# Psychologie Cognitive

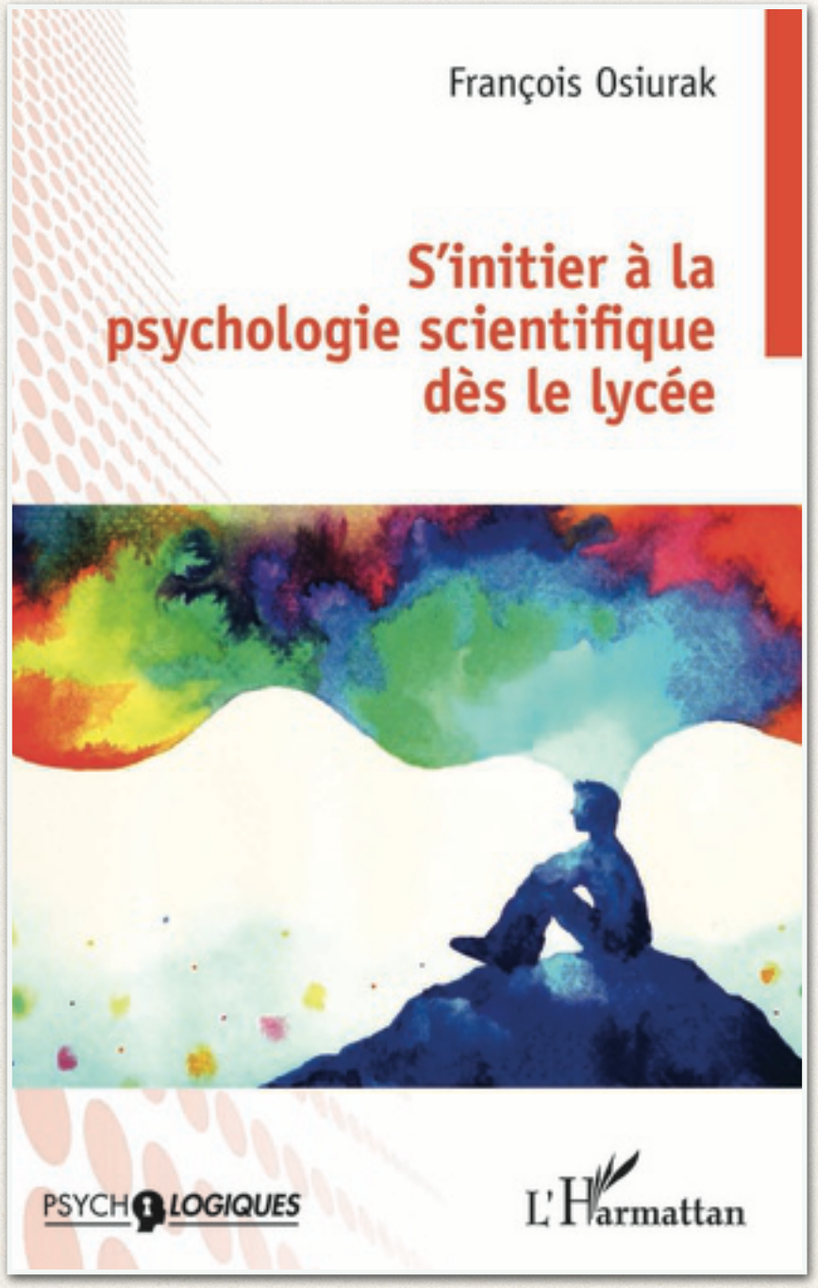

François Osiurak

Professeur des Universités

Laboratoire d'Etude des Mécanismes Cognitifs, Université de Lyon
Institut Universitaire de France, Paris

# Psychologie Cognitive

## François Osiurak




## Sommaire

**INTRODUCTION.....9**

1. De la philosophie a la science .....14
2. Qu'est-ce que la psychologie ? .....21
3. Pourquoi la psychologie n'est pas enseignee des le lycee ? .....28
4. Organisation de l'ouvrage .....32

**CHAPITRE 1 : APPRENTISSAGE.....35**

1. Aux origines de l'apprentissage .....35
2. Le chien de Pavlov.....38
3. Le petit Albert .....40
4. La loi de l'effet.....42
5. Le renforcement, clef de tout apprentissage.....45
6. Apprendre sans renforcement .....49
7. Apprendre en observant.....55

**CHAPITRE 2 : MEMOIRE DE TRAVAIL.....61**

1. Le fil de la pensee .....61
2. L'effet cocktail party.....63
3. Memoire tampon .....65
4. Memoire a court terme *versus* memoire a long terme68
5. Le modele standard de la memoire .....71
6. Quand la memoire se met au travail.....74
7. Boucle phonologique.....74
8. Calepin visuo-spatial .....76
9. L'administrateur central .....79
10. À la recherche de l'homoncule.....83

**CHAPITRE 3 : MEMOIRE A LONG TERME .....85**

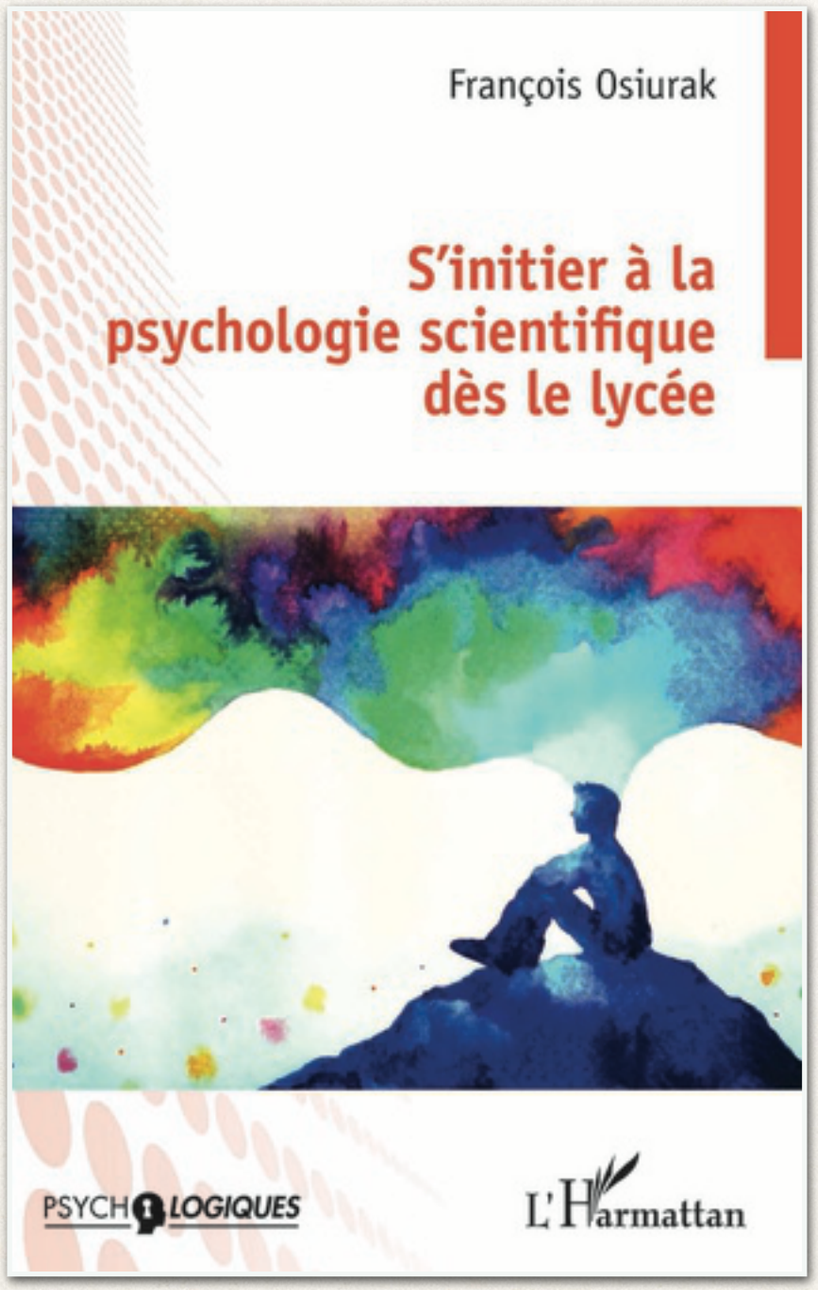
1. Qu'est-ce que la memoire a long terme ?.....85
2. HM, un amnesique celebre .....86
3. Se souvenir.....91
4. Rappeler sans se souvenir .....96
5. Comment evaluer la memoire ?.....99
6. Maladie d'Alzheimer et demence semantique .....100
7. L'oubli motive .....105
8. Les animaux ont-ils une memoire episodique ? .....106

**CHAPITRE 4 : MEMOIRE TRANSACTIVE.....113**

1. Quand les esprits se rencontrent .....113

# Psychologie Cognitive

## François Osiurak




2. MEMOIRE TRANSACTIVE ET RELATIONS INTIMES ..... 114
3. LES CARACTERISTIQUES DE LA MEMOIRE TRANSACTIVE ..... 120
4. DE L'OUBLI DIRIGE… ..... 122
5. … A INTERNET ..... 127
6. COGNITION ETENDUE ..... 132

**CHAPITRE 5 : CULTURE ..... 135**

1. LA CULTURE EST-ELLE UNIQUE AUX HUMAINS ? ..... 135
2. LA CULTURE COMME OBJET D'ETUDE SCIENTIFIQUE ..... 136
3. LA CULTURE CHEZ LES CHIMPANZES ..... 140
4. TRADITIONS CHEZ LES CHIMPANZES ..... 144
5. QU'EST-CE QUE L'APPRENTISSAGE SOCIAL ? ..... 147

**CHAPITRE 6 : IMITATION ..... 153**

1. IMITATION OU EMULATION ? ..... 153
2. QUAND LES ENFANTS IMITENT OU N'IMITENT PAS ..... 157
3. SOMMES-NOUS LES SEULS A IMITER ? ..... 160
4. QUAND NOUS SUR-IMITONS NOS CONGENERES ..... 168
5. EST-CE QUE LES CHIMPANZES SUR-IMITENT ? ..... 174

**CHAPITRE 7 : ENSEIGNEMENT ..... 177**

1. QU'EST-CE QU'ENSEIGNER ? ..... 177
2. QUAND LES SURICATES ENSEIGNENT ..... 181
3. ÉTAYER *VERSUS* ENSEIGNER ACTIVEMENT ..... 184
4. LA THEORIE DE L'ESPRIT ..... 186
5. L'ATTENTION CONJOINTE ..... 193
6. L'HYPOTHESE DE L'INTELLIGENCE CULTURELLE ..... 196

**CHAPITRE 8 : CULTURE CUMULATIVE ..... 201**

1. LES OUTILS ..... 201
2. QUAND LES APPRENTISSAGES S'ACCUMULENT ..... 203
3. IMITATION ET INNOVATION ..... 206
4. LE ROLE CLEF DE L'IMITATION ..... 208
5. IMITER SANS COMPRENDRE ..... 210
6. PEUT-ON REELLEMENT IMITER SANS COMPRENDRE ? ..... 215
7. QUAND LA COMPREHENSION COMPENSE LES PROBLEMES DE TRANSMISSION ..... 219
8. ENSEIGNEMENT ET OPACITE ..... 222

**CONCLUSION ..... 225**

**REFERENCES ..... 227**

# La Mémoire

## Plan détaillé

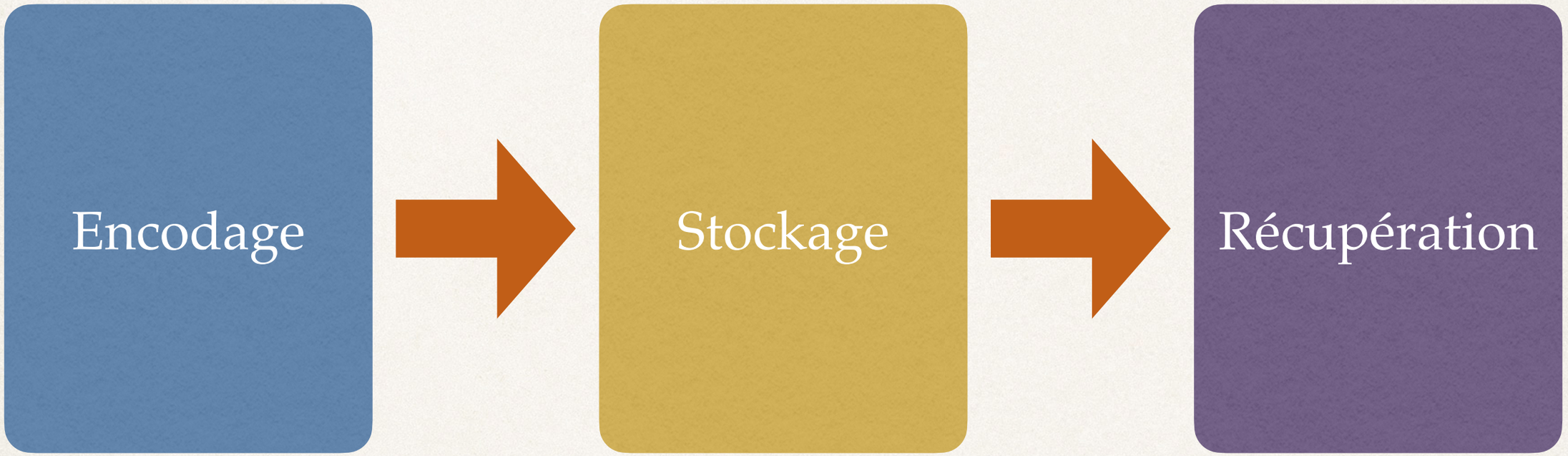
Le modèle standard

- L'effet Cocktail Party
- Le filtre attentionnel
- La mémoire sensorielle
- La position sérielle
- Le modèle standard

Les différentes mémoires

L'encodage

L'oubli


Encodage
Stockage
Récupération

# L'effet Cocktail Party

THE JOURNAL OF THE ACOUSTICAL SOCIETY OF AMERICA VOLUME 25, NUMBER 5 SEPTEMBER, 1953

## Some Experiments on the Recognition of Speech, with One and with Two Ears*

E. COLIN CHERRY
*Imperial College, University of London, England, and Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, Massachusetts*

(Received May 5, 1953)

*Colin Cherry*
*1914 - 1979*

THE experiments described herein are intended as a small contribution to the solution of the general problem of the recognition of speech. They are designed to be essentially objective and behavioristic; that is, the "subject" under test (the listener) is regarded as a transducer whose responses are observed when various stimuli are applied, whereas his subjective impressions are taken to be of minor importance.

The first set of experiments relates to this general problem of speech recognition: how do we recognize what one person is saying when others are speaking at the same time (the "cocktail party problem")? On

# L'effet Cocktail Party

THE JOURNAL OF THE ACOUSTICAL SOCIETY OF AMERICA VOLUME 25, NUMBER 5 SEPTEMBER, 1953

## Some Experiments on the Recognition of Speech, with One and with Two Ears*

E. COLIN CHERRY
*Imperial College, University of London, England, and Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, Massachusetts*

(Received May 5, 1953)

*Colin Cherry*
*1914 - 1979*

Message 1 (a) "It may mean that our religious convictions, legal systems and politics have been so successful in accomplishing their ~~ends~~ AIMS during the past two thousand years, that there has been no need to change our outlooks about them. Or it may mean that the outlook has not changed for other reasons. I will leave ~~the~~ BELIEVE IN first hypothesis for those who are willing to defend it, and choose the second AND IN As the reader may have guessed, I am interested in learning how obsolete structure of languages preserves obsolete metaphysics."

# L'effet Cocktail Party

THE JOURNAL OF THE ACOUSTICAL SOCIETY OF AMERICA VOLUME 25, NUMBER 5 SEPTEMBER, 1953

## Some Experiments on the Recognition of Speech, with One and with Two Ears*

E. COLIN CHERRY
*Imperial College, University of London, England, and Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, Massachusetts*

(Received May 5, 1953)

*Colin Cherry*
*1914 - 1979*

### 5. LANGUAGE OF "REJECTED" EAR UNRECOGNIZED

In a further set of tests the two messages, one for the right ear and one for the left, started in English. After the subject was comfortably repeating his right-ear message, the left-ear message was changed to German, spoken by an Englishman. The subject subsequently reported, when asked to state the language of the "rejected" left-ear message, that he "did not know at all, but assumed it was English." The test was repeated with different, unprepared listeners; the results were similar. It is considered unfair to try this particular test more than once with the same listener.

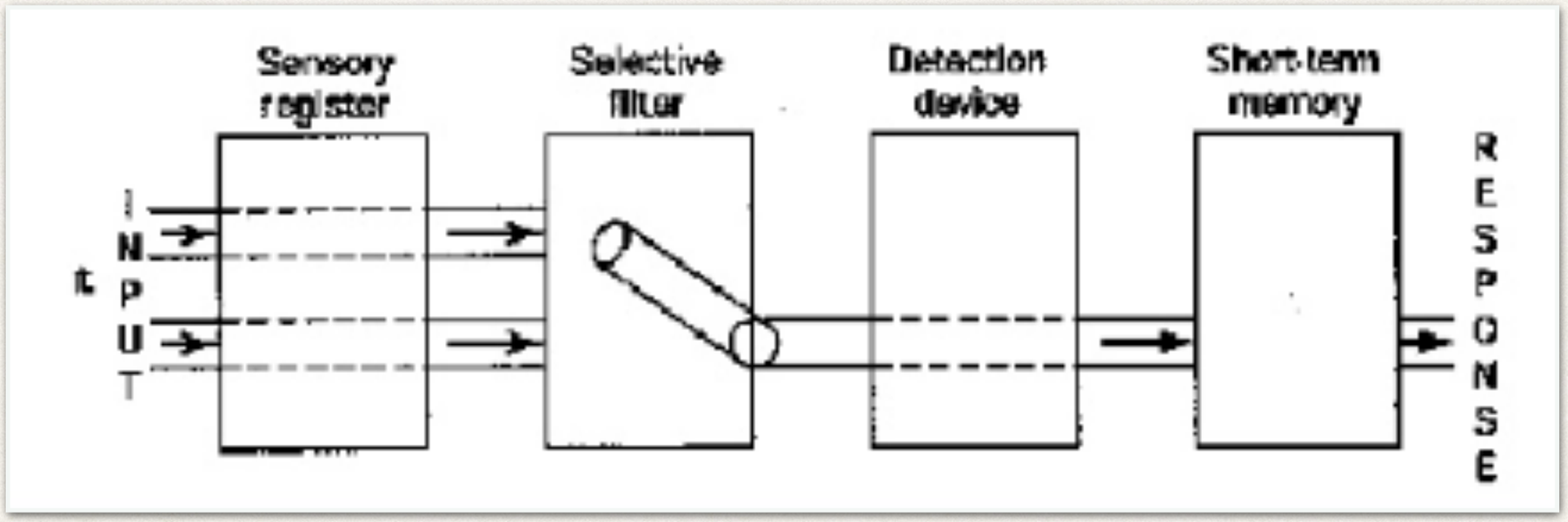
It was considered that a further series of tests might well indicate the level of recognition which is attained in the "rejected" ear, raising the questions, Is the listener aware even that it is human speech? male or female? and the like.

as being English. On the other hand the change of voice—male to female—was nearly always identified, while the 400-cps pure tone was always observed. The reversed speech was identified as having "something queer about it" by a few listeners, but was thought to be normal speech by others.

The broad conclusions are that the "rejected" signal has certain statistical properties recognized, but that detailed aspects, such as the language, individual words, or semantic content are unnoticed.

## Le filtre attentionnel

*Donald Broadbent*
*1926 - 1993*




1958

# La mémoire sensorielle

Vol. 74, No. 11 Whole No. 498, 1960

Psychological Monographs: General and Applied

## THE INFORMATION AVAILABLE IN BRIEF VISUAL PRESENTATIONS[1]

GEORGE SPERLING[2]

*Harvard University*

*George Sperling*
*1934 -*

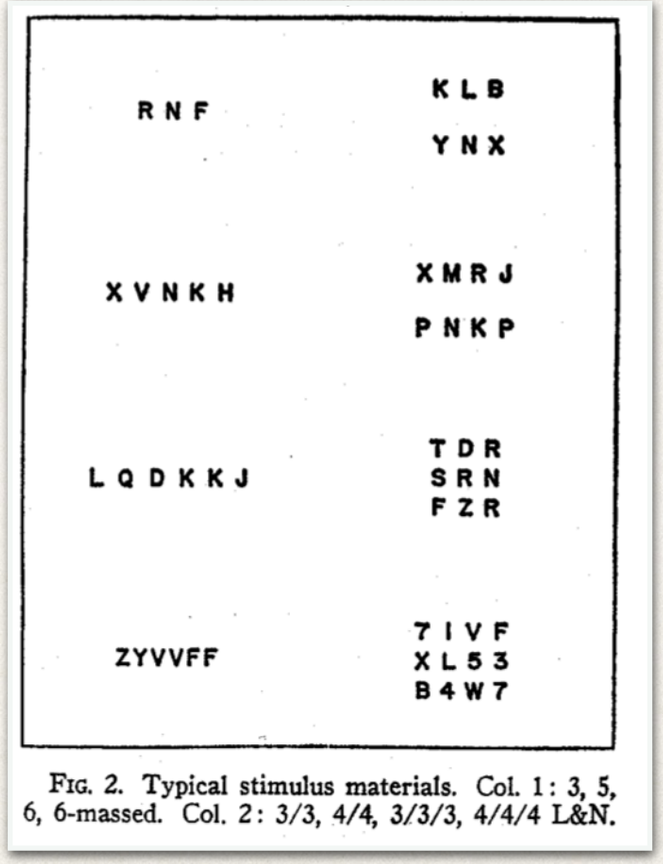



FIG. 2. Typical stimulus materials. Col. 1: 3, 5, 6, 6-massed. Col. 2: 3/3, 4/4, 3/3/3, 4/4/4 L&N.

