L380.20
Understanding and serving users

Class 5:

Users as psychological beings (2)

the psychology of the user (phase 2 of the semester)

- How should we think of “users”?
- User as a psychological being
- Parameters of human information processing
- Emergence of skilled behavior
- Individual differences

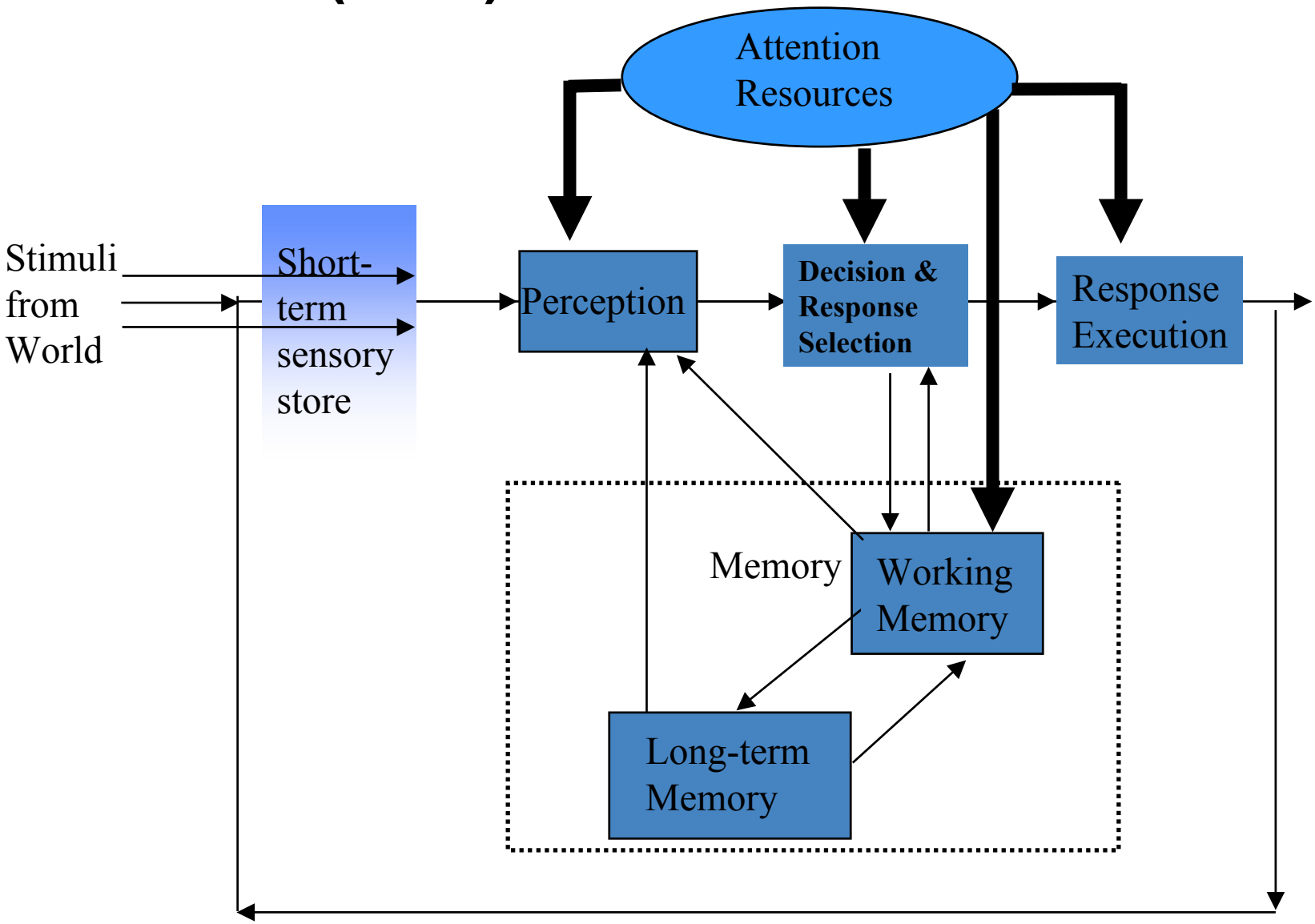
Four Levels of the User:

