Social Memory

Fall 2015

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The Function of Perception

- Forming Mental Representations of…
- Objects and Events Experienced in the...
- Present Environment so that…
- Behavior is Governed by the Meaning of the Current Stimulus

Perceptual Activity Ends with the Identification and Categorization of the Distal Stimulus

2

Perception, Categorization, and Memory

If every act of perception involves an act of categorization….

(as Bruner said it did)

Memory provides the conceptual knowledge that permits categorization to occur.

3

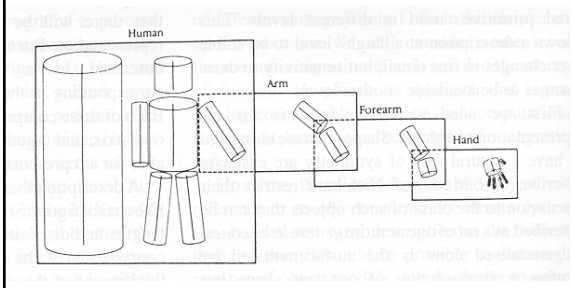
Relations Between Perception and Memory

- Memory as Background of Perception
  - Knowledge, Expectations, Beliefs
  - Cognitive Basis for Perception
- Memory Trace as a Byproduct of Perceptual Activity
  - Record of Perceptual Activity
  - Description of Percept

4

Decomposition of Human Form into Cylinders

Marr & Nishihara (1978)



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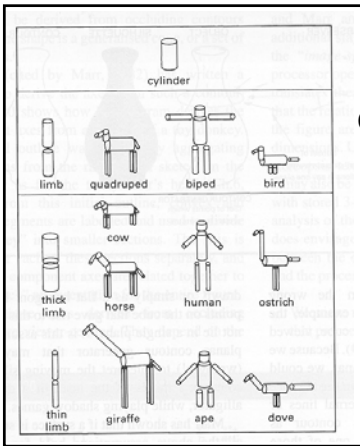

More Cylinder-Figures

Marr & Nishihara (1978)

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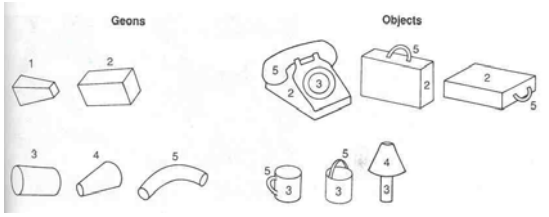
Decomposition into Geons

Biederman (1985)



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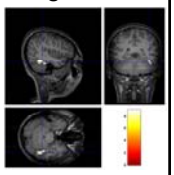
Some Phenomena of Face Recognition

- Classification of Errors in Face Recognition
  - Familiarity
  - Identification
- Prosopagnosia
  - Cannot Recognize Familiar Faces
  - Can Determine Gender, Emotional Expression
  - Can Read Lips
- Evidence from Reaction-Time Studies
  - Familiarity < Occupation < Name
    - Cannot State Name Before Occupation (?)



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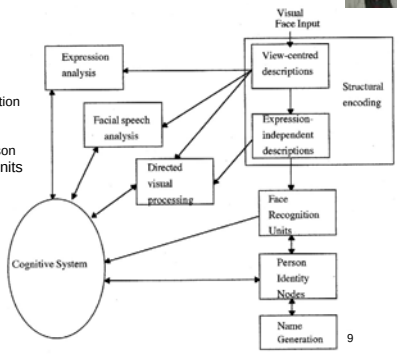
Model of Face Recognition

Bruce & Young (1986, 2012); Young & Bruce (1991, 2011)

- Face Recognition Unit
  - 1/Person
  - Activated by Recognition
- Person Identity Node
  - 1/Person
  - Face Belongs to Person
- Semantic Information Units
  - Occupation
  - Personality
- Name Recognition Unit
  - Verbal Label



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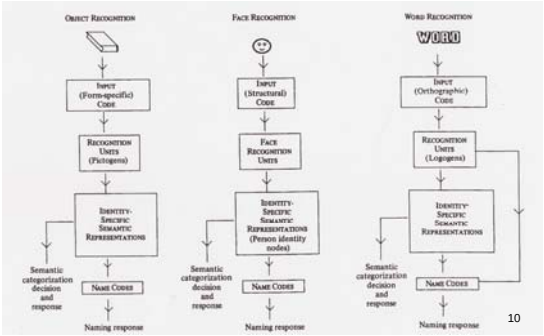
Parallels Between Face, Object, and Word Recognition

