Neuroscience 201C: Vision Two

Recognizing an Object

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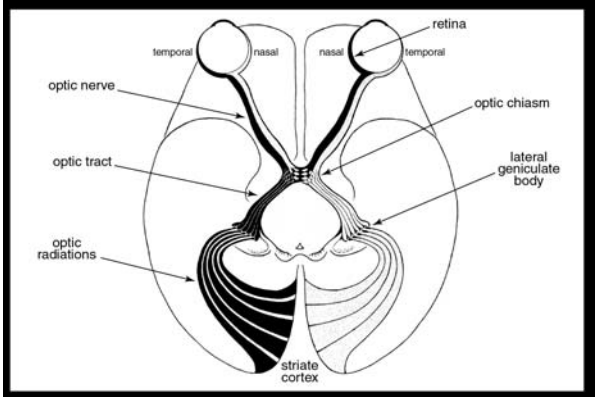
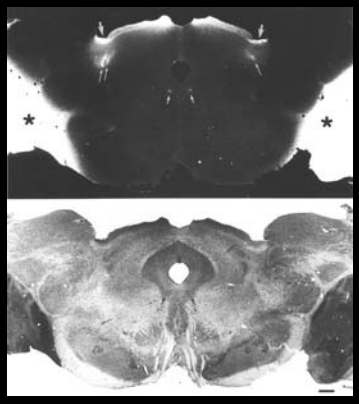
21 February 2016

Hemi-decussation of Retinal Ganglion Cell Fibers
at the Optic Chiasm shown by Autoradiography



Autoradiograph

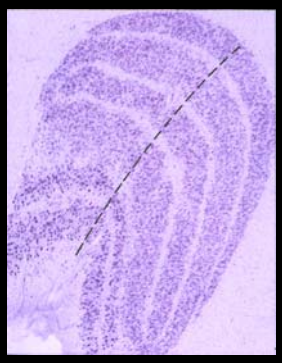
Nissl Stain



Macaque LGN in Nissl Stain

Note 2 ventral magno laminae and 4 dorsal parvo laminae

Dashed line = representation of the horizontal meridian

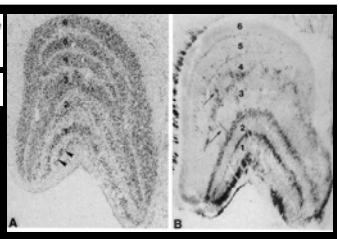


A Neurochemically Distinct Third Channel in the Macaque Dorsal Lateral Geniculate Nucleus

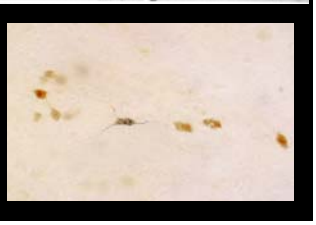
Stewart H. C. Hendry* and Takashi Yoshioka

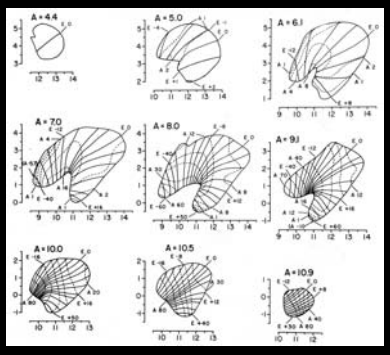
SCIENCE • VOL. 264 • 22 APRIL 1994

α subunit of type II calmodulin–dependent protein kinase



Koniocellular Pathway



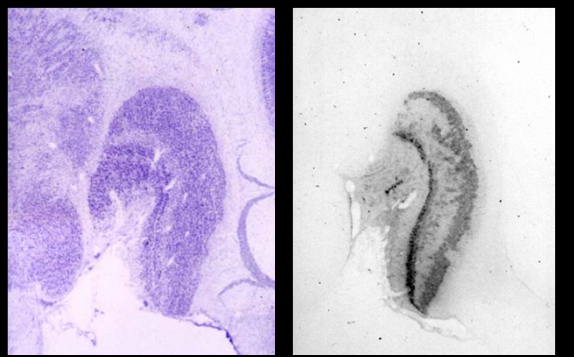


Visual Hemi-Field Representation in the Macaque LGN
A = Anterior, A = Azimuth, E = Elevation (Malpeli & Baker, 1975)

Contralateral to Injected Eye

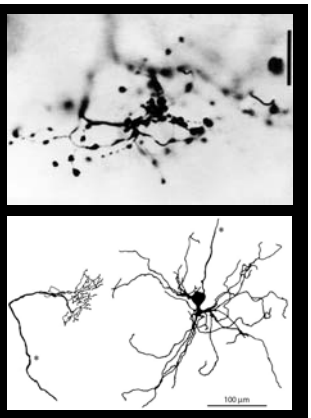
Ipsilateral to Injected Eye

Macaque LGN Autoradiographs after [^{3}H]Proline Eye Injection



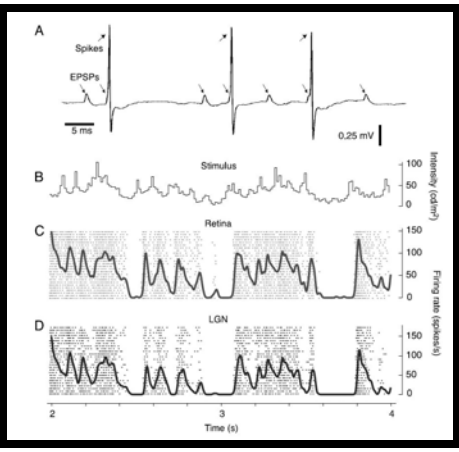
In the squirrel monkey, the dorsal 4 parvo layers are fused, and laminae 3 and 4 are fragmented and interdigitated.