HIGH TONE

# La position sérielle

*Journal of Experimental Psychology*
1962, Vol. 64, No. 5, 482–488

## THE SERIAL POSITION EFFECT OF FREE RECALL[1]

BENNET B. MURDOCK, JR.
*University of Vermont*

*Bennet Murdock*
*1925 -*

Six groups each had a different combination of list length and presentation rate. These six combinations were 10-2, 20-1, 15-2, 30-1, 20-2, and 40-1; the first number indicates list length and the second number indicates presentation time (in sec.) per item. Thus, 10-2 means a list of 10 words presented at a rate of 2 sec/item. Notice that the first

# La position sérielle

*Journal of Experimental Psychology*
1962, Vol. 64, No. 5, 482–488

## THE SERIAL POSITION EFFECT OF FREE RECALL[1]

BENNET B. MURDOCK, JR.
*University of Vermont*

*Bennet Murdock*
*1925 -*

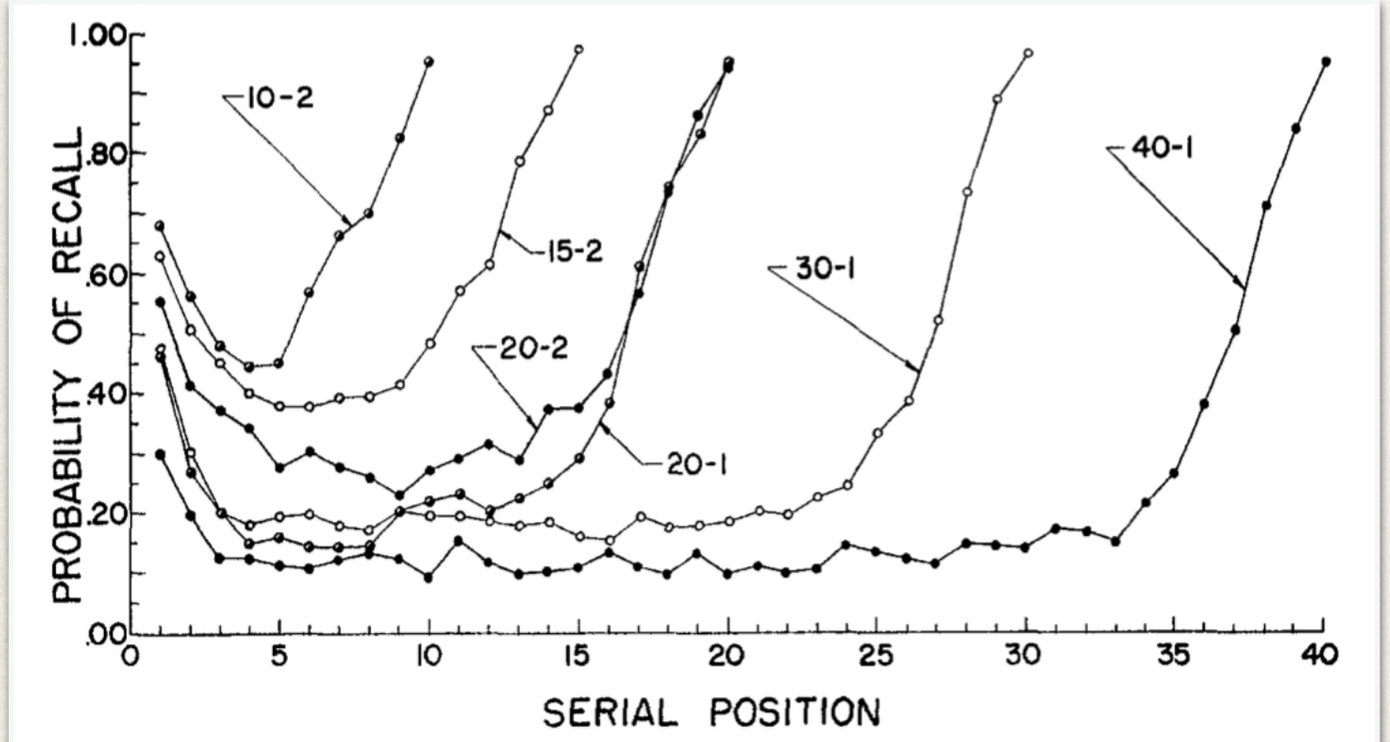



FIG. 1. Serial position curves for the six groups.

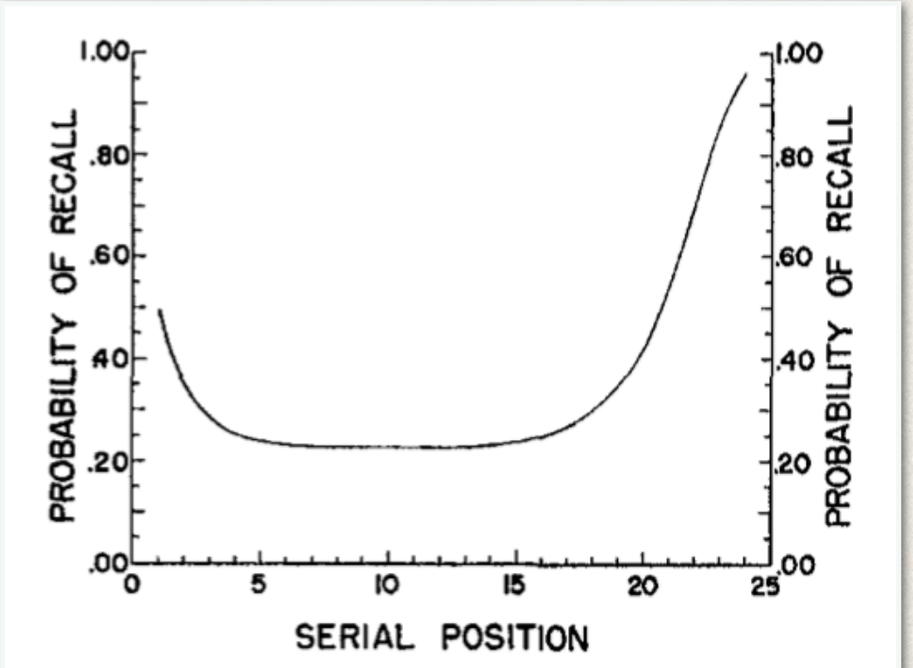



FIG. 3. Idealized serial position curve for 24-word list.

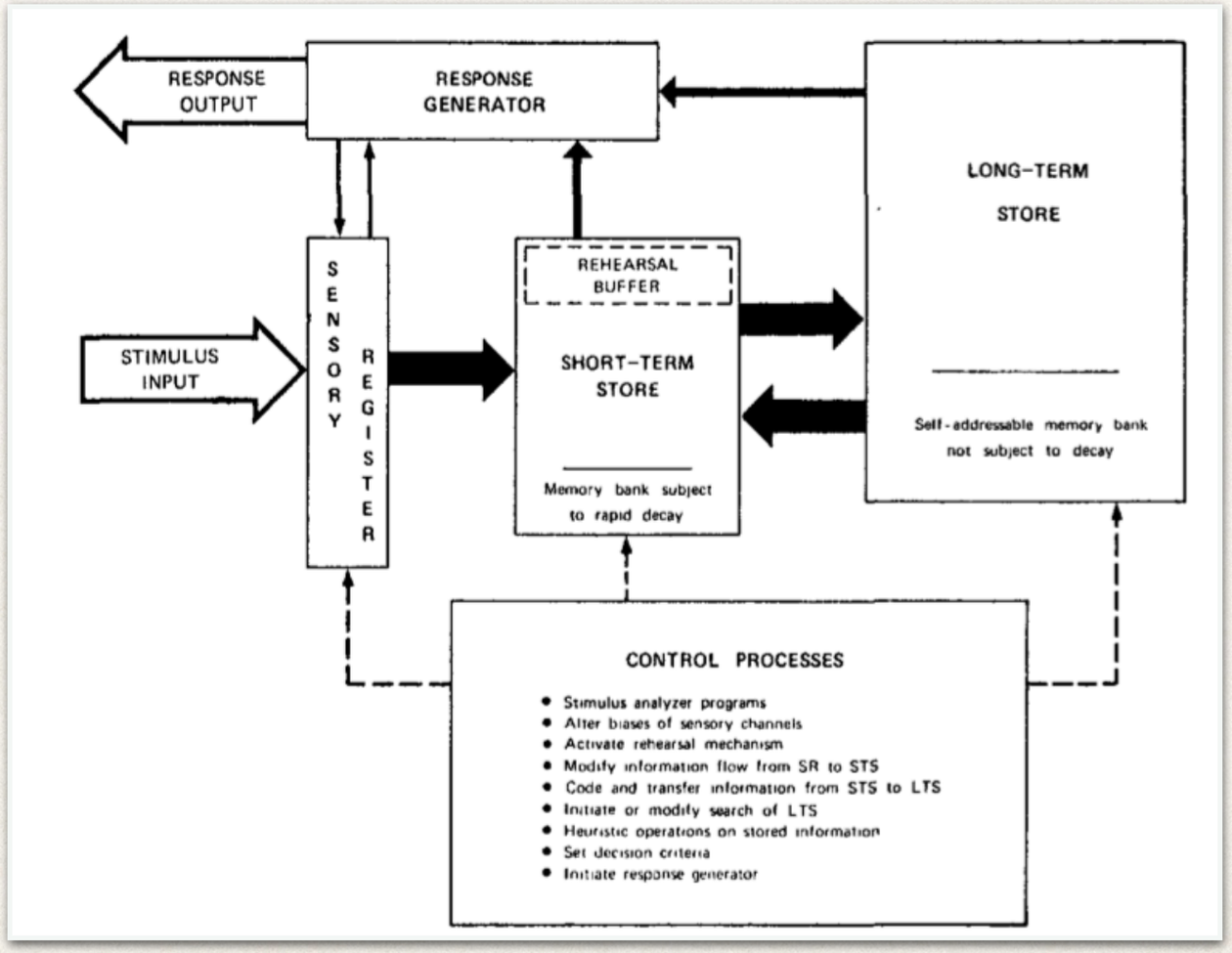
# Le modèle standard

Modèle d'origine en 1968

*Psychological Review*
1969, Vol. 76, No. 2, 179–193

## STORAGE AND RETRIEVAL PROCESSES IN LONG-TERM MEMORY[1]

R. M. SHIFFRIN[2] AND R. C. ATKINSON
*Stanford University*




Extension vers
la mémoire de travail

## Plan détaillé

Le modèle standard

Les différentes mémoires

- Mémoire déclarative *versus* mémoire procédurale
- Mémoire sémantique *versus* mémoire épisodique
- Mémoire implicite *versus* mémoire explicite
- Mémoire autobiographique
- Mémoire épisodique chez les animaux
- Mémoire prospective

L'encodage

L'oubli

## Mémoire déclarative *versus* mémoire procédurale

*John R. Anderson*
*1947 -*

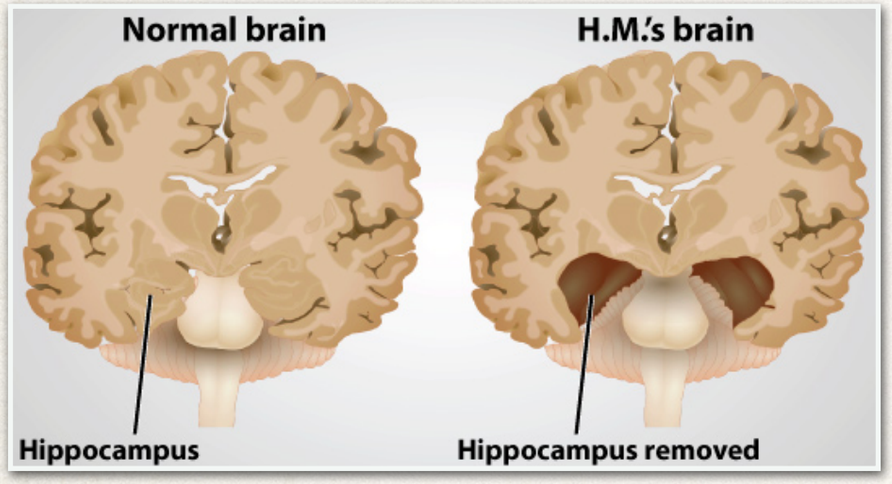
**Mémoire déclarative**

*Faits, événements*

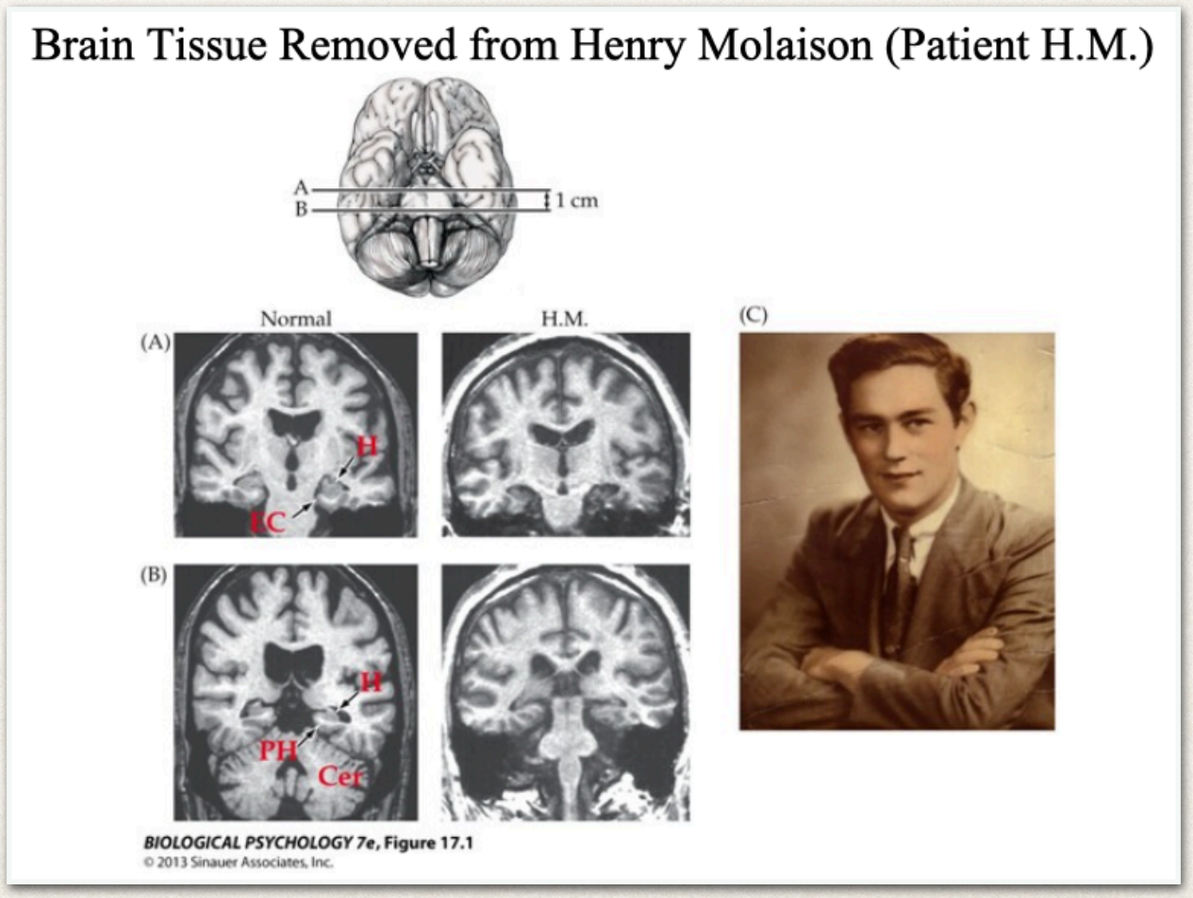
**Mémoire procédurale**

*Habilités*

# Mémoire déclarative *versus* mémoire procédurale

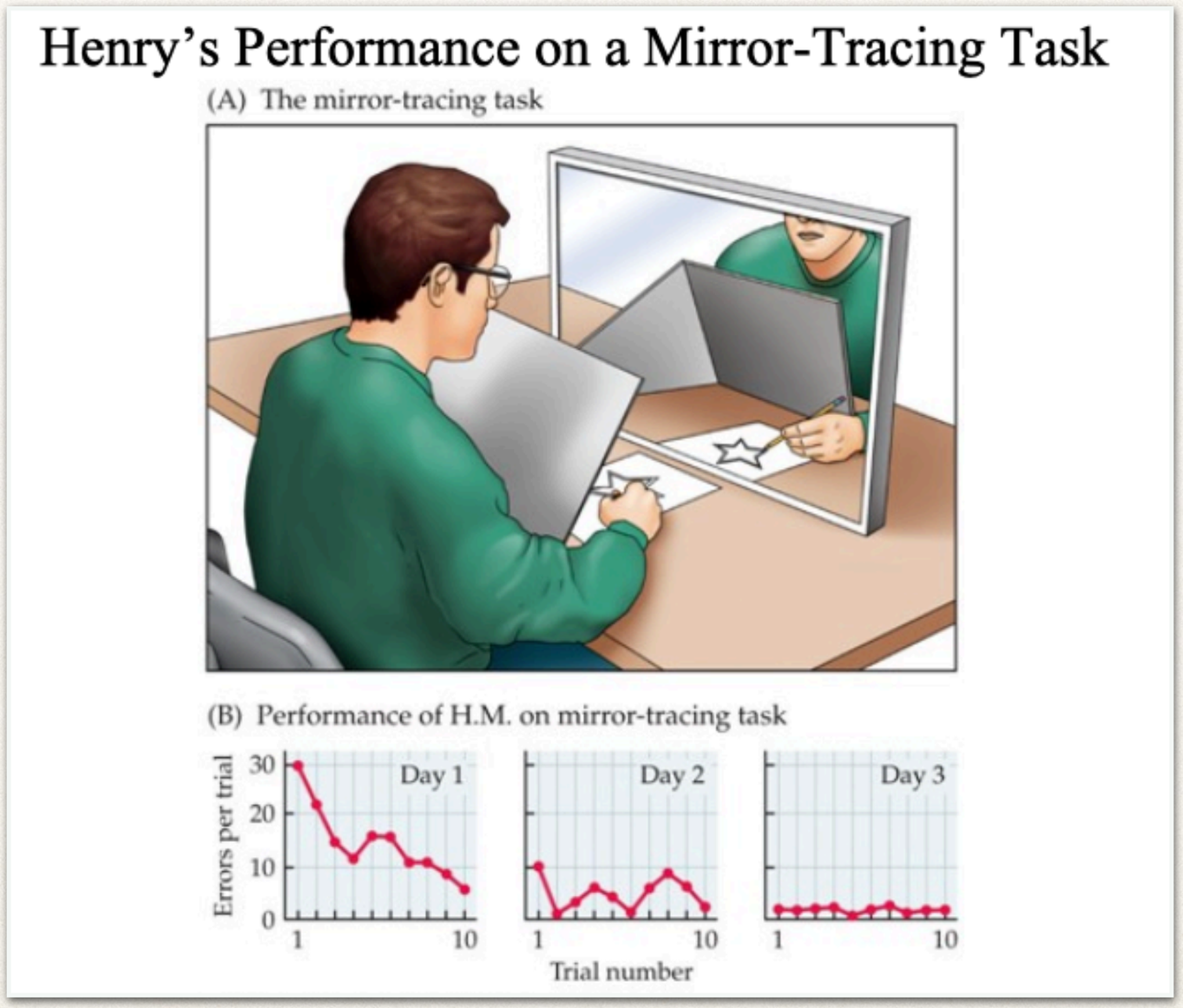



*Brenda Milner*
*1918 -*



# Mémoire déclarative *versus* mémoire procédurale

*Brenda Milner*
*1918 -*



# Psychologie Cognitive

François Osiurak

## Plan détaillé

Le modèle standard

Les différentes mémoires

- Mémoire déclarative *versus* mémoire procédurale
- Mémoire sémantique *versus* mémoire épisodique
- Mémoire implicite *versus* mémoire explicite
- Mémoire autobiographique
- Mémoire épisodique chez les animaux
- Mémoire prospective

L'encodage

L'oubli

# Mémoire sémantique *versus* mémoire épisodique

JOURNAL OF VERBAL LEARNING AND VERBAL BEHAVIOR 8, 240–247 (1969)

## Retrieval Time from Semantic Memory[1]

ALLAN M. COLLINS AND M. ROSS QUILLIAN

*Bolt Beranek and Newman, Inc., Cambridge, Massachusetts 02138*

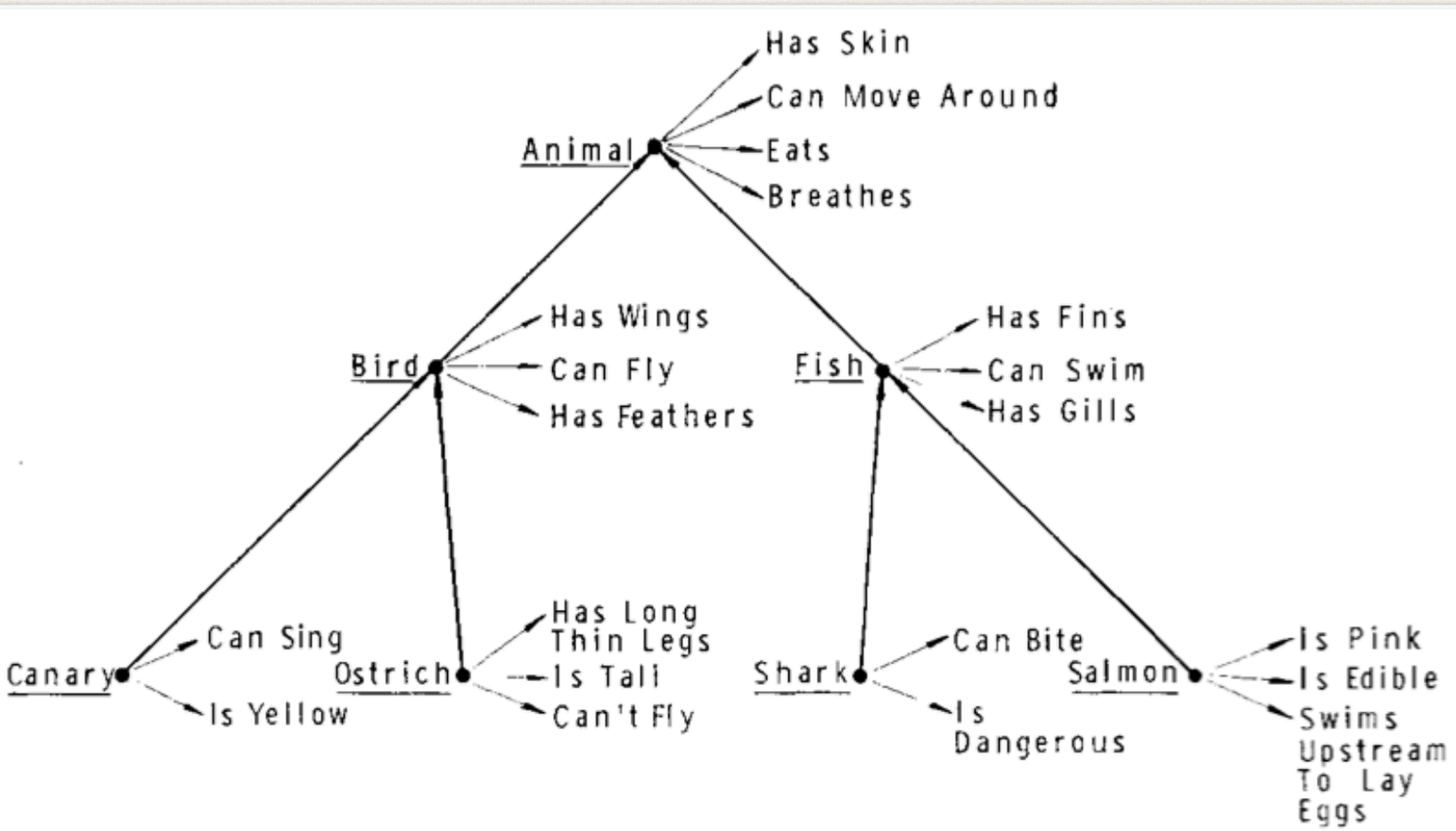



FIG. 1. Illustration of the hypothetical memory structure for a 3-level hierarchy.