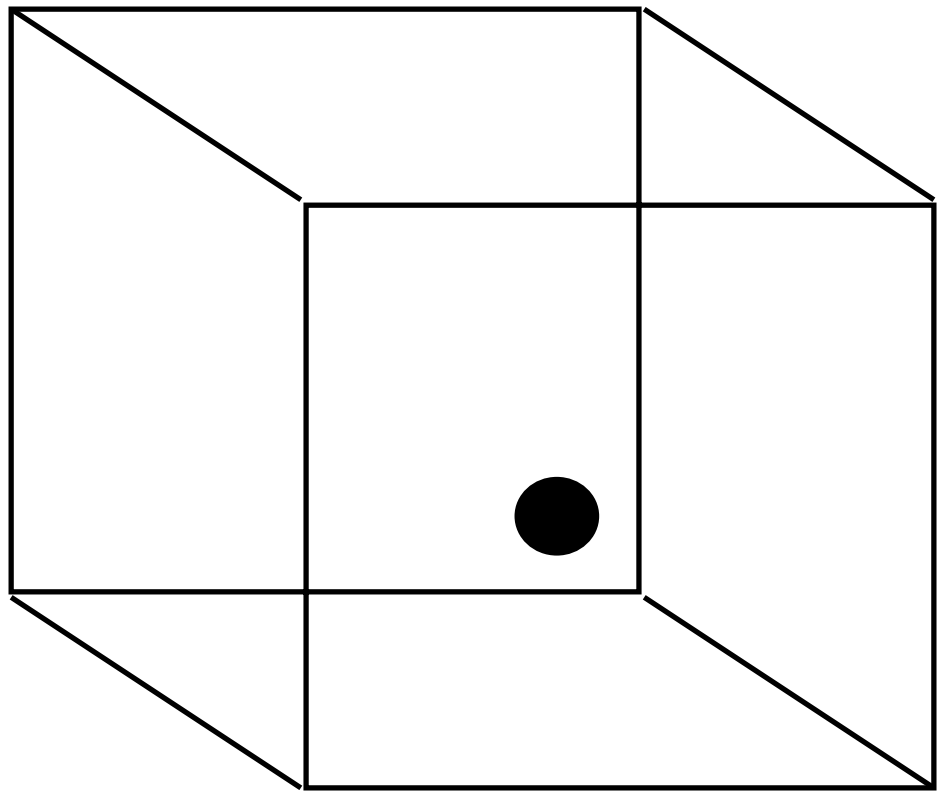
- Psychophysiological
  - Human as physical mechanism
- Perceptual
  - Human as sensing organism
- Cognitive
  - Human as thinking and feeling individual
- Social
  - Human as member of group, organization and culture