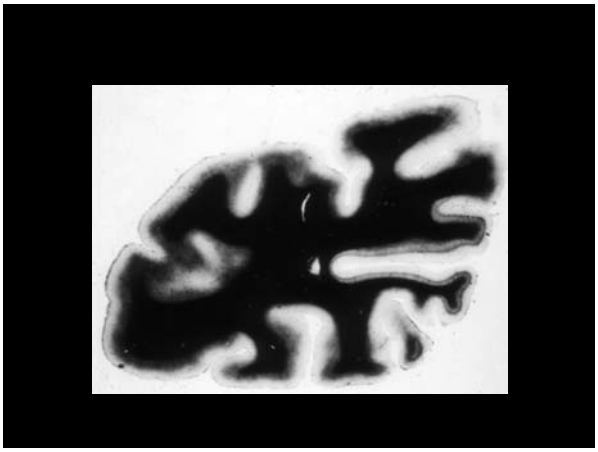
Single Optic Tract Fiber Axonal Terminals in a Parvo LGN Lamina

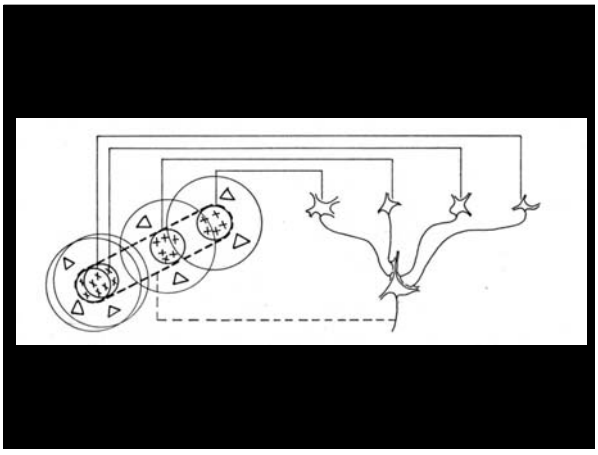


Conley & Fitzpatrick, 1989

Retinal Afferent & LGN Parvo Cell to Scal

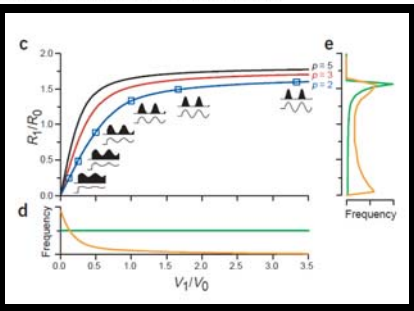






The contribution of spike threshold to the dichotomy of cortical simple and complex cells

Nicholas J Priebe[1], Ferenc Mechler[2], Matteo Carandini[3] & David Ferster[1]



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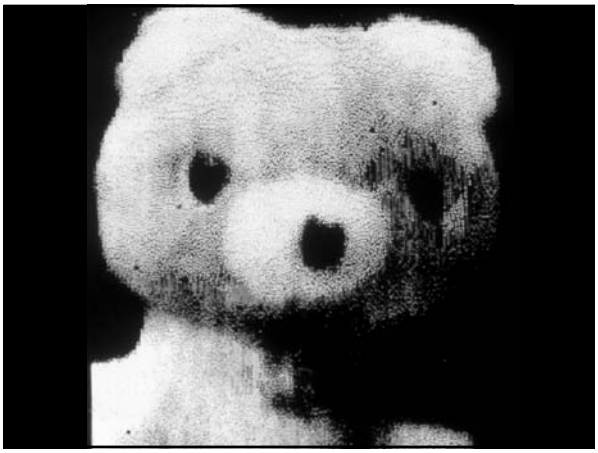