## Mémoire sémantique *versus* mémoire épisodique

JOURNAL OF VERBAL LEARNING AND VERBAL BEHAVIOR **8**, 240–247 (1969)

**Retrieval Time from Semantic Memory**[1]

ALLAN M. COLLINS AND M. ROSS QUILLIAN

*Bolt Beranek and Newman, Inc., Cambridge, Massachusetts 02138*

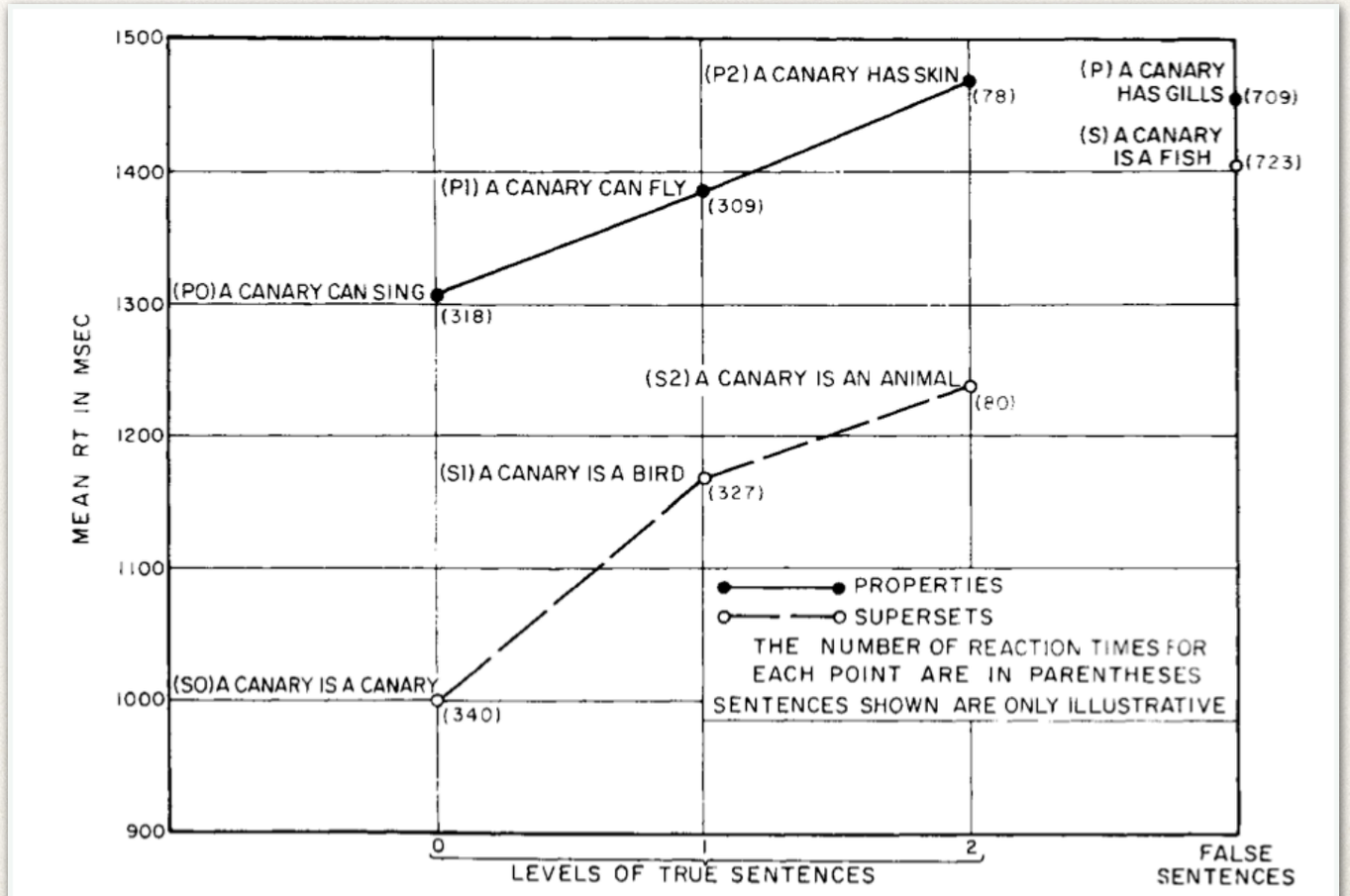
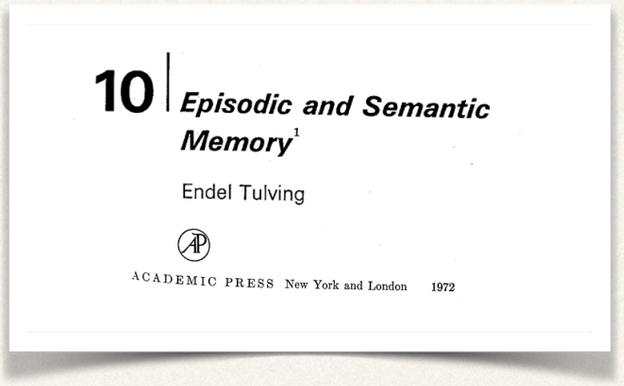



FIG. 2. Average reaction times for different types of sentences in three experiments.

# Mémoire sémantique *versus* mémoire épisodique



10 | *Episodic and Semantic Memory*[1]

Endel Tulving

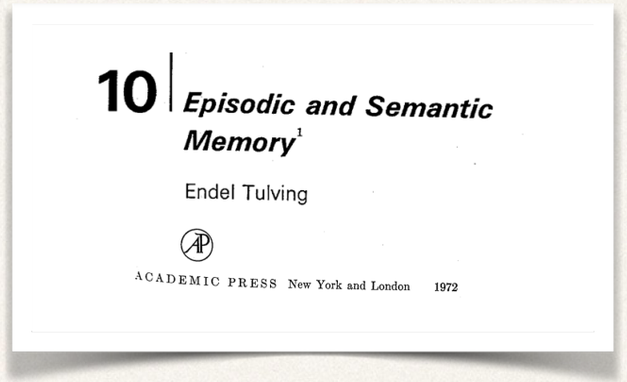
ACADEMIC PRESS New York and London 1972

*Endel Tulving*
*1927 -*

tions, and understanding ideas. Kintsch thinks of semantic memory as an organized internal lexicon that represents a person's knowledge of language and that can serve as a basis for processing information in a variety of memory tasks, including free recall. Collins and Quillian's semantic memory, too, is a highly structured network of concepts, words, and images, capable of making inferences and comprehending language. Although they make no explicit reference to more traditional memory experiments, Collins and Quillian probably would want their "language user" to be able to remember lists of unrelated words.

Despite these explicitly stated or implicitly conveyed intentions of theorists concerned with semantic memory, one may wonder about the term they all use, "semantic memory." A useful concept in science frequently is one whose definition not only makes very clear what it includes, but also what it excludes. For instance, we understand that short-term memory is not long-term memory, auditory memory is not visual memory, and acoustic memory is not articulatory memory. What do we contrast with semantic memory? Semantic memory is not . . . what other kind of memory?

# Mémoire sémantique *versus* mémoire épisodique



10 | *Episodic and Semantic Memory*[1]

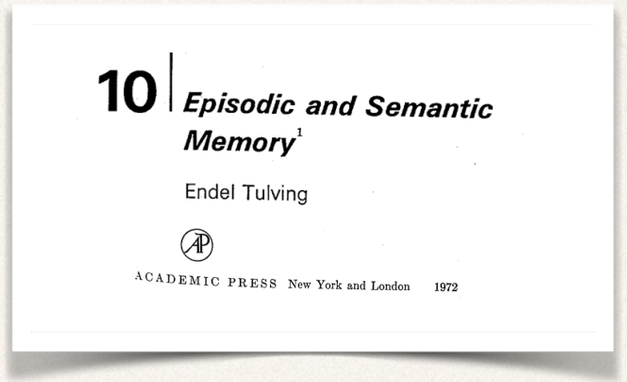
Endel Tulving

ACADEMIC PRESS New York and London 1972

*Endel Tulving*
*1927 -*

Episodic memory receives and stores information about temporally dated episodes or events, and temporal-spatial relations among these events. A perceptual event can be stored in the episodic system solely in terms of its perceptible properties or attributes, and it is always stored in terms of its autobiographical reference to the already existing contents of the episodic memory store. The act of retrieval of information

# Mémoire sémantique *versus* mémoire épisodique



10 | *Episodic and Semantic Memory*[1]

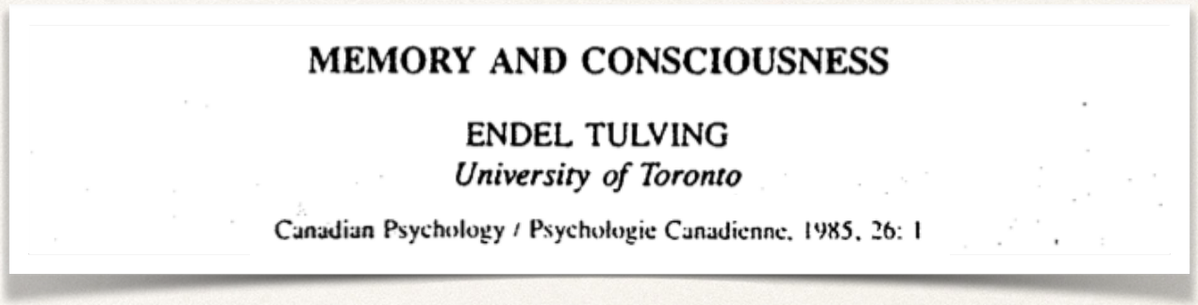
Endel Tulving

ACADEMIC PRESS New York and London 1972

*Endel Tulving*
*1927 -*

Semantic memory is the memory necessary for the use of language. It is a mental thesaurus, organized knowledge a person possesses about words and other verbal symbols, their meaning and referents, about relations among them, and about rules, formulas, and algorithms for the manipulation of these symbols, concepts, and relations. Semantic memory does not register perceptible properties of inputs, but rather cognitive referents of input signals. The semantic system permits the retrieval of information that was not directly stored in it, and retrieval of information from the system leaves its contents unchanged, although any act of retrieval constitutes an input into episodic memory. The semantic system is probably much less susceptible to involuntary transformation and loss of information than the episodic system. Finally,

# Mémoire sémantique *versus* mémoire épisodique



MEMORY AND CONSCIOUSNESS

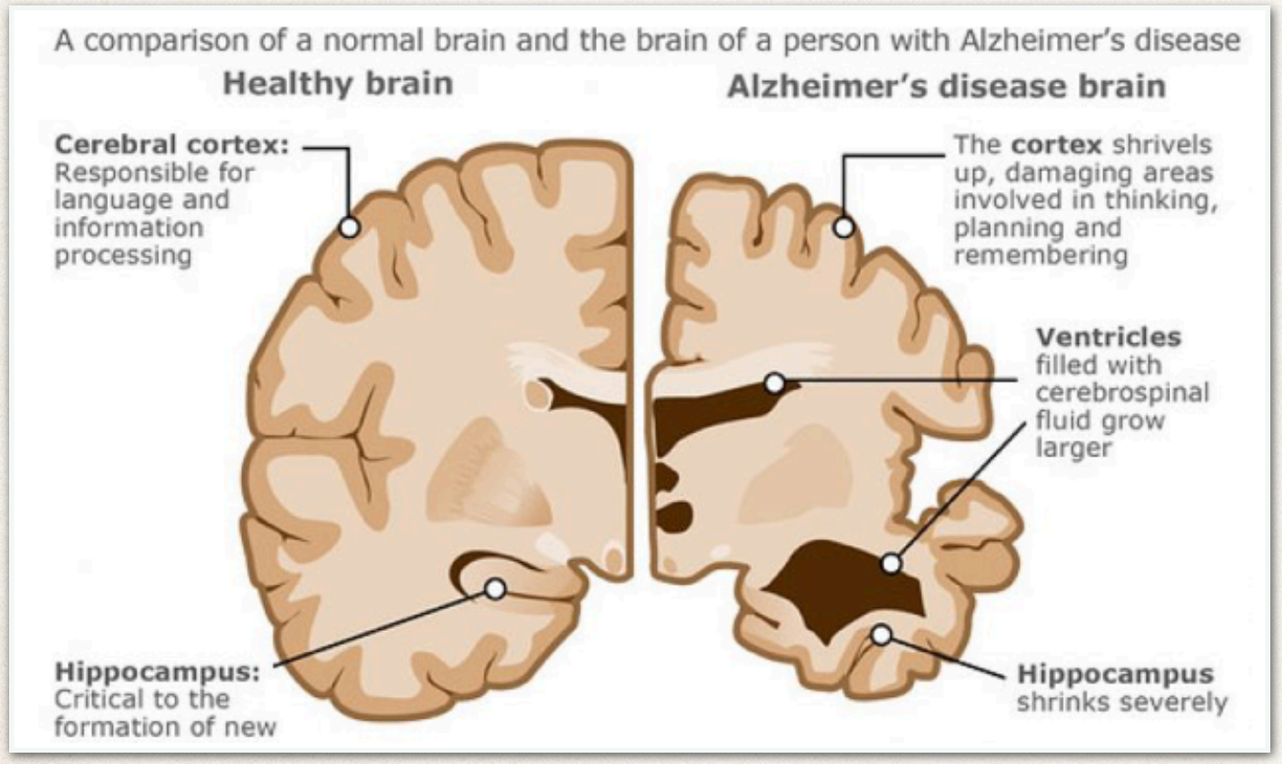
ENDEL TULVING
*University of Toronto*

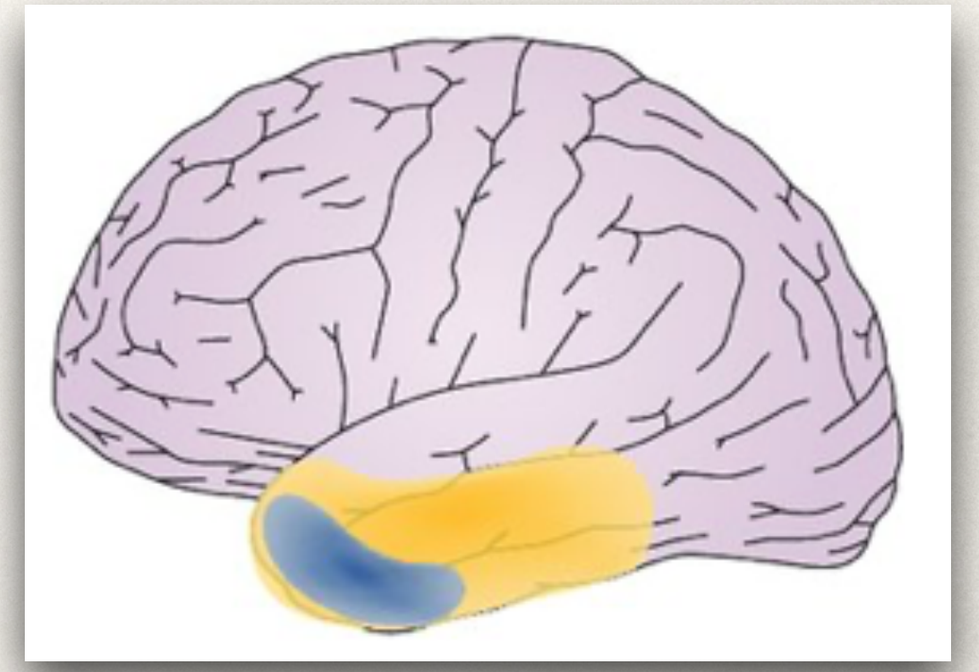
Canadian Psychology / Psychologie Canadienne, 1985, 26: 1