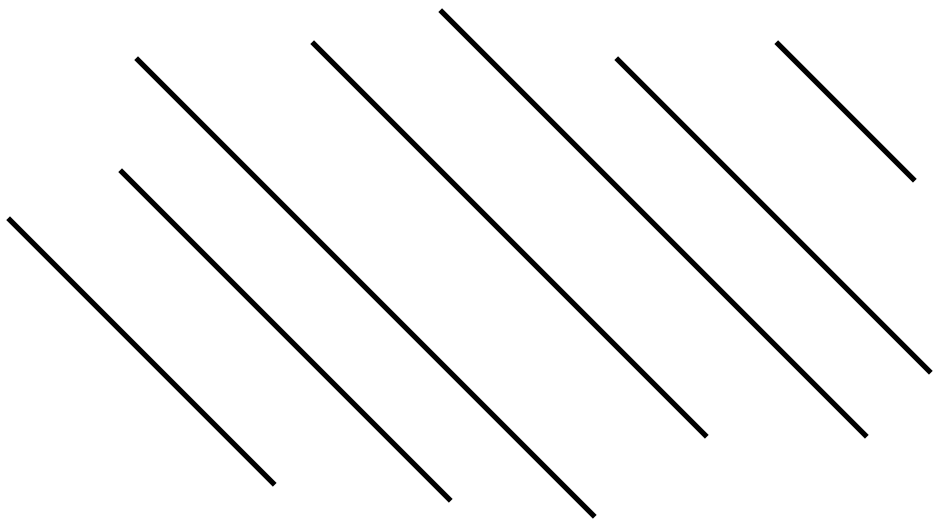
Basic properties of all users

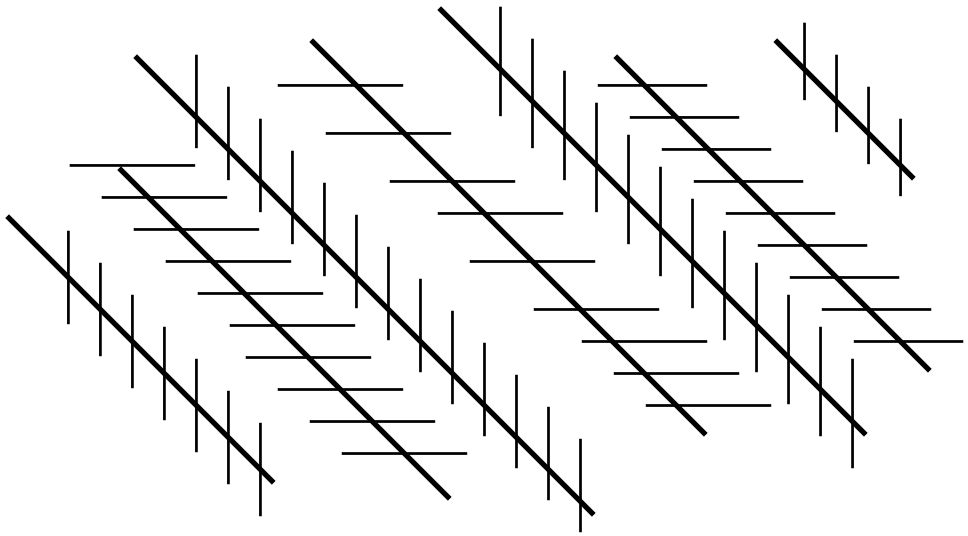
- Changes with experience
- Actively learns
- Limited attention
- Makes mistakes
- Models the system in their mind
- Remains unique
- Goal oriented

Wickens (1992)









So?

- Perception is active and interpretative
- Interpretation is based on the visual data (“bottom-up”) and experience (“top-down”)
- You can partly choose the interpretation
- Interpretation of regular stimuli quickly becomes automatic
- Interpretation of irregular stimuli is heavily knowledge-based