Bruce & Young (1986)



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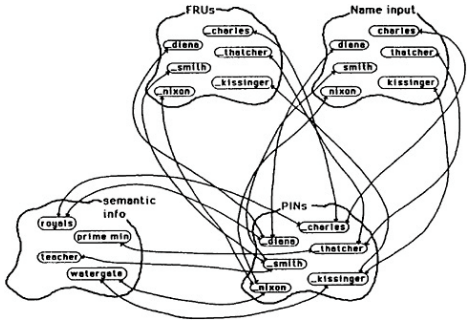
Interactive Activation Model of Face Recognition

Burton et al. (1990)



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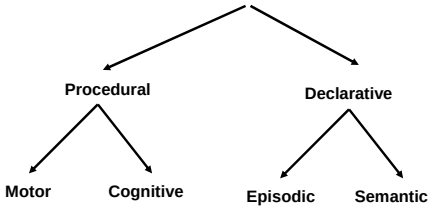
Taxonomy of Memory



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Two Forms of Knowledge

Winograd (1975); Anderson (1976)

- Declarative Knowledge
  - – Factual Statements
  - – Propositional Format
- Procedural Knowledge
  - – Directions for Action
  - – Production Format

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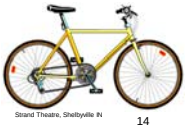
Declarative Knowledge

- Factual Statements
  - – About World, Past
- Sentence Format
  - – Propositions
    - Subject - Verb – Object
- Types of Representations
  - – Meaning-Based
    - Verbal Description
  - – Perception-Based
    - Mental Image

A **bicycle** is a two-wheeled vehicle with seat and handles, propelled by pedaling.

A **bicycle** looks like this:



Strand Theatre, Shelbyville IN

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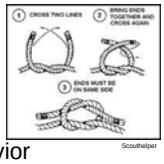
Procedural Knowledge

- Directions for Goal-Directed Action
- "If-Then" Format (Productions)
  - – Goal - Condition – Action
  - – Production System
- Motor
  - – Actions Take Form of Overt Behavior
    - Alter Objective, Publicly Observable World
- Mental
  - – Actions Take Form of Mental Transformation
    - Alter Internal, Private Mental Representations



Scoutshelper

X + 6 = 38

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Types of Declarative Knowledge

Tulving (1972, 1983)

- Episodic
  - Autobiographical Memory
  - Factual Knowledge About Personal Experiences
    - Spatio-Temporal Context
    - Self-Reference
- Semantic
  - Mental "Dictionary" or "Encyclopedia"
  - Abstract, Conceptual Knowledge About the World

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Episodic Memory

- Autobiographical/Personal
  - Specific Experiences
  - Narratives
- Elements
  - Description of event
  - Episodic context
    - Time, Place
    - Causal Relations
  - Self-Reference
    - Agent or Patient, Stimulus or Experiencer
    - Internal Mental State

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Semantic Memory

- Abstract, Context Free
  - Mental Lexicon
  - *Generic* Memory?
- Object Knowledge
- Linguistic Knowledge
- Categorical Knowledge
  - Subsets-Supersets
  - Similarity
  - Category-Attribute

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Declarative Social Memory

- Factual Knowledge
  - Has Truth Value
- Propositional Representation
  - Subject-Relation-Object
    - The *subject* verbed the **object**
  - Propositional Network
- Examples
  - *John smiled at Lucy*
  - *John is a neurotic extravert*
  - *Neurotics are anxious and excitable, while Extraverts are talkative and sociable*

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Structure of Declarative Memory

- Nodes
  - Represent Concepts
- Associative Links
  - Represent Relations Among Concepts
- Perception Activates Corresponding Nodes
- Activation Spreads Across Associative Links
- Spreading Activation Creates Priming
  - Processing of One Event
  - Facilitates or Impairs Processing of Another

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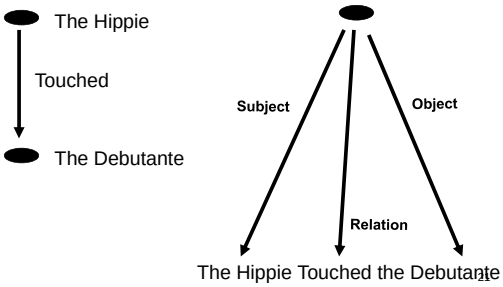
Propositional Representation