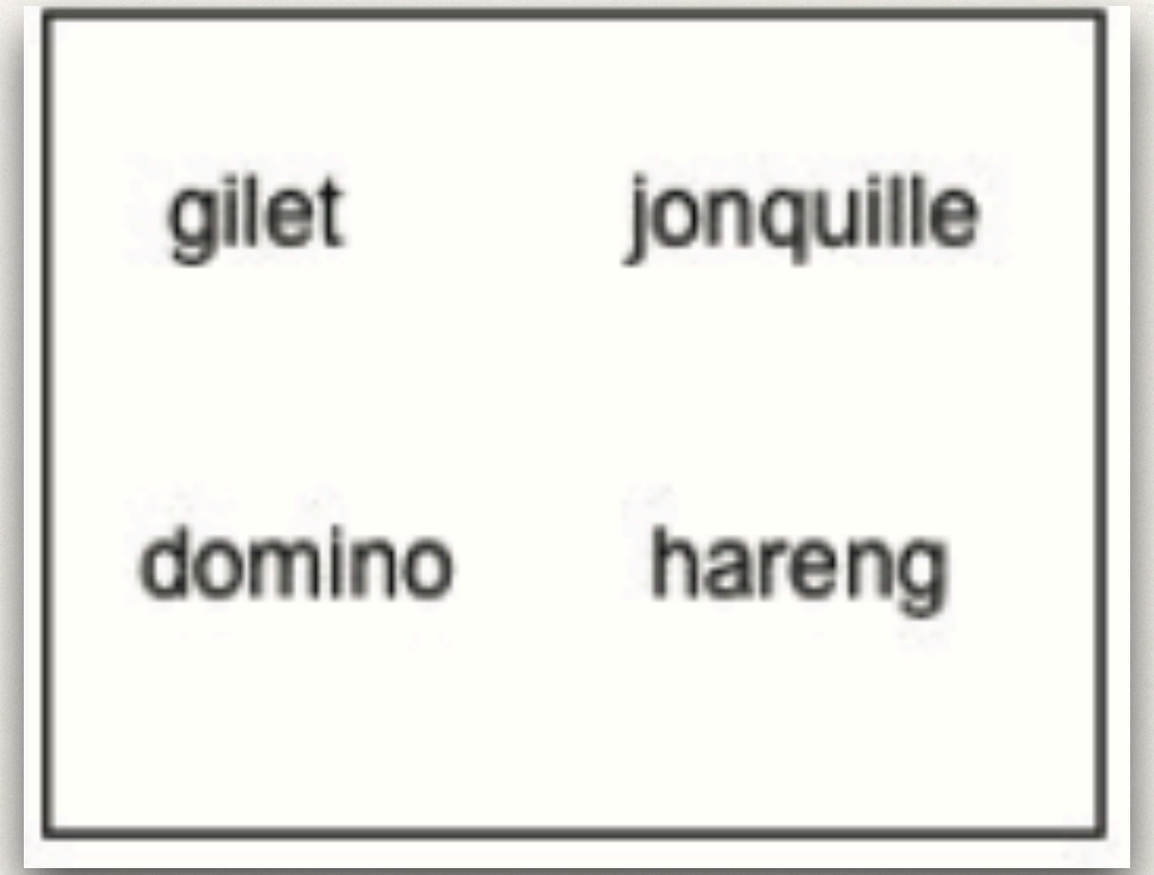
*Endel Tulving*
*1927 -*

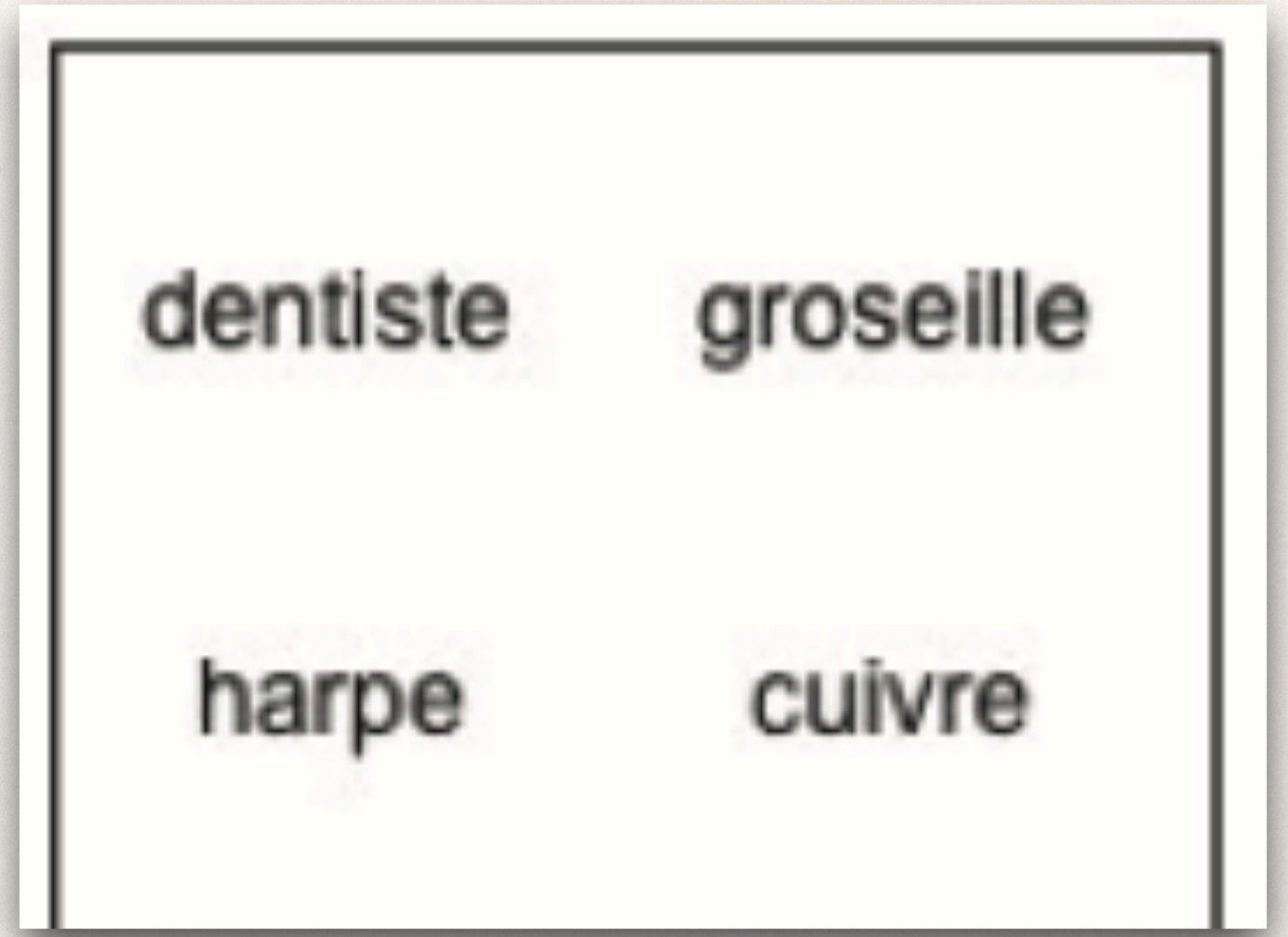
passes both the past and the future. A normal healthy person who possesses autonoetic consciousness is capable of becoming aware of her own past as well as her own future; she is capable of mental time travel, roaming at will over what has happened as readily as over what might happen, independently of physical laws that govern the universe. N.N. seems to be com-

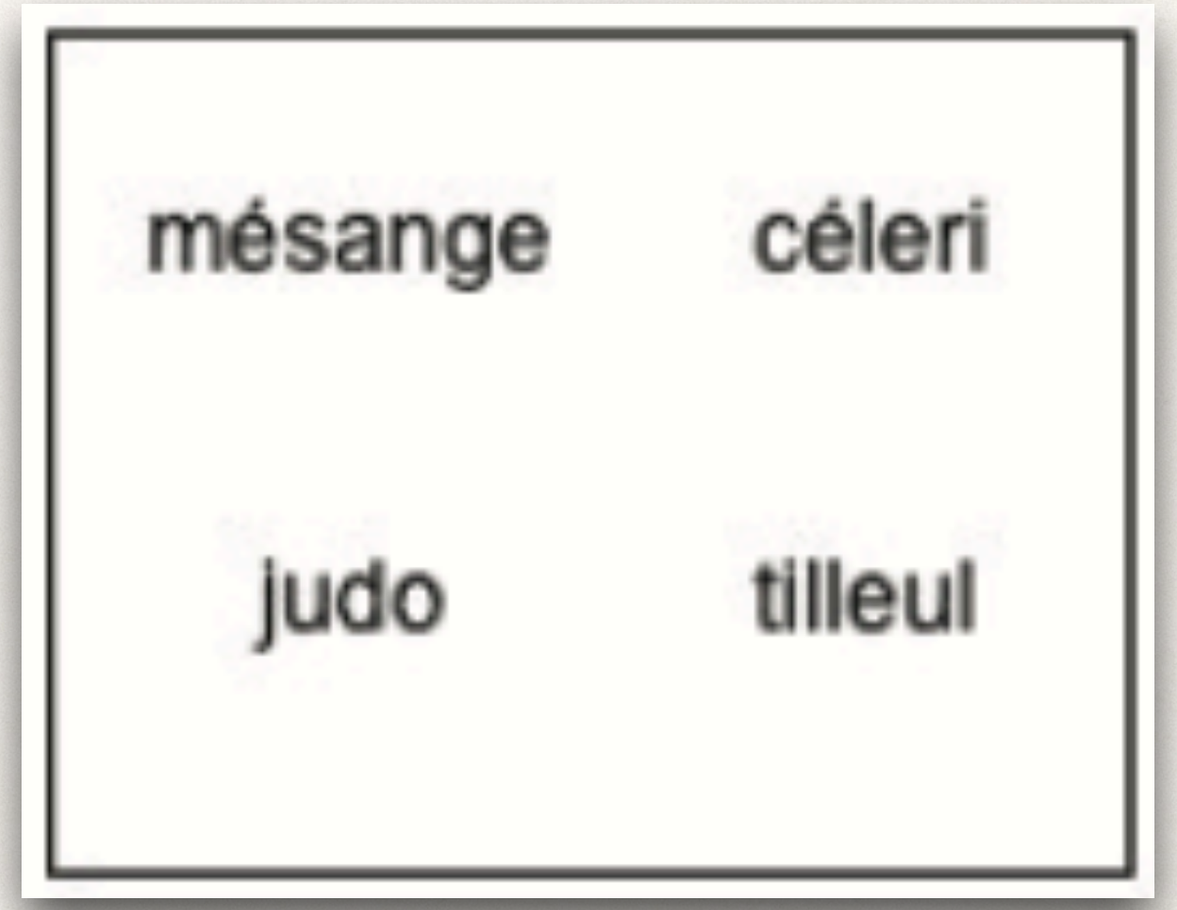
# Mémoire sémantique *versus* mémoire épisodique

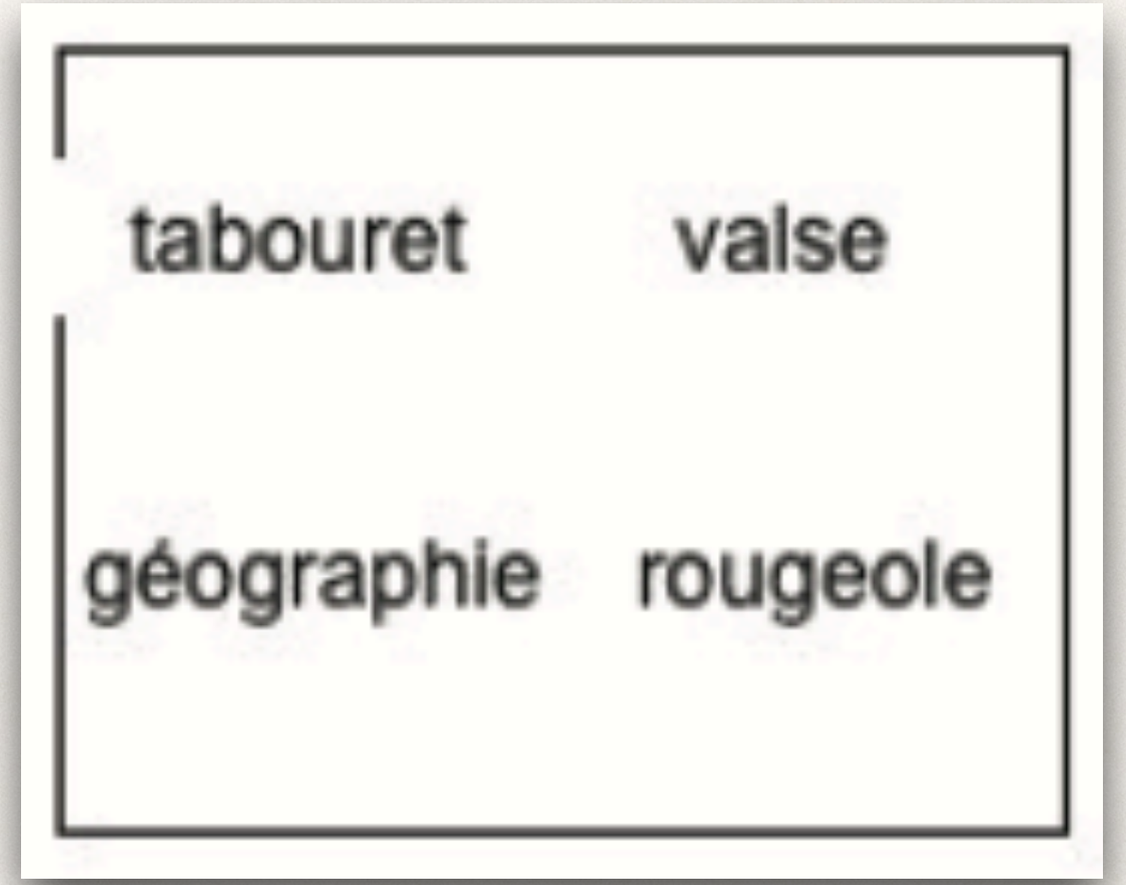



gilet
jonquille
domino
hareng


dentiste
groseille
harpe
cuivre


mésange
céleri
judo
tilleul


tabouret
valse
géographie
rougeole

Comptez à rebours de 3 en 3 à partir de 896

# Rappelez les mots

# Mémoire sémantique *versus* mémoire épisodique

RL/RI16

DEVELOPMENTAL NEUROPSYCHOLOGY, *3*(1), 13-36


EMPIRICAL CONTRIBUTIONS

## Genuine Memory Deficits in Dementia

Ellen Grober and Herman Buschke
*Saul R. Korey Department of Neurology*
*Albert Einstein College of Medicine*

| Catégorie | Item |
|---|---|
| Poisson | Hareng |
| Vêtement | Gilet |
| Jeu | Domino |
| Fleur | Jonquille |

| Catégorie | Item |
|---|---|
| Prof. | Dentiste |
| Fruit | Groseille |
| Métal | Cuivre |
| Instr. mus | Harpe |

| Catégorie | Item |
|---|---|
| Oiseau | Mésange |
| Arbre | Tilleul |
| Sport | Judo |
| Légume | Céleri |

| Catégorie | Item |
|---|---|
| Danse | Valse |
| Maladie | Rougeole |
| Meuble | Tabouret |
| Science | Géographie |

Fiche 1

gilet jonquille

domino hareng

Fiche 2

dentiste groseille

harpe cuivre

Fiche 3

mésange céleri

judo tilleul

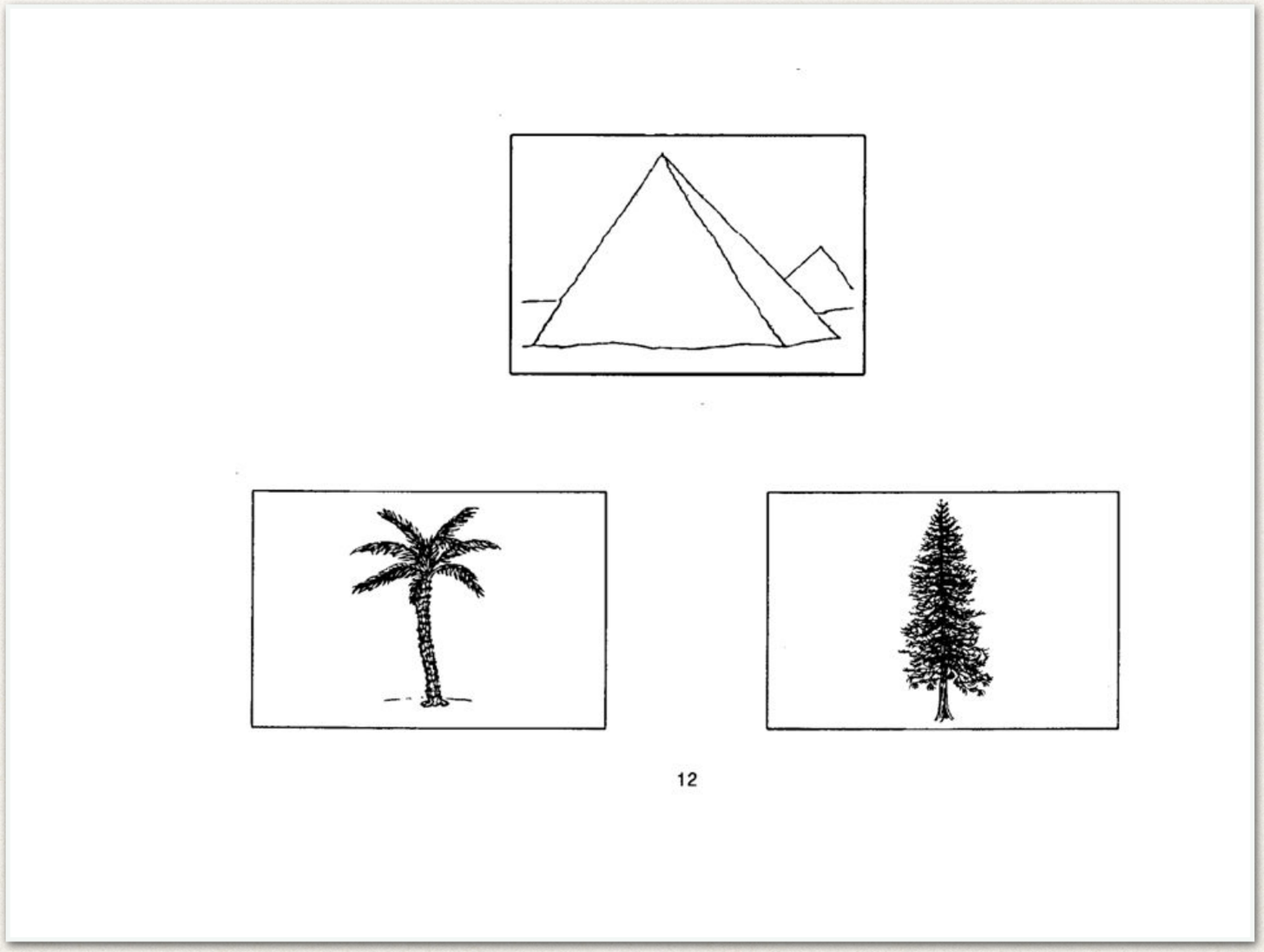
Fiche 4

tabouret valse

géographie rougeole

## Mémoire sémantique *versus* mémoire épisodique

Howard & Patterson (1992)
Pyramid & Palm Tree Test



# Mémoire sémantique *versus* mémoire épisodique

Neuropsychology
1997, Vol. 11, No. 1, 77–89


0894-4105/97/$3.00

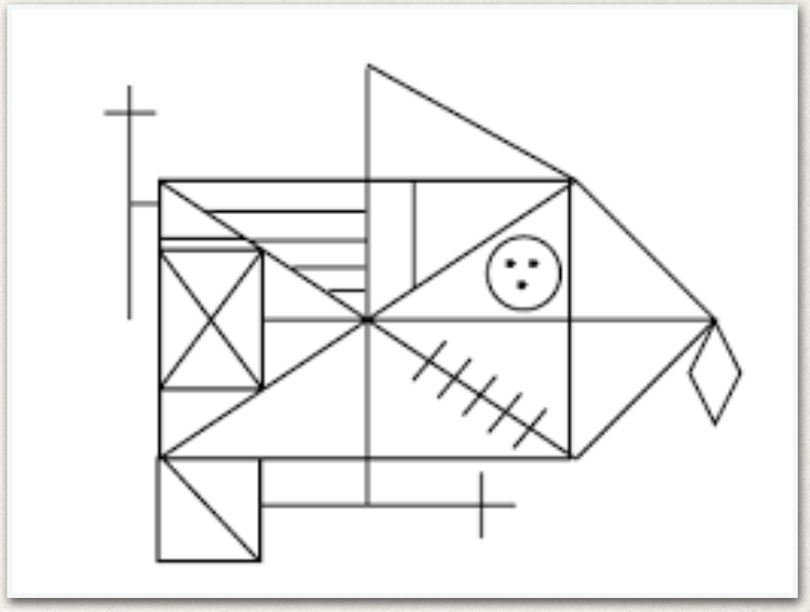
## Differentiating the Roles of the Hippocampal Complex and the Neocortex in Long-Term Memory Storage: Evidence From the Study of Semantic Dementia and Alzheimer's Disease

Kim S. Graham and John R. Hodges
University of Cambridge

Table 1
*Comparison of Alzheimer's Disease (AD) Patients, Semantic Dementia Patients (SD), and 24 Control Participants on a Range of Psychological Tests*

| Measure | AD patients ($n = 6$) | | SD patients ($n = 6$) | | Controls ($n = 24$) | |
|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Age | 76.8 | 8.2 | 58 | 5.4 | 70 | 7.8 |
| Education | 11 | 3.3 | 11 | 2.5 | 10.8 | 2.2 |
| Test | | | | | | |
| National Adult Reading Test (Nelson, 1982; errors, 50) | 17 | 12.4 | 40.4 | 6.6 | 10.9 | 6.2 |
| Mini-Mental State Exam (Folstein et al., 1975; 30) | 21.5 | 1.4 | 20.6 | 5.2 | 29.2 | 1.0 |
| Dementia Rating Scale (Mattis, 1988; total, 144) | 117.7 | 5.2 | 92.7 | 4.0 | 140.5 | 2.4 |
| Semantic memory | | | | | | |
| Word–picture matching (48) | 46.5 | 1.2 | 32.5 | 8.4 | 47.4 | 1.1 |
| Category fluency—Living | 27.5 | 7.6 | 8.0 | 6.1 | 58.3 | 12.3 |
| Category fluency—Man-made | 31.8 | 6.9 | 7.5 | 9.7 | 55.4 | 8.6 |
| Naming (48) | 40.5 | 3.5 | 5.8 | 3.6 | 43.6 | 2.3 |
| Naming to description (24) | 18.8 | 2.7 | 2.5 | 3.3 | 22.4 | 1.3 |
| Pyramids and Palm Trees Test (Howard & Patterson, 1992; 52) | 49.6 | 1.5 | 37.2 | 7.8 | 51.2 | 1.4 |
| Episodic memory | | | | | | |
| Dementia Rating Scale (memory) | 12.7 | 2.5 | 14.7 | 2.1 | 24.2 | 1.0 |
| Logical memory—Immediate recall[a] (24) | 2.8 | 1.2 | 1.5 | 0.3 | 11.6 | 3.9 |
| Logical memory—Delayed recall (24)[a] | 0 | | 0.9 | 0.9 | 8.5 | 3.4 |
| Rey Complex Figure—Copy (Osterrieth, 1944; 36) | 26.2 | 9.5 | 33.8 | 2.3 | 34.0 | 2.9 |
| Rey Complex Figure—Recall (Osterrieth, 1944; 36) | 0.6 | 1.4 | 8.4 | 5.9 | 15.2 | 7.4 |
| Visuoperceptual skills | | | | | | |
| Judgment of line orientation (Benton et al., 1983; 30) | 27.0 | 2.2 | 23.8 | 3.7 | 27.4 | 4.0 |
| Object matching (40) | 37.2 | 1.6 | 36.4 | 2.7 | 37.3 | 3.1 |
| Language | | | | | | |
| Test for the Reception of Grammar (Bishop, 1989; 80) | 75.5 | 1.1 | 70.2 | 6.8 | 78.8 | 1.8 |

*Note.* Numbers in parentheses beside each test represent the highest possible score.
[a]From Wechsler Memory Scale; Wechsler, 1987.