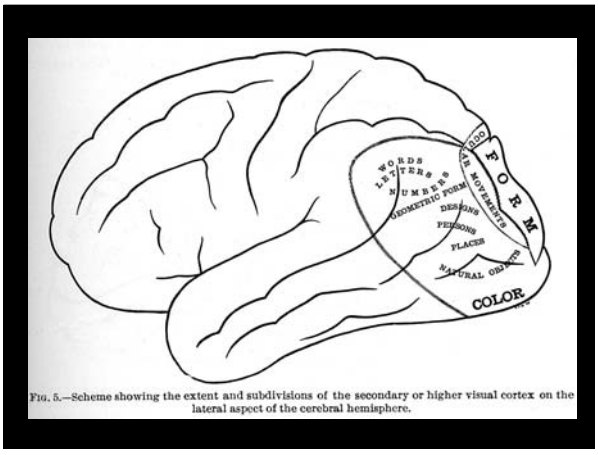
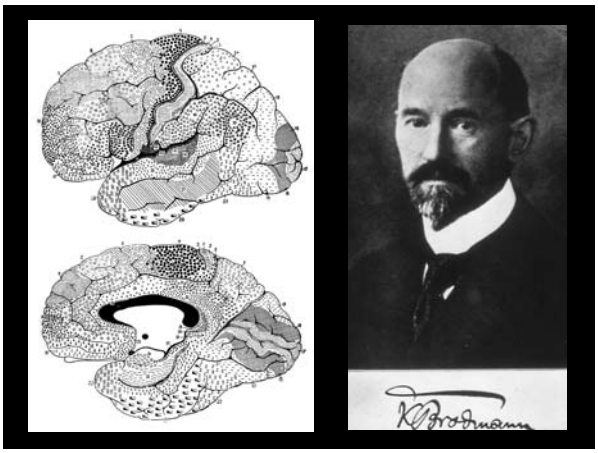
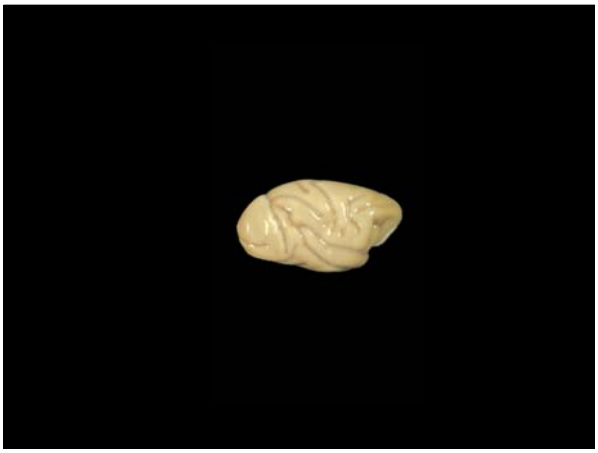
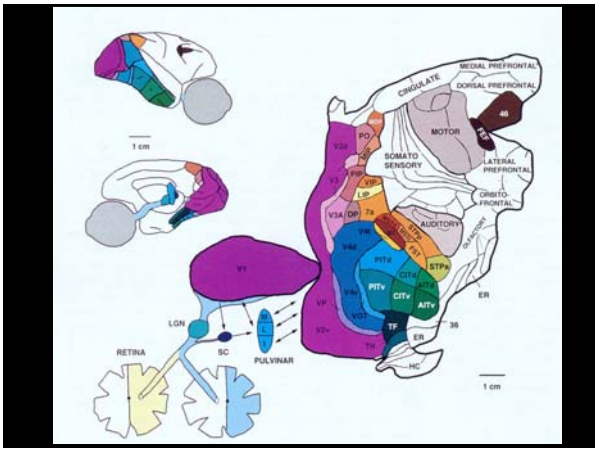
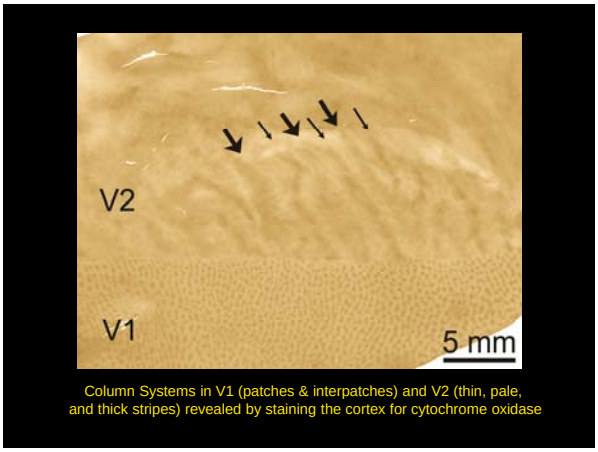


FIG. 5.—Scheme showing the extent and subdivisions of the secondary or higher visual cortex on the lateral aspect of the cerebral hemisphere.