After Anderson (1976)



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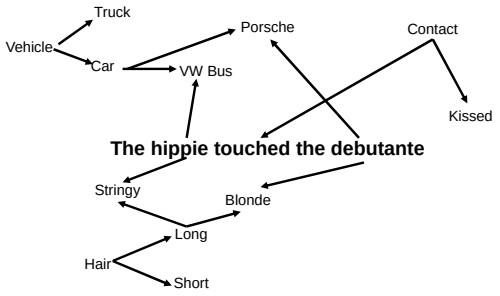
An Associative Network



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Relations Between Episodic and Semantic Memory

- Semantic Knowledge Begins in Episodes
  - Learning Experiences
- Accumulation Blurs Episodic Features
- Episodic Memory Formed Against Background of Semantic Knowledge
  - Cognitive Basis for Perception

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Memory in Social Cognition

Procedural

- Motor
  - Eye Contact
  - Handgrip
  - Display Rules
  - Interpersonal Distance
- Cognitive
  - Impression Formation
  - Self-Regulation

Declarative

- Semantic
  - Implicit Personality Theory
- Episodic
  - Autobiographical Memory
  - Person Memory

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Person Memory

- Knowledge Concerning Another Person
- Mix of Declarative Memories
  - Episodic
    - Memories of Past Encounters
    - Knowledge of Behavioral Episodes
  - Semantic
    - Generic Knowledge About Person
    - Traits, Attitudes, Other Characteristics

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Memory and Person Memory

- Person Memory Can Be Studied with Techniques Used in Nonsocial Memory
- Social Context is Important
  - Impression Formation Improves Person Memory

What Do Person Memories Look Like?

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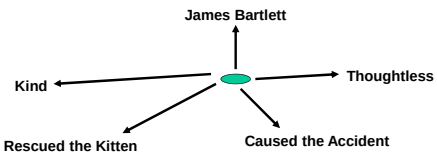
Associative Structure of Person Memory



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Individuation and Reference in Person Memory

Anderson & Hastie (1974)

First You Learn:

- James Bartlett rescued the kitten.
- James Bartlett adopted the child.
- The lawyer caused the accident.
- The lawyer cursed the salesgirl.

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Individuation and Reference in Person Memory

Anderson & Hastie (1974)

First You Learn:

- James Bartlett rescued the kitten.
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Then You Learn:

- James Bartlett is the lawyer.

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Individuation and Reference in Person Memory

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First You Learn:

- James Bartlett rescued the kitten.
- James Bartlett adopted the child.
- The lawyer caused the accident.
- The lawyer cursed the salesgirl.

Then You Learn:

- James Bartlett is the lawyer.

Now You're Asked:

- Did James Bartlett cause the accident?

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Retrieval from Episodic Memory

Anderson (1974)

- Learn Facts about People, Locations
  - The doctor is in the bank (1-1)
  - The fireman is in the park (1-2)
  - The lawyer is in the church (2-1)
  - The lawyer is in the park (2-2)
- – Memorize to criterion of perfect recall
- – Recognition
  - Studied targets
    - – The doctor is in the bank
  - Unstudied lures
    - – The doctor is in the park

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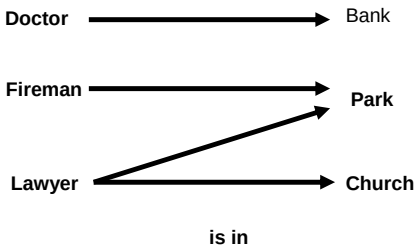
People and Locations
Anderson (1974)



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The Fan Effect

Anderson (1974)

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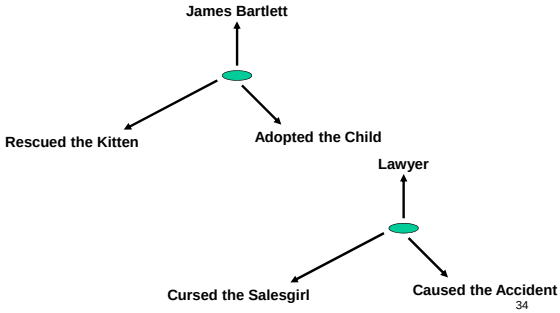
Separate Representations



