

# Beyond *Superficial* Embodiment Theories of Concepts

概念の“表面的な”身体基盤論を越えて

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# Outline of My Talk

- ☞ I examine possible (if not likely) answers to the question:
  - ☞ What are **concepts** for?
- ☞ thereby suggesting possible (if not likely) answers to the question:
  - ☞ Why is **embodiment** caused?
- ☞ But I'm not quite sure if I'm successful or not.

# Excuses

- ☞ I am a **linguist** who loves to think about **fundamental issues**.
- ☞ I'm too **philosophical** a person to be a psychologist.
- ☞ This makes my talk philosophical and my slides with
  - ☞ **fewer** graphs, numbers for experimental result, equations
  - ☞ **but** ashamedly **more** thoughts and words
- ☞ I added as many pictures as I can not to get you (too) bored.



# What Are Concepts *for*?

# Naïve yet Fundamental Questions

- ☞ People talk about *concepts* and *conceptualizations* in a variety of fields such as
  - ☞ **Linguistics:** Laoff (1987), Lakoff & Johnson (1980, 1999)
  - ☞ **Cognitive Psychology:** Murphy (2002), Glenburg 1997
  - ☞ **Developmental Psychology:** Piaget and Inhelder (1962)
  - ☞ **Artificial Intelligence/Robotics:** Searle (1980), Harnad (1990), *et seq.*, 谷口 (2011), Hawkins and Blakeslee (2004)
  - ☞ **Ontology/Knowledge Engineering:** Gruber (1993), *et seq.*

# References

- ☞ Lakoff, G. (1987). *Women, Fire and Dangerous Things*: University of Chicago Press.
- ☞ Johnson, M. (1987). *The Body in the Mind*. University of Chicago Press.
- ☞ Lakoff, G. & M. Johnson (1980). *Metaphors We Live By*.
- ☞ Lakoff, G. & M. Johnson (1999). *The Philosophy in Flesh*. Basic Books.
- ☞ Murphy, G. (2002). *The Big Book of Concepts*. MIT Press.
- ☞ Glenberg, A. (1997). What memory is for. *Behavioral and Brain Sciences* 20(1): 1–19.
- ☞ Inhelder, B & J. Piaget. (1958). *The Growth of Logical Thinking from Childhood to Adolescence*. Basic Books.
- ☞ Piaget, J. & B. Inhelder. (1962). *The Psychology of the Child*. Basic Books.
- ☞ Searle, J. (1980). Minds, brains and programs. *Behavioral and Brain Sciences* 3 (3): 417–457.
- ☞ Harnad, S. (1990). The symbol grounding problem. *Physica D: Nonlinear Phenomena* 42: 335–346.
- ☞ 谷口 忠大 (2011). コミュニケーションするロボットは創れるか: 記号創発システムへの構成論的アプローチ. NTT出版.
- ☞ Hawkins, J. & Blakeslee, S. (2004). *On Intelligence: How a New Understanding of the Brain Will Lead to the Creation of Truly Intelligent Machines*. Times Books.
- ☞ Gruber, T. R. (1993). A translation approach to portable ontology specifications. *Knowledge Acquisition* 5: 199–220.



# Naïve yet Fundamental Questions

- ☞ Let me ask:
  - ☞ **Exactly what are concepts and conceptualizations?**
- ☞ I ask this because:
  - ☞ **There is no operational definition of concepts.**
  - ☞ **And the definition of conceptualization refers to concepts.**
- ☞ This is my conclusion after a long search for it in the vast literature.
  - ☞ **All that we can find is only theoretical definitions.**
  - ☞ **Operational definition is missing even in reference work like Murphy (2002).**

Murphy, G. (2002). *The Big Book of Concepts*, MIT Press.

# Surprise (at Least to Me)

- ☞ Even Murphy (2002) provides no operational definition of concepts.
- ☞ He only says:
  - ☞ In general, I try to use the word *concepts* to talk about mental representations of classes of things, and *categories* to talk about the classes themselves. (Murphy 2002: 5)
  - ☞ Concepts are the glue that holds our mental world together. When we walk into a room, try a new restaurant, [...], we must rely on our concepts of the world to help us understand what is happening. [...] If we have formed a concept (mental representation) corresponding to that category (the class of objects in the world), then the concept will help us understand and respond appropriately to a new entity in that category. (Murphy 2002: 1)
- ☞ Murphy, like many other working psychologists, takes a naïve concepts-categories correspondence theory.



# Surprise (at Least to Me)

## ☞ Another quotation

- ☞ There is a real temptation for researchers in the field of concepts to get carried away on the “everything is concepts” bandwagon that I have started rolling here. [...] Although in unguarded moments I do think that everything is concepts, that is not as restrictive a belief as you might think. **Concepts may have a variety of forms and contents, and this is part of what has made the field so complex. (Murphy 2002: 3)**
- ☞ It's interesting to ask how such a variety arise.
- ☞ If correspondence assumption implies that the environmental complexity brings about it. But is it true?

# Surprise (at Least to Me)

- Murphy (2002) is, perhaps rightly for a working psychologist, only concerned with the questions:
  - How are concepts represented in the mind/brain?
  - What behavioral data favors or disfavors particular models of concepts?
- without questioning:
  - What are concepts *for*?
  - What are concepts after all?

# Naïve yet Fundamental Questions

- ☞ Now, I ask the following, prima facie naïve question:
  - ☞ **What are concepts for?**
- ☞ by echoing Glenberg's (1997) intriguing question:
  - ☞ **What is memory for?**
- ☞ Remark
  - ☞ **While Glenberg tries to reduce basic functionalities of memories to conceptualizations, I do the opposite.**

Glenberg, A. (1997). What memory is for. *Behavioral and Brain Sciences* 20(1): 1-19.



# Outline of My View

- Given the **potentially full memory (PFM)**,
  - Concepts are indices over the PFM.**
  - Conceptualizations are local networks of concepts that are mutually strengthening.**
    - Elaboration of the proposal in 黒田 (2010)
- Suggestions to make:
  - People need concepts for effective management of their virtually unlimited memories.**

黒田 航. 2010. 超常記憶症候群の理論的含意. In 認知科学会第27回大会発表論文集, pp. 789-792.

# Concepts out of *Potentially* Full Memory

# My Theory

- ☞ In a nutshell,
  - ☞ Concepts are **indices** for whatever classes of **perception** stored in the potentially full memory.
  - ☞ **Embodiment** is the way perception is organized using such indices and other devices for information retrieval.
- ☞ In what follows, I present motivations for my view.



# Memory Disorders

- Jill Price's exceptional autobiographic memory
  - described by Parker, Cahill and McGaugh (2006)
  - first official case of **hyperthymestic syndrome**
- Solomon Shereshevsky's exceptional mnemonics
  - described in Luria (1987)
  - anecdotal case of hyperthymestic syndrome?



J. Price & B. Davis (2008). *The Woman Who Can't Forget*. Free Press.  
Parker, E.S., L. Cahill, & J.L. McGaugh (2006). A case of unusual autobiographical remembering. *Neurocase* 12(1): 35-49.  
Luria, A.R. (1987). *The Mind of a Mnemonist: A Little Book about Vast Memory*. Harvard University Press.

# “Savant” Syndrome

- ❧ Unusual memory performances in “savants”

- ❧ **Temple Grandin**

- ❧ who “thinks in pictures”

- ❧ **Kim Peek**

- ❧ hyper event mnemonist due to FG syndrome (Opitz-Kaveggia syndrome)

- ❧ **and many more**

- ❧ the number of reported “savants” increasing



Grandin, T. (1996). *Thinking in Pictures: and Other Reports from My Life with Autism*. Vintage

# “Savant” Syndrome

- According to Treffert (2009):
  - One in ten autistic people have savant skills.
  - 50% of savants are autistic; the other 50% often have psychological disorders or mental illnesses.
  - Prodigious savants have very little disability.
- quoted from Wikipedia “savant syndrome”

Treffert D.A. (2009). The savant syndrome: an extraordinary condition. A synopsis: past, present, future. *Philos. Trans. R. Soc. Lond Series B. Biol. Sci.* 364 (1522): 1351–1357.



# What's *Unusual* with Them?

- ☞ What's unusual those people suffering memory disorders or savant syndrome is that
  - ☞ They perform extraordinarily **detailed** and **precise** remembering
- ☞ In “normal” people, by contrast,
  - ☞ There are two general classes of errors in remembering: **omission** and **commission**. In the former, people fail to recollect a prior event when they try to retrieve it. In the latter, people remember events quite differently from the way they happened, or they remember an event that never happened at all. (Roediger and McDermott 2000)

Roediger, H.L. & K. B. McDermott (2000). Memory distortions. In E. Tulving & F.I.M. Craik (eds.), *The Oxford Handbook of Memory*, Oxford University Press.

