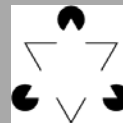


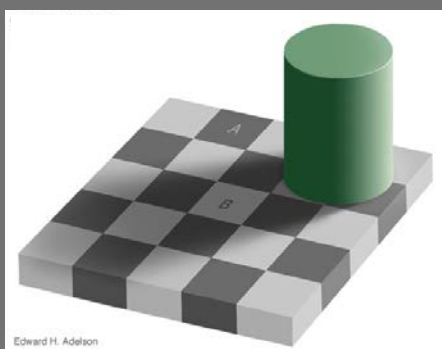
## Neurociencia de Sistemas

- Clase 1. Introducción
- Clase 2. Registros extracelulares y Spike sorting.
- Clase 3. Procesado de información visual.
- Clase 4. Percepción y memoria.
- Clase 5. Decodificación - Teoría de la información.
- Clase 6. Electroencefalografía - Análisis de tiempo-frecuencia y Wavelets.
- Clase 7. Potenciales evocados - Análisis de ensayo único.
- Clase 8. Dinámica no-lineal - Sincronización.

## Percepcion visual



## Visual illusion

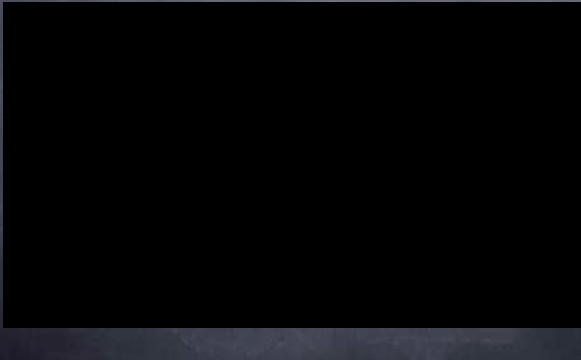


Edward H. Adelson

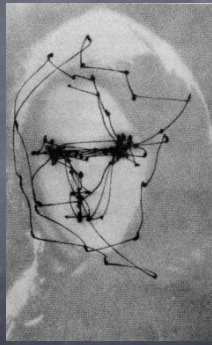
## Change blindness



## Atencion selectiva

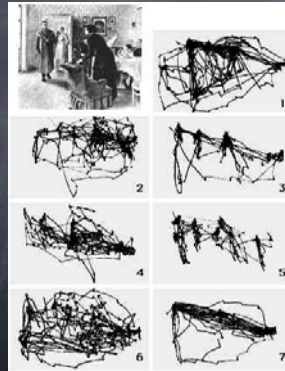


## Fijaciones y Sacadas



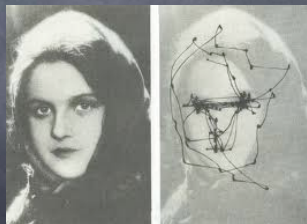
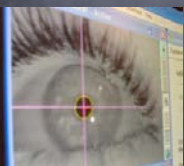
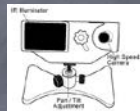
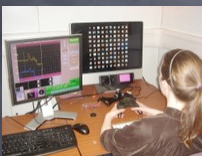
Yarbus, 1967

## Saccades depend on the task

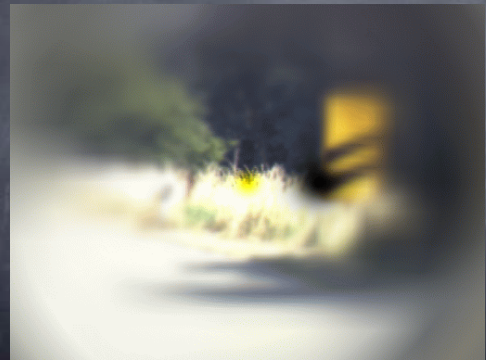


1. Free examination of the picture.
2. Estimate the material circumstances of the family in the picture.
3. Give the ages of the people.
4. Surmise what the family had been doing before the arrival of the "unexpected visitor"
5. remember the clothes worn by the people.
6. remember the position of the people and objects in the room
7. estimate how long the "unexpected visitor" had been away from the family