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Separate Representations

- James Bartlett
  - Rescued the kitten
  - Adopted the child
  - Is the lawyer
- The Lawyer
  - Is James Bartlett
  - Caused the accident
  - Cursed the salesgirl
- Can't Answer the Question
  - Knowledge Not Represented in Memory
- But We *Can* Answer the Question

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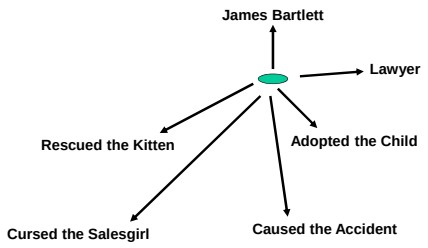
Single Representation



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Single Representation

- James Bartlett
  - is the lawyer
  - rescued the kitten
  - adopted the child
  - caused the accident
  - cursed the salesgirl
- Answer Question by Memory Retrieval
  - Knowledge Represented Directly

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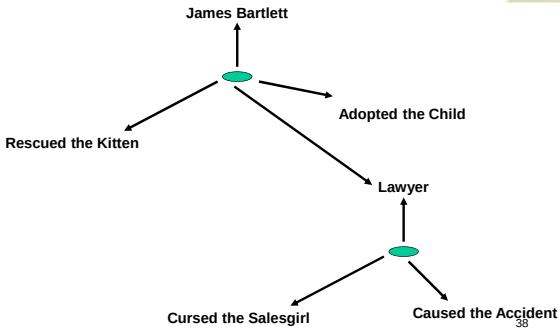
Linked Representations



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Linked Representations

- James Bartlett
  - rescued the kitten
  - adopted the child
  - is the lawyer
    - caused the accident
    - cursed the salesgirl
- Answer Question by Inference
  - From Knowledge that Bartlett is the Lawyer

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Experimental Procedure

- Study Facts
  - About James Bartlett
  - About the Lawyer
- Learn Identity
  - Before Learning Facts
  - After Learning Facts
- Sentence Verification
  - No Inferences
    - James Bartlett rescued the kitten
  - Inferences
    - James Bartlett cursed the salesgirl

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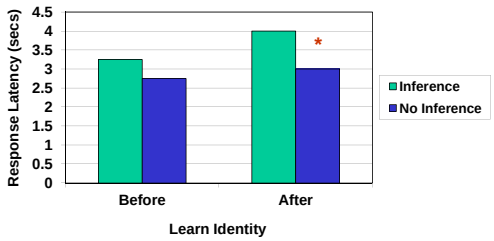
Response Latencies in Sentence Verification

Anderson & Hastie (1974)



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How Persons Are Represented in Memory

- Node Representing a Person
  - James Bartlett
  - The Lawyer
- Nodes Representing Facts about Person
  - Behaviors, Experiences
  - Traits, Attitudes
- Associative Links
  - Connect Person Nodes to Fact Nodes

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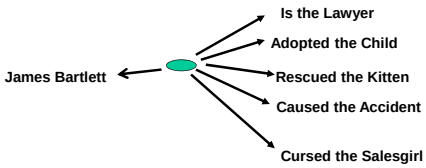
Individuation and Reference

- If Reference Known at the Outset
  - Reference Treated as Another Fact



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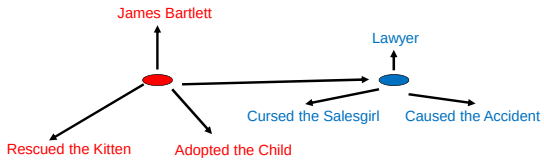
Individuation and Reference

- If Reference Learned Later
  - Reference Links Representations
    - Knowledge of **B** not Transferred to **A**
    - Get from **A** to **B** via Associative Link



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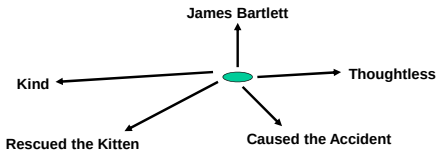
Associative Structure of Person Memory



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Schematic Effects on Person Memory

- Information in Person Memory
  - Semantic
    - General Characteristics
  - Episodic
    - Specific Behaviors, Experiences
- What is the Relation Between Semantic and Episodic Person Memory?
  - How Does Semantic Knowledge Affect Episodic Knowledge
  - How are Relations Represented?