# What's *Wrong* with Them?

- ❧ What's *wrong* with those “exceptional” figures with “unusual” talents in memory?
- ❧ Possibility 1
  - ❧ They happened to acquire exceptional ability to memorize **and** recall.
- ❧ Possibility 2
  - ❧ They happened to acquire exceptional ability to recall, given that memorization ability stays the same.

# What's *Wrong* with Them?

- ☞ If Possibility #1 is correct,
  - ☞ they suffer both **hyper-memorization** and **hyper-recollection**.
- ☞ If Possibility #2 is correct,
  - ☞ they suffer only **hyper-recollection**.
- ☞ Points
  - ☞ Possibility #1 is stronger than Possibility #2. So, Possibility 2 needs to be preferred, with other things being equal.
  - ☞ Either way, PFM is confirmed but Possibility #2 is preferable.



# What's *Wrong* with Them?

☞ My guess:

☞ Hyper-recollection is a disorder in which recollection is ill controlled.

☞ More specifically,

☞ Hyper-recollection is a disorder in which recollection is not properly suppressed.

# Good Memory is Double-edged

- ☞ Good memory is **a benefit**, but too good memory is **a pain** and even **a torture**.
  - ☞ the more you can remember, the more convenient your life is.
  - ☞ the more you forget, the less you regret.
- ☞ If forgetting is **adaptive** (Bjork & Bjork 1992; McGaugh 2006),
  - ☞ then what's the line between **good memory** and **too good memory**?
- ☞ Possible answer:
  - ☞ **Good memory is beneficial as far as remembering is well controlled and therefore selective enough.**

Bjork, R.A. & E.L. Bjork (1992). A new theory of disuse and an old theory of stimulus fluctuation. In A.F. Healy, et al. (eds.), *From Learning Processes to Cognitive Processes: Essays in Honor of William K. Estes, Vol.2*, pp.35-67.

Earlbaum

McGaugh, J. (2006). *Memory and Emotion*. Columbia University Press.

# Where Does Selectivity Come from?

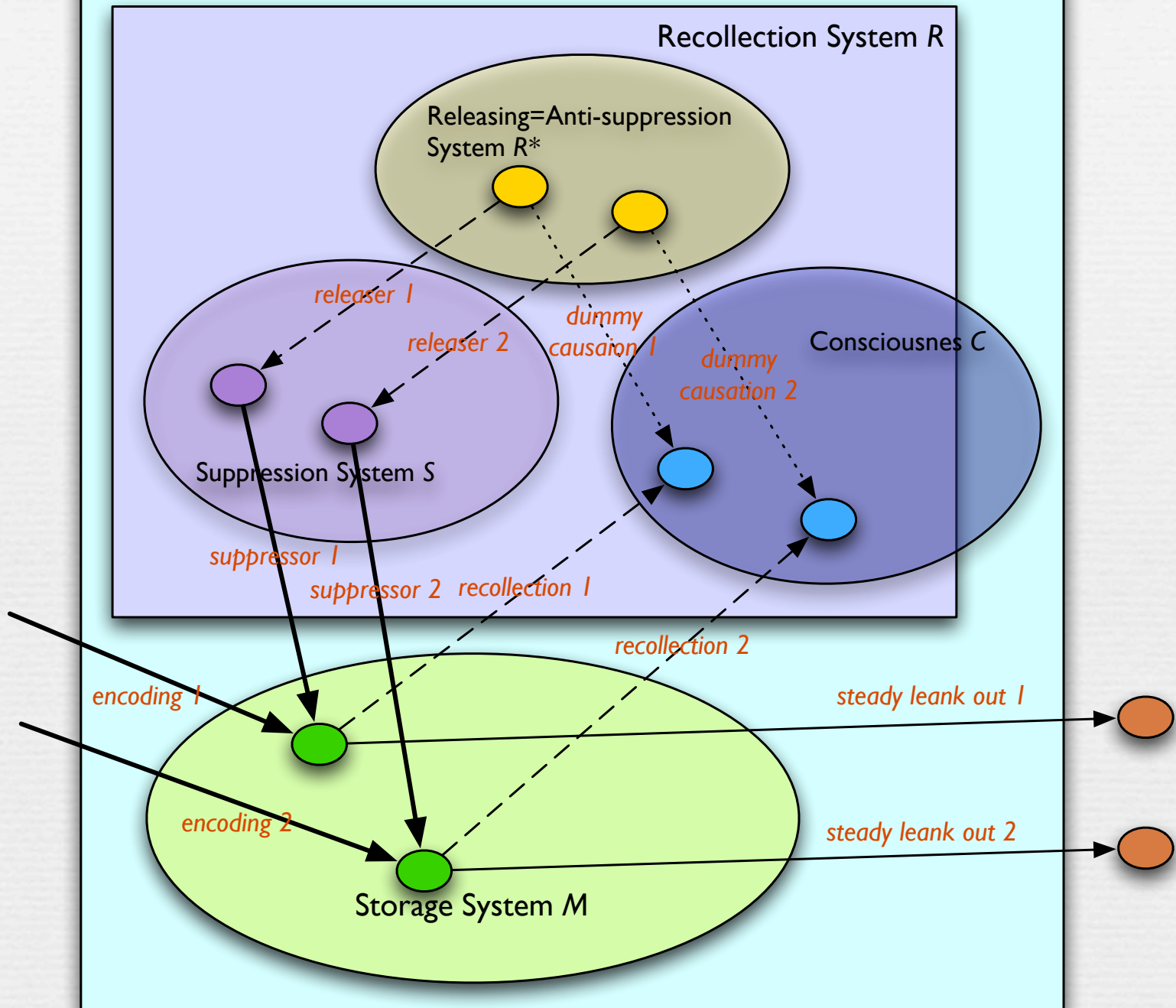
- ☞ Memory is an interaction between *M* and *R*:
  - ☞ Memorization system *M* stores virtually all perceptual inputs **unselectively**.
  - ☞ Recollection system *R* retrieves data stored in *M* **selectively**.
- ☞ In more detail,
  - ☞ All data in *M* have potential to be automatically recollected, but their recollection potential is suppressed as soon as they are stored.
  - ☞ System *R* somehow implements to release the suppression.
    - ☞ This is a theoretical possibility not seriously investigated yet except in McGaugh (2006) and 月元 (2008)

McGaugh, J. (2006). *Memory and Emotion: The Making of Lasting Memories*. Columbia University Press.

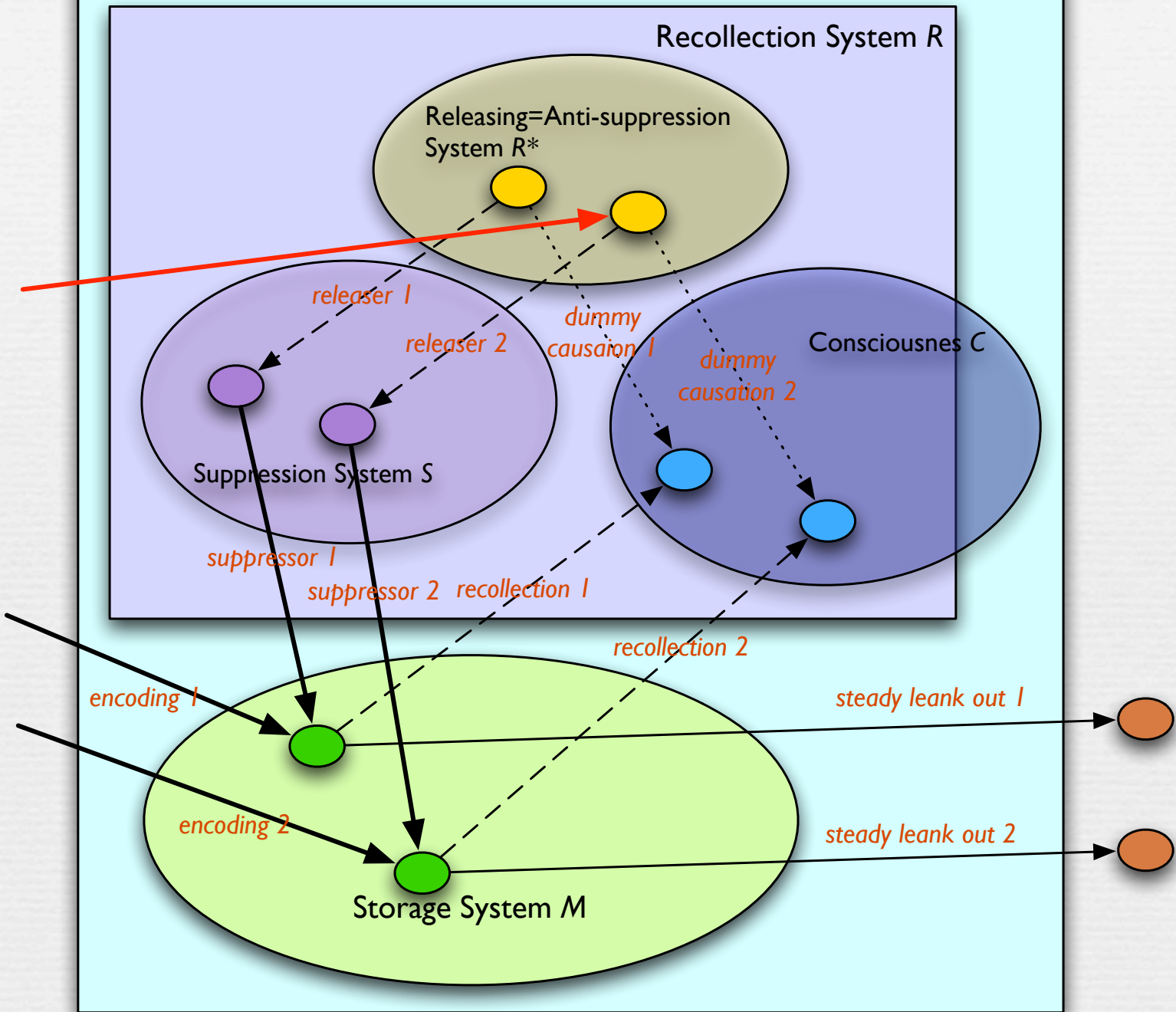
月元 敬 (2008). 抑制に基づく記憶検索理論の構成. 風間書房.