## Plan détaillé

Le modèle standard

Les différentes mémoires

- Mémoire déclarative *versus* mémoire procédurale
- Mémoire sémantique *versus* mémoire épisodique
- Mémoire implicite *versus* mémoire explicite
- Mémoire autobiographique
- Mémoire épisodique chez les animaux
- Mémoire prospective

L'encodage

L'oubli

# Mémoire implicite *versus* mémoire explicite

Journal of Experimental Psychology:
Learning, Memory, and Cognition
1982, Vol. 8, No. 4, 336-342


0278-7393/82/0804-0336$00.75

## Priming Effects in Word-Fragment Completion Are Independent of Recognition Memory

Endel Tulving, Daniel L. Schacter, and Heather A. Stark
University of Toronto
Toronto, Ontario, Canada

## Method

The materials consisted of a pool of 192 words and corresponding graphemic fragments. Most of the words occur with low frequency in English, and most were seven or eight letters in length. Each fragment allowed only one legitimate completion. Some examples of the fragments used are as follows: A_ _A_ _IN, C_ _AR_T, _YS_ _RY, _E_D_L_M, and _H_O_EM. As these examples show, a variety of fragment patterns were used. The words corresponding to these fragments are ASSASSIN, CABARET, EMISSARY, MYSTERY, PENDULUM, and THEOREM. The pool of 192 words is reproduced in the Appendix.

# Mémoire implicite *versus* mémoire explicite

Journal of Experimental Psychology:
Learning, Memory, and Cognition
1982, Vol. 8, No. 4, 336-342


0278-7393/82/0804-0336$00.75

## Priming Effects in Word-Fragment Completion Are Independent of Recognition Memory

Endel Tulving, Daniel L. Schacter, and Heather A. Stark
University of Toronto
Toronto, Ontario, Canada

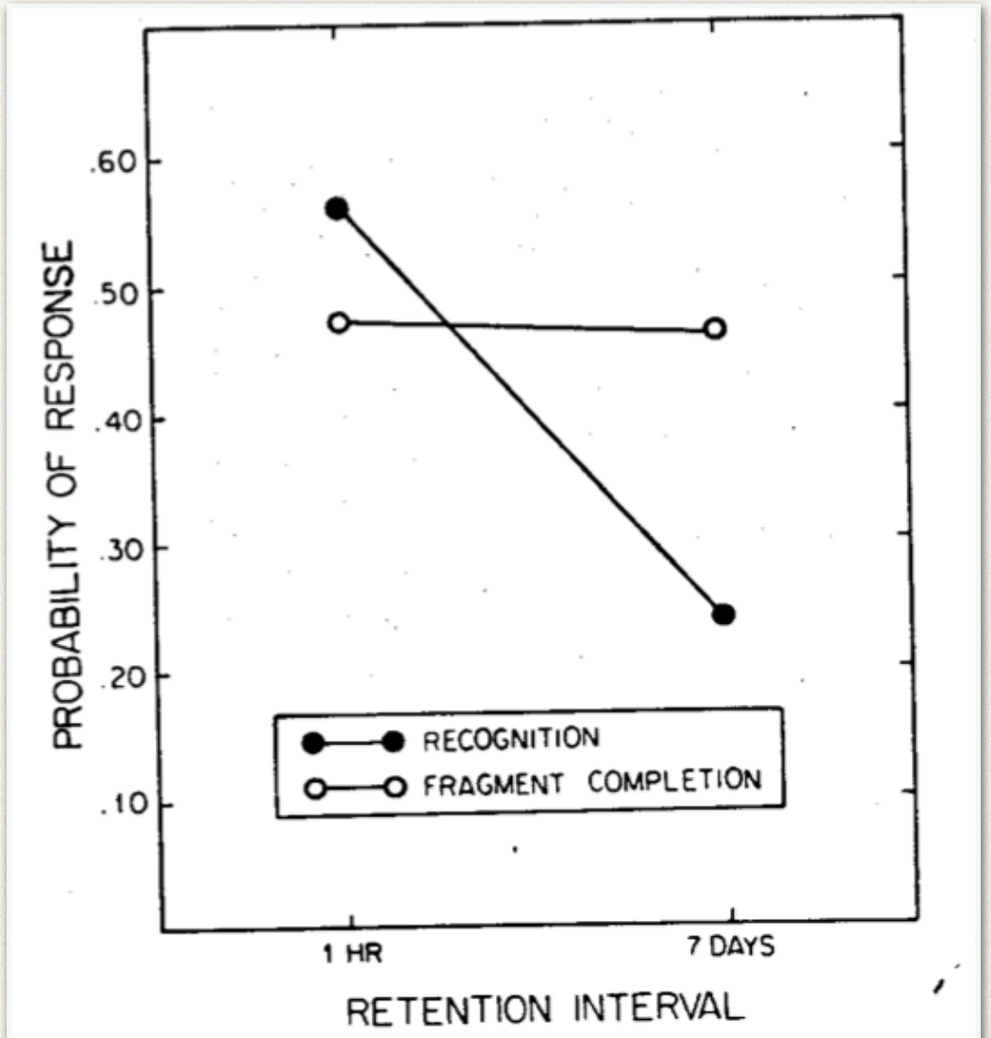
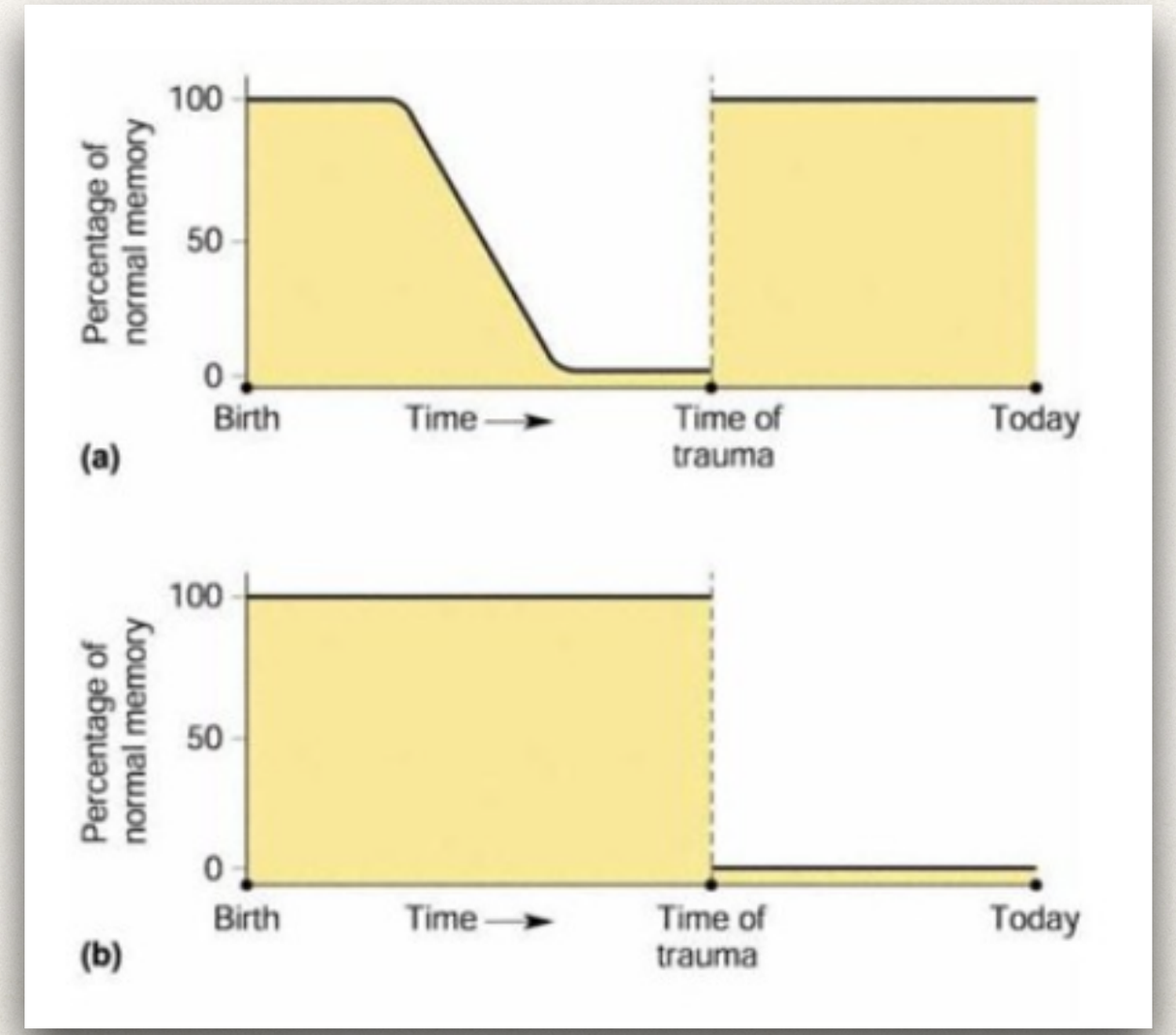



***Figure 1.*** Time course of retention of priming effects in word-fragment completion and recognition over an interval from 1 hr to 7 days.

Extension vers
les fonctions exécutives

## Mémoire implicite *versus* mémoire explicite

*Théodule Ribot*
*1839 - 1916*




## Loi de Ribot

1908

## Mémoire implicite *versus* mémoire explicite


Journal of Experimental Psychology:
Learning, Memory, and Cognition
1985, Vol. 11, No. 3, 501-518

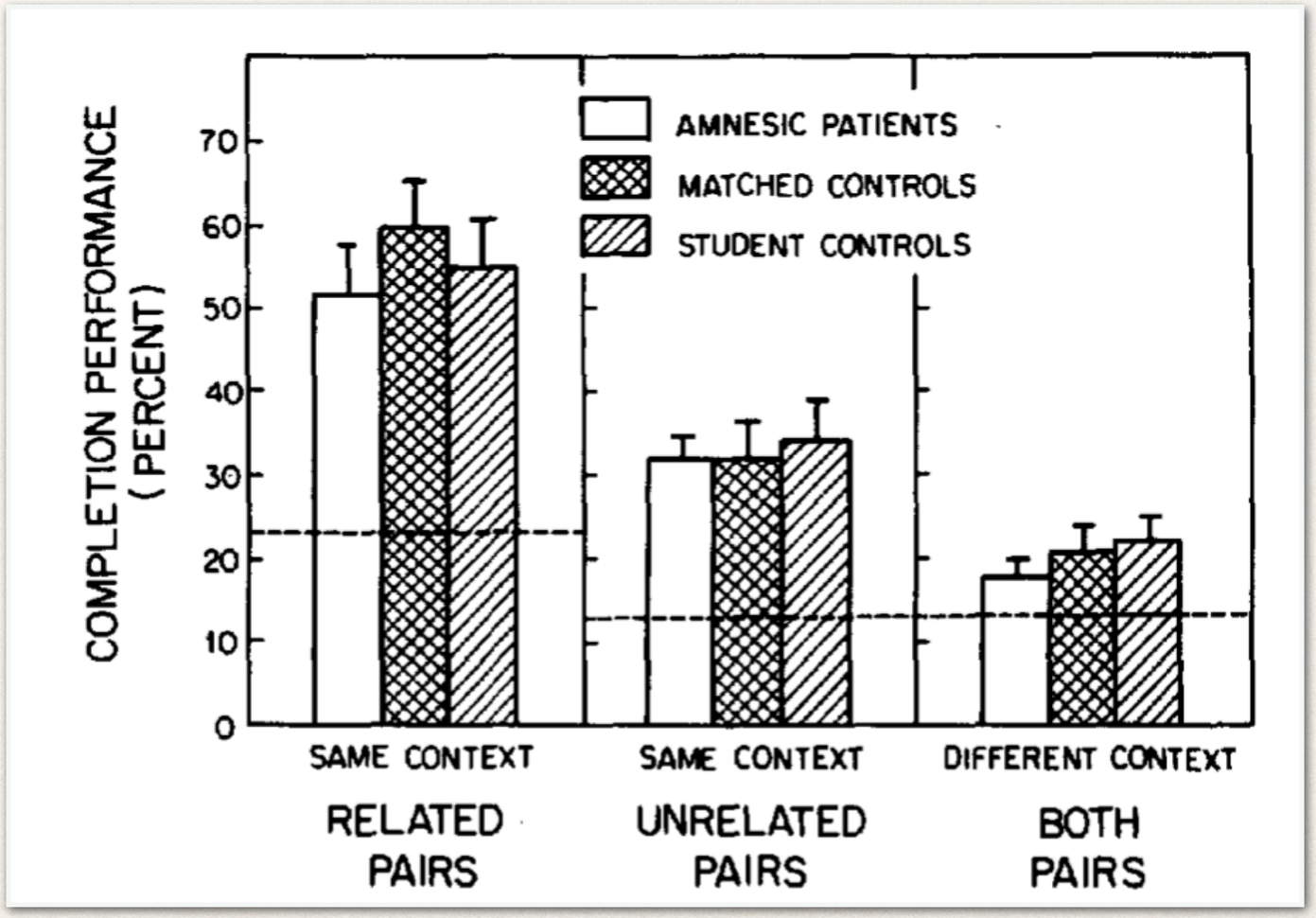




0278-7393/85/$00.75


### Implicit and Explicit Memory for New Associations in Normal and Amnesic Subjects


Peter Graf and Daniel L. Schacter
University of Toronto, Toronto, Ontario, Canada

## Plan détaillé

Le modèle standard

Les différentes mémoires

- Mémoire déclarative *versus* mémoire procédurale
- Mémoire sémantique *versus* mémoire épisodique
- Mémoire implicite *versus* mémoire explicite
- Mémoire autobiographique
- Mémoire épisodique chez les animaux
- Mémoire prospective

L'encodage

L'oubli

# Mémoire épisodique chez les animaux

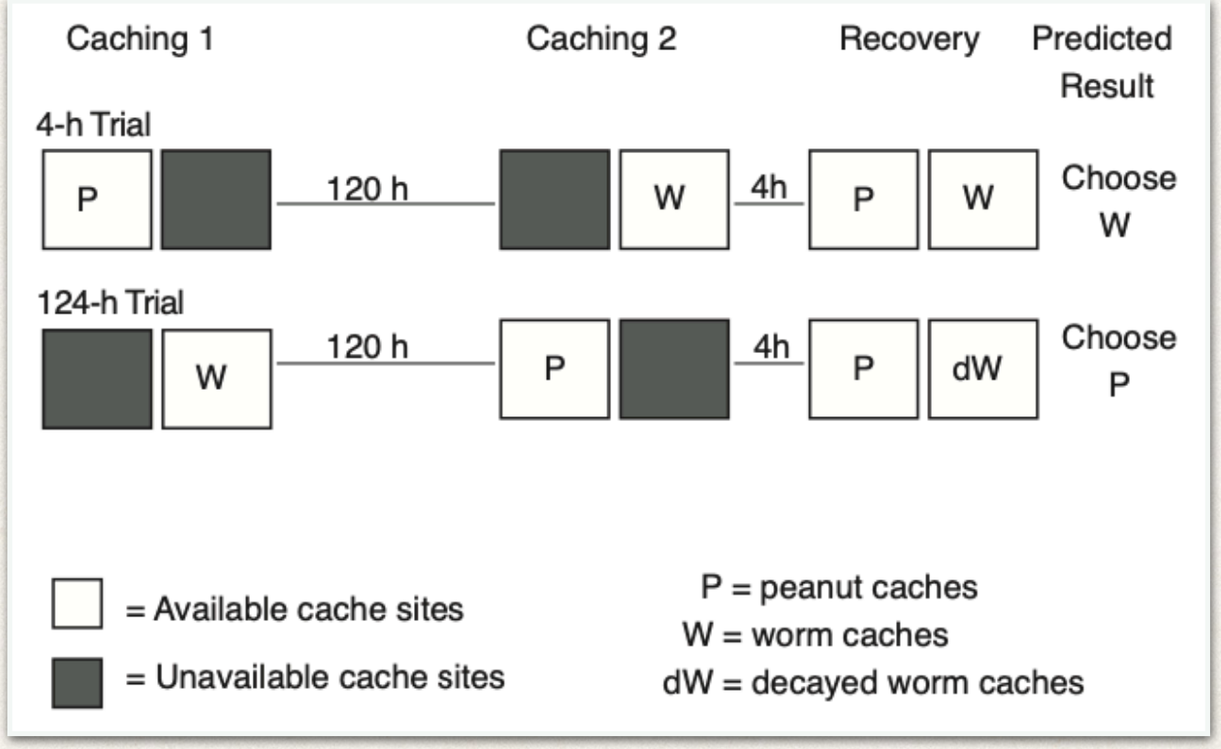
**The recollection of past experiences allows us to recall what a particular event was, and where and when it occurred[1,2], a form of memory that is thought to be unique to humans[3]. It is known,**

NATURE | VOL 395 | 17 SEPTEMBER 1998

## Episodic-like memory during cache recovery by scrub jays

**Nicola S. Clayton* & Anthony Dickinson†**

** Section of Neurobiology, Physiology & Behavior, University of California at Davis, California 95616, USA*
*† Department of Experimental Psychology, University of Cambridge, Downing Street, Cambridge CB2 3EB, UK*



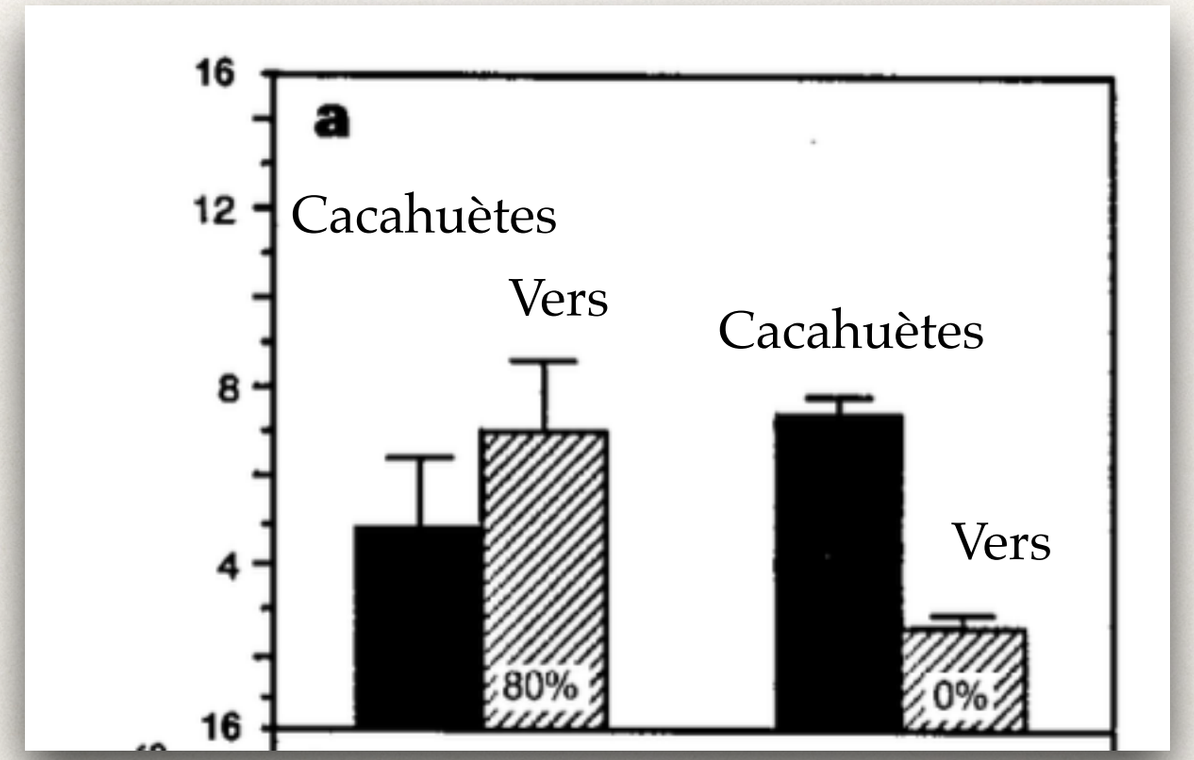

# Mémoire épisodique chez les animaux

NATURE | VOL 395 | 17 SEPTEMBER 1998

## Episodic-like memory during cache recovery by scrub jays

**Nicola S. Clayton*** **& Anthony Dickinson†**

** Section of Neurobiology, Physiology & Behavior, University of California at Davis, California 95616, USA*
*† Department of Experimental Psychology, University of Cambridge, Downing Street, Cambridge CB2 3EB, UK*




ago) the worms were cached. Current theories of human episodic memory refer to autonoetic consciousness[3]—the conscious experience of self—that accompanies episodic recall but, as this state has no obvious manifestation in non-linguistic behaviour[3] it is probably undetectable in many species. In terms of purely behavioural criteria, however, the cache recovery pattern of scrub jays fulfils the three, 'what', 'where' and 'when' criteria for episodic recall and thus provides, to our knowledge, the first conclusive behavioural evidence of episodic-like memory in animals other than humans. □

# Mémoire épisodique chez les animaux

*Phil. Trans. R. Soc. Lond.* B (2001) **356**, 1483–1491

## Elements of episodic-like memory in animals

**N. S. Clayton[1*], D. P. Griffiths[1], N. J. Emery[2] and A. Dickinson[1]**
[1]*Department of Experimental Psychology, University of Cambridge, Cambridge CB2 3EB, UK*
[2]*Sub-department of Animal Behaviour, University of Cambridge, Cambridge CB3 8AA, UK*

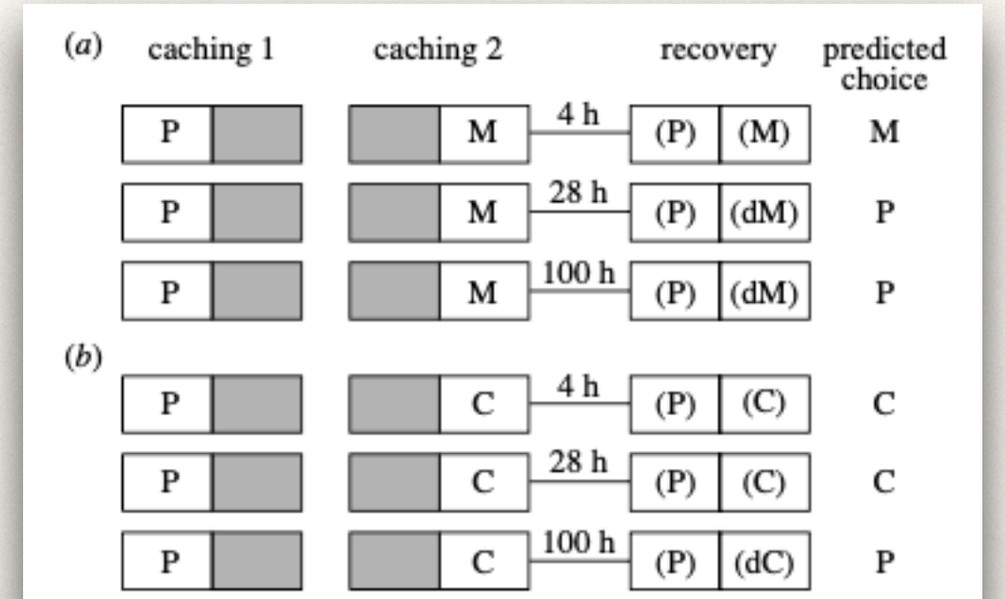



Figure 1. The caching and recovery conditions during each type of training trial for the two sides of the caching tray during the two caching periods and the recovery period for experiment 1; (*a*) P/M trials, (*b*) P/C trials. Also shown are the predicted choices for the degrade group at recovery. The shaded areas represent the non-accessible side of the tray and the non-shaded areas the accessible side. P, peanuts; M, fresh mealworms; C, fresh crickets; dM, decayed mealworms; dC, decayed crickets; ( ), food items present on training trials but absent on test trials. h = hour. Reprinted by permission of Clayton *et al.* (2001, fig. 1).