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Memory and Schema-Congruence

- Bartlett (1932)
  - Memory Favors Schema-Congruence
- Conflicting Results
  - Congruence > Controls
  - Congruence = Controls
  - Congruence < Controls
- Result Depends on Control Condition

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Schematic Effects on Person Memory

Hastie & Kumar (1979)

- Present Trait Ensemble
  - Traits Descriptive of Target Person
  - Induce Schema for Person
    - Prior Beliefs and Expectations
- Study Specific Behaviors
  - Vary Relationship to Schema
    - Schema-Congruent
      - *p*(Behavior | Schema) > *p*(Behavior | No Schema)
    - Schema-Incongruent
      - *p*(Behavior | Schema) < *p*(Behavior | No Schema)
    - Schema-Irrelevant
      - *p*(Behavior | Schema) = *p*(Behavior | No Schema)

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Sample Materials

- Judy is:
  - intelligent, clever, bright, smart, quick, wise, knowledgeable, decisive
- Judy…
  - won the chess tournament.
  - attended the symphony concert.
  - made the same mistake three times.
  - was confused by the television show.
  - ordered a cheeseburger for lunch.
  - took the elevator to the third floor.

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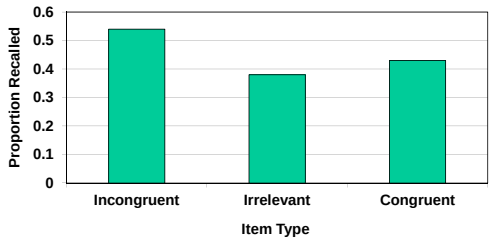
Schematic Effects on Memory

Hastie & Kumar (1979), Exp. 1



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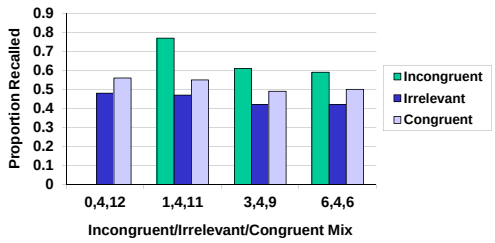
Schematic Effects on Memory

Hastie & Kumar (1979), Exp. 2



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The Schematic Processing Principle

The Memorability of an Event
is a Function of its Relationship
to Pre-Existing Schemata.

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Two Processes in the Schematic Processing Effect

Hastie & Kumar (1979); Hastie (1980, 1981, 1984)

- Schema-Congruent
  - – Schema Provides Internally Generated Cues
  - – Facilitates Retrieval
- Schema-Incongruent
  - – Surprise Instigates Explanatory Activity
  - – Facilitates Encoding
- Schema-Irrelevant
  - – Get Neither Advantage

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Explanation in Terms of Network Model of Memory

Srull (1981)

- Behavioral Items Linked to Person Node
- Interitem Associations
  - – Among Incongruent Items
  - – Between Incongruent and Congruent Items
- Retrieval by Tracing Associative Links
  - – Favor Incongruent Items
    - Most Associative Links
  - – Ignores Irrelevant Items
    - No Associative Links

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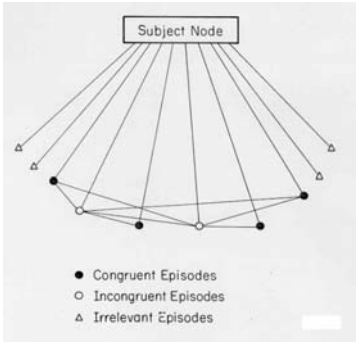
Srull's Model of Person Memory

Srull (1981)



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Effects of Schema-Incongruent Behaviors on Memory

Srull et al. (1985)

- Induce Schema
  - Memorize Trait Ensemble
- Study Behaviors
  - 12 Schema-Congruent
  - 12 Schema-Neutral
  - 0, 6, or 12 Schema-Incongruent
- Test Recall for Behaviors

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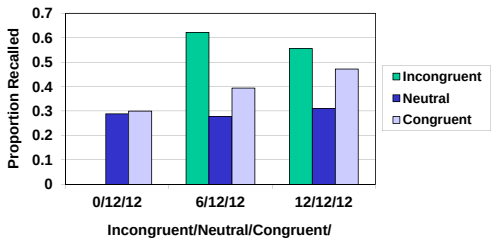
Recall and Schema-Congruence