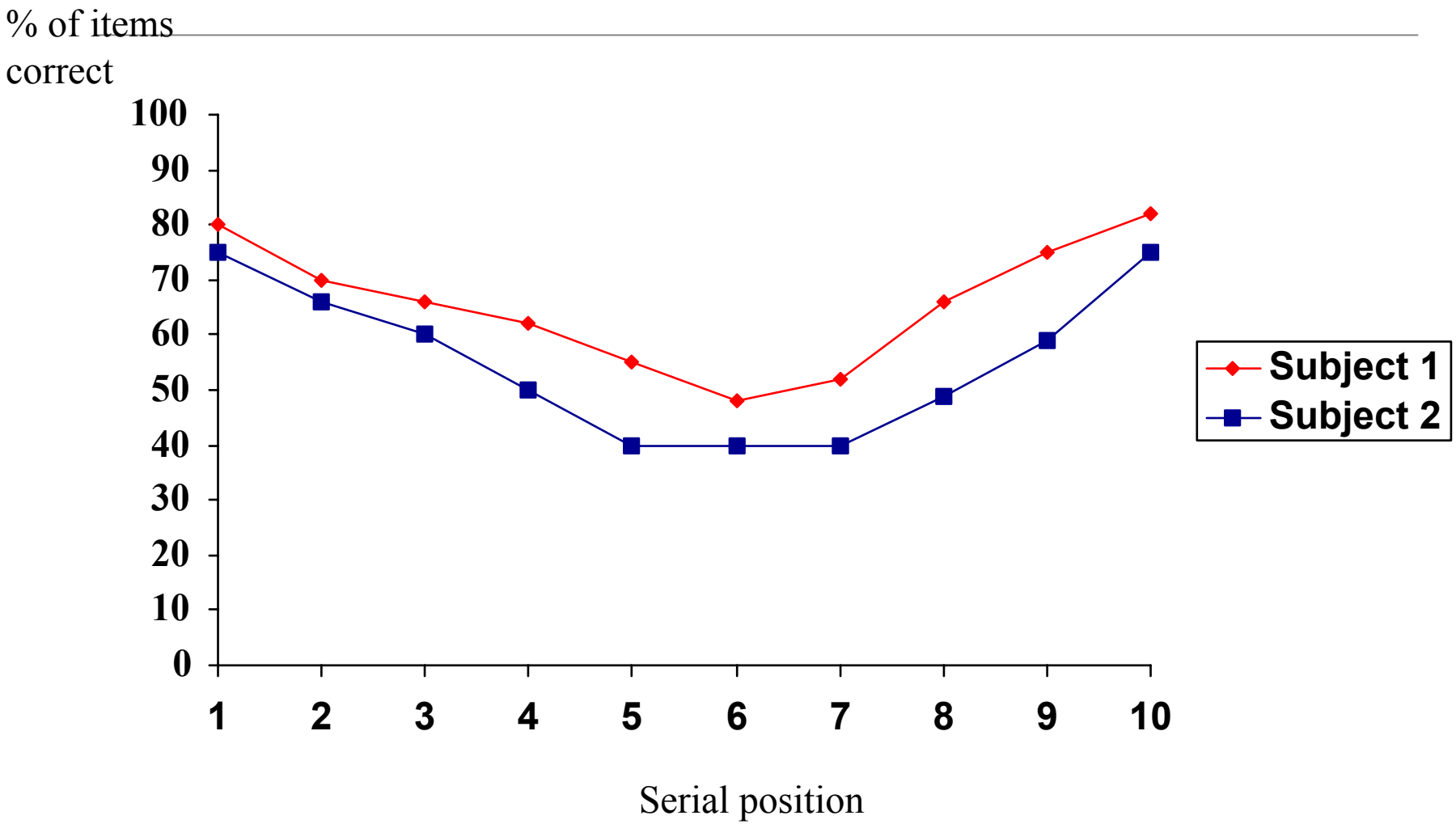
Implications for design:

- Designer *never* sees exactly what the user sees
- Experience and repeated use narrow the interpretations of users
- Differences among users can lead to radically different perceptions of the information space

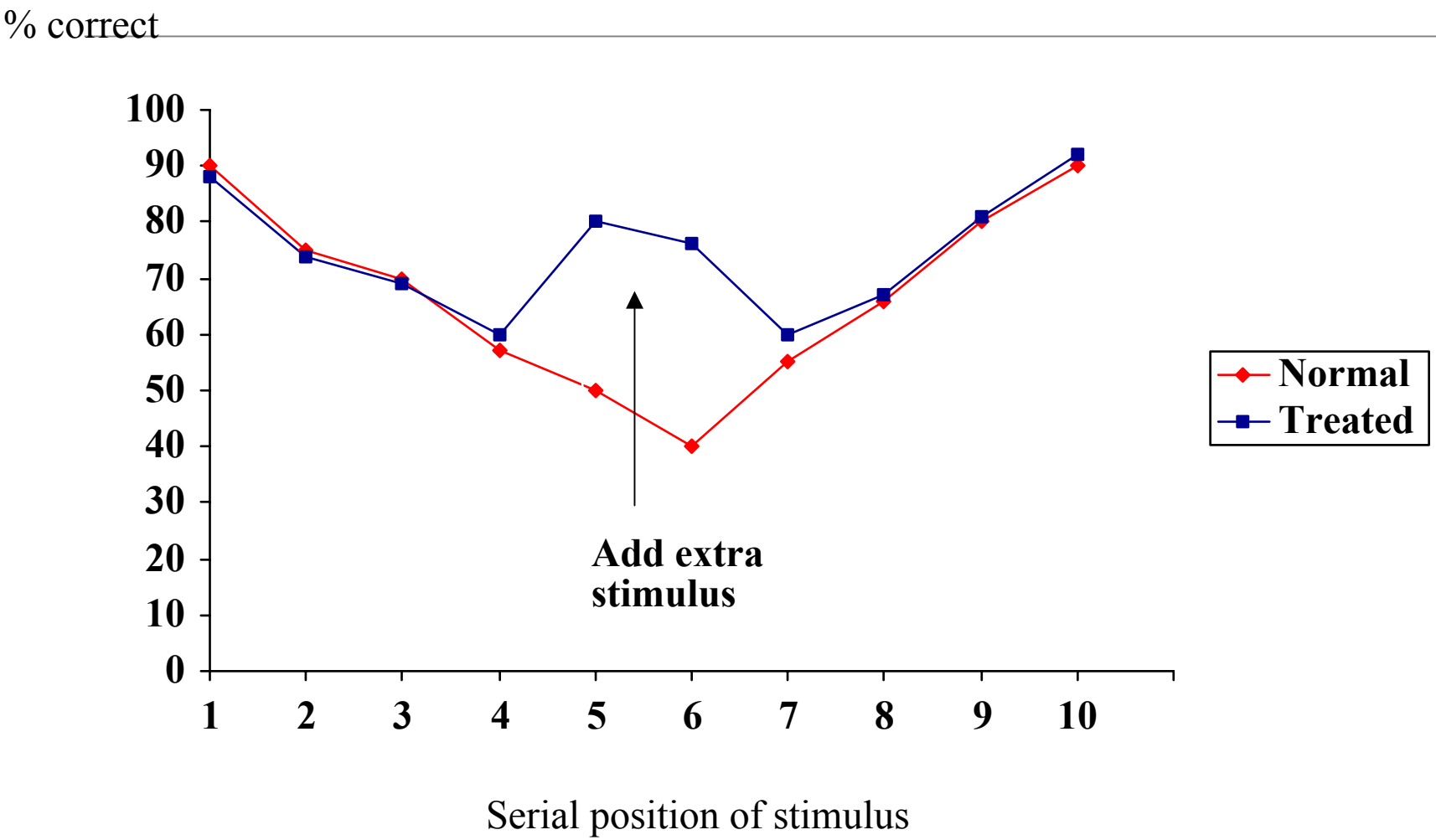
Working or Short-term memory (STM)