# Mémoire épisodique chez les animaux

19 MAY 2006 VOL 312 SCIENCE

## Apes Save Tools for Future Use

Nicholas J. Mulcahy and Josep Call*

Tulving (*1*) recounts an Estonian tale of a girl who dreamed about attending a party but was unable to eat her favorite dessert because there were no spoons available. Facing the possibility of attending the party again, she took a spoon to bed. Crucially, the girl took the spoon not because she currently needed it, but because she would need it in the future. Tulving used this example to illustrate the putatively unique human ability to think about the past and plan for the future (*2*–*4*) and proposed that an analogous "spoon" test could be used to test for future planning in nonhuman animals. Future planning is cognitively demanding because it imposes a long delay between performing an action and getting rewarded for it: a skill that humans use when preparing a suitcase before a trip or by making a cake to celebrate someone's birthday. Although various animals can plan and execute multiple actions toward a goal (*5*, *6*), they may achieve this without taking into account future needs, just current ones (*3*, *4*, *7*). Thus, when chimpanzees transport stones to use them to crack open nuts, or New Caledonian crows make hook-shaped tools to fish for insects, they do so in an attempt to satisfy their current hunger state, not some future one.

# Mémoire épisodique chez les animaux

19 MAY 2006 VOL 312 SCIENCE

## Apes Save Tools for Future Use

Nicholas J. Mulcahy and Josep Call*

We tested five bonobos and five orangutans (table S1). First, subjects learned to use a tool to get a reward from an apparatus in the test room (*14*). Then, we placed two suitable and six unsuitable tools in the test room but blocked subjects' access to the baited apparatus. After 5 min, subjects were ushered outside the test room into the waiting room, and the caretaker removed all objects left in the test room while subjects watched. One hour later, subjects were allowed to return to the test room and were given access to the apparatus. Thus, to solve the problem, subjects had to select a suitable tool from the test room, bring it into the waiting room, keep it there for 1 hour, and bring it back into the test room upon their return (fig. S1). The trial ended after the subject retrieved the reward or 5 min had elapsed.

# Mémoire épisodique chez les animaux

19 MAY 2006 VOL 312 SCIENCE

## Apes Save Tools for Future Use

Nicholas J. Mulcahy and Josep Call*

In Exp.1, we baited the apparatus but blocked the subjects' access to it by interposing a plexiglass sheet and placed the tools on the floor in front of the apparatus with their location counterbalanced across trials (Fig. S1.1). After 5 minutes, subjects were ushered outside the test room into a waiting room (Fig. S1.2), from where they could see the apparatus and the caretaker removing all objects left in the test room. Subjects were allowed to return to the test room and given access to the apparatus after a 1-hour delay (Fig. S1.3). Thus, to solve the problem, subjects had to select a suitable tool from the test room, bring it into the waiting room, keep it there for one hour, and return it to the test room. The trial ended after the subject got the reward or 5 minutes had elapsed.

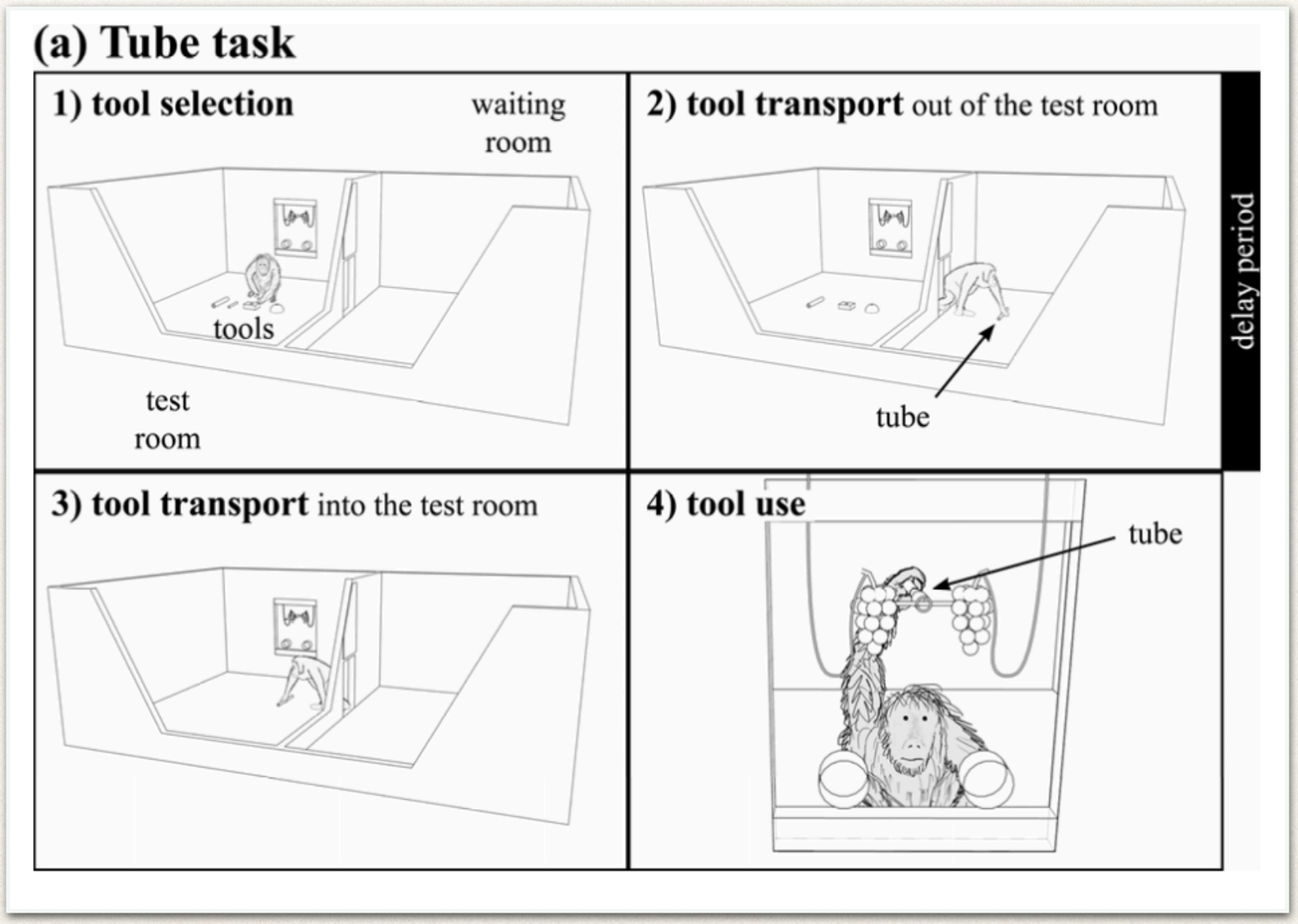
The remaining experiments followed the same steps as Exp. 1 with the following changes. Exp. 2 presented a 14-hour delay between obtaining the tool and returning to the test room. Exp. 3 used the hook task but the apparatus with the reward was installed after subjects returned to the test room after the 1-hour delay period (Fig. S1b). Exp. 4 was identical to Exp. 3 except that the apparatus was not installed and apes were rewarded with the juice bottle, which was deposited next to the experimenter after subjects entered the test room if they had brought the hook. In none of these additional experiments were subjects able to see the apparatus from the waiting room.

# Mémoire épisodique chez les animaux

19 MAY 2006 VOL 312 SCIENCE

## Apes Save Tools for Future Use

Nicholas J. Mulcahy and Josep Call*

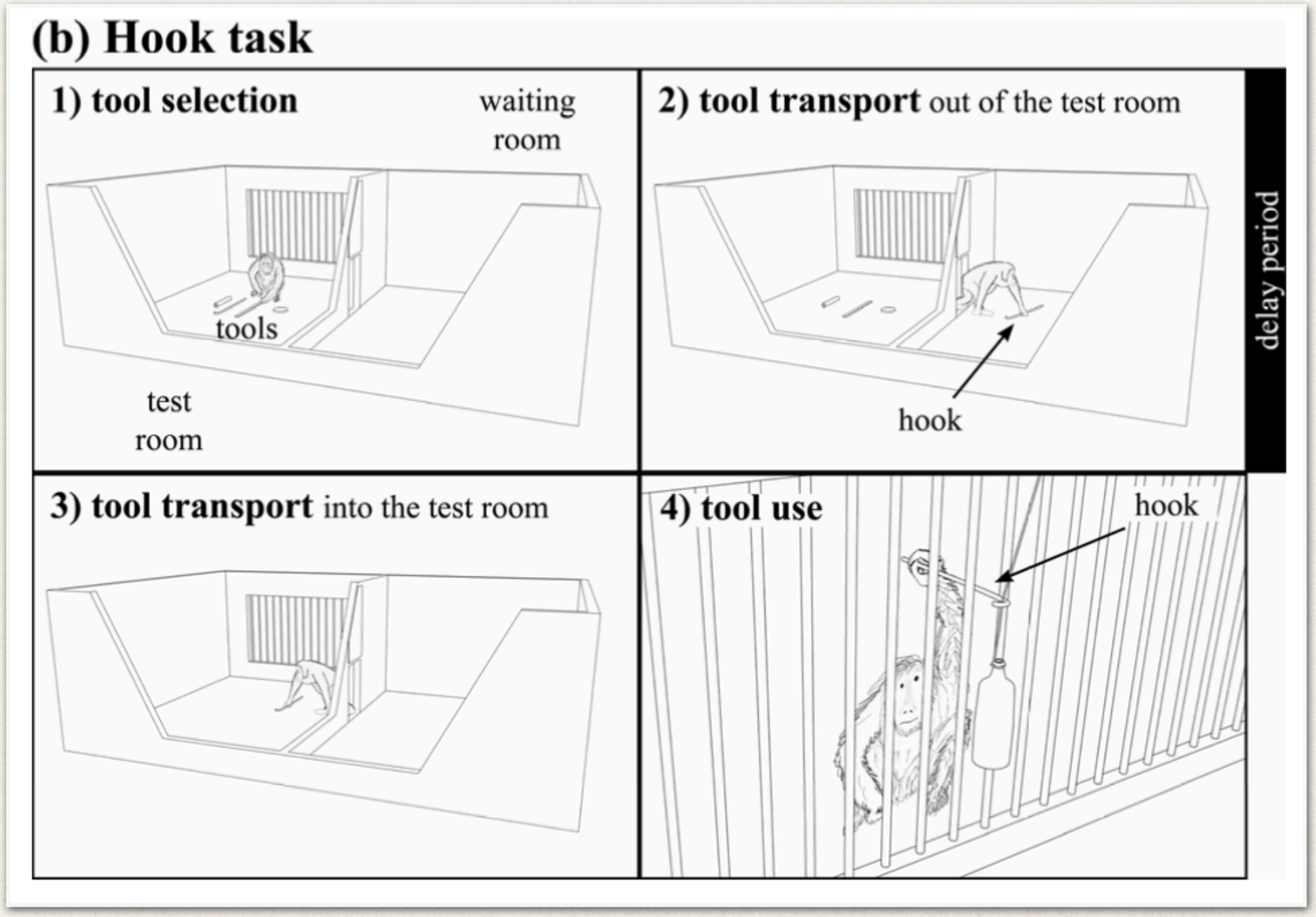


# Mémoire épisodique chez les animaux

19 MAY 2006 VOL 312 SCIENCE

## Apes Save Tools for Future Use

Nicholas J. Mulcahy and Josep Call*



# Mémoire épisodique chez les animaux

19 MAY 2006 VOL 312 SCIENCE

## Apes Save Tools for Future Use

Nicholas J. Mulcahy and Josep Call*

Planning for future needs, not just current ones, is one of the most formidable human cognitive achievements. Whether this skill is a uniquely human adaptation is a controversial issue. In a study we conducted, bonobos and orangutans selected, transported, and saved appropriate tools above baseline levels to use them 1 hour later (experiment 1). Experiment 2 extended these results to a 14-hour delay between collecting and using the tools. Experiment 3 showed that seeing the

**Table 1.** Number and order of correct trials for each subject for each experiment. NT, not tested.

| Subjects | Experiment 1 | | Experiment 2 | | Experiment 3 | | Experiment 4 | |
|---|---|---|---|---|---|---|---|---|
| | Correct trials (*n*) | Trial no. | Correct trials (*n*) | Trial no. | Correct trials (*n*) | Trial no. | Correct trials (*n*) | Trial no. |
| Bonobos | | | | | | | | |
| Kuno | 7/16 | 7, 8, 10, 13–16 | 8/12 | 2–6, 9–11 | 7/16 | 5, 7, 8, 10, 11, 13, 15 | NT | |
| Joey | 2/16 | 1, 13 | NT | | NT | | NT | |
| Limbuko | 5/16 | 7, 10, 11, 13, 16 | NT | | 6/16 | 5–7, 13, 14, 16 | NT | |
| Yasa | NT | | NT | | NT | | 0/16 | |
| Ulindi | NT | | NT | | NT | | 0/16 | |
| Orangutans | | | | | | | | |
| Walter | 6/16 | 4–8, 14 | NT | | NT | | NT | |
| Toba | 7/16 | 1, 3, 6, 10–13 | NT | | 6/16 | 1, 4, 6, 7, 12, 13 | NT | |
| Dokana | 15/16 | 1, 3–16 | 7/12 | 2, 4–6, 9, 11, 12 | 7/16 | 6–9, 11, 14, 16 | NT | |
| Dunja | NT | | NT | | NT | | 2/16 | 2, 16 |
| Pini | NT | | NT | | NT | | 5/16 | 1, 13–16 |

## Plan détaillé

Le modèle standard

Les différentes mémoires

- Mémoire déclarative *versus* mémoire procédurale
- Mémoire sémantique *versus* mémoire épisodique
- Mémoire implicite *versus* mémoire explicite
- Mémoire autobiographique
- Mémoire épisodique chez les animaux
- Mémoire prospective

L'encodage

L'oubli

# Mémoire prospective

Journal of Experimental Psychology:
Learning, Memory, and Cognition
1990, Vol. 16, No. 4, 717-726


0278-7393/90/$00.75

## Normal Aging and Prospective Memory

Gilles O. Einstein
Furman University

Mark A. McDaniel
Purdue University

Prospective memory is memory for activities to be performed in the future, such as remembering to purchase a loaf of bread on the way home or remembering to give someone a telephone message. This type of memory contrasts with retrospective memory, which is memory for past events, such as remembering the characters from a movie or remembering the words from a list learned in an experiment. One often noted deficiency in the memory literature is that, unlike retrospective memory, we know very little about prospective memory (Baddeley & Wilkins, 1983; Ceci & Bronfenbrenner, 1985; Harris, 1983). This lack of research on prospective memory is a serious gap in the literature because many memory situations are prospective (Dobbs & Rule, 1987; Meacham & Leiman, 1982). For older adults, who often have special needs such as remembering to take medication and meeting health-related appointments, prospective memory functioning is of utmost importance.

# Mémoire prospective

Journal of Experimental Psychology:
Learning, Memory, and Cognition
1990, Vol. 16, No. 4, 717-726


0278-7393/90/$00.75

## Normal Aging and Prospective Memory

Gilles O. Einstein
Furman University

Mark A. McDaniel
Purdue University

The prospective memory test was embedded within this short-term memory task. After the short-term memory instructions, subjects were told that we had a secondary interest in their ability to remember to do something in the future. Specifically, they were told that we wanted them to press a response key on the computer keyboard whenever a particular target event occurred. For all subjects, the target event was the word *rake*, and it appeared three times across the 42 test trials. Subjects were not told how often the target event would appear across the test trials. Subjects in the no-aid condition were simply told to press the response key whenever they saw the word *rake*. Subjects in the external-aid condition were given 30 s to formulate some type of memory aid. To facilitate the creation of an external aid, we had rubber bands, paper clips, Scotch tape, erasers, paper pads, scissors, a stapler, and pens in front of subjects. These objects were present for all subjects, but only external-aid subjects were allowed to use them. At the end of 30 s, the experimenter recorded the particular memory aid constructed by the subjects. Subjects who did not use an obvious external aid were asked at the end of the experiment to describe any internal strategies that they may have used.

# Mémoire prospective

Journal of Experimental Psychology:
Learning, Memory, and Cognition
1990, Vol. 16, No. 4, 717-726


0278-7393/90/$00.75

## Normal Aging and Prospective Memory

Gilles O. Einstein
Furman University

Mark A. McDaniel
Purdue University

**Table 1**
*Retrospective and Prospective Memory Measures as a Function of Age and Memory Aid Condition in Experiment 1*

| | Young | | Elderly | |
|---|---|---|---|---|
| Dependent measure | No aid | Memory aid | No aid | Memory aid |
| WAIS-R | 52.00 | 48.33 | 58.67 | 57.08 |
| Free recall[a] | .58 | .54 | .46 | .43 |
| Recognition score[b] | .69 | .73 | .58 | .60 |
| Short-term memory—trials[c] | .30 | .32 | .43 | .33 |
| Short-term memory—items[d] | .70 | .70 | .71 | .65 |
| Prospective memory[e] | .47 | .83 | .47 | .69 |

*Note.* WAIS-R = Wechsler Adult Intelligence Scale-Revised.
[a] Probability of recall.
[b] $p$(hits) − $p$(false alarms)/1 − $p$(false alarms).
[c] Proportion of trials correctly recalled.
[d] Mean proportion of items per trial.
[e] Proportion of correct responses.