Srull et al. (1985)



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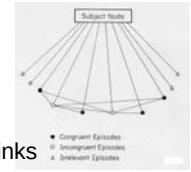
Priming Effects on Person Memory

Srull et al. (1985)



- Test Recognition for Behaviors
  - Response Latency
- Priming Mediated by Associative Links
  - Between Incongruent Items
  - Between Congruent, Incongruent Items

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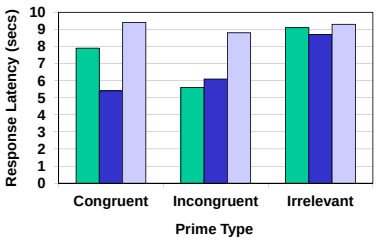
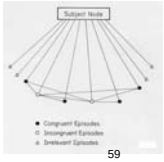
Priming in Sentence Verification

Srull et al. (1985)





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How Are Traits Represented in Person Memory?

- Nodes Representing…
  - Person
  - Behaviors
  - Traits
- Relation Between Traits and Behaviors
  - Traits, Behaviors Linked Independently
  - Behaviors Organized by Traits

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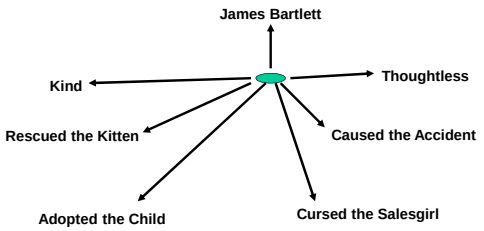
Traits and Behaviors Represented Independently



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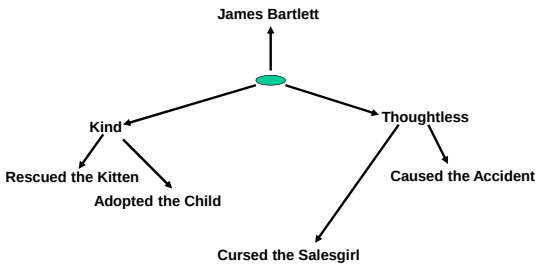
Behaviors Clustered by Traits



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Organization of Person Memory

Klein & Loftus (1990)

- 20 Behavior Descriptions
  - 4 per trait
    - Athletic, Intelligent, Honest, Religious, Sociable
- 3 Conditions
  - Impression Formation
  - Memorization
  - Category Sorting

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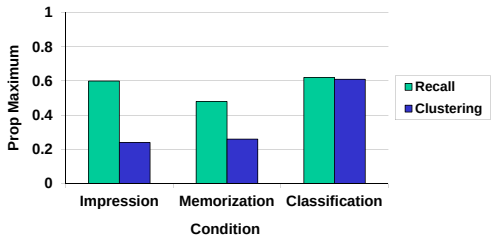
Recall and Clustering

Klein & Loftus (1990)



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Beyond Clustering: Priming

- Nodes Representing…
  - Person
  - Traits
  - Behaviors
- If Behaviors Clustered Under Trait nodes
  - Traits Should Prime Behaviors
- If Traits, Behaviors Linked Independently
  - No Priming Effects

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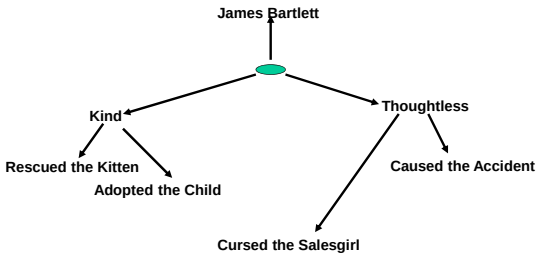
Behaviors Clustered by Traits



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Priming Effects in Person Memory

Klein, Loftus, Trafton, & Fuhrman (1992)

- Target Person: *Mother*
  - Rate Descriptiveness of Each Trait
- Present Trait Term
  - Define
  - Describes *Mother*
  - Remember Event Involving *Mother*
- Compare Performance
  - Trial *N* vs. Trial *N-1*

Does Remembering a Trait
Prime Remembering a Behavior?