## Eye tracker



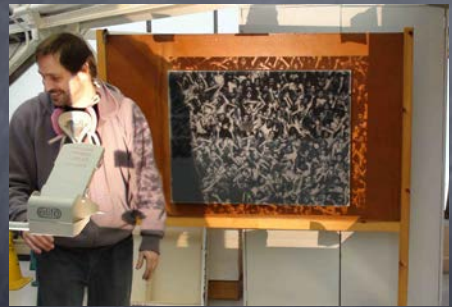
## Retinal sampling



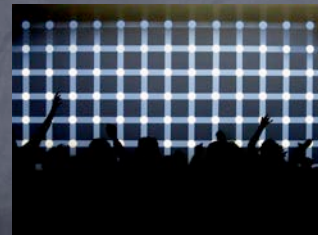
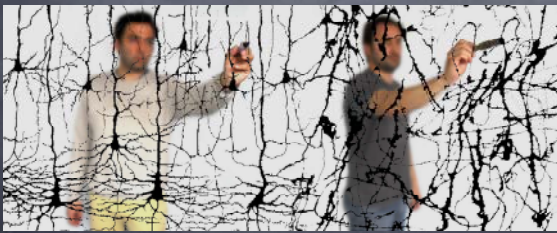
Mariano Molina - El centro de las miradas

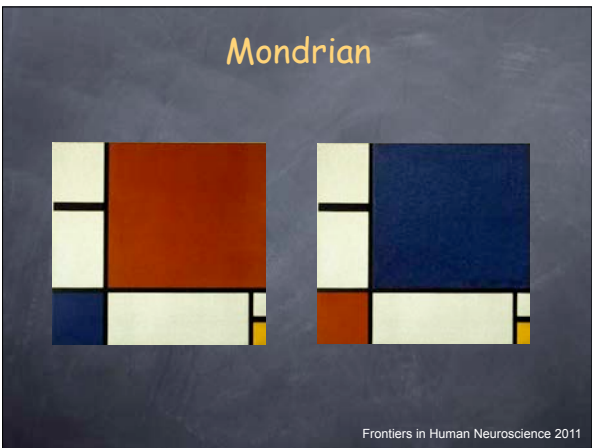
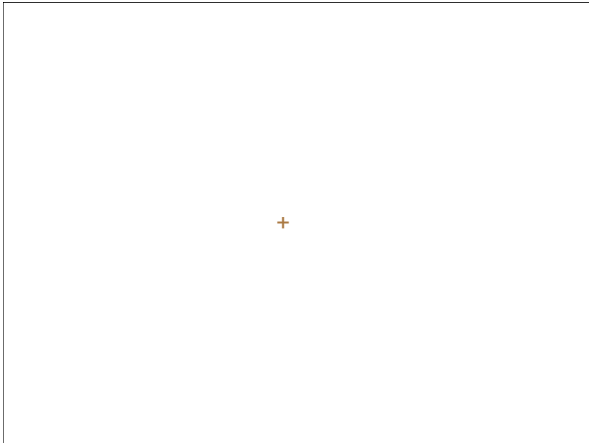


