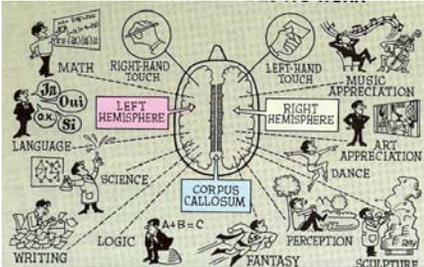
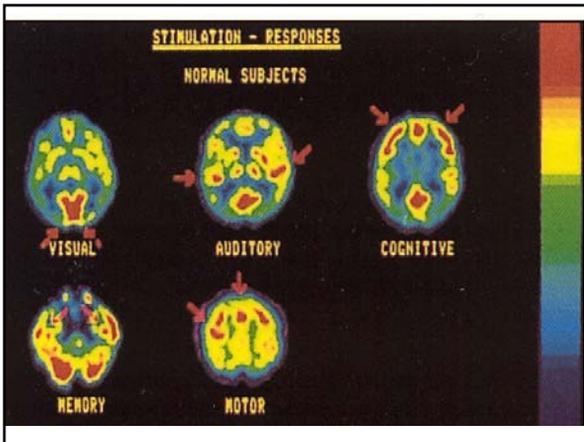


Hemispheric Specialization

- Right Brain = creative thinking
- Left Brain – logical, rational thinking
 - Simplification of Sperry's research
- No support for proposal of hemispheric dominance of complex tasks
 - Complex thought typically involves both hemispheres





Localization of Brain Function

- Complex cognitive processes
 - Involve both hemispheres
 - Involve many areas of the brain
- Localization
 - Left = language, right = spatial
 - General rule. Not a constant
- Brain “maps” are an approximation
 - Individual differences

Brandi Binder

- Right hemispherectomy to control epilepsy
- Lost muscular control
 - Left side of body
- Years of rehabilitation
 - A student
 - Excels at many “right brained” tasks
- Brain finds ways of compensating for damage



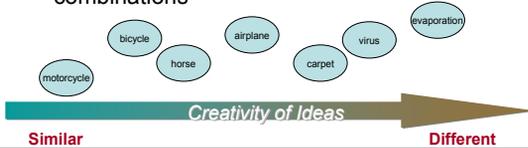
Poincare (1913)

- Mathematician, theoretical physicist, philosopher of science
 - “Genesis of Mathematical Creation”
- Mathematical reasoning
 - Order more important than constituent elements



Poincare: Mathematical Creation

- Creation comes from useful combination
 - “Invention is discernment, choice”
- Use analogy to pick fruitful combinations
 - Greater disparity = Greater creativity
 - Greater disparity = More useless combinations



Poincare: Mathematical Creation

- Choosing useful combinations to explore
 - Unconscious
- Potentially good ideas
 - Conscious
 - May be rejected



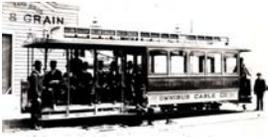
Creative Thought Processes

- Working on Fuschian functions (15 days)
- Coffee prevented sleep
 - Ideas “rose in crowds” and collided
 - Interlocking pair made a stable combination
 - Insight
- Wrote out results the next morning



Creative Thought Processes

- Went on Geographical excursion
 - Forgot mathematical work
- Entered omnibus
 - Insight
- Verified insight when he returned home



Creative Thought Processes

- Further work on Fuchsian functions
 - Several impasses
 - Resolved when engaged in other task
 - Verified later



Creative Thought Processes

- Illumination
 - Sign of long, unconscious work
 - Requires stopping conscious work
- “Fruitful” unconscious work
 - Preceded and followed by conscious work



Wallas (1926) & Helmholtz (1896)

- Examined retrospective accounts of creative problem solving
 - Identified similarities in processes
- Stages of creative problem solving
 1. Preparation
 2. Incubation
 3. Illumination
 4. Verification (Wallas)

Incubation

- No conscious or voluntary work on problem
 - Engaged in another task
- Unconscious, involuntary events occur
- Results in illumination / insight



Question: What Occurs During Incubation?

- Primary process thinking?
- Defocused attention?
- Cortical arousal?
- Right hemisphere activation?