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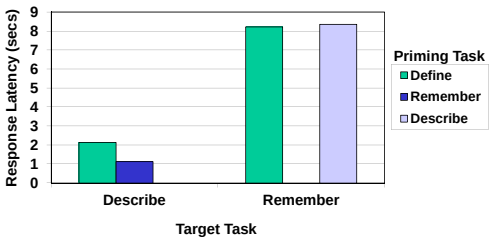
Traits Highly Descriptive of *Mother*

Klein, Loftus, Trafton, & Fuhrman (1992)



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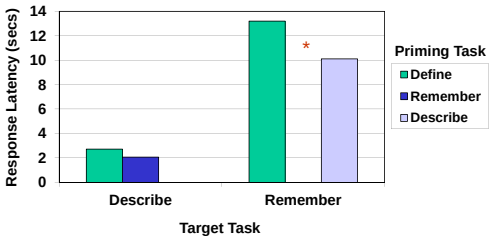
Traits Less Descriptive of *Mother*

Klein, Loftus, Trafton, & Fuhrman (1992)



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Implications for the Organization of Person Memory

- Retrieval of Highly Descriptive Traits
  - *Does Not* Prime Retrieval of Trait-Related Behaviors
    - Highly Descriptive Traits are Represented Independently of Trait-Related Behaviors
- Retrieval of Less-Descriptive Traits
  - *Does* Prime Retrieval of Trait-Related Behaviors
    - Trait Judgments are Based on Retrieval of Exemplary Behaviors

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Evidence from Amnesia

Tulving (1993); Klein & Loftus (1996)

- Amnesic Patients
  - Anterograde (Postmorbid Memories)
  - Retrograde (Premorbid Memories)
- Cannot Remember Episodes
  - No Episodic Self-Knowledge
- But Can Describe Personality
  - Spared Semantic Self-Knowledge
- Can Even Appreciate Personality Change
    - Source Amnesia?

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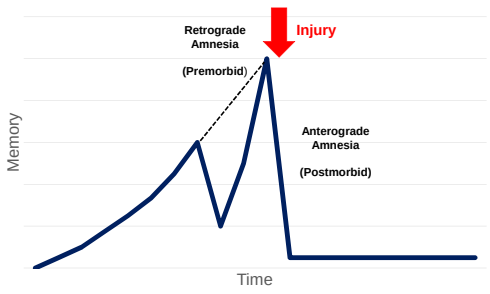
Forms of Amnesia



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The Case of K.C.

Tulving (1993)

- Motorcycle Accident at Age 30
- Complete Amnesia
  - Anterograde
  - Retrograde
- Personality Change
  - Premorbid, Extraverted
  - Postmorbid, Introverted

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Ratings of K.C.'s Postmorbid Personality

- K.C.'s vs. Mother's Ratings of *K.C.*
  - *Q* = .77
- K.C.'s vs. Mother's Ratings of *Mother*
  - *Q* = .80

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K.C.'s Personality: Premorbid vs. Postmorbid

- 2-Alternative Forced Choice
  - Matched Items for Social Desirability
- Reliability of K.C.'s "Post" Ratings
  - 76% Agreement
- Mother's ratings of K.C. "Pre" vs. "Post"
  - 50% Agreement (Chance)
- K.C. "Post" vs. Mother "Post"
  - 73% Agreement
- K.C. "Post" vs. Mother "Pre"
  - 53% Agreement (Chance)

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The Case of W.J.

Klein, Loftus, & Kihlstrom (1996)

- 18 y/o College Undergraduate
  - 2nd-Quarter Freshman
- Concussive Blow to the Head
  - No Neurological Abnormalities
- Anterograde Amnesia
  - 45 Min After Injury
- Retrograde Amnesia
  - Covering Previous 6-7 Months
  - Cleared in 11 Days

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Memory Testing in W.J.

