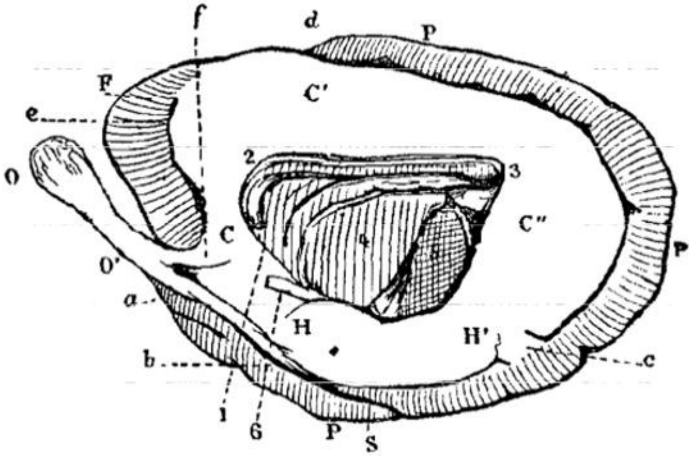
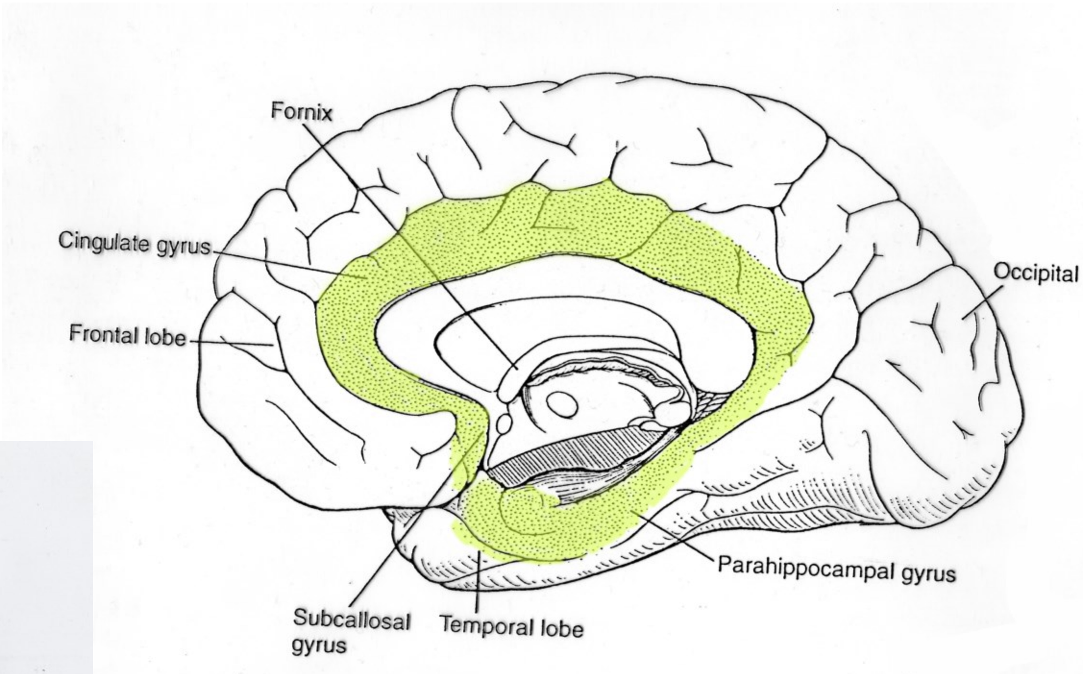
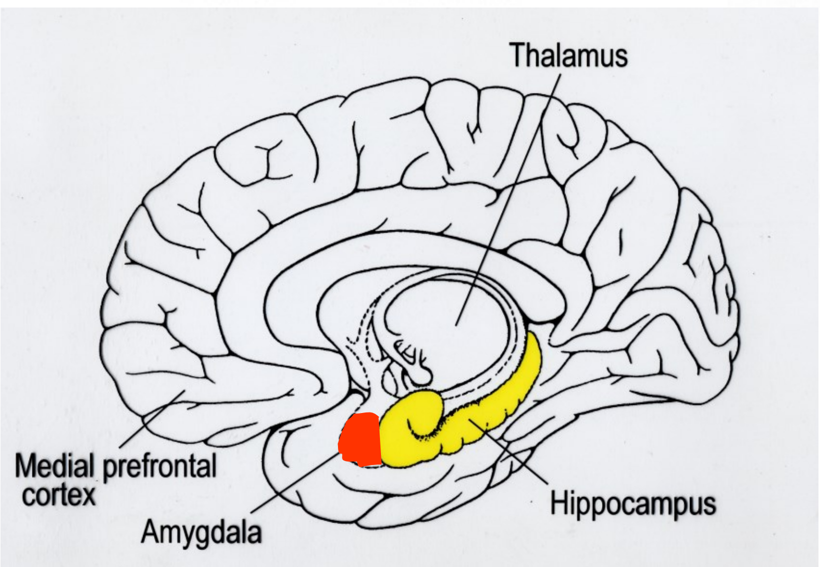
Limbic lobe of Broca

