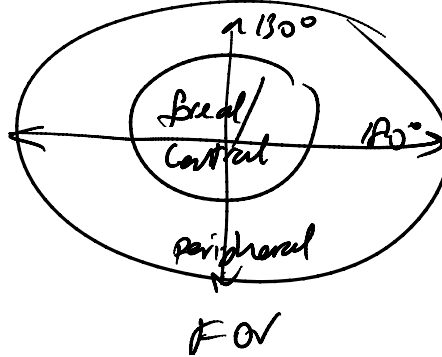


Visual Attention → the way the back is laid out:

What is it?

- denoting "mental faculty" or capacity to a region of interest.
- visually concentrating on something
- see William James
- analogous to auditory sense: listening to orchestra, "pick out" a specific instrument, by piccolo



"high-level" vision - cognitive functions

"low-level" vision - neural functions

- humans are "finite beings" in the sense we cannot do all things at once
- G.A. Miller pointed in a paper in 1956 that our capacity for info processing is roughly bounded by the "magic number" 7 ± 2
 - based on aural experiments
 - listening to strings of numbers
- just as auditory sense is limited in its capacity
so is vision — scene perception is performed piecemeal (in small pieces, piecemeal)
not in toto (as a whole)
↓
goes against Gestalt psychologists' idea of holistic perception (sort of)
- piecemeal ^{visual} perception is a consequence of biology — construction of our eyes \Rightarrow eye movements
- Key concept: scene integration — essence of an open problem

Scene Integration

- how is a "mental picture" of the visual scene constructed in the brain
- not very well understood, but one thing is clear: there is no "picture" or "pixelated", or "camera-like" image representation - rather analogous to a camera eye

- Chronological review of visual attention:
focuses on two qualitative components: "what" & "where"

detailed
inspection of
a region of
interest
(what is this?)

orienting of
attention
(where does attention
go next?)

- Note: my idea of the what
tends to coincide with
focal vision which isn't
necessarily correct

- but we can dissociate
attention from focal point

- von Helmholtz:

viewed visual attention as mental mechanism
of visual perception

- mainly concerned with "the choice" of v.o.a

- he noted that attention can be:

- consciously controlled (voluntary)

- given to peripheral objects without moving eyes

- William James:

- believed attention to be more covert - a
internal mechanism akin to
imagination, anticipation, thought

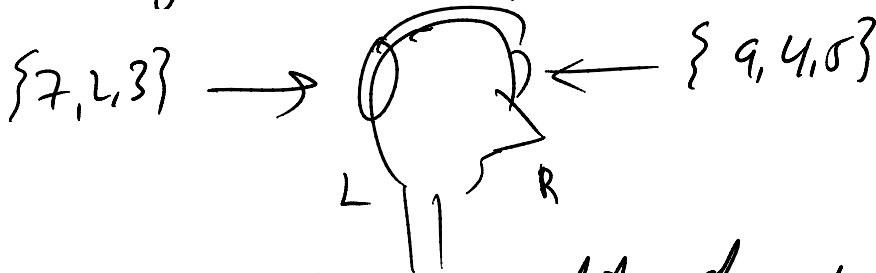
- defined attention mainly in terms of "the what",
i.e. identity, meaning, an expectation
associated with focus of attention

↓
focal vision

- favored active & voluntary aspects of attention,
but recognized its passive, reflexive,
involuntary qualities

- both views of attention (what/where) are not mutually exclusive
 - { what ~ focal vision (James)
 - { where ~ peripheral vision (Vandl.)
- gross oversimplification, but tends to be useful in practical sense, e.g. applied work

- Broadbent (1958)
 - sees attention as a "selective filter"
 - responsible for filtering info to sensory channel of limited capacity



- simultaneous presentation of spoken messages
- listeners reported {7, 2, 3, 9, 4, 5} or {7, 4, 5, 7, 2, 3} with no interweaving
- concluded that ^{responses} info enters in parallel but is selectively filtered (serially?)