Mariano Molina

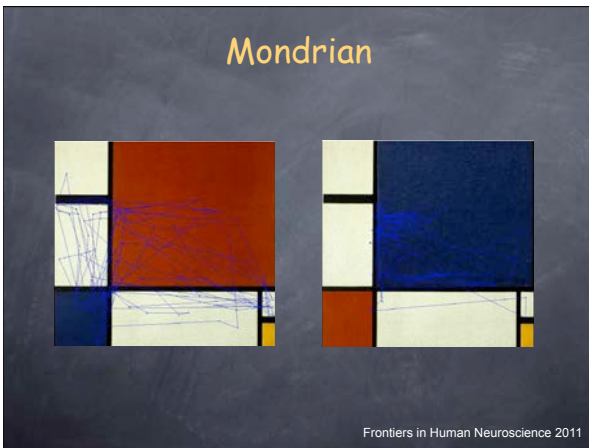


<http://projects.beyondtext.ac.uk/perceptionandwellbeing-fo/index.php>

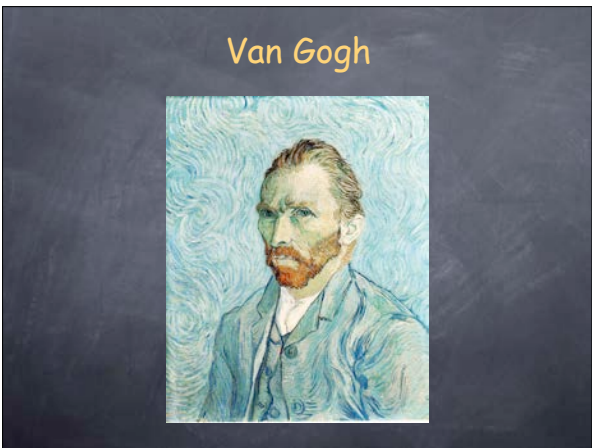




Frontiers in Human Neuroscience 2011



Frontiers in Human Neuroscience 2011



## Van Gogh

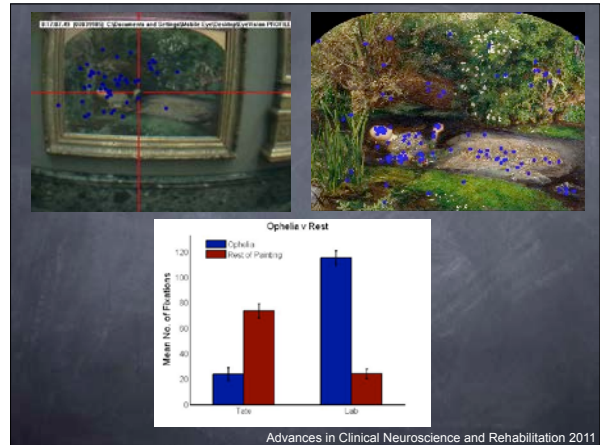


## Tate Britain

### Ophelia - Millais



### Ophelia - Millais



Advances in Clinical Neuroscience and Rehabilitation 2011

## Magic

## Miguel Angel Gea



### Miguel Angel Gea



Current Biology 2016

### Miguel Angel Gea



### Miguel Angel Gea



Current Biology 2016

### Paul Daniels

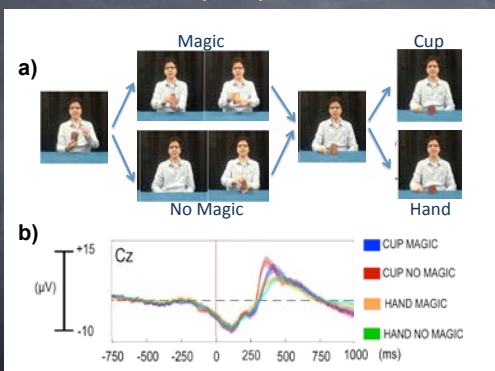


### Hugo Caffaratti



Psychophysiology 2016

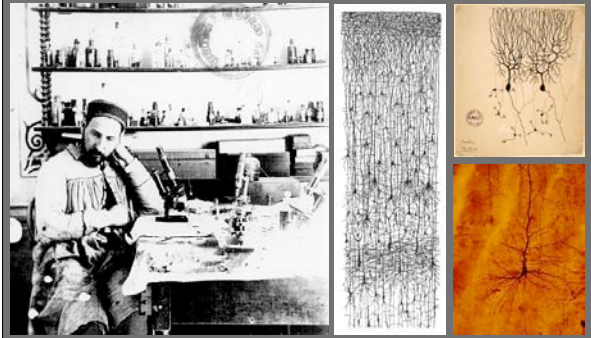
### Chop cup trick



Psychophysiology 2016

un poco de neurofisiologia...

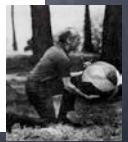
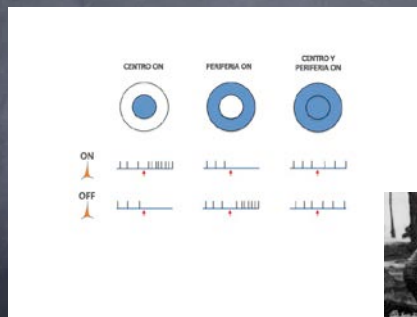
## Santiago Ramon y Cajal