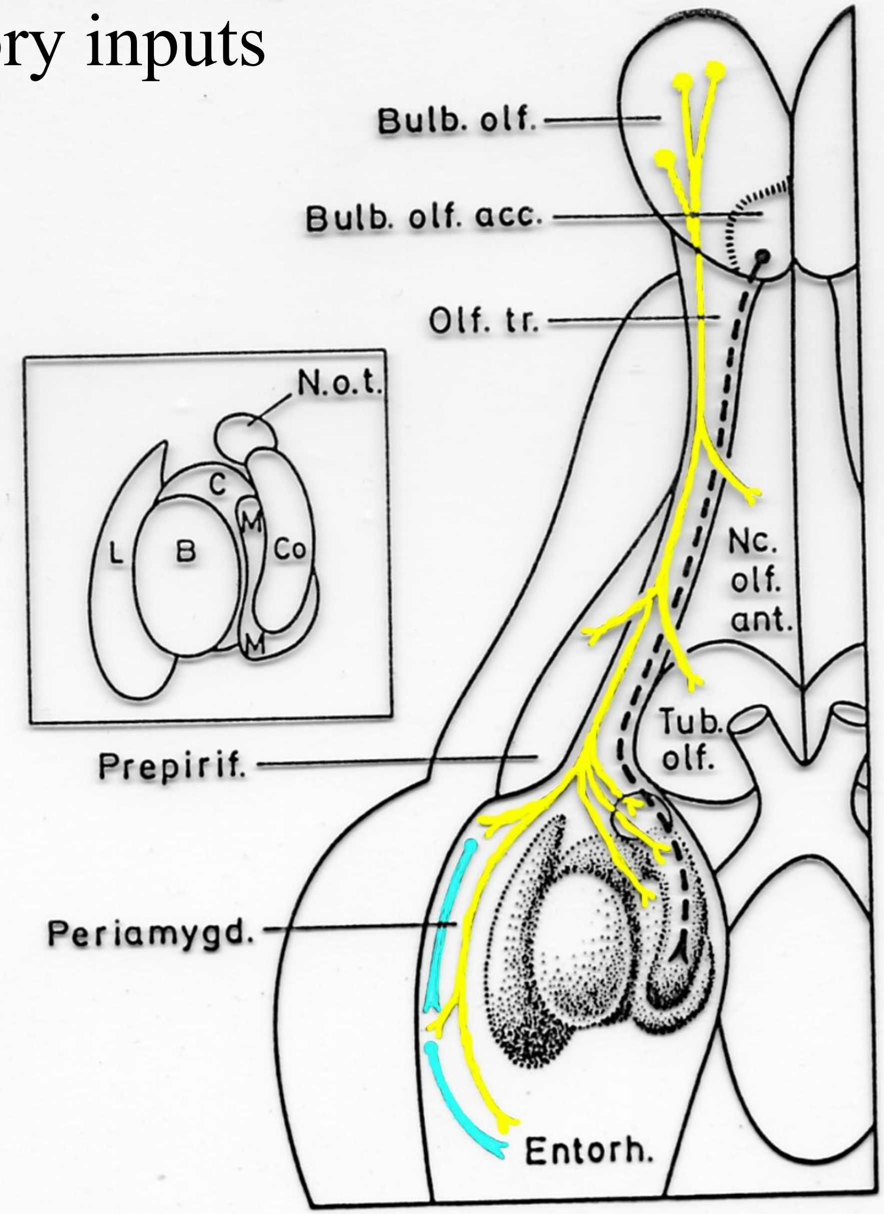


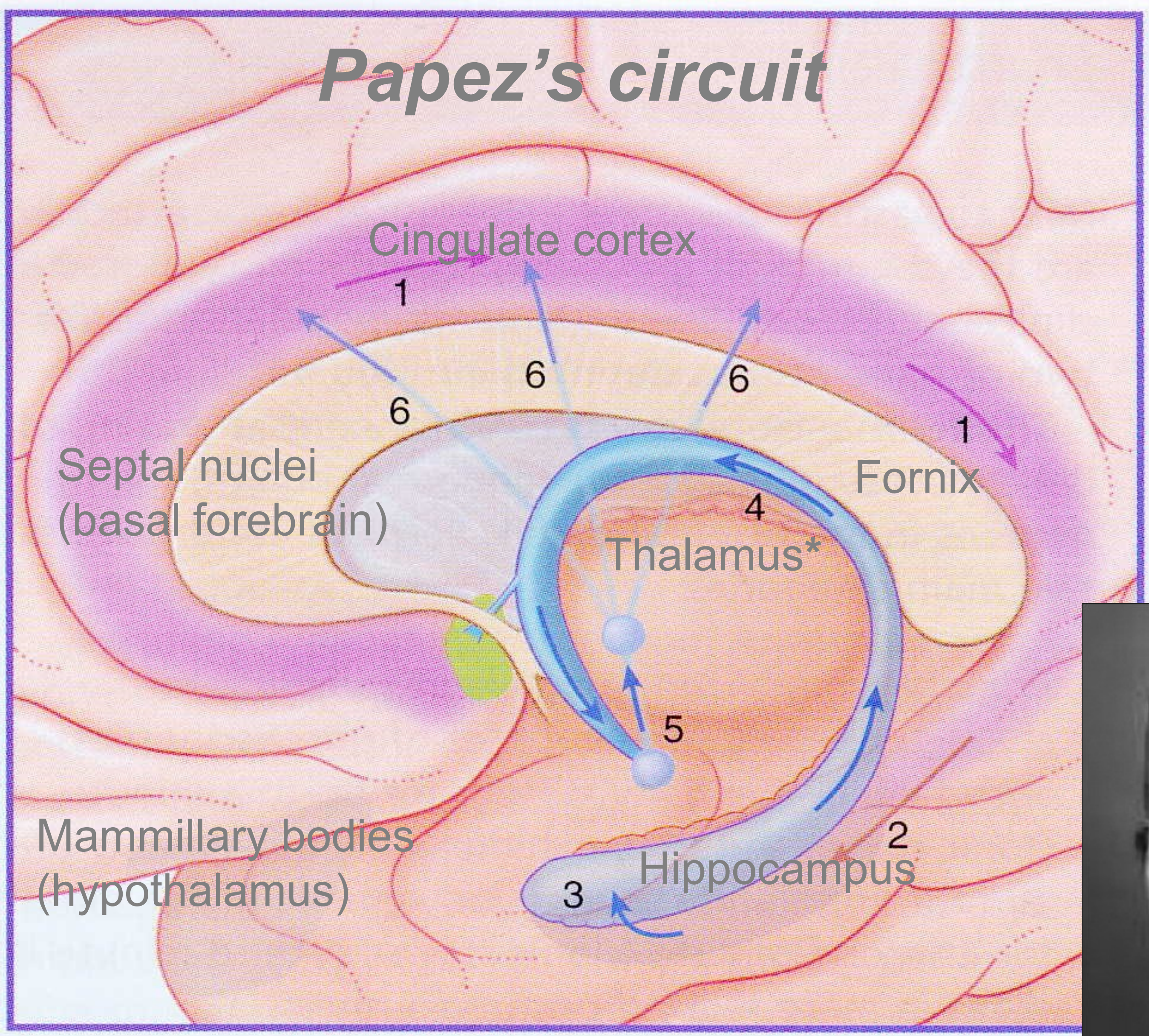




Olfactory inputs

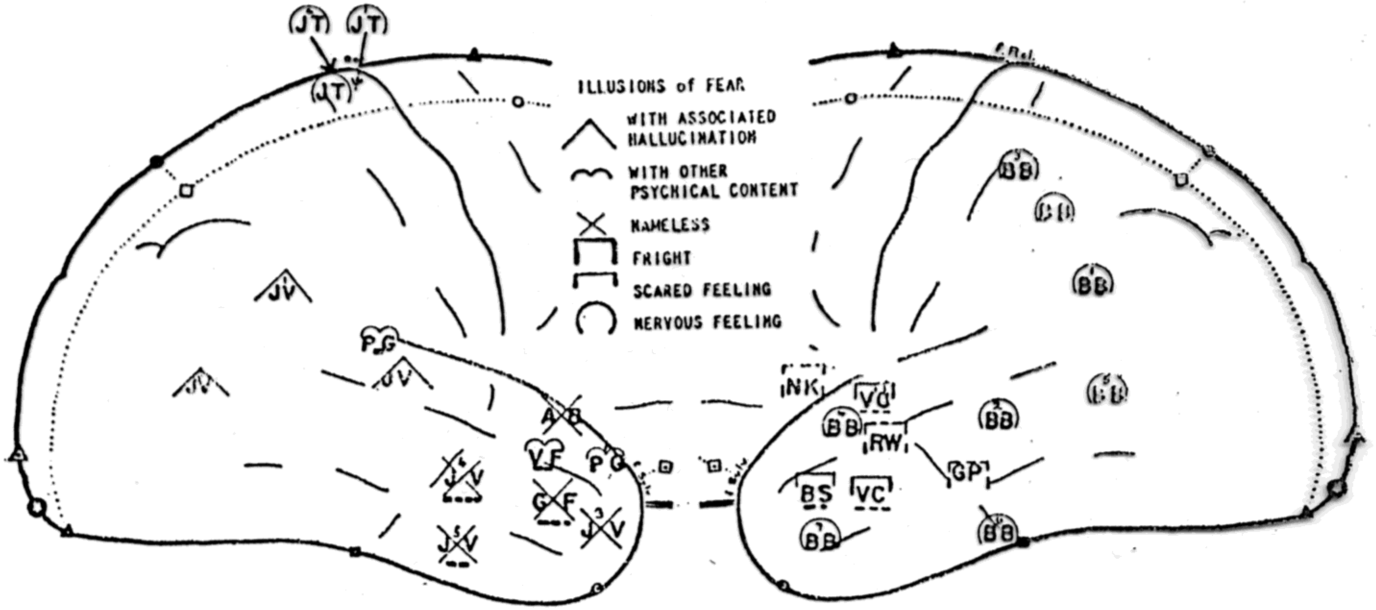
rabbit