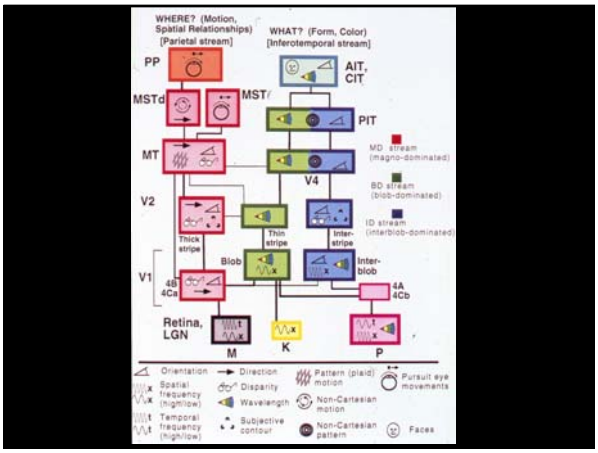


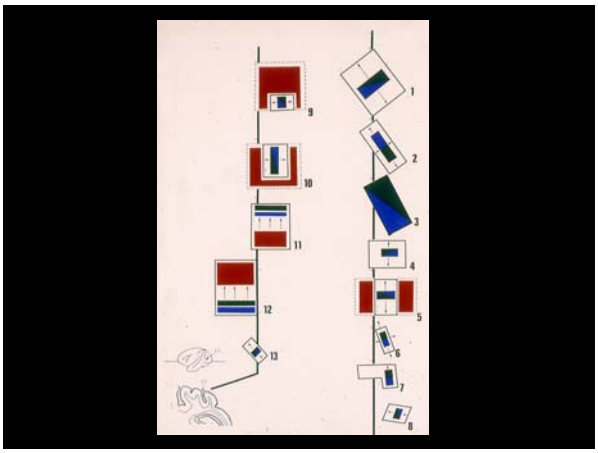


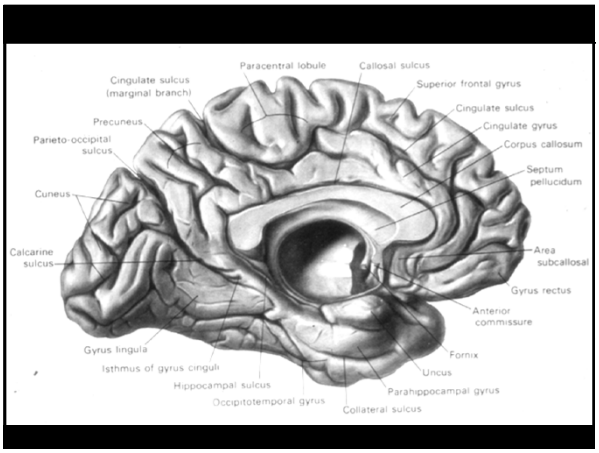


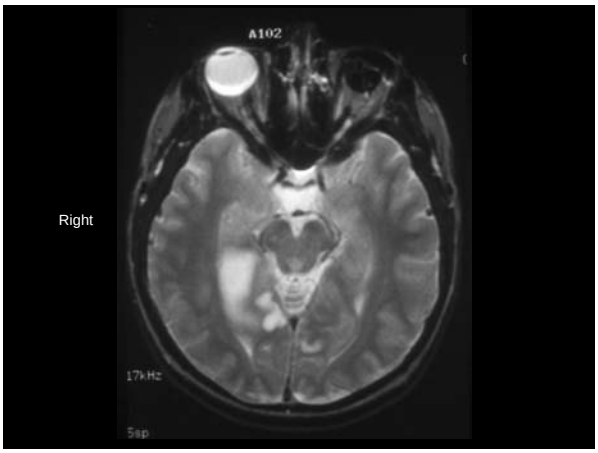


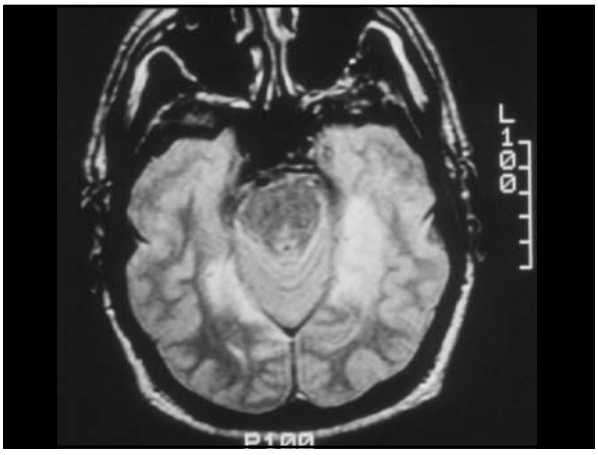
Column Systems in V1 (patches & interpatches) and V2 (thin, pale, and thick stripes) revealed by staining the cortex for cytochrome oxidase

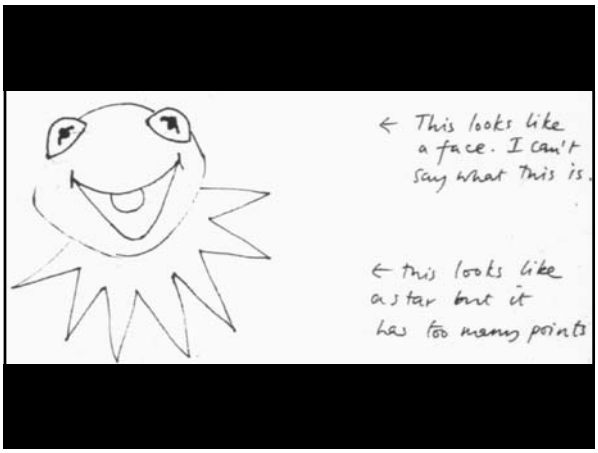


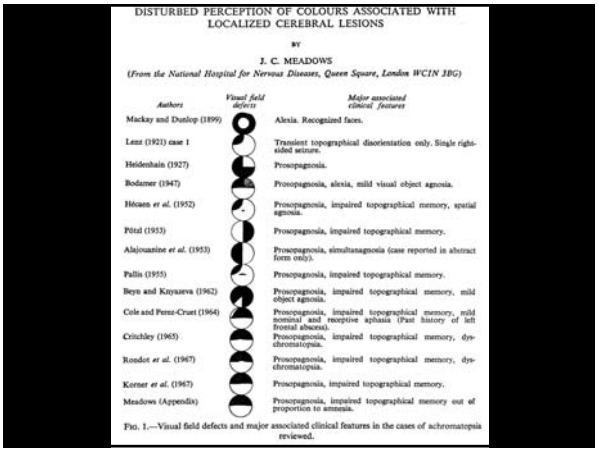

1
2
3
4
5
6
7
8
9
10
11
12
13


Paracentral lobule
Callosal sulcus
Cingulate sulcus (marginal branch)
Superior frontal gyrus
Cingulate sulcus
Precuneus
Cingulate gyrus
Parieto-occipital sulcus
Corpus callosum
Septum pellucidum
Cuneus
Area subcallosal
Calcarine sulcus
Gyrus rectus
Anterior commissure
Gyrus lingula
Fornix
Isthmus of gyrus cinguli
Uncus
Hippocampal sulcus
Parahippocampal gyrus
Occipitotemporal gyrus
Collateral sulcus