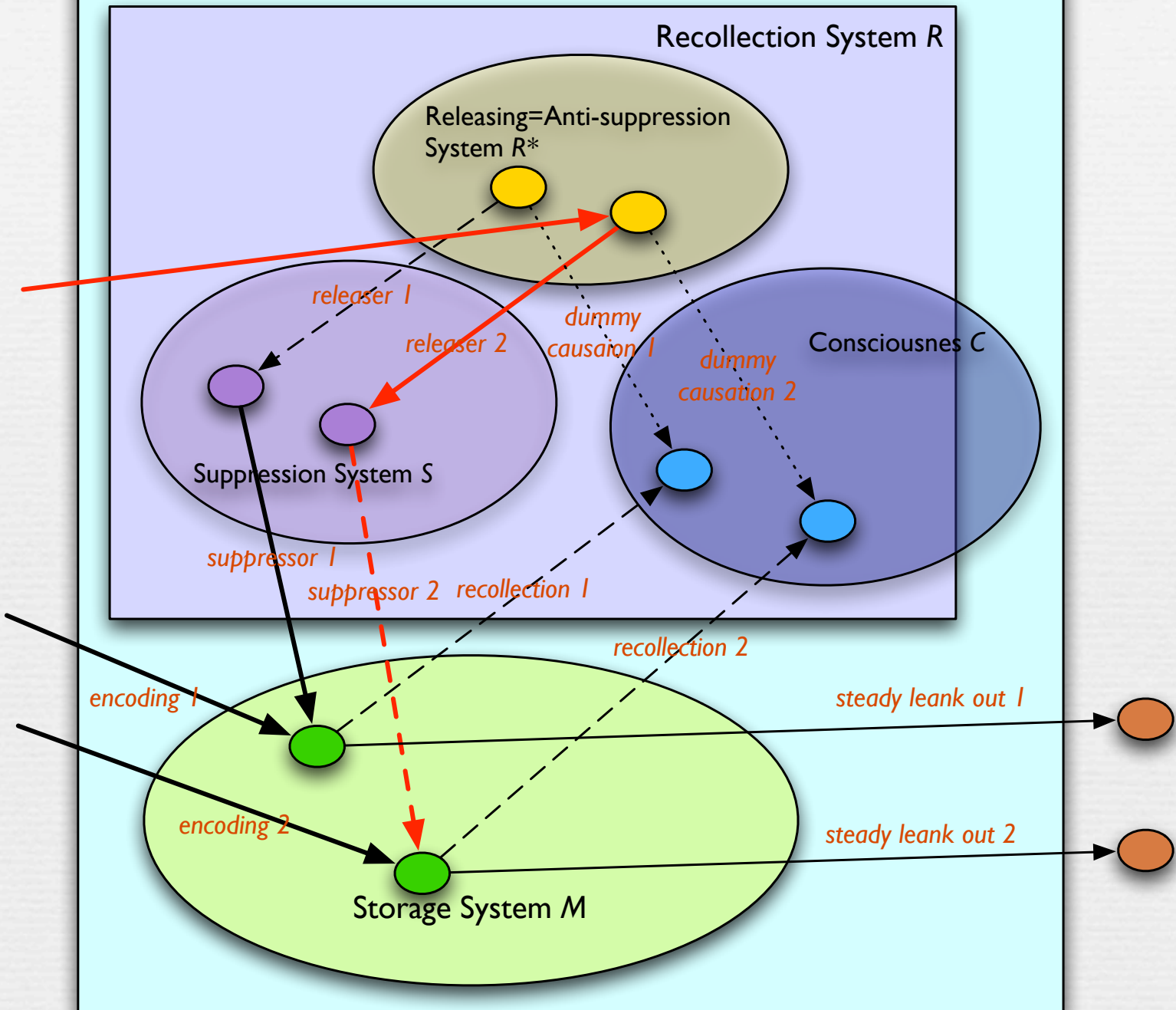
# Memory System W as a Whole



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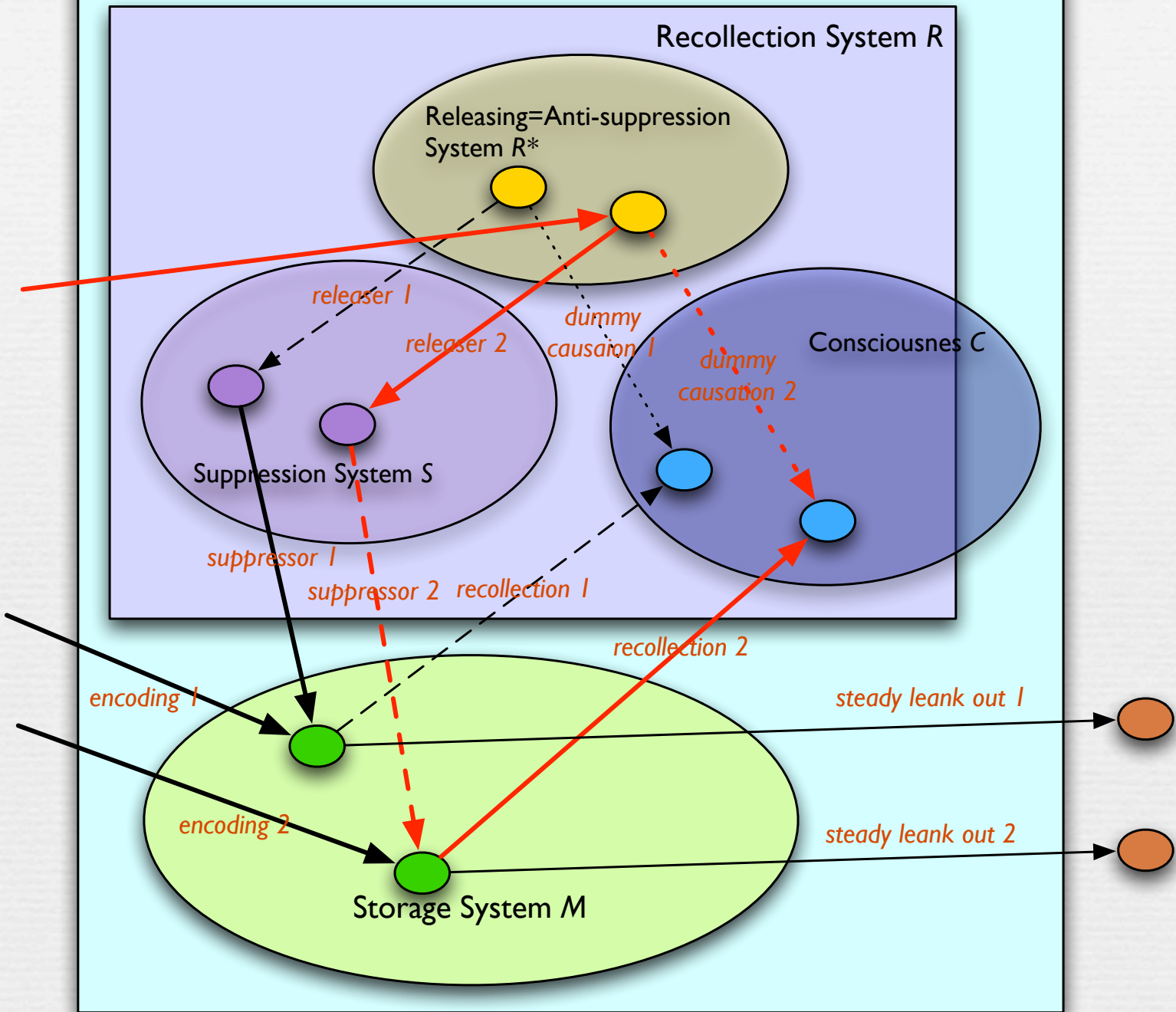