## Plan détaillé

Le modèle standard

Les différentes mémoires

L'encodage

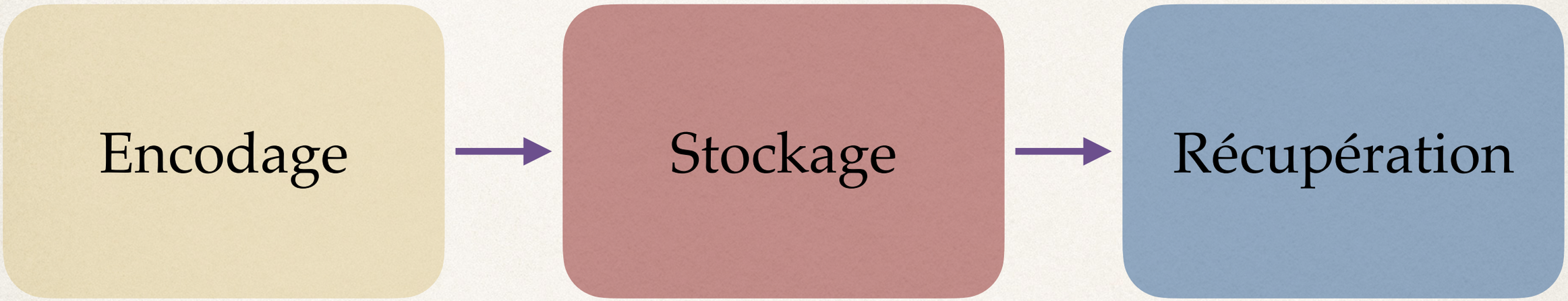
Effet d'espacement

Effet de contexte

Profondeur de traitement

L'oubli

## Les étapes de la mémorisation



# Effet d'espacement

*Hermann Ebbinghaus*
*1850 - 1909*

1885

38 répétitions d'une liste de syllabes sans significations sur 3 jours

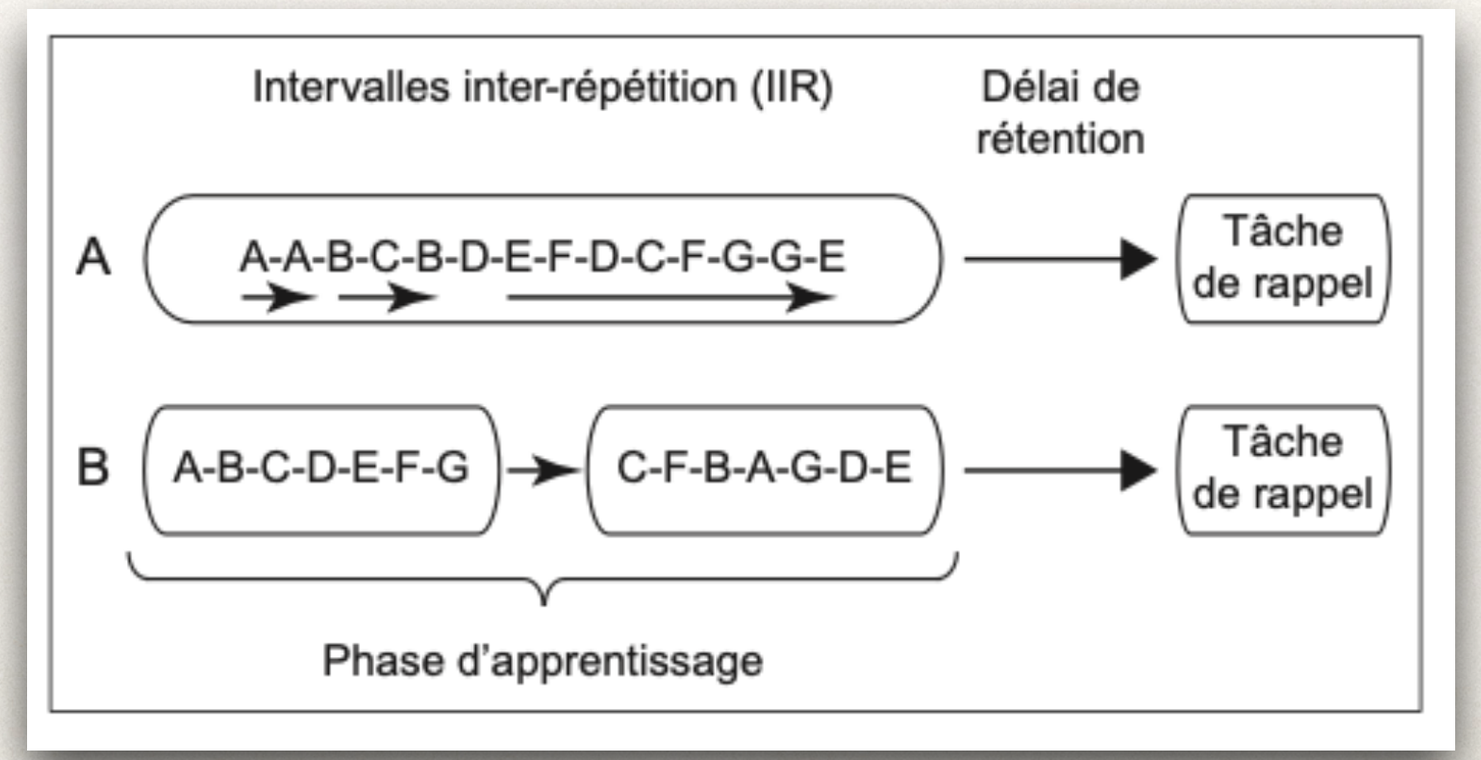
68 répétitions d'une liste de syllabes sans significations le même jour

# Effet d'espacement

L'année psychologique/Topics in Cognitive Psychology, 2015, 115, 435-462

## Comment les intervalles temporels entre les répétitions d'une information en influencent-ils la mémorisation ? Revue théorique des effets de pratique distribuée

Émilie Gerbier* et Olivier Koenig
*Laboratoire d'Études des Mécanismes Cognitifs, EA 3082, Université de Lyon, Université Lumière Lyon 2, France*



# Effet d'espacement

Journal of Educational Psychology
1987, Vol. 79, No. 2, 162-170


0022-0663/87/$00.75

## Effects of Variable Encoding and Spaced Presentations on Vocabulary Learning

Frank N. Dempster
University of Nevada, Las Vegas

Table 3
*Recall Means and Standard Deviations for Experiments*

| Condition | Experiment 1 | 2 | 3 | 4 | 5 Definitions plus sentences | 5 Sentence-cued recall[a] |
|---|---|---|---|---|---|---|
| Control | | | | | | |
| Single presentation | | | | | | |
| *M* | 17.00 | | | | | |
| *SD* | 8.75 | | | | | |
| Massed | | | | | | |
| *M* | | | 13.42 | 19.25 | | |
| *SD* | | | 9.18 | 8.43 | | |
| Spaced | | | | | | |
| *M* | | 19.17 | 22.17 | 26.08 | 22.75 | 5.50 |
| *SD* | | 9.53 | 10.43 | 8.85 | 9.30 | 2.50 |
| Definition + one sentence | | | | | | |
| Single presentation | | | | | | |
| *M* | 15.33 | | | | | |
| *SD* | 10.36 | | | | | |
| Massed | | | | | | |
| *M* | | | | | | |
| *SD* | | | | | | |
| Spaced | | | | | | |
| *M* | | 21.25 | | | | |
| *SD* | | 9.62 | | | | |
| Definition + three sentences | | | | | | |
| Single presentation | | | | | | |
| *M* | 16.50 | | | | | |
| *SD* | 9.48 | | | | | |
| Massed | | | | | | |
| *M* | | | 12.92 | 13.25 | | |
| *SD* | | | 8.36 | 6.98 | | |
| Spaced | | | | | | |
| *M* | | 18.83 | 17.42 | 26.58 | 16.00 | 3.50 |
| *SD* | | 7.55 | 7.60 | 7.28 | 8.15 | 2.97 |
| No-presentation baseline | | | | | | |
| *M* | | | | | 2.67 | 0.25 |
| *SD* | | | | | 4.01 | 0.45 |

[a] Maximum correct = 19.

## Effet de contexte

*Br. J. Psychol.* (1975), **66**, 3, *pp.* 325–331
*Printed in Great Britain*



# CONTEXT-DEPENDENT MEMORY IN TWO NATURAL ENVIRONMENTS: ON LAND AND UNDERWATER

BY D. R. GODDEN AND A. D. BADDELEY
*Department of Psychology, University of Stirling*

different from the surface as any he is ever likely to experience. Divers were therefore asked to learn word lists both on land and underwater and subsequently recalled either on land (Dry) or underwater (Wet). Each diver performed under all four possible conditions: DD (Learn Dry, Recall Dry); DW (Learn Dry, Recall Wet); WW and WD. Should the phenomenon of context-dependent memory exist under these conditions, performance when learning and recall took place in the same environment (DD and WW) should be significantly better than when recall took place in a different environment to that of learning (DW and WD).

## Effet de contexte

*Br. J. Psychol.* (1975), **66**, 3, *pp.* 325–331
*Printed in Great Britain*



# CONTEXT-DEPENDENT MEMORY IN TWO NATURAL ENVIRONMENTS: ON LAND AND UNDERWATER

BY D. R. GODDEN AND A. D. BADDELEY
*Department of Psychology, University of Stirling*

Table 1. *Mean number of words recalled in Expt. I as a function of learning and recall environment*

| | Recall environment: Dry | | Recall environment: Wet | | |
|---|---|---|---|---|---|
| Learning environment | Mean recall score | S.D. | Mean recall score | S.D. | Total |
| Dry | 13·5 | 5·8 | 8·6 | (3·0) | 22·1 |
| Wet | 8·4 | 3·3 | 11·4 | (5·0) | 19·8 |
| Total | 21·9 | — | 20·0 | — | — |

## Effet de contexte

SCIENCE, VOL. 163

**Alcohol and Recall: State-Dependent Effects in Man**

DONALD W. GOODWIN
BARBARA POWELL
DAVID BREMER, HASKEL HOINE
JOHN STERN
*Department of Psychiatry, Washington University School of Medicine, St. Louis, Missouri 63110*

1969

on day 1 and intoxicated on day 2. Intoxicated subjects, depending on body weight, consumed between 8 and 10 ounces (250 and 300 ml) of 80-proof vodka, diluted in a soft drink, over 1 hour, after which testing began. Con-

The rote-learning task involved memorizing four five-word "sentences" of varying meaningfulness (normal sentence, anomalous sentence, anagram, and word list) (*7*). On day 2 subjects were asked to recall the sentences memorized on day 1, after which a relearning session was conducted. Performance was measured in terms of errors of sequence and omission.

## Effet de contexte

SCIENCE, VOL. 163

**Alcohol and Recall: State-Dependent Effects in Man**

DONALD W. GOODWIN
BARBARA POWELL
DAVID BREMER, HASKEL HOINE
JOHN STERN

*Department of Psychiatry, Washington University School of Medicine, St. Louis, Missouri 63110*

1969

| Group | Rote-learning | |
|---|---|---|
| | Day 1 | Day 2 |
| AA | 16.96 ± 5.14 | 16.45 ± 6.35 |
| SS | 12.05 ± 5.90 | 13.75 ± 7.09 |
| AS | 20.56 ± 5.12 | 24.55 ± 6.90 |
| SA | 12.29 ± 5.02 | 15.10 ± 7.94 |

# Profondeur de traitement

*Journal of Experimental Psychology: General*
1975, Vol. 104, No. 3, 268–294

## Depth of Processing and the Retention of Words in Episodic Memory

Fergus I. M. Craik and Endel Tulving
*University of Toronto, Toronto, Ontario, Canada*

TABLE 1

TYPICAL QUESTIONS AND RESPONSES USED IN THE EXPERIMENTS

| Level of processing | Question | Answer: Yes | Answer: No |
|---|---|---|---|
| Structural | Is the word in capital letters? | TABLE | table |
| Phonemic | Does the word rhyme with WEIGHT? | crate | MARKET |
| Category | Is the word a type of fish? | SHARK | heaven |
| Sentence | Would the word fit the sentence: "He met a____in the street"? | FRIEND | cloud |

# Profondeur de traitement

*Journal of Experimental Psychology: General*
1975, Vol. 104, No. 3, 268–294

## Depth of Processing and the Retention of Words in Episodic Memory

Fergus I. M. Craik and Endel Tulving
*University of Toronto, Toronto, Ontario, Canada*

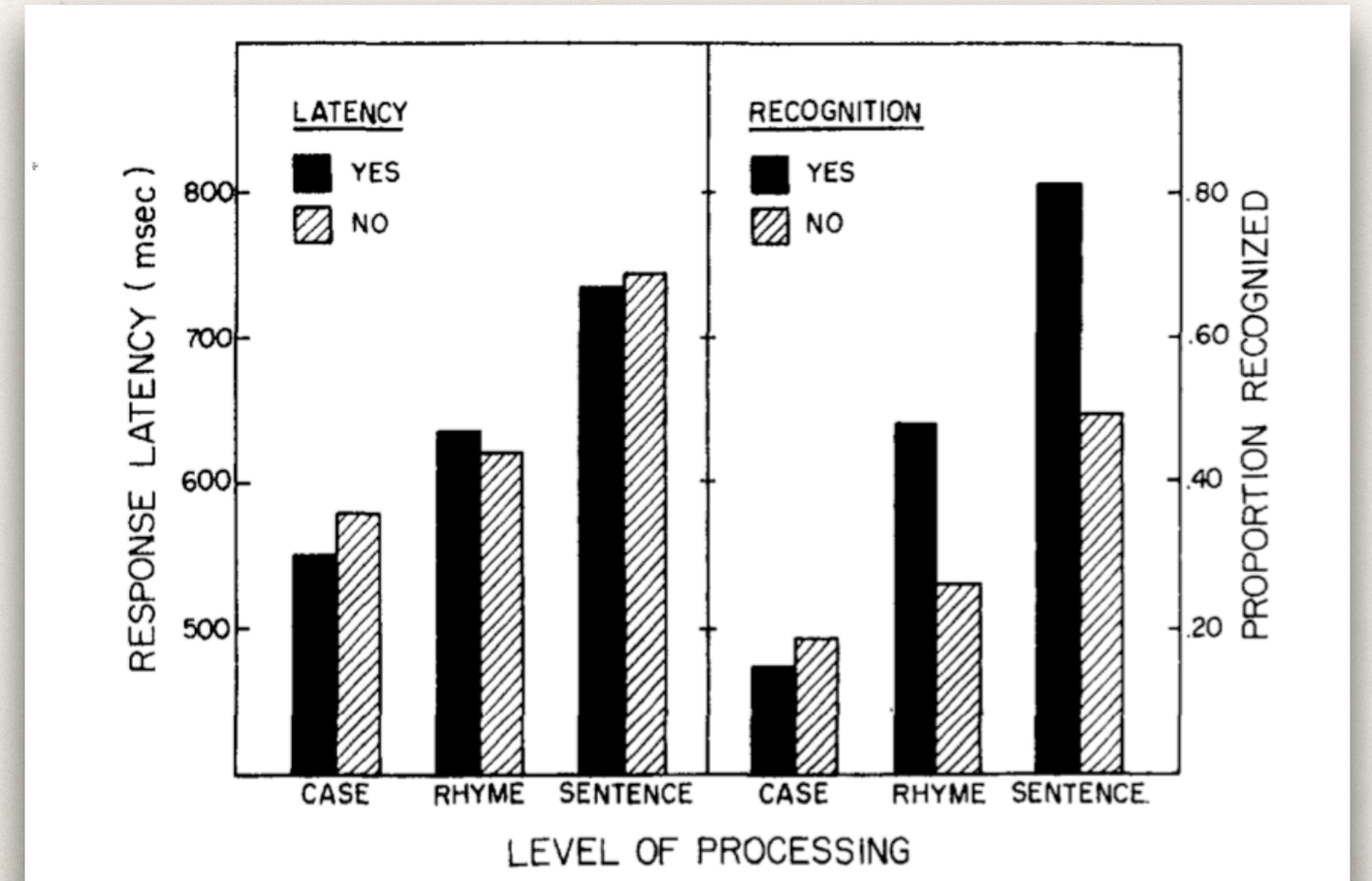



FIGURE 1. Initial decision latency and recognition performance for words as a function of the initial task (Experiment 2).

## Autres effets

Extension vers
la mémoire de travail

VOL. 76, NO. 3 MAY 1969

PSYCHOLOGICAL REVIEW

# MENTAL IMAGERY IN ASSOCIATIVE LEARNING AND MEMORY[1]

ALLAN PAIVIO[2]

*University of Western Ontario*

Nonverbal imagery and verbal symbolic processes are considered in relation to associative learning and memory. These two hypothesized processes are operationally distinguished in terms of stimulus attributes and experimental procedures designed to make them differentially available as associative mediators or memory codes. The availability of imagery is assumed to vary directly with item concreteness or image-evoking ($I$) value, whereas verbal processes are presumably independent of concreteness but functionally linked to meaningfulness ($m$) and codability. Stimulus characteristics are hypothesized to interact with mediation instructions, presentation rates, and type of memory task. Performance and subjective-report data resulting from experimental tests of the model indicated that imagery-concreteness is the most potent stimulus attribute yet identified among meaningful items, while $m$ and other relevant attributes are relatively ineffective; that both processes can be effectively manipulated by mediation instructions, but imagery is a "preferred" mediator when at least one member of the pair is relatively concrete; and that the two mechanisms are differentially effective in sequential and nonsequential memory tasks. The findings substantiate the explanatory and heuristic value of the imagery concept.

## Plan détaillé

Le modèle standard

Les différentes mémoires

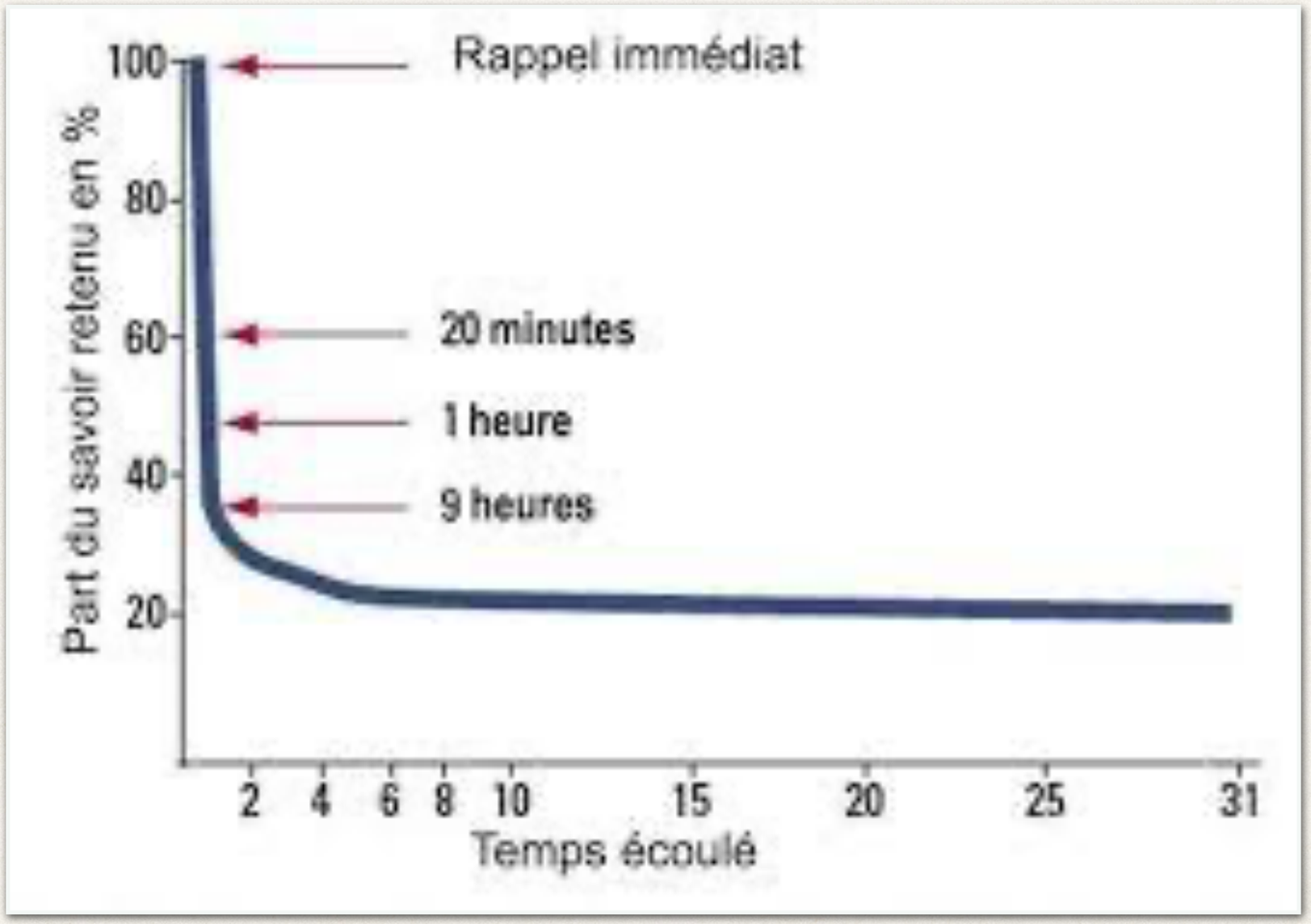
L'encodage

L'oubli

- La courbe de l'oubli
- L'oubli motivé
- L'oubli dirigé
- Oubli dirigé et mémoire transactive

## La courbe de l'oubli

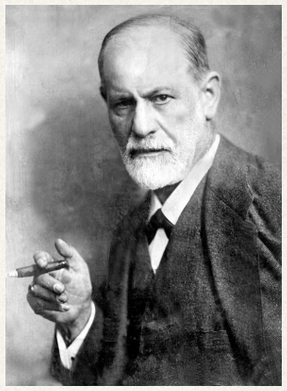
1885



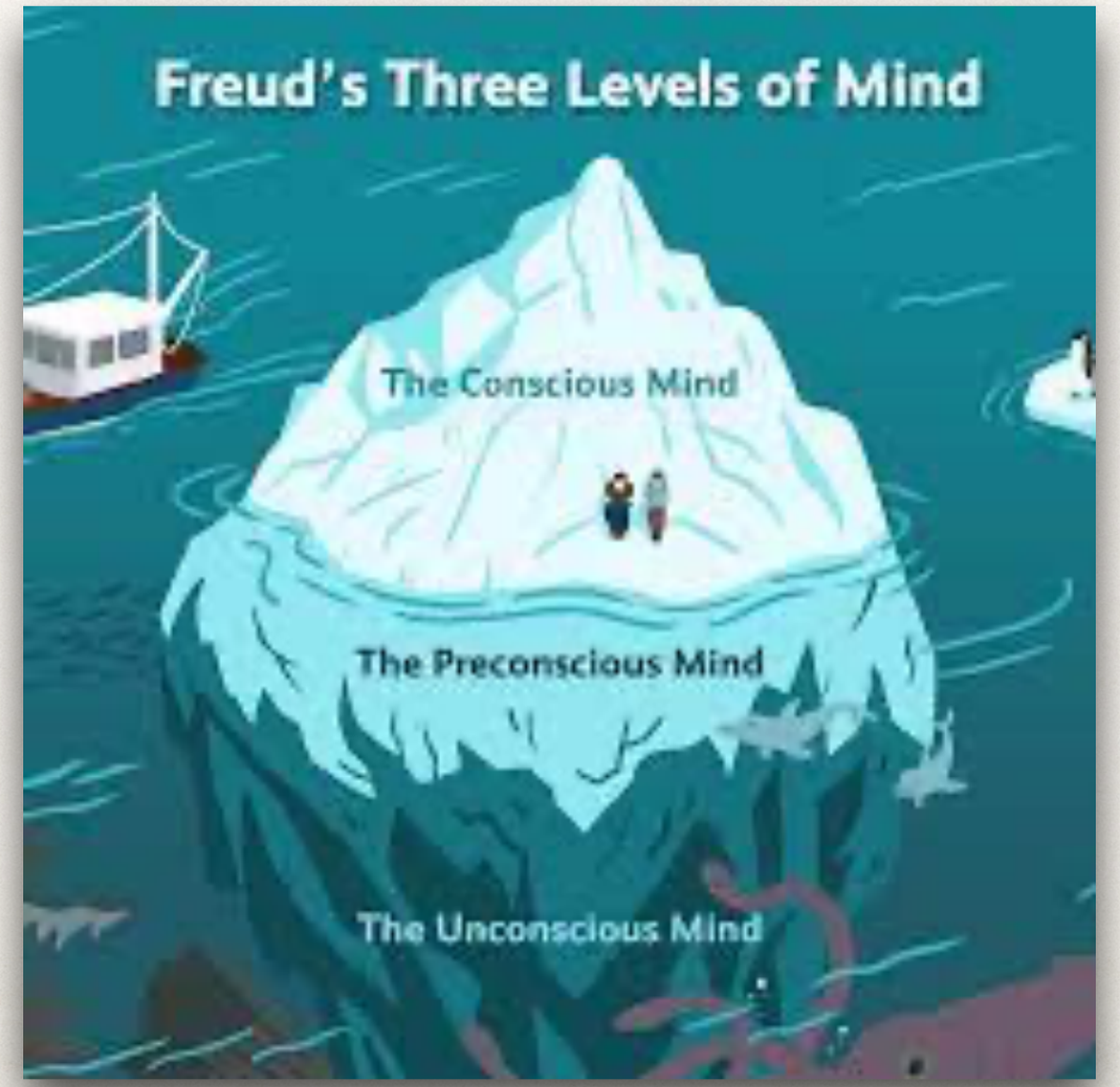

*Hermann Ebbinghaus*
*1850 - 1909*

Extension vers faux souvenirs

# L'oubli motivé



*Sigmund Freud*
*1856 - 1939*



# L'oubli motivé

*Am J Psychiatry 152:7, July 1995*

## MRI-Based Measurement of Hippocampal Volume in Patients With Combat-Related Posttraumatic Stress Disorder

J. Douglas Bremner, M.D., Penny Randall, M.D., Tammy M. Scott, M.S., Richard A. Bronen, M.D., John P. Seibyl, M.D., Steven M. Southwick, M.D., Richard C. Delaney, Ph.D., Gregory McCarthy, Ph.D., Dennis S. Charney, M.D., and Robert B. Innis, M.D., Ph.D.