- Deutsch & Deutsch (1963)
 - argued against selective filter, proposing that all sensory messages are perceptually analyzed at highest level
 - rejected selective filter & limited capacity theory
 - reasoned that the filter would need to be at least as complex as limited capacity system itself (hence why the need for a filter?)
 - instead proposed central structures with preset "importance weights" which determined selection
- Broadbent's selective filter is similar to von Helmholtz's "where"
- Deutsch & Deutsch's importance weights were similar to James' expectancy & "the what"

- 1960s: Anne Treisman brought both concepts together into one theory of attention containing two components
 - attention filter (similar to Broadbent's)
 - followed by (in the info processing stream)
 - structures referred to as "dictionary units"
 - these process verbal & nonverbal messages
 - certain thresholds linked to importance, relevance, contrast
- her work is important because it unified complementary models of attention

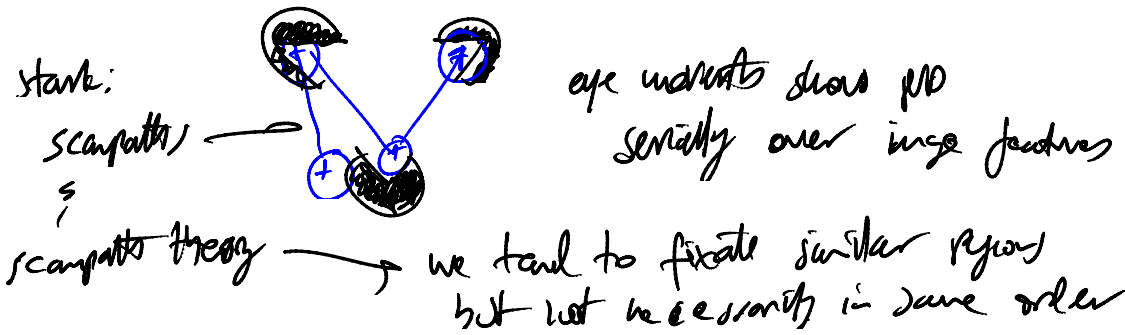
- Eye Tracking showed up around 1969: 1971

Yanovskiy ———
Nelson & Hawk

- eye tracking helped cast
doubt on Gestalt hypotheses

↓
Lawrence
Stark, was
at UC Berkeley

↓
various illusions, e.g.



- saccades: being serial in nature, tend to support the "what" since they show the body under foveal inspection

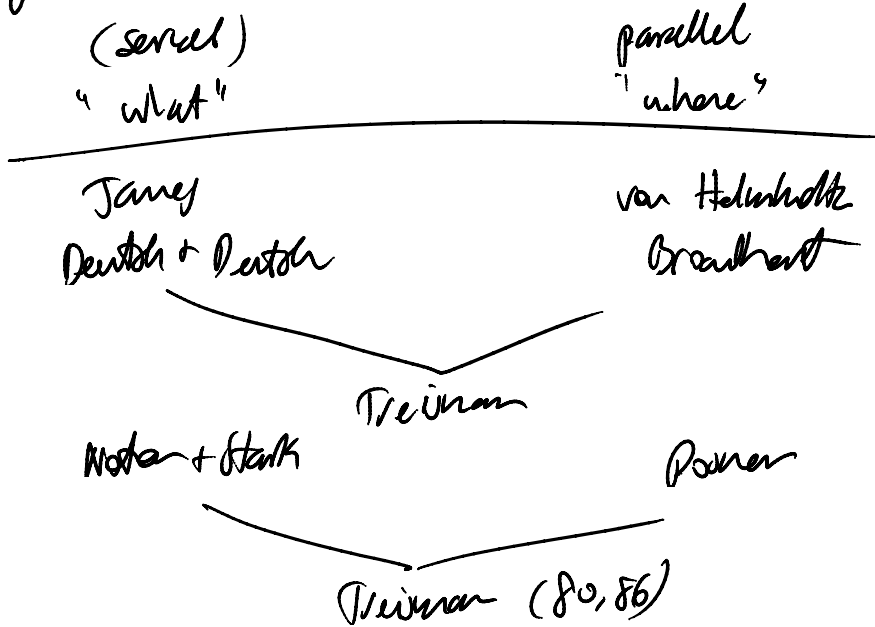
- In contrast, Posner (1980 at MIT) suggested that orientation of attention (the where) is done in parallel

- Posner's "spotlight" of attention —

- limited in spatial extent

- but dissociated from the fovea

- a kind of finch



- Treisman provided Feature Integration Theory (FIT) of attention: "glue" integrating separate features in particular location & how the conjunction, i.e. the object, is perceived as a unified whole

- claimed that attention selects features from a master map of locations showing where feature boundaries are but not what those features were

⇒ master map specifies where, not what

- map encodes ripe & useful properties of the scene, such as color, orientation, size distance (stereo)