A102
Right
17kHz
5ap


L
100
P100





DISTURBED PERCEPTION OF COLOURS ASSOCIATED WITH LOCALIZED CEREBRAL LESIONS

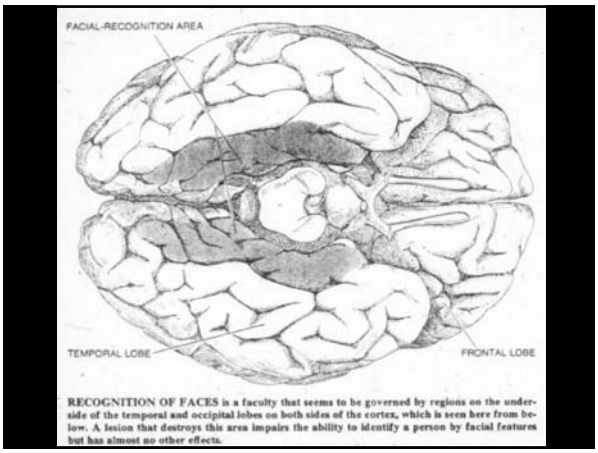
BY

J. C. MEADOWS

(From the National Hospital for Nervous Diseases, Queen Square, London WC1N 3BG)

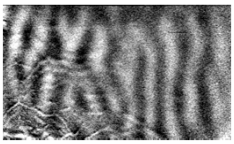
Authors	*Visual field defects*	*Major associated clinical features*
Mackay and Dunlop (1899)		Alexia. Recognized faces.
Lenz (1921) case 1		Transient topographical disorientation only. Single right-sided seizure.
Heidenhain (1927)		Prosopagnosia.
Bodamer (1947)		Prosopagnosia, alexia, mild visual object agnosia.
Hécaen *et al.* (1952)		Prosopagnosia, impaired topographical memory, spatial agnosia.
Pötzl (1953)		Prosopagnosia, impaired topographical memory.
Alajouanine *et al.* (1953)		Prosopagnosia, simultanagnosia (case reported in abstract form only).
Pallis (1955)		Prosopagnosia, impaired topographical memory.
Beyn and Knyazeva (1962)		Prosopagnosia, impaired topographical memory, mild object agnosia.
Cole and Perez-Cruet (1964)		Prosopagnosia, impaired topographical memory, mild nominal and receptive aphasia (Past history of left frontal abscess).
Critchley (1965)		Prosopagnosia, impaired topographical memory, dyschromatopsia.
Rondot *et al.* (1967)		Prosopagnosia, impaired topographical memory, dyschromatopsia.
Korner *et al.* (1967)		Prosopagnosia, impaired topographical memory.
Meadows (Appendix)		Prosopagnosia, impaired topographical memory out of proportion to amnesia.

FIG. 1.—Visual field defects and major associated clinical features in the cases of achromatopsia reviewed.

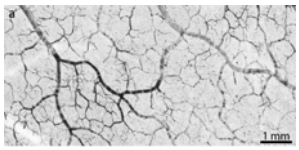


RECOGNITION OF FACES is a faculty that seems to be governed by regions on the underside of the temporal and occipital lobes on both sides of the cortex, which is seen here from below. A lesion that destroys this area impairs the ability to identify a person by facial features but has almost no other effects.

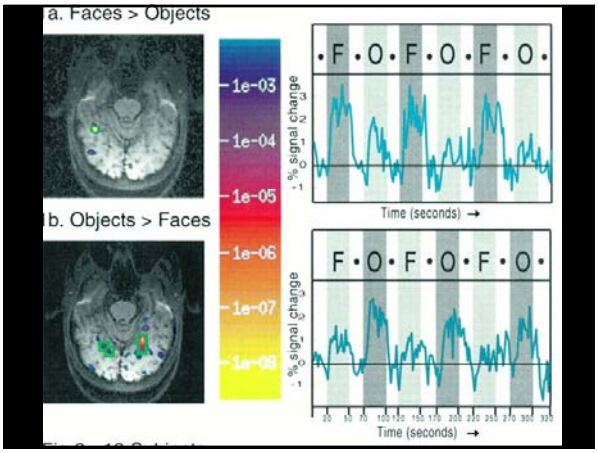
Functional Magnetic Resonance Imaging:
exploiting the link between neuronal activity and blood flow



Optical imaging of monkey ocular dominance columns



Local brain activation causes increased blood flow, and after a some delay,
a relative rise in the ratio of oxygenated/deoxygenated hemoglobin. This produces
a blood oxygen level dependent (BOLD) signal that can be detected with MRI