**TABLE 4. Volume of the Hippocampus in Male Patients With PTSD and in Matched Comparison Subjects**

| Hippocampal Region | Volume ($mm^3$): Patients With PTSD (N=26) Mean | SD | Comparison Subjects (N=22) Mean | SD | Analysis of Variance: F (df=1, 46) | p |
|---|---|---|---|---|---|---|
| Left | 1186 | 138 | 1233 | 163 | 1.20 | 0.28 |
| Right | 1184 | 142 | 1286 | 175 | 5.02 | 0.03 |
| Mean | 1185 | 123 | 1260 | 160 | 3.38 | 0.07 |

**TABLE 5. Volume of Brain Structures Other Than the Hippocampus in Male Patients With PTSD and in Matched Comparison Subjects**

| Brain Region | Volume ($mm^3$): Patients With PTSD (N=26) Mean | SD | Comparison Subjects (N=20)[a] Mean | SD | Analysis of Variance: F (df=1, 44) | p |
|---|---|---|---|---|---|---|
| Temporal lobe[b] | | | | | | |
| Left | 52,044 | 7,259 | 54,807 | 9,005 | 1.32 | 0.26 |
| Right | 58,773 | 9,247 | 63,606 | 10,923 | 2.69 | 0.11 |
| Mean | 55,408 | 7,362 | 59,206 | 9,019 | 2.53 | 0.12 |
| Caudate | | | | | | |
| Left | 3,056 | 578 | 3,310 | 907 | 0.34 | 0.56 |
| Right | 3,254 | 669 | 3,474 | 828 | 0.20 | 0.66 |
| Mean | 3,155 | 608 | 3,392 | 860 | 0.27 | 0.60 |

[a]Data for the caudate and temporal lobe in two comparison subjects were missing.
[b]As described in the Method section, the volume of the hippocampus was subtracted from that of the temporal lobe.

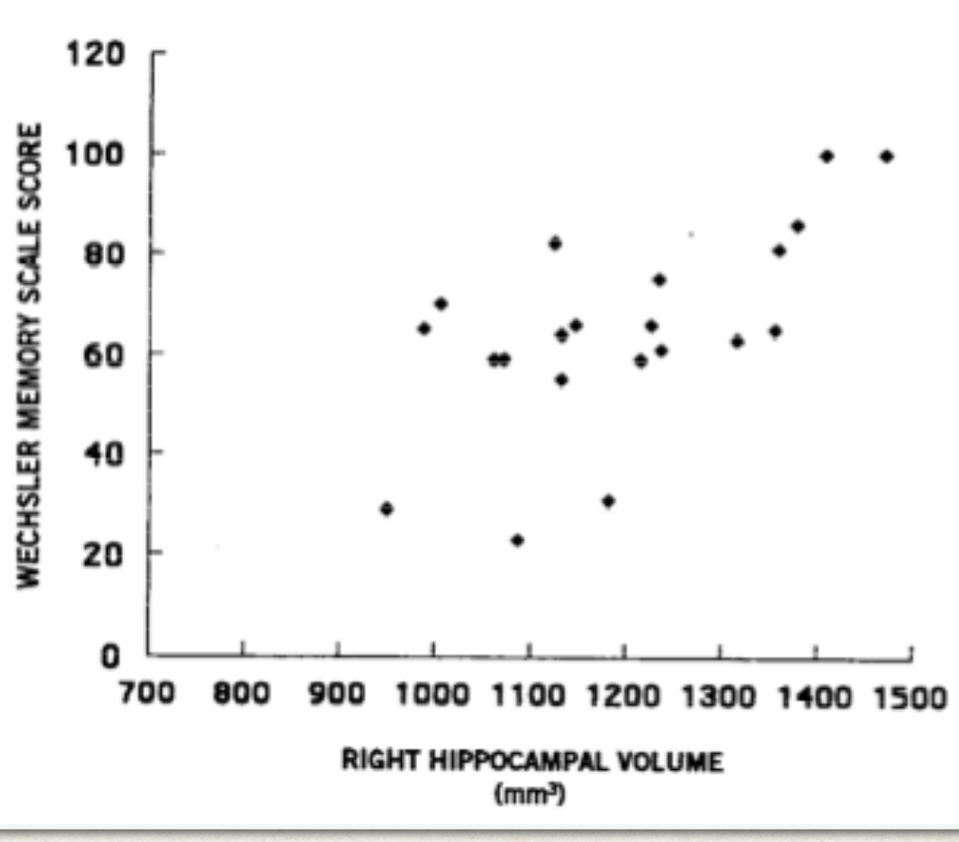
# L'oubli motivé

*Am J Psychiatry 152:7, July 1995*

## MRI-Based Measurement of Hippocampal Volume in Patients With Combat-Related Posttraumatic Stress Disorder

J. Douglas Bremner, M.D., Penny Randall, M.D., Tammy M. Scott, M.S.,
Richard A. Bronen, M.D., John P. Seibyl, M.D., Steven M. Southwick, M.D.,
Richard C. Delaney, Ph.D., Gregory McCarthy, Ph.D.,
Dennis S. Charney, M.D., and Robert B. Innis, M.D., Ph.D.

**FIGURE 2. Relation Between Verbal Memory and Right Hippocampal Volume in Patients With PTSD[a]**



# L'oubli dirigé

Psychon. Sci., 1968, Vol. 10 (2)

## The modification of short-term memory through instructions to forget[1]

ROBERT A. BJORK, *UNIVERSITY OF MICHIGAN*
DAVID LaBERGE AND ROSS LEGRAND, *UNIVERSITY OF MINNESOTA*

*Condition 1.* These lists contained two CCCC items separated by four or eight digits. The first item was preceded by two, four, or six digits and there were zero, four, eight, or twelve digits between the second item and the end of the list. In this condition the Ss were required to recall both items, second item first, at the end of the list.

*Condition 2.* These lists were identical to Condition 1 except that colored dots appeared to the left of the two digits just preceding the second CCCC item. The colored dots served as a signal to the S that he could forget the first item because he would have to recall only the second item.

*Condition 3.* These were control lists in which there was only one CCCC item placed at positions corresponding to the positions of the second CCCC item in Conditions 1 and 2.

The four retention intervals (0, 4, 8, or 12 sec) and the three conditions generated the 12 possible combinations. Each of the 12 combinations was given in a block

## L'oubli dirigé

Psychon. Sci., 1968, Vol. 10 (2)

# The modification of short-term memory through instructions to forget[1]

ROBERT A. BJORK, *UNIVERSITY OF MICHIGAN*
DAVID LaBERGE AND ROSS LEGRAND, *UNIVERSITY OF MINNESOTA*

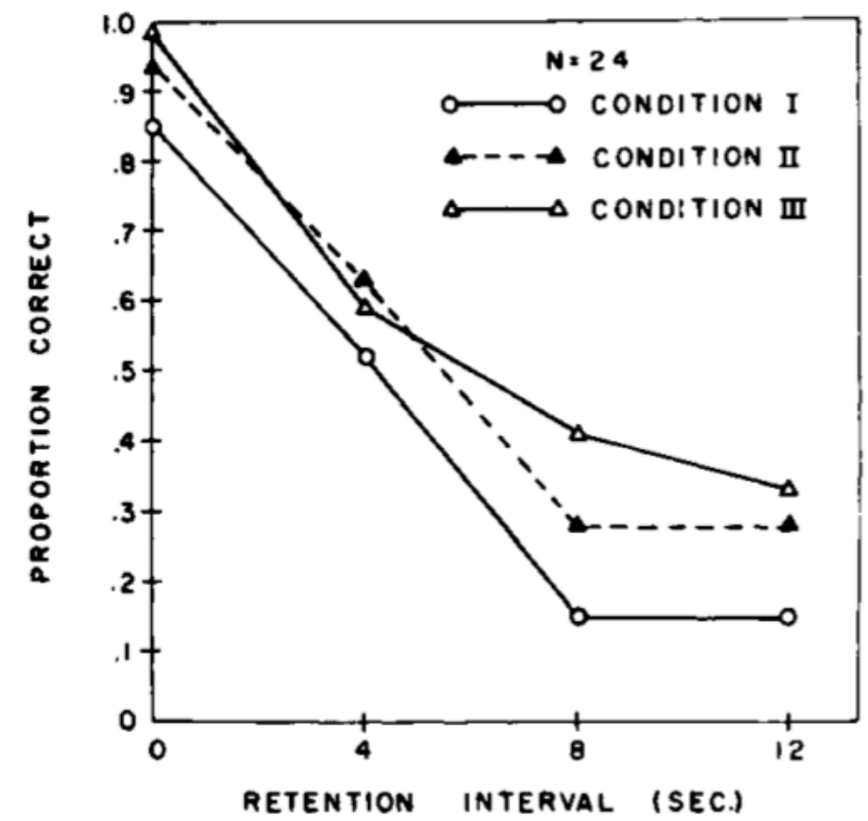



**Fig. 1. Proportion of correct recalls. Condition 1: two items presented, recall both. Condition 2: two items presented, recall second only. Condition 3: only one item presented and recalled.**

## Mémoire transactive

5 AUGUST 2011 VOL 333 SCIENCE

# Google Effects on Memory: Cognitive Consequences of Having Information at Our Fingertips

Betsy Sparrow,[1]* Jenny Liu,[2] Daniel M. Wegner[3]

In a development that would have seemed extraordinary just over a decade ago, many of us have constant access to information. If we need to find out the score of a ball game, learn how to perform a complicated statistical test, or simply remember the name of the actress in the classic movie we are viewing, we need only turn to our laptops, tablets, or smartphones and we can find the answers immediately. It has become so commonplace to look up the answer to any question the moment it occurs that it can feel like going through withdrawal when we can't find out something immediately. We are seldom offline unless by choice, and it is hard to remember how we found information before the Internet became a ubiquitous presence in our lives. The Internet, with its search engines such as Google and databases such as IMDB and the information stored there, has become an external memory source that we can access at any time.

# L'oubli dirigé

5 AUGUST 2011 VOL 333 SCIENCE

## Google Effects on Memory: Cognitive Consequences of Having Information at Our Fingertips

Betsy Sparrow,[1]* Jenny Liu,[2] Daniel M. Wegner[3]

In experiment 2, we tested whether people remembered information that they expected to have later access to—as they might with information they could look up online (*4*). Participants were tested in a 2 by 2 between-subject experiment by reading 40 memorable trivia statements of the type that one would look up online (both of the new information variety, e.g., "An ostrich's eye is bigger than its brain," and information that may be remembered generally, but not in specific detail, e.g., "The space shuttle Columbia disintegrated during re-entry over Texas in Feb. 2003."). They then typed them into the computer to ensure attention (and also to provide a more generous test of memory). Half the participants believed the computer would save what was typed; half believed the item would be erased. In addition, half of the participants in each of the saved and erased conditions were asked explicitly to try to remember the information. After the reading and typing task, participants wrote down as many of the statements as they could remember.

A between-subjects 2 (saved or erased) by 2 (explicit memory instructions versus none) ANOVA revealed a significant main effect for only the saved/erased manipulation, as those who believed that the computer erased what they typed had the best recall, omnibus $F(3, 56) = 2.80$, $P < 0.05$ [Erase $M = 0.31$, SD = 0.04, and Erase Remember $M = 0.29$, SD = 0.07, paired comparisons of erased conditions not significant (ns)] compared with those who believed the computer would be their memory source (Save $M = 0.22$, SD = 0.07 and Save Remember $M = 0.19$, SD = 0.09, paired comparisons of saved conditions ns). This finding corresponds to previous

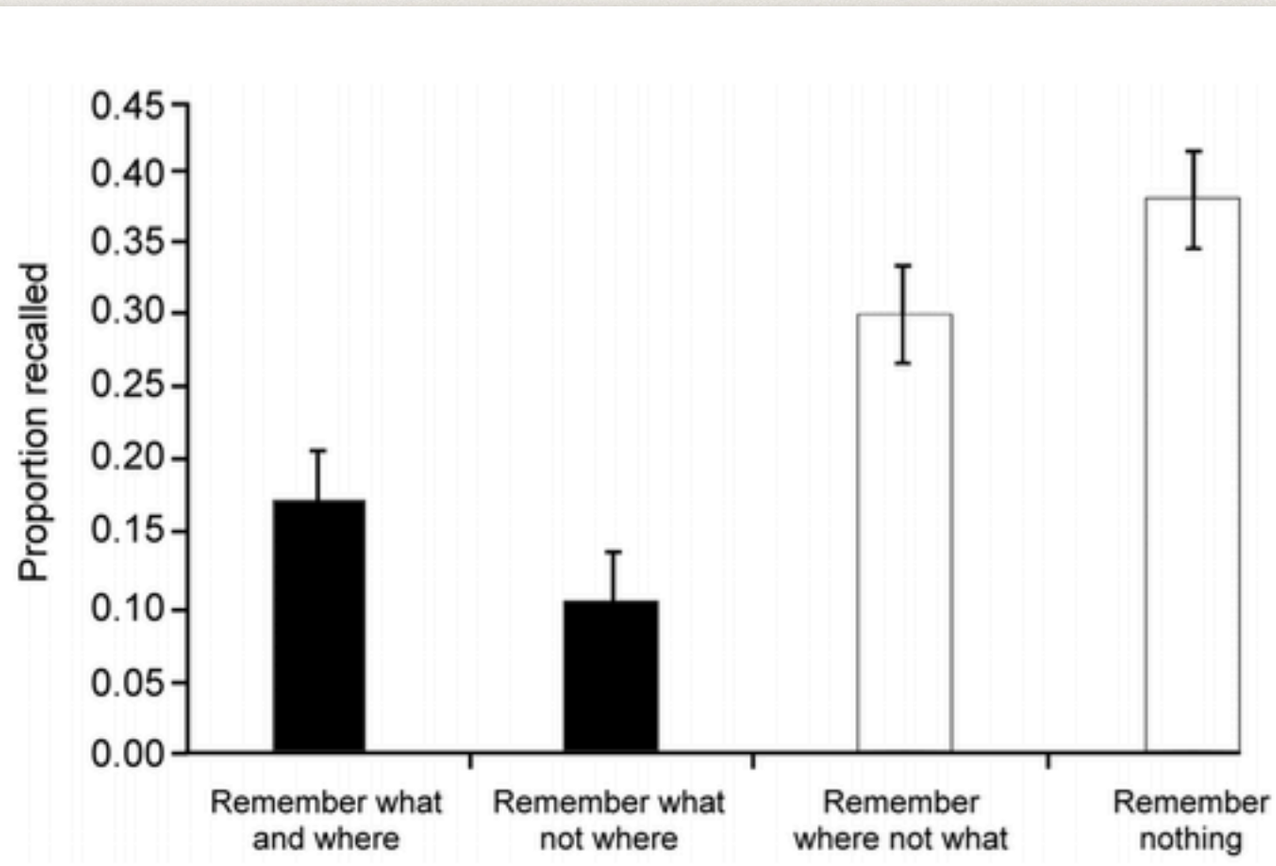
# L'oubli dirigé

5 AUGUST 2011 VOL 333 SCIENCE

## Google Effects on Memory: Cognitive Consequences of Having Information at Our Fingertips

Betsy Sparrow,[1]* Jenny Liu,[2] Daniel M. Wegner[3]

**Fig. 2.** An if/then analysis of memory for what the information is and where to find it. Scale is measured in proportion recalled. Error bars, mean ± SEM.



# L'oubli dirigé

Journal of Personality and Social Psychology
1991, Vol. 61, No. 6, 923-929


0022-3514/91/$3.00

## Transactive Memory in Close Relationships

Daniel M. Wegner
University of Virginia

Ralph Erber
DePaul University

Paula Raymond
New York University

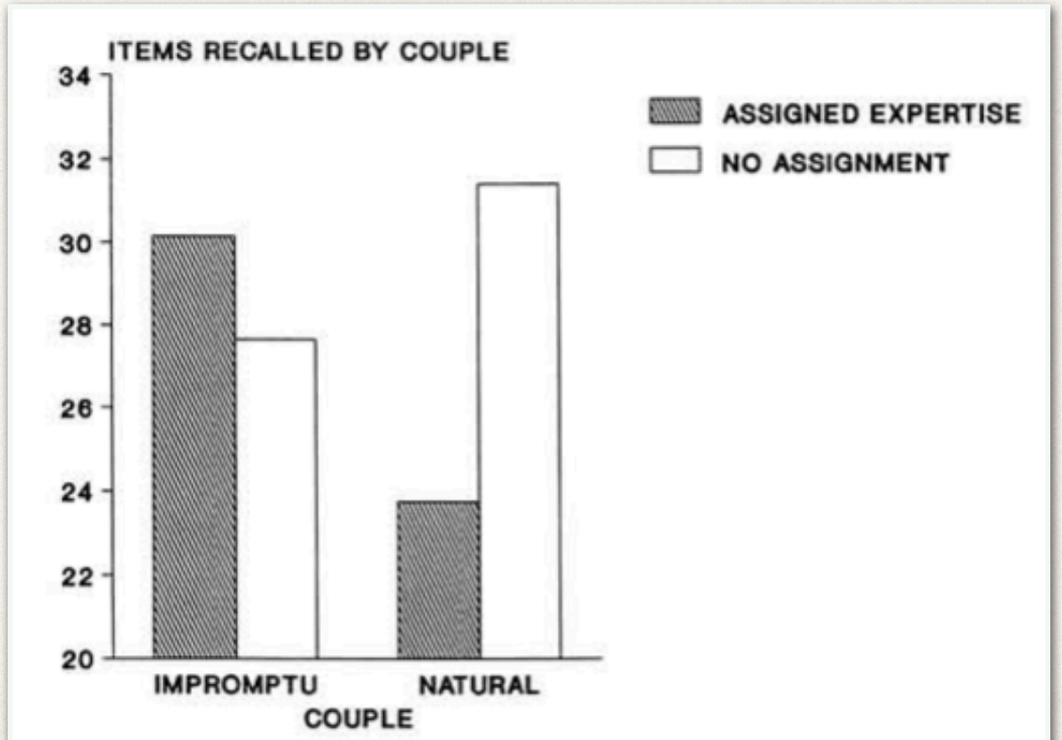



*Figure 1.* Couple recall as a function of couple type (natural vs. impromptu) and assignment (assigned expertise vs. no assignment).

# L'oubli dirigé

Chapter 11

**Cognitive Interdependence in Close Relationships**

*Daniel M. Wegner, Toni Giuliano, and Paula T. Hertel*

1985

*Daniel Wegner*
*1948 - 2013*

**The Nature of Transactive Memory**

Ordinarily, psychologists think of memory as an individual's store of knowledge, along with the processes whereby that knowledge is constructed, organized, and accessed. So, it is fair to say that we are studying "memory" when we are concerned with how knowledge gets into the person's mind, how it is arranged in the context of other knowledge when it gets there, and how it is retrieved for later use. At this broad level of definition, our conception of transactive memory is not much different from the notion of individual memory. With transactive memory, we are concerned with how knowledge enters the dyad, is organized within it, and is made available for subsequent use by it. This analogical leap is a reasonable one as long as we restrict ourselves to considering the *functional equivalence* of individual and transactive memory.

# Psychologie Cognitive


François Osiurak

Professeur des Universités

Laboratoire d'Etude des Mécanismes Cognitifs, Université de Lyon
Institut Universitaire de France, Paris