## Extracellular recordings



## Retina - Organizacion centro-periferia

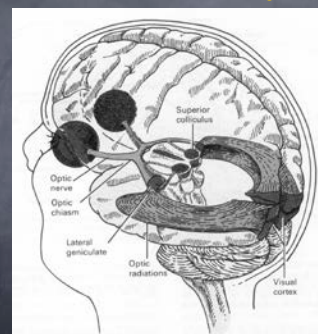


Steven Kuffler

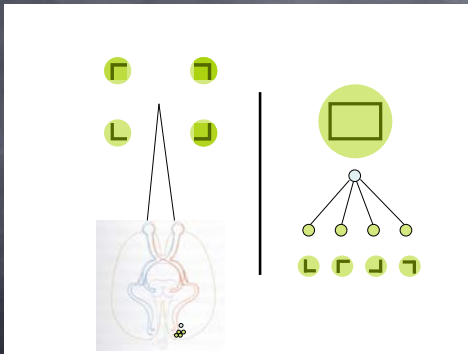
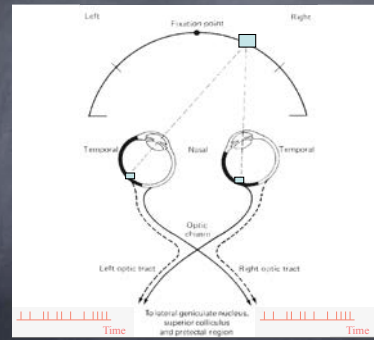
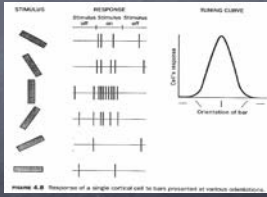
## Constraste



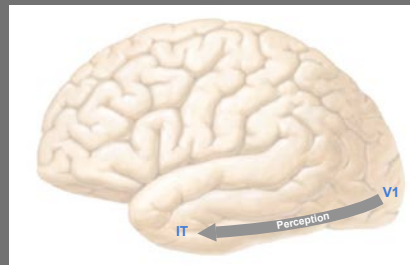
## Visual pathway



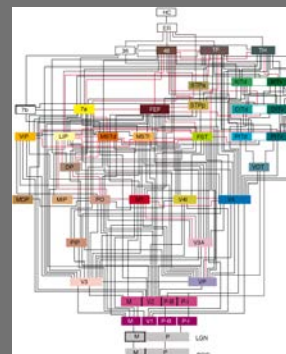
# V1 - Hubel and Wiesel



# Ventral visual pathway



# IT - Charles Gross

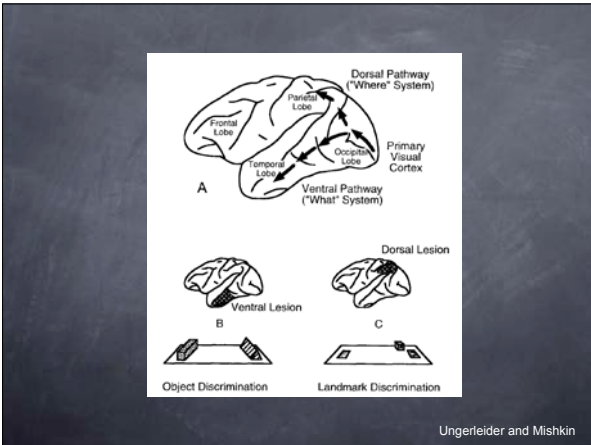




Visual area	Receptive Field	Optimal stimulus
IT		
V4		
V1		
LGN		
Retina		

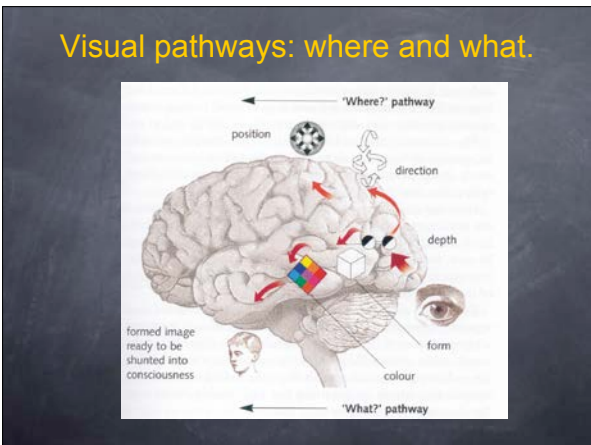
- William James: Pontifical neurons
  - Sigmund Freud: Phi and Psy neurons
  - Charles Sherrington (1940): Million-fold democracy 
  - Jerzy Konorski (1967): 
  - Jerry Lettvin (1969): 
  - Horace Barlow (1972): 
- Gross Neuroscientist 2002  
Scientific American 2013