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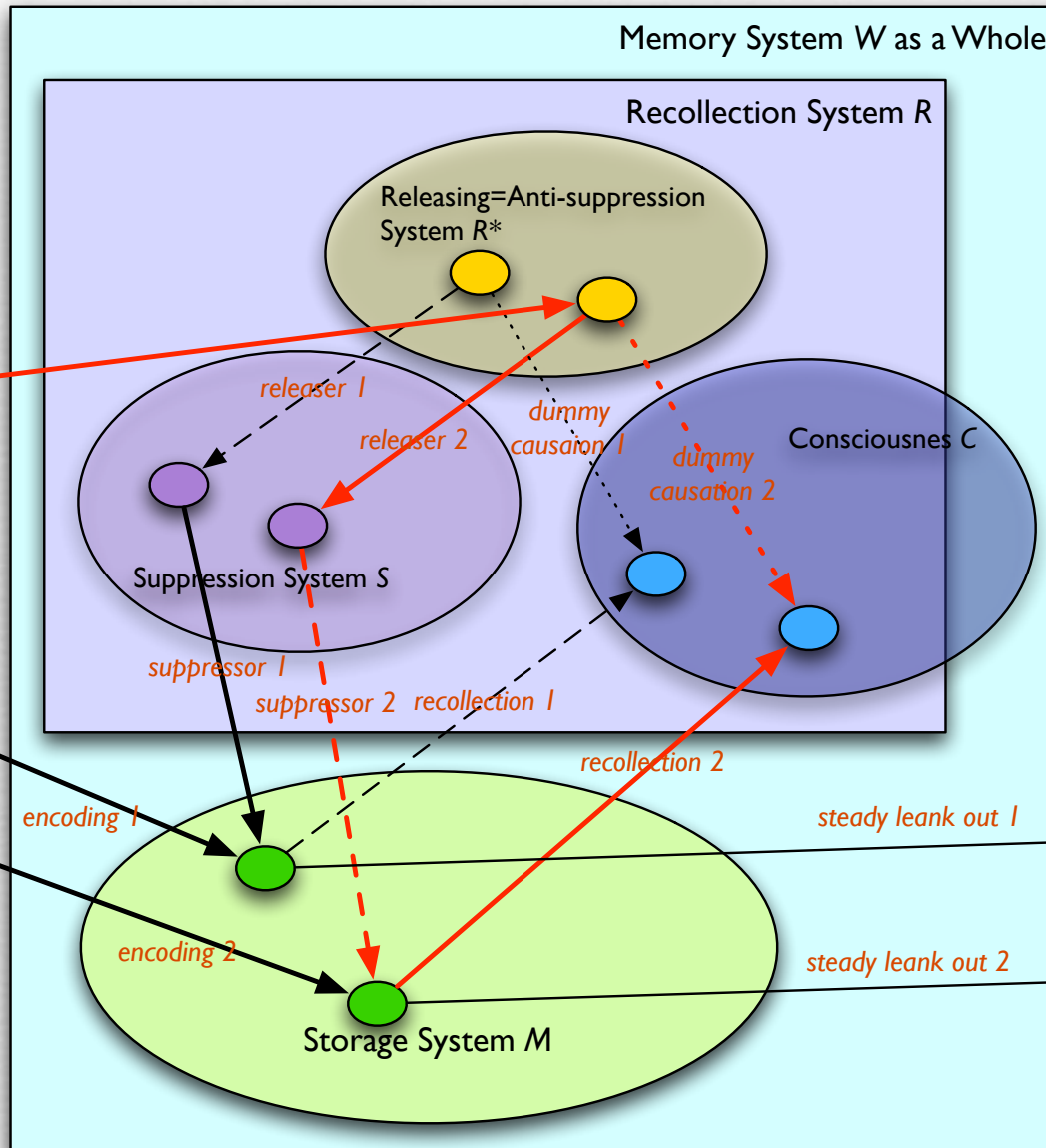




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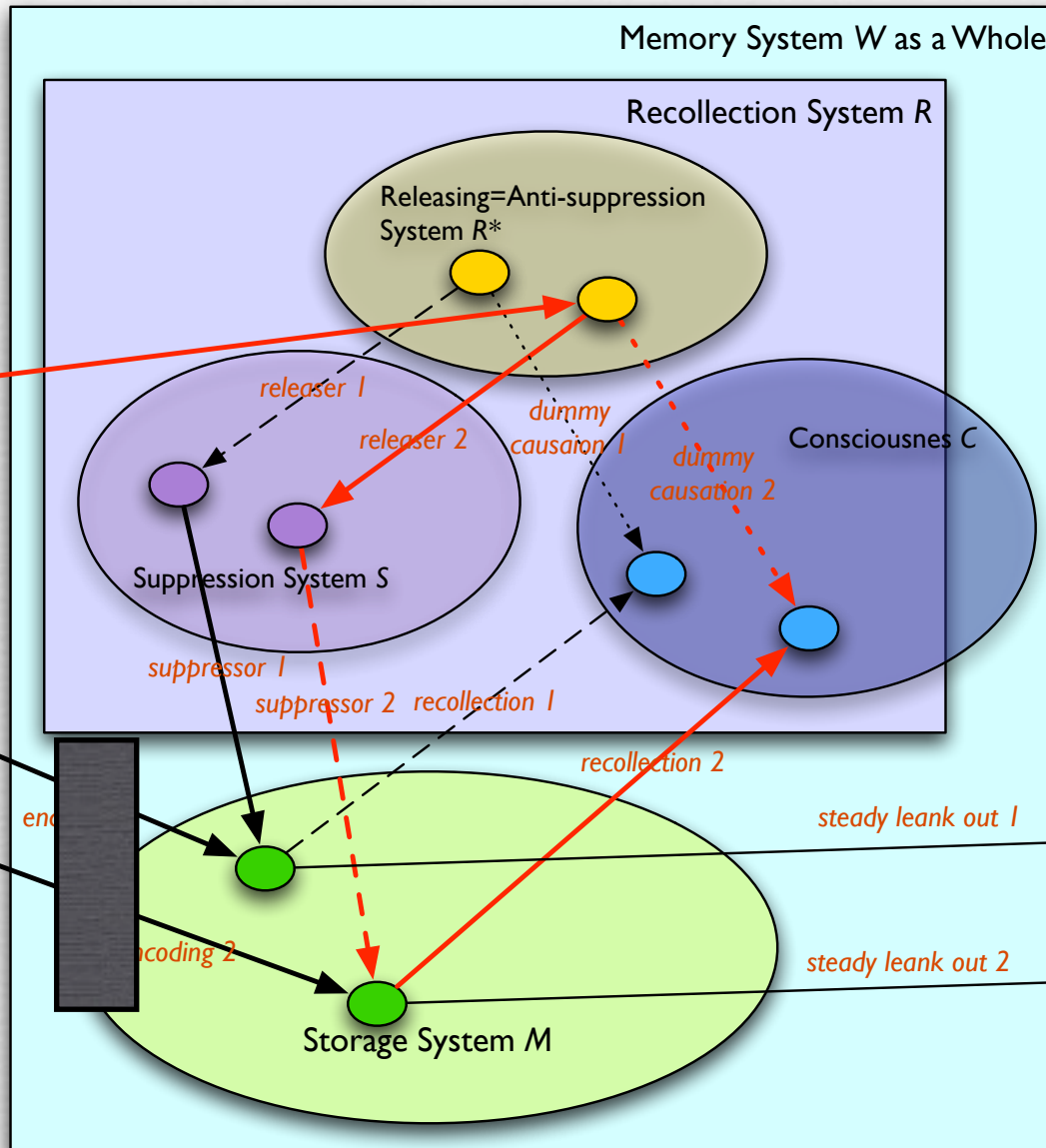


# How System Can Break Down



- ☞ Types of disorders
- ☞ **between I and M**
- ☞ encoding error
- ☞ **between S and M**
- ☞ suppressing error
- ☞ **between R\* and S**
- ☞ releasing error
- ☞ **between M and C**
- ☞ transfer error 1
- ☞ **between M and O**
- ☞ transfer error 2
- ☞ **misactivation on R\***
- ☞ triggering error