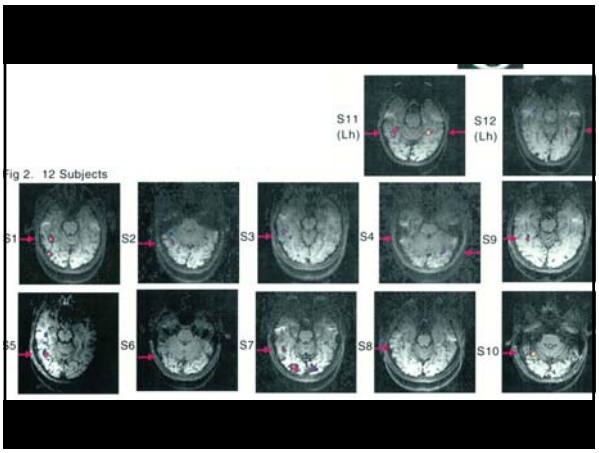
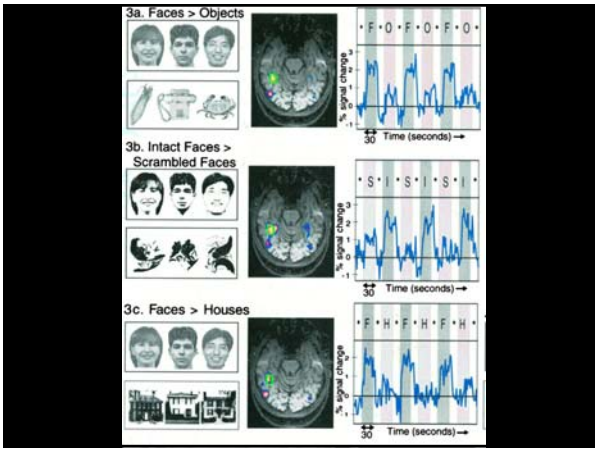
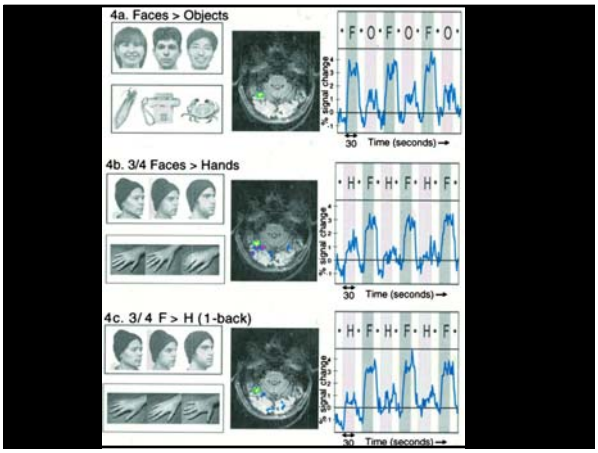
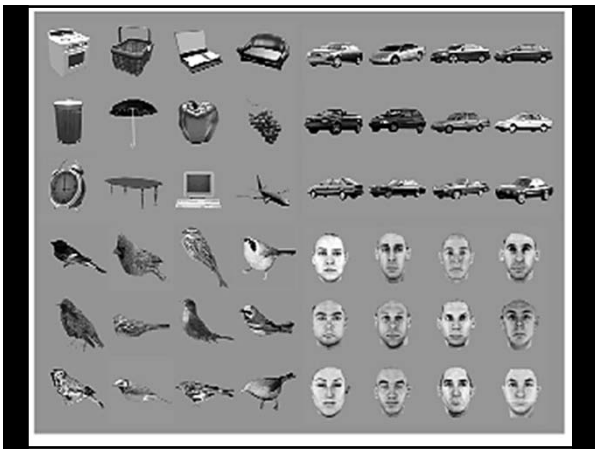
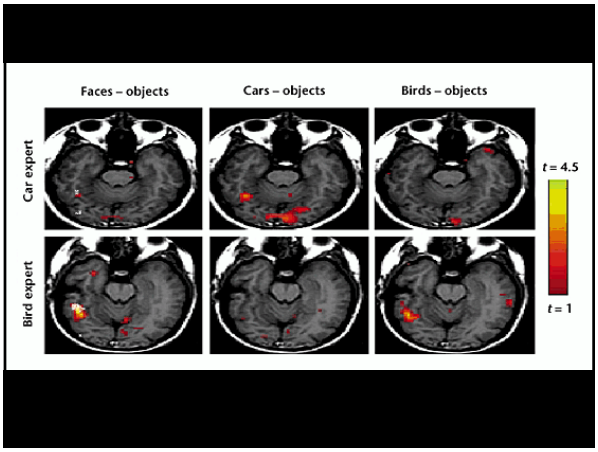


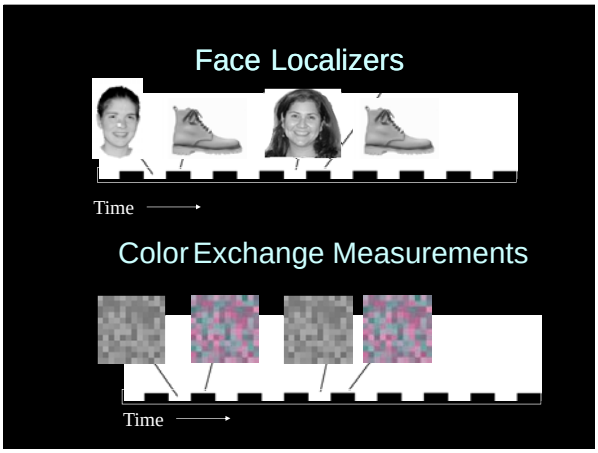
Fig 2. 12 Subjects
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11 (Lh)
S12 (Lh)


3a. Faces > Objects
3b. Intact Faces > Scrambled Faces
3c. Faces > Houses
% signal change
Time (seconds)
30

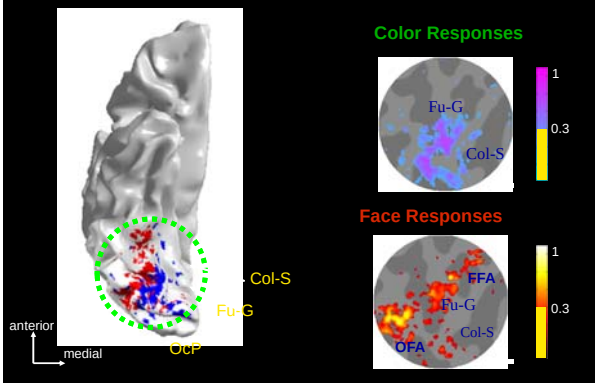

4a. Faces > Objects
4b. 3/4 Faces > Hands
4c. 3/4 F > H (1-back)
% signal change
Time (seconds)
30