- Finite capacity buffer zone ($7^{+}/-2$ chunks)
- Limited duration (10-30 secs. decay rate)
- New information displaces old
- Rehearsal can maintain contents
- Chunking extends STM capacity

Primacy and Recency effects



Added cues improve recall



The value of chunking

- Expands capacity of working memory
  - The larger the chunk, the more you can recall

- Example :
  - S,U,N,I,B,M,M,A,C (9 units)

  - 3.1.7.8.5.4.3.2.7.2 (10 units)

The value of chunking for recall

- Become:
  - SUN, IBM, MAC (3 chunks)
  - 317- 854 3272 (1 chunk)
- Chunks must be meaningful for you

Meaningful chunking example

- Try to memorize the following:

onp, rph, dcb, sfb, itw,aso, src, aus, aat, t

Becomes more memorable as:

- npr, phd, cbs, fbi, twa, sos, rca, usa, att..

Searching for order

- Humans seek regularity and patterns in order to categorize and reduce processing effort.
- What is the sequence:

-- T T F F S S -- --

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In interactive terms...

- Chunking occurs for both cognitive and physical responses
  - Visual design
  - Command sequences
- Even where not meaningful, repetition can induce chunk formation
- Task....observe your own chunking!

Reading as Perceptual chunking

- Most words are fixated at least partially
- Less than 10 characters taken in per fixation
- Unusual words are fixated longer
- Skilled readers fixate and regress less

Left-right assymetry

- Eye Fixations biased towards start of words:

_he ____tion _f ____tions ___ies _n ___ding

As opposed to:

Th_ loca____ o_ fixa_____ var___ i_ rea____

Word shape

It is easier to read this part of the sentence than it is TO READ THIS PART BECAUSE ALL THE UPPER CASE LETTERS HAVE THE SAME SHAPE.

BuT iT cAn Be DiFfIcUlT tO rEaD tHiS tOO

So context matters.....

e.g, “Find the letter t” problem:

All week, the weather was amazing. Even flowers in the park withered and became leathery under the sun's thermal rays. Children wearing no clothes bathed near the southern shore of the lake, while their mothers discussed other problems of psychotherapy and anesthesia. Panthers in the zoo surveyed the scene in a fatherly manner. As shadows lengthened, the air became ethereal and clouds began gathering on the horizon. "Bother" mumbled Alice, who was one of the sunbathers. "I've hardly begun my thesis on the theory of medieval atheism, and I'd rather go and buy the earthenware jug I saw on Friday"

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what happens?