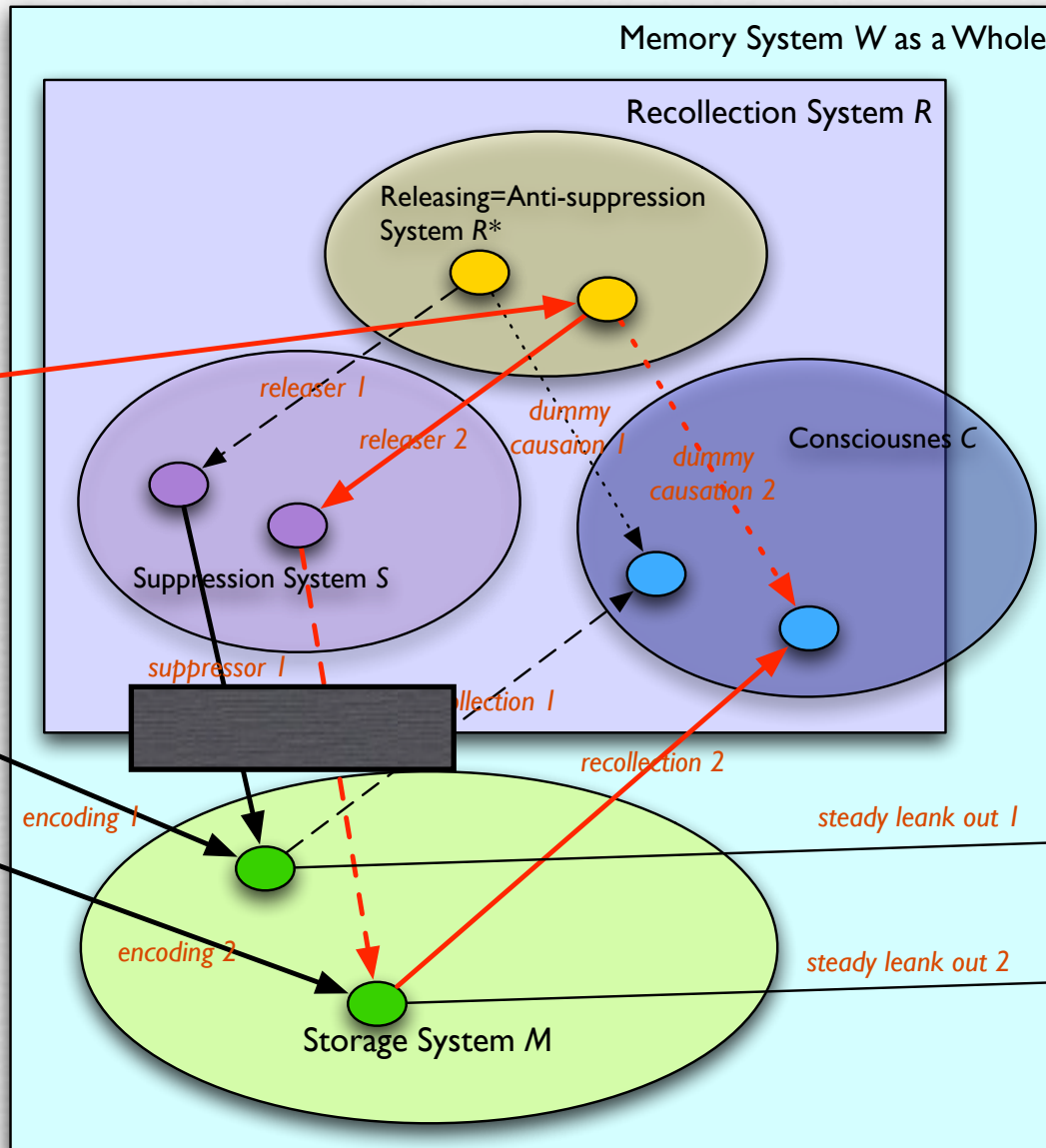
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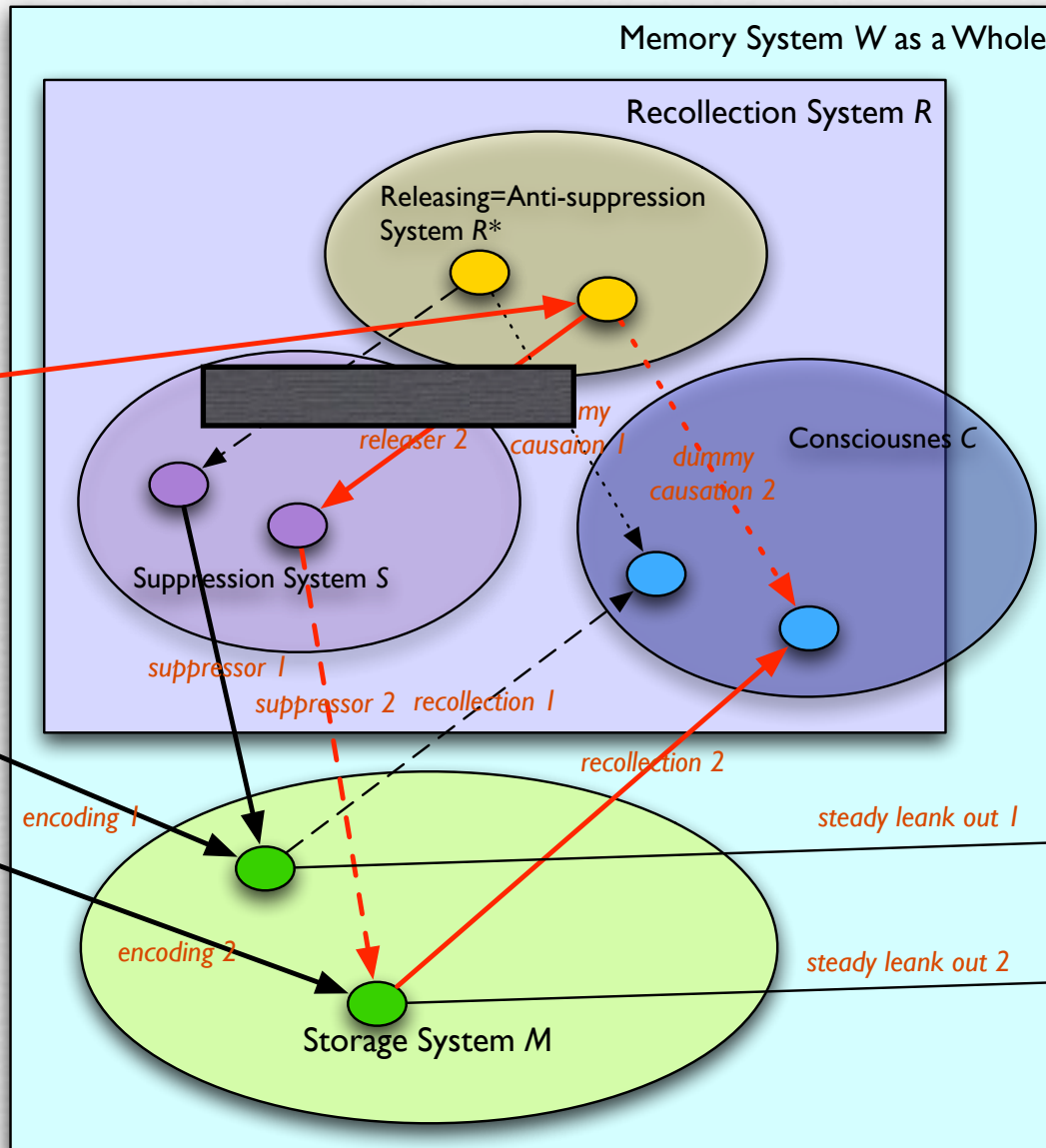