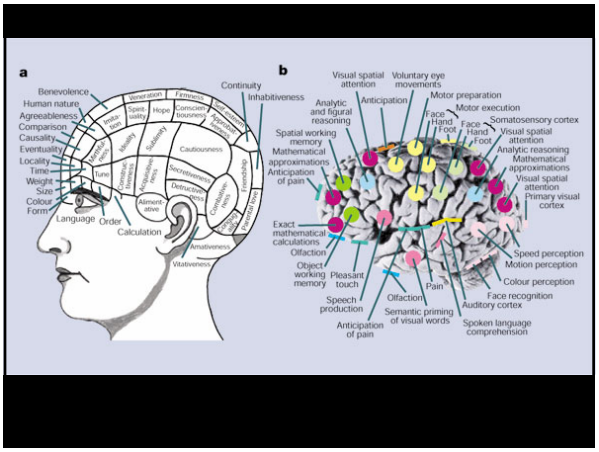


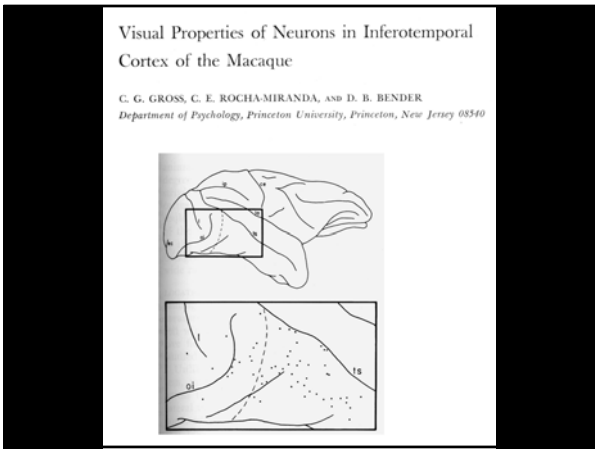

Faces – objects
Cars – objects
Birds – objects
Car expert
Bird expert
t = 4.5
t = 1


Face Localizers
Time
Color Exchange Measurements
Time

Color and face responses along the ventral surface are largely non-overlapping.

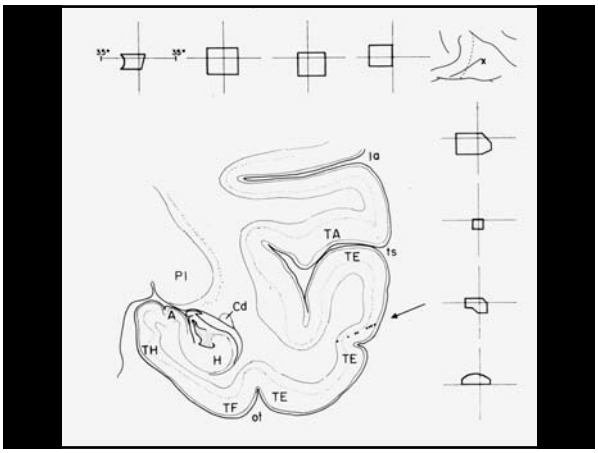


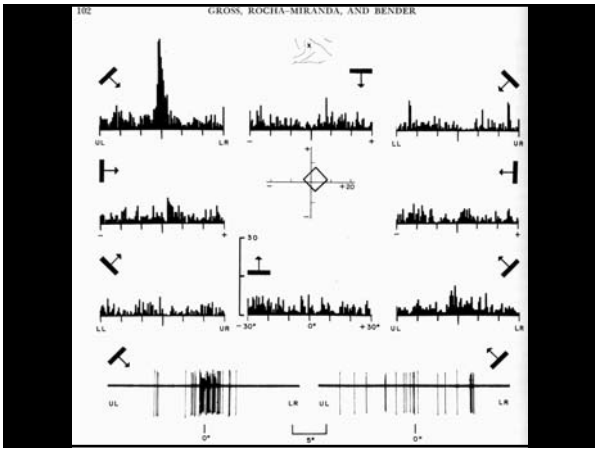




Visual Properties of Neurons in Inferotemporal Cortex of the Macaque

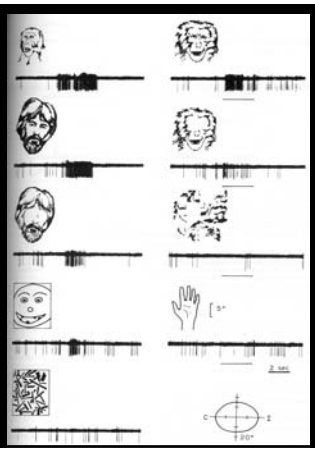
C. G. GROSS, C. E. ROCHA-MIRANDA, AND D. B. BENDER
Department of Psychology, Princeton University, Princeton, New Jersey 08540





dark stimuli (by picking up objects at hand or making paper cutouts) did yield some interesting observations. The most common dark stimuli used were a variety of rectangles or slits with widths of .25–30° and lengths of 1–70°, and the shadow of a human or monkey hand. The use of the latter stimuli was begun one day when, having failed to drive a unit with any light stimulus, we waved a hand at the stimulus screen and elicited a very vigorous response from the previously unresponsive neuron. We then spent the next 12 hr testing various paper cutouts in an attempt to find the trigger feature for this unit. When the entire set of stimuli used were ranked according to the strength of the response that they produced, we could not find a simple physical dimension that correlated with this rank order. However, the rank order of adequate stimuli did correlate with similarity (for us) to the shadow of a monkey hand. The relative adequacy of a few of these stimuli is shown in Fig. 6. Curiously, fingers pointing downward elicited very little response as compared to fingers pointing upward or laterally, the usual orientations in which the animal would see its own hand.