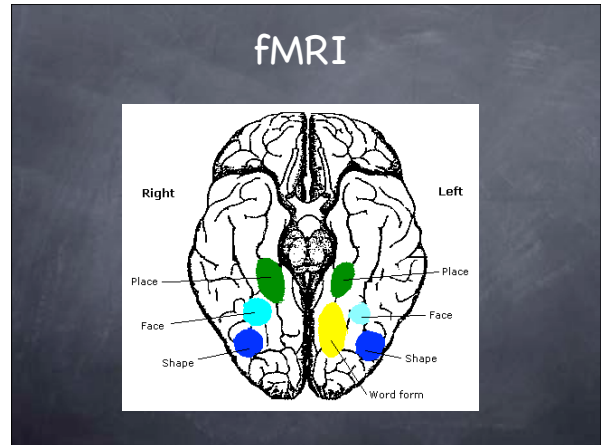
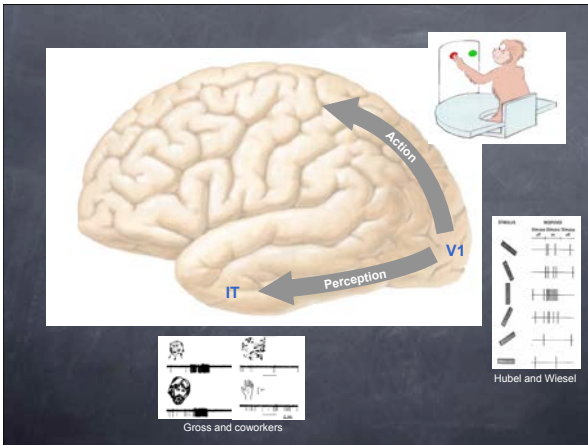
# Dorsal and ventral visual pathways



**Figure 2**  
The diagram at the top of this figure illustrates the apparatus that was used to test sensitivity to orientation in the patient DF. The slit could be placed in any one of a number of orientations around the circle. Subjects were required either to rotate a hand-held rod to match the orientation of the slit or to "point" the rod from the center to where the slit was. The pointer hole to the right of the figure illustrates the orientation of the hand-held rod on the pointing and matching task and the visuomotor pointing task for DF. In an age-matched control subject, the correct orientation on each trial had been retained in memory from that although DF was unable to match the orientation of the rod to that of the slit in the pointing and matching task, she did retain the rod in the correct orientation so she attempted to insert it into the slit on the pointing task.

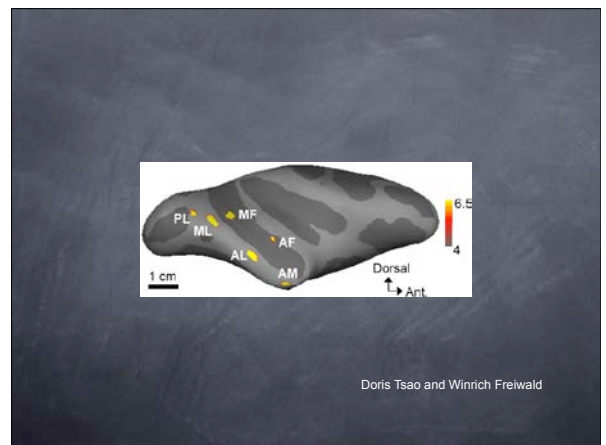
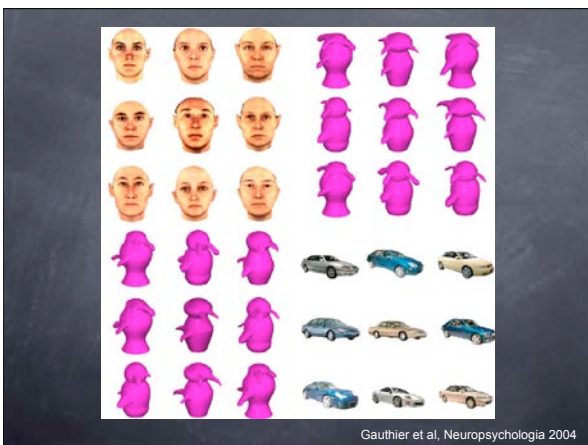
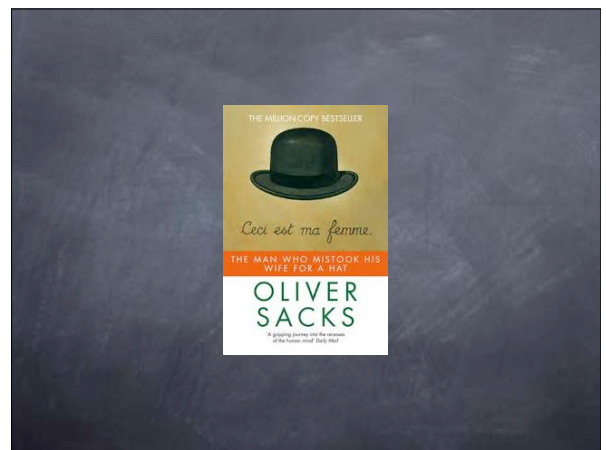
Milner and Goodale





