of emotions
- We still have a long way to go to reach common theoretical ground
- And the way to a working model is even longer

Where does that leave us?

- So, we are still left with our first question:

  What is an affective system?

- Maybe we need to think a bit more about it.