FIG. 6. Examples of shapes used to stimulate a group TE unit apparently having very comples trigger features. The stimuli are arranged from left to right in order of increasing ability to drive the neuron from none (1) or little (2 and 3) to maximum (6).



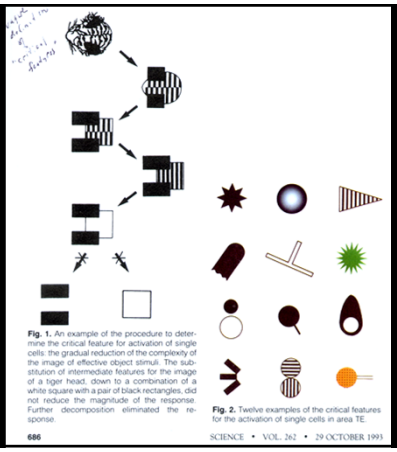


Fig. 1. An example of the procedure to determine the critical feature for activation of single cells: the gradual reduction of the complexity of the image of effective object stimuli. The substitution of intermediate features for the image of a tiger head, down to a combination of a white square with a pair of black rectangles, did not reduce the magnitude of the response. Further decomposition eliminated the response.

Fig. 2. Twelve examples of the critical features for the activation of single cells in area TE.

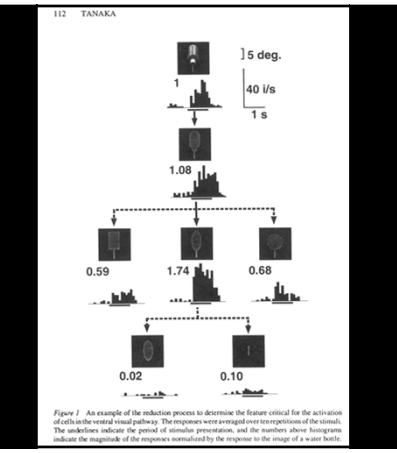


Figure 1 An example of the reduction process to determine the feature critical for the activation of cells in the ventral visual pathway. The responses were averaged over ten repetitions of the stimuli. The underlines indicate the period of stimulus presentation, and the numbers above histograms indicate the magnitude of the responses normalized by the response to the image of a water bottle.

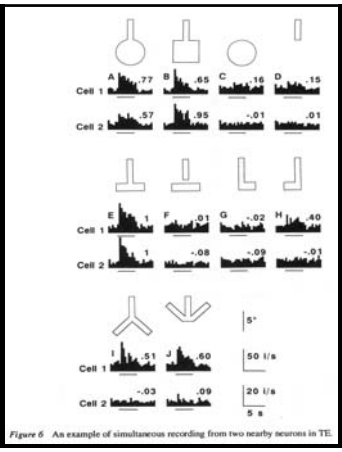


Figure 6 An example of simultaneous recording from two nearby neurons in TE.

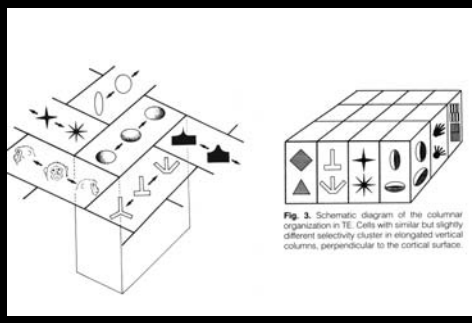
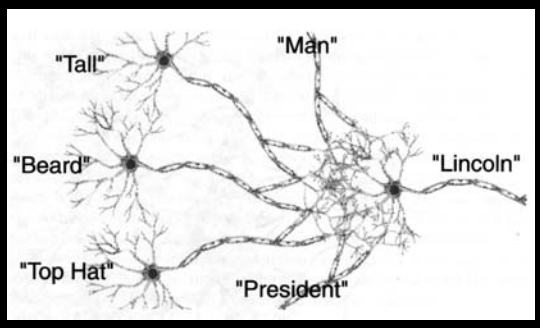


Fig. 3. Schematic diagram of the columnar organization in TE. Cells with similar but slightly different selectivity cluster in elongated vertical columns, perpendicular to the cortical surface.

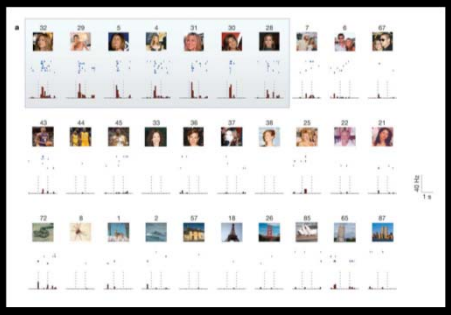


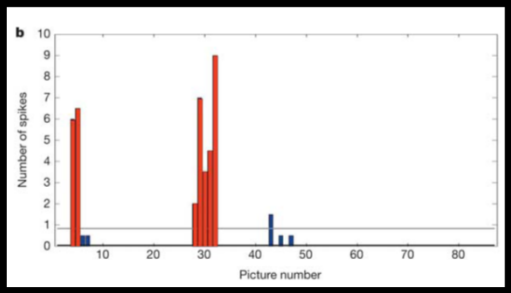
Invariant visual representation by single neurons in the human brain

nature
Vol 435|23 June 2005

R. Quian Quiroga[1–3], L. Reddy[1], G. Kreiman[3], C. Koch[3] & I. Fried[3,4]

Unit in the left, posterior hippocampus





Only 7/87 images produced any cell discharge – all of Jennifer Aniston

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Noticing Familiar Objects in Real World Scenes: The Role of Temporal Cortical Neurons in Natural Vision

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For Discussion Section