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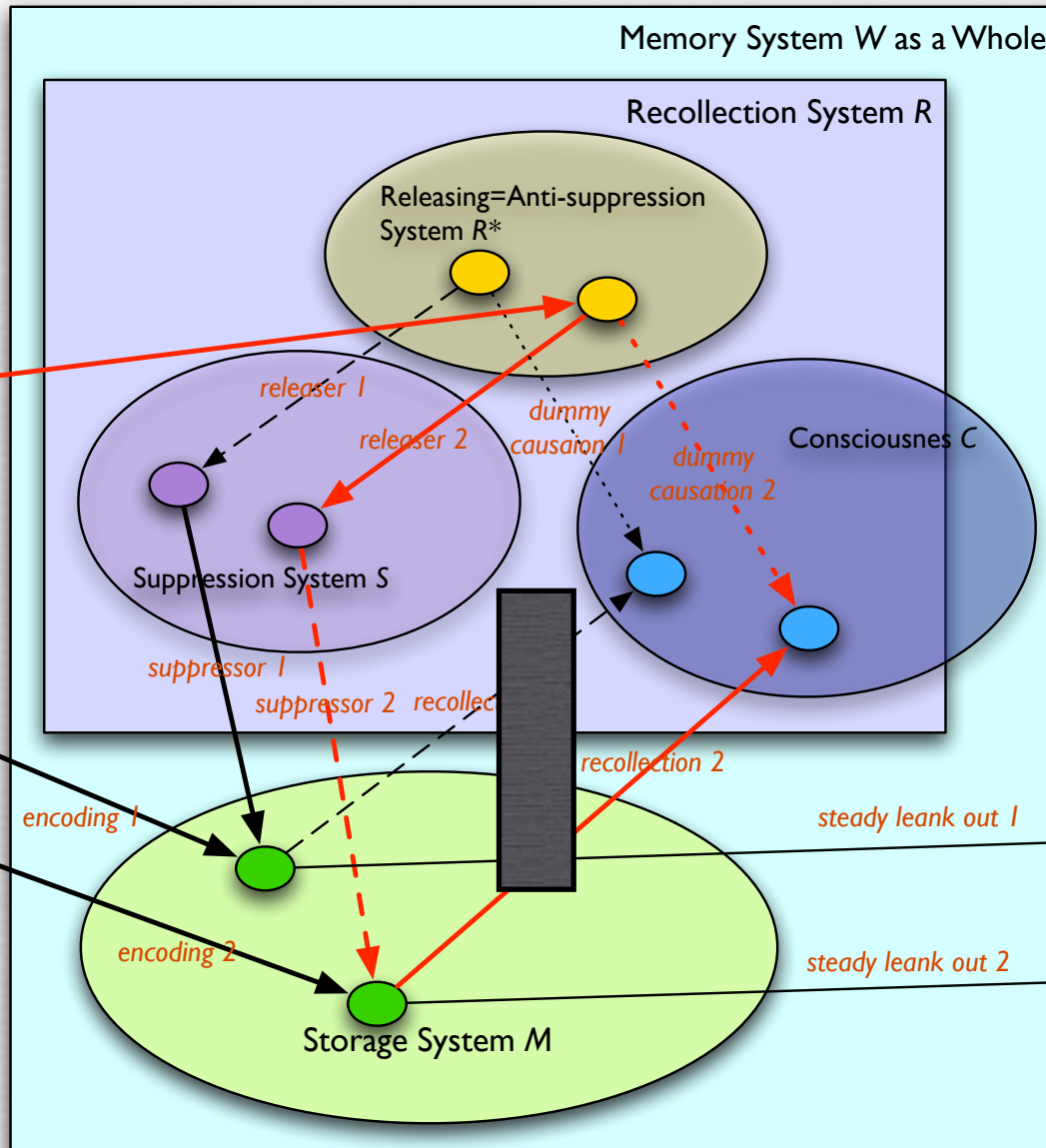
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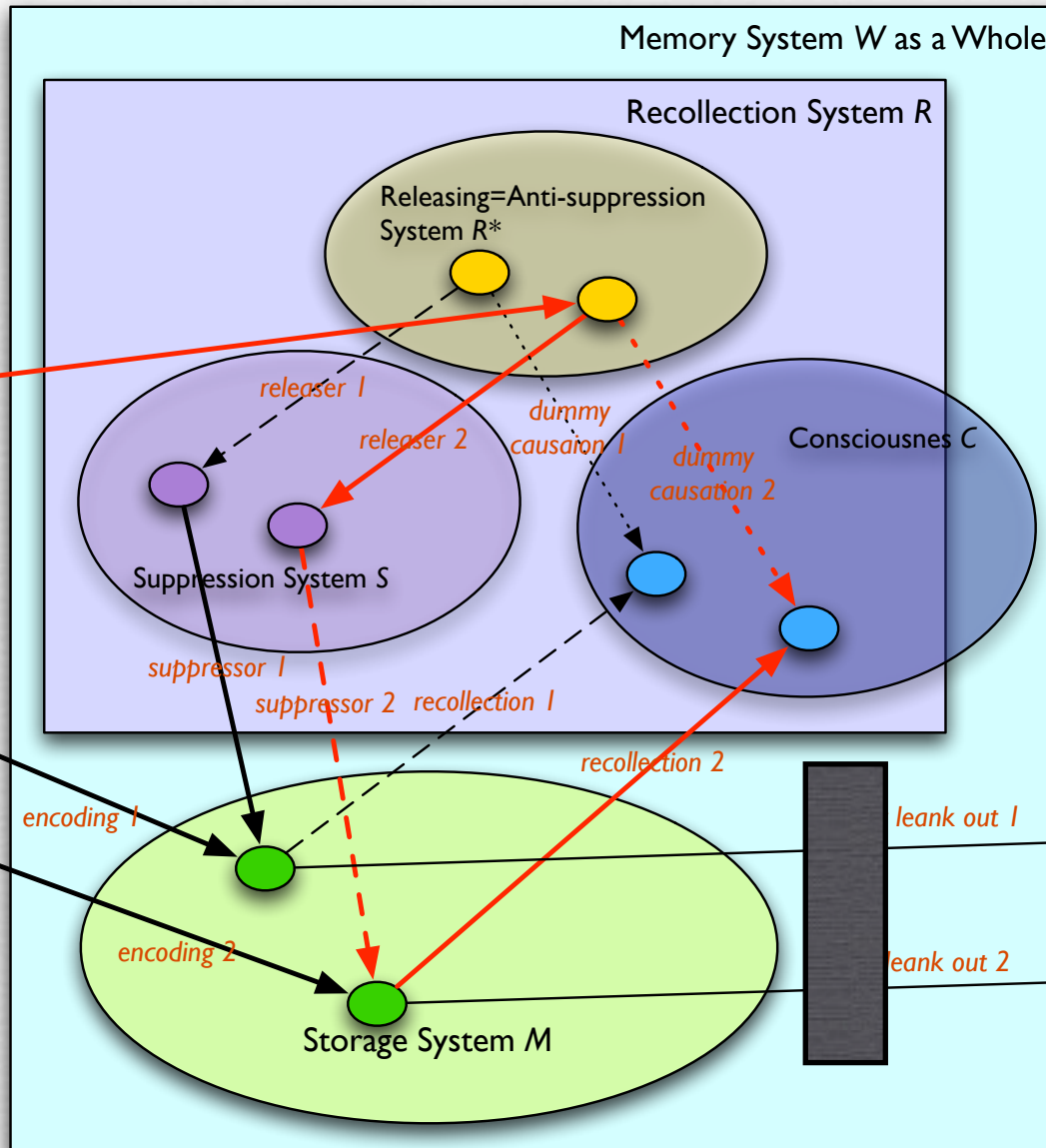
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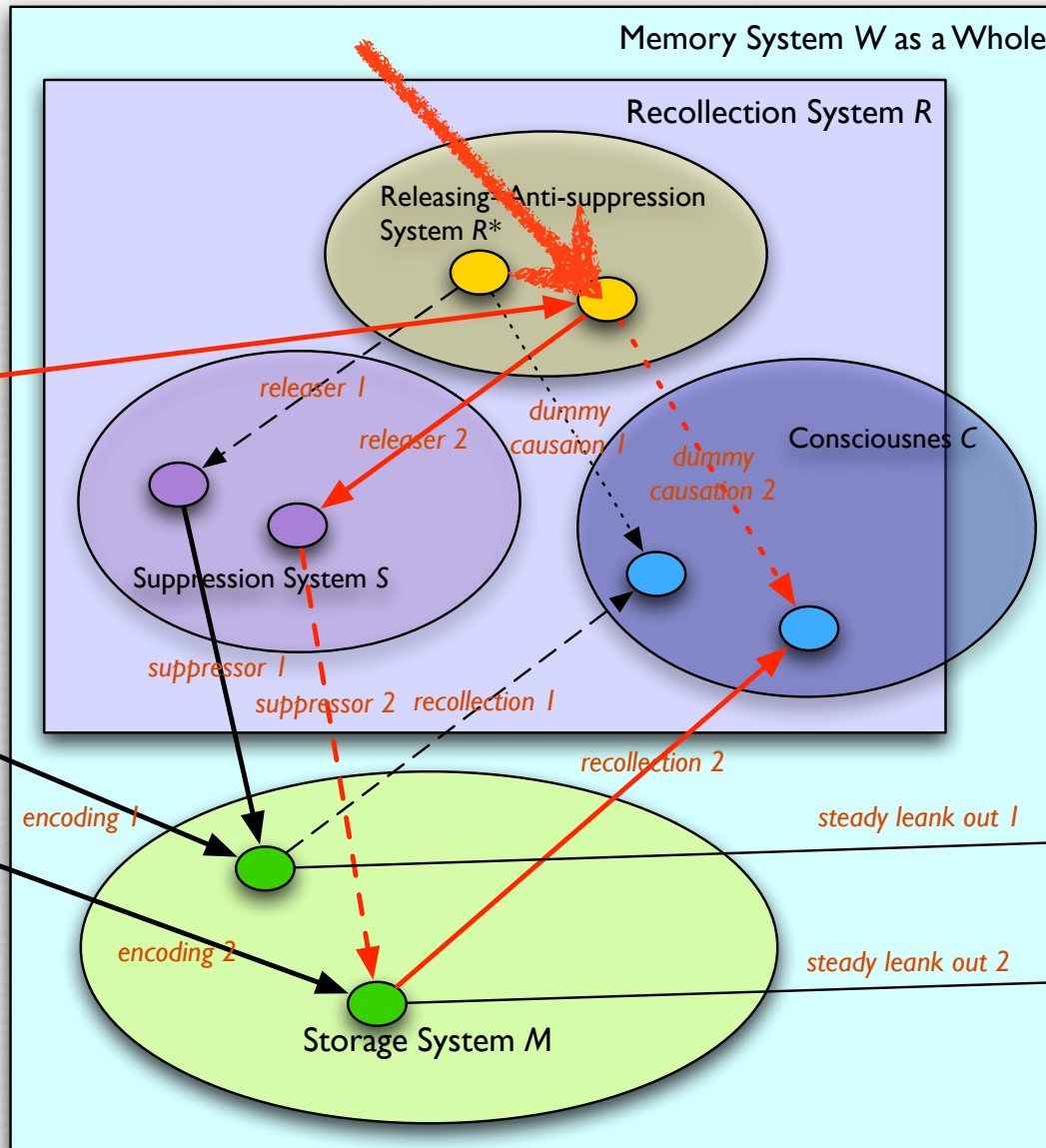