Primary and Secondary Process Thinking

- Primary Process thinking
 - “Autistic,” associative, analogical, concrete images
 - Dreams, reverie, psychosis, hypnosis
- Secondary process thinking
 - Abstract, logical, reality-oriented



Primary Process Thinking

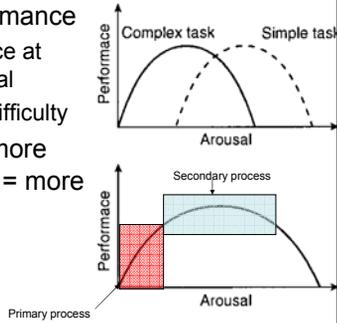
- Creativity (divergent thinking)
 - Regression to primary process thinking
 - Discover new combinations of elements
- Elaboration (convergent thinking)
 - Secondary process thinking

Defocused Attention

- Differences in attention = Differences in creativity
- More focused = less creative
- Less focused = more creative
 - More ideas considered at once
 - More novel combinations possible

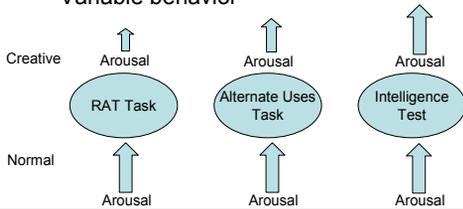
Cortical Arousal

- Arousal & performance
 - Best performance at moderate arousal
 - Varies by task difficulty
- Less arousal = more primary process = more creativity



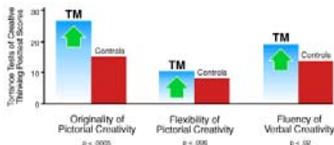
Cortical Arousal and Creativity

- Increased arousal
 - Stereotyped behavior
- Decreased arousal
 - Variable behavior



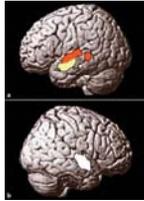
Cortical Arousal and Creativity

- Defocused attention
 - Good for ideation
- Focused attention
 - Good for elaboration



Right Hemisphere Activation

- Differential activation of hemispheres
 - Right hemisphere
 - Primary process
 - Global, parallel, holistic
 - Left hemisphere
 - Secondary process
 - Verbal, sequential, analytical



Demonstration of activity in separate auditory regions for processing phonetic information (red), speech intelligibility (yellow), and voice pitch and intonation (white): a, left hemisphere; b, right hemisphere.

Right Hemisphere Activation

- Increase right hemisphere activation
 - Hypnosis
 - Marijuana (low doses)
 - Music
- Increased performance on creativity tests

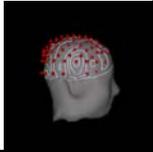


Creative Thinking (Martindale) Summary

- Analogy between unrelated ideas
 - Sudden insight
- Creative inspiration
 - Attention defocused
 - Associative thought
 - Many representations activated
- Processes
 - Low cortical activation
 - More right-hemisphere activation
 - Low frontal lobe activation

Brain Studies – “Demystifying Insight”

- Examine mechanisms underlying insight
 - Cognitive science paradigms
 - Brain imaging techniques
 - EEG, fMRI
- “Special Processes” vs. “Business as Usual” views



“Demystifying Insight”

- Special Processes View
 - Representational change theory
 - Reinterprets problem
 - Relaxes self-imposed constraints
- Business as Usual View
 - Progress-monitoring theory
 - Realize goal is unachievable with current methods
 - Select new approach
 - Solution now perceived as achievable

Insight Problem

A prisoner was trying to escape from a tower. He found in his cell a rope that was half long enough to permit him to reach the ground safely. He divided the rope in half and tied the two parts together and escaped. How could he have done this?



“Demystifying Insight” Stimuli

- Compound Remote Associates (CRA)
 - Characteristics of insight experience
 - Misdirected efforts
 - No knowledge of how impasse resolved
 - AHA! experience
- | |
|--------|
| BOOT |
| SUMMER |
| GROUND |
| |
| WORM |
| SHELF |
| END |
| |
| HAMMER |
| GEAR |
| HUNTER |

“Demystifying Insight” Predictions

- Involve problem solving and language comprehension processes
 - Initial processing
 - Strong activation in non-solution brain areas (LH)
 - Steep (LH) vs. shallow (RH) association hierarchies
 - Weak activation in solution brain areas (RH)
 - Re-representation
 - Integrating across non-dominant interpretations
 - Insight
 - Switch focus to unconscious activation and select