- More people miss the t's in 'the' than in the other words
- Implies users chunk some words automatically, & tend to move forward.
  - reading backwards minimizes this

(correct answer is 36)

Two types of cognitive processes (Shiffrin & Schneider 1977)

- Controlled
  - when you must think about what you are doing

    or how you are responding or reacting
- Automatic
  - when you don’t!

Controlled processing

- Requires attention
  - focus on relevant stimuli
  - ignore irrelevant ones
- Under conscious control
  - human is self-aware of effort
- Subject to limits of cognitive system
  - slows pace of processing

Automatic processing

- Minimal demands on attention
  - Action responses freely occur
- Unavailable to consciousness
- Fast
  - No decision making stage involved
- Difficult to unlearn

From controlled to automatic

- Most learned behaviors represent this shift
  - driving a car
  - learning to write/ type, play a musical instrument
  - routine activities of predictable form
- Except
  - If task is infrequently performed
  - Consequences of error are perceived to be costly
  - Or high knowledge-based task

Types of action

- Physical Skill based
  - simple responses to stimuli e.g., foot response to traffic signal change
- Rule based
  - Invokes decision making, e.g., deciding to turn right at red light.
- Knowledge based
  - Invokes planning and strategy, e.g., determining route over a new long journey

So Practice Works?

- Depends on task type:
  - Skill-based
    - High potential for automaticity
  - Rule-based
    - Can be automated with extensive training
  - Knowledge-based
    - Not automated

Automation in action

- Can I have a volunteer please…..

ZYP
QLEF
SUWRG
XCIDB
WOPR
ZYP
QLEKF
XCIB
SUWRG
ZYP
XCIDB
QLEKF
WOPR
QLEKS
WOPR
ZYP
XCIDB
SWRG
SUWRG
QLEKF
WITR
PYZ
XCIDB

YELLOW
BLUE
BLACK
GREEN
YELLOW
RED
BLACK
ORANGE
GREEN
RED
BLUE
YELLOW
GREEN
RED
BLUE
BLACK
GREEN
RED
BLUE
ORANGE
RED
BLUE
YELLOW

Recap:

- Perception is active
- There are limits on our capacity to process information
- We “chunk” regularly occurring information
- We seek to impose order on events
- Unusual stimuli slow processing

Getting info into memory

- Working memory fades quickly
- Long term memory lasts
- Learning is partly the process of transferring from WM to LTM

Let’s try making that transfer…..

- Listen to the following list of words.

BLANK SCREEN

North	John	dime	red	apple
South	Bill	quarter	blue	grape
East	Fred	nickel	green	pear
West	Charlie	dollar	yellow	banana

Common problems

- Who remembered ‘orange’?
  - Category errors are high, knowledge is activated by similar terms
- Who added new words?
  - What were they - similar or unique categories?

Thus

- Context matters
- Categorization helps
- Retrieval cues can aid memory
- Visual association can help
- Errors are systematic

- If you don’t know the structure, you are like a novice!

Memory and information usage

- Readers demonstrate a reliable spatial memory for location
  - E.g., can recall where specific image was located in terms of top left, middle right etc.
  - Spatial memory holds for screens too
    - Scrolling can seriously distort this

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Long-term memory

- Considered infinite in capacity
- Highly organized
  - Semantic networks
  - Schemata
  - Scripts

What kinds of knowledge must we have in memory?

- Declarative
  - knowledge of facts
- Procedural
  - Knowledge of how to do things
- Episodic
  - knowledge of event sequences

These vary in our ability to articulate them

At the intersection of LTM and STM

- At any one time we are using both
- LTM processing is largely automatic
- Recognition over recall
  - Recognition primes LTM
  - Knowledge ‘in the head’ or ‘in the world’ (Norman 1988)

Mental Models

- Assumed to be automatically created in working memory
- Dynamic representation of current condition of the world (or system etc.)
- Most noticeable in situations of incomplete or ambiguous information
- Incoming info (stm) meets activated schema (LTM) to form model

More than an image..