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# How System Can Break Down



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- between M and O
  - transfer error 2
- over-activation on R\*
- triggering error

# What Causes Hyper-recollection?

- ☛ People who suffer hyper-recollection
  - ☛ can remember all or most of what they store in memory
- ☛ By contrast, normal people
  - ☛ can't remember most of what they store in memory
- ☛ Possibility
  - ☛ Unusually effective indexing is made or suppression is not enough in hyper-recollection.
- ☛ But this is only true of **explicit** memory. As for **implicit** memory (Roediger 1990),
  - ☛ Both people with and without hyper-recollection can access most of what they store in memory.

Roediger, H. L. (1990). Implicit memory: Retention without remembering. *American Psychologist* 45, 1043-1056



# Open Questions and New Problems

- ❧ Open questions
  - ❧ How encoding is achieved/implemented
- ❧ New problems
  - ❧ How indexing is achieved/implemented
    - ❧ How suppression is achieved/implemented
    - ❧ How releasing is achieved/implemented
- ❧ Long-term potentiation (LTP) is relevant to them all.

From *Concepts* to  
*Conceptualizations*?  
Or Just Another *Virtus Dormitiva*?

# Conceptualizations instead of Concepts

- ☞ “Conceptualization” is one of the recent buzzwords in cognitive psychology and cognitive linguistics.
- ☞ More and more people talk about “conceptualizations” instead of “concepts” per se.
  - ☞ Even people working with ontology (Gruber 1993) do so.
- ☞ But I, for one, am very at a loss
  - ☞ What people really mean by conceptualization.
    - ☞ And aren’t you like me?
- ☞ Let’s listen to the voice of Glenberg (1997) who is one of the trend makers.

Gruber, T. R. (1993). A translation approach to portable ontology specifications. *Knowledge Acquisition* 5: 199–220.



# Glenberg 1997

- starts with stating the following challenge:
  - Most memory theories presuppose that memory is for memorizing. What would memory theory be like if this presupposition were discarded? Here, I approach memory theory guided by the question “What is memory for?”
- and expounds his idea like the following:
  - I examine the literature on memory (the second source) for evidence that cognitive structures are indeed embodied, and why that is so. I will propose that memory involved in service of perception and action in a three-dimensional environment, and that memory is embodied to facilitate interaction with the environment.

# Glenberg 1997

☞ In a nutshell,

- ☞ Thus, what is memory for? Its primary function is to mesh the embodied conceptualization of projectable properties of the environment (e.g., a path or a cup) with embodied experiences that provide nonprojectable properties. Thus the path becomes the path home and the cup becomes my cup. This meshed conceptualization, the meaning, is in the service of control of action in a three-dimensional environment.
- ☞ The basic claim is that an individual's memory serves perception and action. Memory meshes nonprojectable features with projectable features of the environment to suggest actions for that person in that situation. These patterns of action are what make the environment meaningful to that person. This framework provides a way to address meaning, symbol grounding, recollective and automatic uses of memory, and language comprehension. (p.17)

# Glenberg 1997

- ❧ adopts the **embodied cognition framework** proposed by Lakoff (1987), Johson (1987) and Lakoff & Johnson (1980, 1999)
- ❧ attempts to
  - ❧ **explain meanings away in terms of embodiment or embodied cognition.**
  - ❧ relates it to the **symbol grounding problem** (Harnad 1990, *et seq.*)
  - ❧ **reduce basic functionalities of memories to embodied cognition.**
  - ❧ rejects the multiplicity of memory, thereby denying the idea of task-wise specialization of memory into memories.

Lakoff, G. (1987). *Women, Fire and Dangerous Things*: University of Chicago Press.  
Johnson, M. (1987). *The Body in the Mind*. University of Chicago Press.  
Lakoff, G. & M. Johnson (1980). *Metaphors We Live By*. University of Chicago Press.  
Lakoff, G. & M. Johnson (1999). *The Philosophy in the Flesh*. Basic Books.



# Glenberg 1997

☞ What's wrong?

☞ **Glenberg (1997) appears to assess positive sides only.**

☞ Why?

# Reasoning in Embodiment Theory

- Following work by Johnson and Lakoff, Glenberg (1997) reasons roughly as follows:
- Claim
  - Concepts are **embodied** and therefore are **not symbols that need grounding**.
- Reason
  - Concepts are part of a **conceptualization**,
  - and
  - all conceptualizations are **embodied**.

# Isn't Embodiment Another *Virtus Dormitiva*?

- ☞ If my understanding is correct, we need to be concerned with the following possibility:
  - ☞ Isn't embodiment another *virtus dormitiva* in cognitive psychology?
- ☞ Note
  - ☞ *virtus dormitiva* is a **superficial** explanation of the **cause** of the sleepiness that follows opium dose.
  - ☞ appeared in play *Le Malade Imaginaire* (1673) by Molière's (or Jean-Baptiste Poquelin)
    - ☞ *The Imaginary Invalid* (or *The Hypochondriac*)



# Isn't Embodiment Another *Virtus Dormitiva*?

- The statement “Conceptualization is embodied” is superficial unless
  - conceptualization itself is precisely defined and adequately described
- and
  - embodiment itself is precisely defined and adequately described.
- I don't think either condition is met (yet), and I recommend to get around the second task and to concentrate on the first task first.

# Where Do Meanings Come from?

# Root of Embodiment

- ❧ Quest for embodiment virtually started when people started to question and reconsider the foundations of *classical* cognitive science, artificial intelligence (including robotics).
- ❧ First appearance in the early 80's
  - ❧ **Chinese room debate** triggered by Searle (1980)
- ❧ Resurrection in the early 90's
  - ❧ **Symbol grounding problem** (Harnad 1990, *et seq.*)

Searle, J. 1980, Minds, brains and programs. *Behavioral and Brain Sciences* 3 (3): 417-457.  
Harnad, S. 1990. The symbol grounding problem. *Physica D: Nonlinear Phenomena* 42: 335-346.



# What is at Stake?

- You can build an artificial system to simulate human cognitive behavior  $B$  when you do it by **programming**,
- What guarantees the **correspondence** between targeted **behavior  $B$**  and computational **simulation  $S$** ?
- More specifically,
  - How do **symbols** used in the system get **meaningful**?
- More fundamentally
  - Is it possible to **design** intelligent systems?

# Two Reactions

## ☞ Revival of “constructivist” approach

☞ Brooks (1991), Harnad (1990), *et seq.*, 谷口 2011  
(referring to Piaget & Inhelder (1962), Maturana & Valera (1987))

☞ Hawkins and Blakeslee (2004)

## ☞ Inquiry into embodied meaning

☞ Lakoff (1987), Johnson (1987), Varela, *et al.* (1991), Glenberg (1997)

☞ anticipated by Merleau-Ponty (1962)

Brooks, R. (1991), Intelligence without representation. *Artificial Intelligence* 47 (1-3): 139–159.

Maturana, H. R. and F. J. Varela. 1987. *The Tree of Knowledge*. Shambhala Publications.

Varela, F. J., E. Thompson, and E. Rosch (1991). *The Embodied Mind*. MIT Press.

Merleau-Ponty, M. (1962). *Phenomenology of Perception* (translated by Colin Smith). Humanities Press.

# What are Meanings?

- ☞ Here comes the crucial question:
  - ☞ What are **meanings** after all?
- ☞ This is a **bitch of a question** that nobody was ever successful to answer.



# Here Comes *Embodiment* Thesis

- ☞ Some people (with reductionist tendency) proposed:
  - ☞ Hey, the answer is easy! **meanings** are (by)product of, or epiphenomenon to **embodied cognition**, or simply **embodiment**.
    - ☞ suggested by Johnson (1987), Lakoff (1987), Lakoff & Johnson (1980, 1999), Harnad (1990), Varela, *et al.* (1991)
    - ☞ and followed by Glenberg (1997)
- ☞ Implications
  - ☞ You will be (finally) able to **define** meanings if you do intensive research into embodiment.