Klein et al. (1996)

- Digit Span
- Free Recall
- Semantic Memory
- Episodic Memory
  - Galton Cued-Recall Technique
    - Unconstrained
    - Constrained
- Personality Testing

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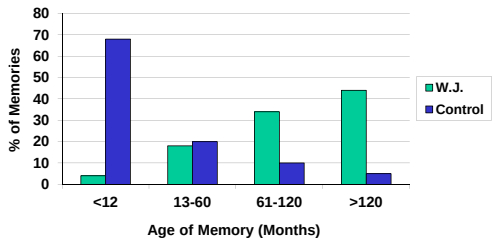
Autobiographical Memory During Amnesia

Klein et al. (1996)



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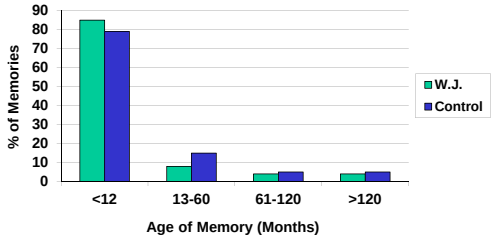
Autobiographical Memory Post-Amnesia

Klein et al. (1996)



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W.J.'s Personality in College

Klein et al. (1996)

- Agreement with Boyfriend, College
  - *r* = .65*[a] Controls, *r* = .65*[a]

Knows What She's Like Now

- College vs. High-School
  - *r* = .53*[b]

Some Relation to High-School Personality

- Test-Retest Reliability, College
  - *r* = .74 *[c] Controls, *r* = .78*[c]

College Self Not Accounted For by High-School Self

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Trait and Behavioral Self-Knowledge in Amnesia

- Amnesics Retain Knowledge of Personality
  - Forget Knowledge of Events
- Trait, Behavioral Information
  - Represented Independently
  - Confirms Results of Priming Studies

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Structure of Person Memory

- Persons Represented as Nodes
- Traits, Behaviors Represented as Nodes
  - Fan Out from "Person" Node
- Trait and Behavioral Knowledge Represented Separately
  - Behaviors Do Not Fan Out from the Traits They Exemplify

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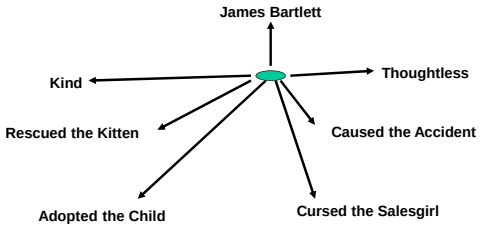
Traits and Behaviors are Represented Independently



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Neural Representation of Memory

- Distributed (Lashley; Hebb)
  - Reverberating Pattern of Neural Activity
  - Distributed Widely Over Cerebral Cortex
- Localist (Penfield)
  - Activity of Single Neurons
    - Or Small Clusters of Neurons
  - Centered on Specific Cortical Location
    - A "Grandmother Neuron" (Lettvin, 1967)

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Invariant Visual Representation by Single Neurons

Quian Quiroga, Reddy, Kreiman, Koch, & Fried (2005)

- 8 Patients with Intractable Epilepsy
  - Electrodes Implanted to Localize Seizures
    - Medial Temporal Lobe
      - Hippocampus, Amygdala
      - Entorhinal Cortex, Parahippocampal Cortex
    - 8 Active Microwires per Electrode
- Responses to Visual Stimulation
  - Individuals, Objects, Animals, Landmarks
    - Selection Based on Interviews with Patients
    - Activity Spikes Within 1 Second
      - 5 SD Above Baseline

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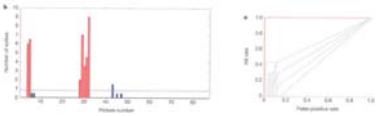
The "Jennifer Aniston" Neuron?

Quian Quiroga et al. (2005)



Single Unit in Left Posterior Hippocampus

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The "Halle Berry" Neuron?

Quian Quiroga et al. (2005)

Single Unit in right Anterior Hippocampus

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Summary of Findings

Quian Quiroga et al. (2005)

- Tested 993 Units
  - 343 Single Units, 650 Multi-Units
- Response to 1+ Pictures in 132 (14%)
- Then Test 3-8 Variants
  - 51 of 132 Showed Invariant Representation
    - People, Landmarks, Animals, Food Items
- Representations are Abstract
  - Different Views of Subject
  - Photographs and Line Drawings
  - Pictures and Names

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Maybe there is a "*Grandmother Neuron*" After all!

- Sparse Neural Representation
  - Small Number of Units Active At Any One Time
- Psychophysical Linking Principle (Barlow, 1972)
  - Whenever two stimuli can be distinguished reliably...
  - …the physiological messages they cause in some single neuron would enable them to be distinguished with equal or greater reliability
- Knowledge Distributed Widely in Cortex
  - But Comes Together in Single Units
- Hippocampus as Index
  - Relates Memories to Each Other

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