- A mental model supports *inference*
- Users naturally develop models of the applications they use
- Models are often incorrect, partial etc.
- May be functional (how do I operate this?)
- or Structural (how does this machine work?)
- Influenced by context

Each card has a number on one side and a letter on other

Given Rule:
If there is a vowel on one side,
then there is an even number on the other:

Which cards MUST you turn over to test the rule?

Here are 4 checks for purchases in a shop

<u>Given rule</u>
If purchase exceeds $20, then
check must be signed on back

Which checks do you turn over?

So?

- Model that is based on experience and familiar context is richer
- Rich model seems to support inference
- Logical and psychological reasoning are not the same!

Logic and psychology?

- Reeves and Naas propose the ‘social actors’ model
  - Users treat computers as social actors
  - Apply gender stereotypes
  - *Act* as if computer has ‘feelings’ but *know* that they do not…. “ethopoeia”

- “*The Media Equation*”
  Cambridge University Press, 1996

Attribution and flattery

- We believe flatterers speak the truth
- Being flattered makes us feel good
- We like those who flatter us
- We rate favorably the performance of flatterers

Fogg and Naas (1997) in readings

- Compared user ratings from three conditions of computerized feedback
  - Flattery (insincere praise)
  - Sincere praise
  - Generic
- Task: 20 questions with computer guessing user's target, then asking user for help

Flattery manipulation

Condition	Flattery	Sincere
Feedback	“Your question makes a useful distinction, well done”	Identical
Origin	User told the feedback was fake	Users told the feedback was based on comparison of their performance with others.

Results: flattery matters

- In both praise conditions users felt better about themselves, their interactions and the computers than they did in the generic (no praise) condition
- There was no difference between the two praise conditions!!!

Quote:

"Surprisingly, these beneficial effects occur even when users know that the computer's positive feedback has no bearing on their actual work; as this study shows, the beneficial effects of sincere praise and flattery from a computer were identical."

So what?

- Humans are not entirely rational beings
- Theories of human information processing are abstractions only, and set basic parameters.
- Our decisions and judgments are based on many factors of which even we ourselves are not always aware

Aesthetics and usability (Tractinsky, 1997)

- Does interface ‘beauty’ matter?
- Are interfaces rated high for ‘aesthetics’ also rated high on ‘usability’
- 3 experiments tested this relationship
- So is usability really only screen-deep?

Experiment 1

- 104 students rated 26 images of ATM
  - scale of 1-10
  - Aesthetics : “How beautiful is this interface?”
  - Usability : “How usable does it appear to be?”
- Aesthetics: range= 3.5 - 8.5; mean=5.9
- Usability: range= 2.7 - 8.5, mean=5.4
- Correlation: r=.921 (p<.01)

Experiment 2

- Could correlation be an experimental artifact resulting from method used?
- Repeat study, 84 new users, ratings of usability gathered separately from aesthetics
- Correlation $r=.832$ ($p<.01$)

Experiment 3

- Now try it on a computer screen
- Presentation randomized, duration under user control
- Ratings on same 1-10 scales
- Correlation between beauty and usability:

  $r=.920$ ($p<.01$)

So what?

- Interface “beauty” affects initial estimate of usability (before use)
- Does apparent usability correlate with experience in use (‘true’ usability)?

Aesthetics and user performance -Dillon and Black (2000)

- Took 7 interface designs with known user performance data
- Asked 15 similar users to rate “aesthetics” and “likely usability” of each alternative design
- Compared ratings with performance data

Rankings of 7 interfaces

Interface	Performance	Preference	Rating of Aesthetics	Perceived usability
A	2	4	1	3
B	7	5	1	1
C	6	6	4	2
D	1	1	3	4
E	4	2	6	5
F	3	3	5	3
G	5	7	7	7

R=.85 R=.83

Correlation between aesthetics and performance = 0

Follow up study:

- 30 users
- Rated the aesthetics, likely usability
  - Correlation held
- Ss then used 4 web search interfaces
- Rated aesthetics and usability again again
  - Correlation between aesthetics/usability still
- No correlation with performance!

So what?

- Users respond to interface beauty
- Users do not predict their own performance (process and outcome) accurately
- Designers cannot usefully predict user response through introspection, any current theory of interaction, or asking their colleagues!