# Conditions on Embodiment

- ❧ How about Action-sentence Compatibility Effect (ACE) (Glenberg & Kashak 2002; Borghi, et al. 2004)?
  - ❧ ACE is predictable if recollection system R indexes sources of extrovert signals for muscular controls as well as perceptual images stored in M.
- ❧ More generally,
  - ❧ Perceptual symbol system (Barsalou 1999) is a natural consequence if bodily movements work as **virtual** perceptual inputs to memory system **as well as true** perceptual inputs from the environment

Borghi, A. M., Glenberg, A. M., & Kaschak, M. P. (2004). Putting words in perspective. *Memory & Cognition* 32, 863-873.

Glenberg, A. M. & Kaschak, M. P. (2002). Grounding language in action. *Psychonomic Bulletin & Review* 9, 558-565.

Barsalou, L. W. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences* 22, 577-609.

# Astonishing Possibility

- ☞ Another (not mutually exclusive) possibility
  - ☞ **Isn't system  $R$  part of motor control system?**
- ☞ I cannot be sure, but it's not theoretically impossible.
- ☞ If it's true, it means that
  - ☞ **thinking itself is a (kind of) motion.**
- ☞ Caveat:
  - ☞ **In this case, though,  $R$  is not properly for recollection.**



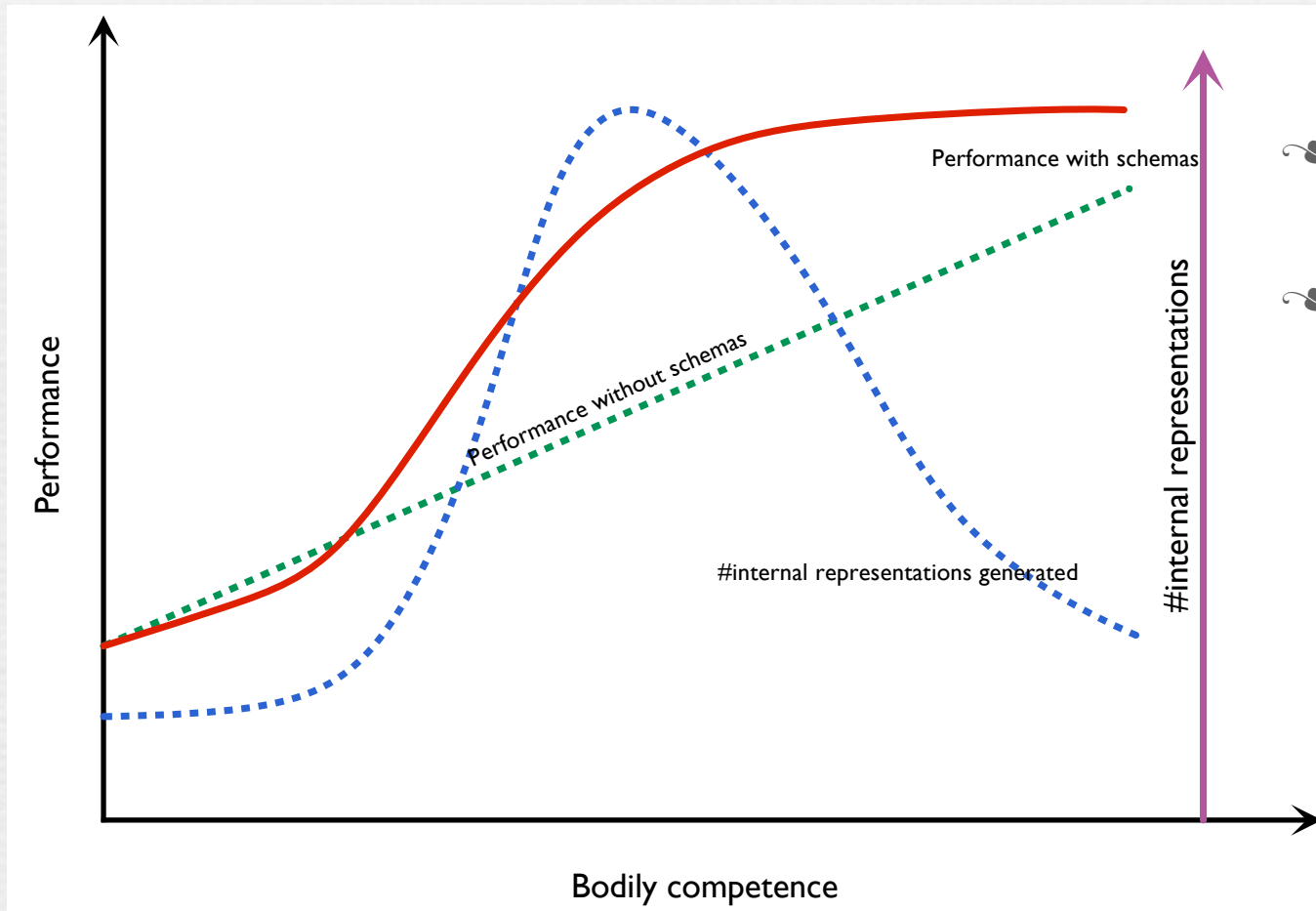
# Relevant Work

- Hawkins & Blakeslee (2004)
  - presents **Memory-Prediction Framework (MPF)**
    - incorporated into what is latter called **Hierarchical Temporal Memory (Hawkins and George 2006)**
  - puts far more emphasis on **memory-driven automation than traditional AI which cherish symbol processing.**
- 谷口 2011
  - applies **Piagetian developmental perspective to build “robots who can communicate with human”.**

Hawkins, J. & Blakeslee, S. (2004). *On Intelligence: How a New Understanding of the Brain Will Lead to the Creation of Truly Intelligent Machines*. Times Books.

Hawkins, J. and D. George (2006). *Hierarchical Temporal Memory: Concepts, Theory, and Terminology*. Numenta, Inc. [[http://www.numenta.com/Numenta\\_HTM\\_Concepts.pdf](http://www.numenta.com/Numenta_HTM_Concepts.pdf)]

# Effects of embodiment



谷口 2011: 133

plot of the performance ratio of number of internally generated schemas against robot's bodily competence (= degree of articulateness)

# Where Are Schemas?

- ☞ Last question to ask:
  - ☞ **Where are schemas?**
- ☞ Possible answer
  - ☞ Schemas residing in *R* are concept-like entities
  - ☞ Schemas residing in *M* are motor schemas
  - ☞ They are **different in kind.**
- ☞ If this is true, it would not be valid to say that “everything is concepts” (Murphy 2002)



# Is Embodiment a “Solution”?

- ☞ Embodiment thesis should advance our understanding of meanings by answering the question:
  - ☞ **Where do meanings come from?**
- ☞ but I am skeptical about hasty claims like:
  - ☞ **Embodiment explains meanings away.**
- ☞ Why? Because it just begs the question:
  - ☞ **What are embodied? And what is embodiment for?**
- ☞ Without reasonable account for them, embodiment thesis remains the analogue of *virtus dormitiva*.

# *Anti-conclusion*

# Used Pieces of a Puzzle

- ☞ Basics in Psychology of Concepts

- ☞ **Murphy 2002**

- ☞ Memory Disorders

- ☞ **Jill Price**

- ☞ Hyperthymestic syndrome after Parker, Cahill & McGaugh 2001

- ☞ **Solomon Shereshevsky**

- ☞ Luria 1986

- ☞ Unusual Memory Performances in Savant Syndrome

- ☞ **Temple Grandin**

- ☞ **Kim Peek**

- ☞ Symbol Grounding Problem in AI

- ☞ **Searle 1980**

- ☞ **Harnad 1990, et seq.**

- ☞ 谷口忠大 2011

- ☞ Concepts and Conceptualizations

- ☞ **Gruber 1993, et seq.**

- ☞ Embodiment of Concepts/ Conceptualizations

- ☞ **Glenberg 1997, Glenberg & Kaschak 2002**

- ☞ **Barsalou 1999**

- ☞ **Johnson 1987, Lakoff 1987, Lakoff and Johnson 1980, 1999**

- ☞ Memory-Prediction Framework

- ☞ **Hawkins & Blakeslee 2004**

- ☞ **Hawkins & George 2006**



# My Concerns

- ☞ **Mainly,**
  - ☞ **it's upside down to try to derive properties/functionalities of memories/functionalities from properties of conceptualizations.**
- ☞ **More specifically,**
  - ☞ **it's wrong to say that memories are in service of effective use of conceptualizations.**
- ☞ **Reason**
  - ☞ **Attempt to reduce meanings to embodiment is premature without enough description of meanings at reasonable quality.**

# My Concerns

- ❧ Unlike opportunistic proponents, I hold
  - ❧ behavioral science of mind/brain has not yet advanced to tell exactly what meanings are.
- ❧ This is because
  - ❧ we are still missing a “language” with which meaning are described at satisfiable precision.

Thank You for Your  
Attention