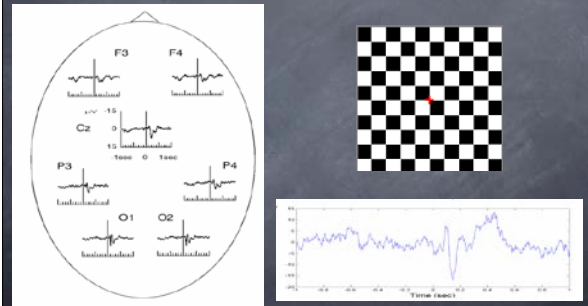
### Visual processing of faces

- Prosopagnosia (Sacks, Farrah, Rossion)
- Innate or acquired? (Gauthier vs Kanwisher)
- Face patches (Tsao and Freiwald)
- Why right dominance? (Berhmann)
- Invariance – grandmother cells?

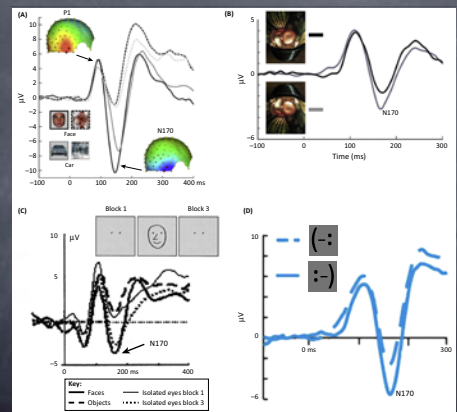
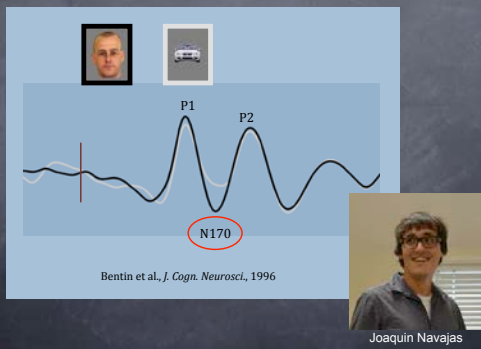


# EEG

## Visual Evoked Potentials - P100

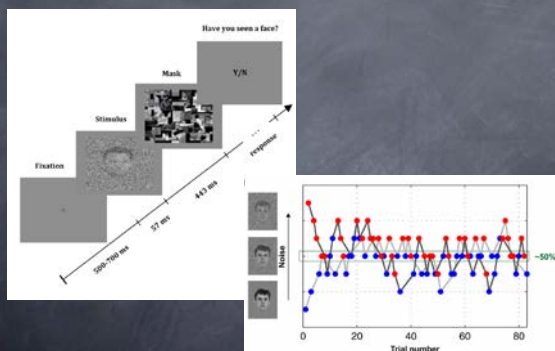


## N170 - Face responses

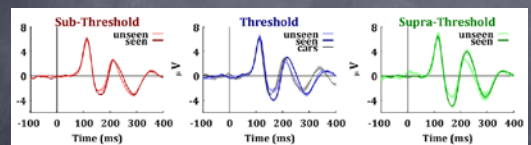


Rossion, TICS 2014

## Paradigm - Responses to exactly same stimuli



Navajas et al., J. Neuroscience 2013



Navajas et al., J. Neuroscience 2013

### **Clase 3. Procesado de información visual.**

Inferotemporal Cortex and Object Vision. K. Tanaka.  
Annual Review of Neuroscience 19: 109-139; 1996 (*un review clasico*)

Visual Object Recognition. N. Logothetis and D. Sheinberg  
Annual Review of Neuroscience 19: 577-621; 1996 (*otro review clasico*)

#### **Selectivity and invariance for visual object perception.**

Ison M and Quian Quiroga R  
Frontiers in Bioscience 4889-4903, May 1; 2008.

**Que es la memoria?**  
Rodrigo Quian Quiroga.  
Paidós, 2015.

**Borges y la Memoria.**  
Rodrigo Quian Quiroga, Sudamericana, 2011.

Vision Science. Palmer (*un clásico*)

Vision. David Marr (*otro clásico, sobre todo para modelado*)