

## Memory reactivation and consolidation during sleep

**Sidarta Ribeiro**

Neuronal reverberation, gene expression and the hippocampal exodus of memories during sleep

**Bruce McNaughton**

Hippocampal reactivation of patterns and pattern sequences and its relation to spatial learning

–Break–

**Carlyle Smith**

Memory and rapid eye movement sleep

**Robert Stickgold**

Sleep and memory consolidation, enhancement, and “rehabilitation”

**Jessica D. Payne & Lynn Nadel**

To dream, perchance to remember: Hippocampal function and memory during sleep

**Rosalind Cartwright** (discussant)

## Memory reactivation and consolidation during sleep

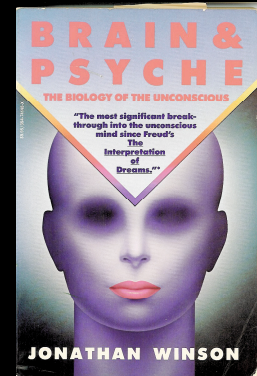
**Jonathan Winson**

□ *Brain & Psyche:*

*The Biology of the Unconscious* (1984)

□ *The meaning of dreams*

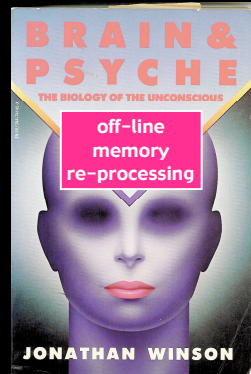
*Scientific American*, 1990, 2002



## Memory reactivation and consolidation during sleep

**Jonathan Winson**

- dreams are meaningful and reflect memory processing
- a mammalian mechanism whereby recent experiences are evaluated and related to behavioral strategies and plans
- experiences that are relevant to these strategies tend to be accessed during sleep
- sleep cognition promotes memory consolidation, guided by current issues, strategies for problem-solving, personality



## Memory reactivation and consolidation during sleep

- REM sleep allows **off-line** memory re-processing / animals
- REM is generally observed in placental and marsupial mammals — but not in monotremes; monotremes have a disproportionately large prefrontal cortex used for *on-line* memory re-processing
- hippocampal theta occurs in animals during experiences generally important for the individual to remember, and also during REM as this information is re-processed (intracranial theta in humans? – Kahana et al.; Fell et al., 2002)
- synchronous theta in multiple MTL regions associated with the regulation of LTP and thus of plasticity
- firing patterns of CA1 neurons altered during sleep stages in accordance with their spatial coding during waking (1989)
  - Sidarta Ribeiro, Bruce McNaughton



echidna

duck-billed platypus

Platypus [Gr. platypous flat-footed platys flat + pous foot] A small, aquatic, egg-laying monotreme mammal (Ornithorhynchus anatinus), with webbed feet, a tail like a beaver's, and a horny beak resembling the bill of a duck; in full duckbill platypus. It inhabits rivers and their banks in eastern Australia and Tasmania. <https://www.monotremes.com/australian-bird>

## Memory reactivation and consolidation during sleep

- REM sleep allows **off-line** memory re-processing / humans
- sleep cognition is closely connected to solving life's problems
  - Rosalind Cartwright
- dreams = a distorted reflection of an individual's strategies for survival, plus associations to other issues; an adaptive function for dealing with current problems; the unconscious
- dreams need not be consciously remembered
- declarative memory consolidation occurs when a memory is retrieved and associated with other stored information: sleep [linking episodic fragments in neocortex; Paller, K.A. (1997) *Memory*, 5, 73-88]
  - consolidation more purposeful than random or inexorable
- evidence that sleep (and sleep deprivation) can have effects on many types of memory
  - Carlyle Smith, Bob Stickgold (Karni et al., Born et al., Wagner et al., Manquet et al., ...)
  - Lynn Nadel and Jessica Payne