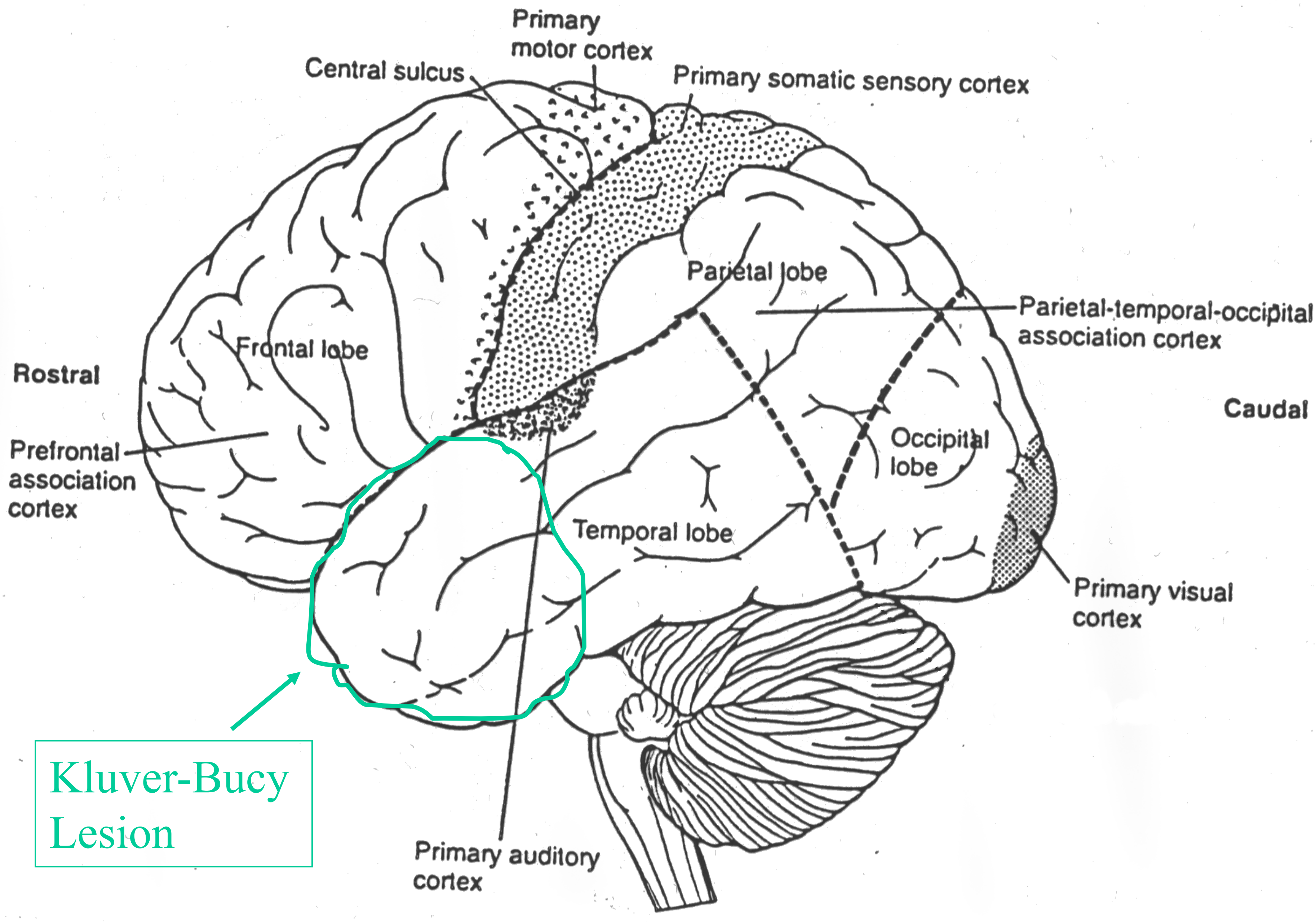

Papez's circuit
Cingulate cortex
1
6
6
6
1
Septal nuclei
(basal forebrain)
Fornix
4
Thalamus*
5
2
Mammillary bodies
(hypothalamus)
Hippocampus
3

James Papez

Brain Stimulation during Surgery



Wilder Penfield


Primary motor cortex
Central sulcus
Primary somatic sensory cortex
Parietal lobe
Parietal-temporal-occipital association cortex
Frontal lobe
Rostral
Caudal
Prefrontal association cortex
Occipital lobe
Temporal lobe
Primary visual cortex
Kluver-Bucy Lesion
Primary auditory cortex

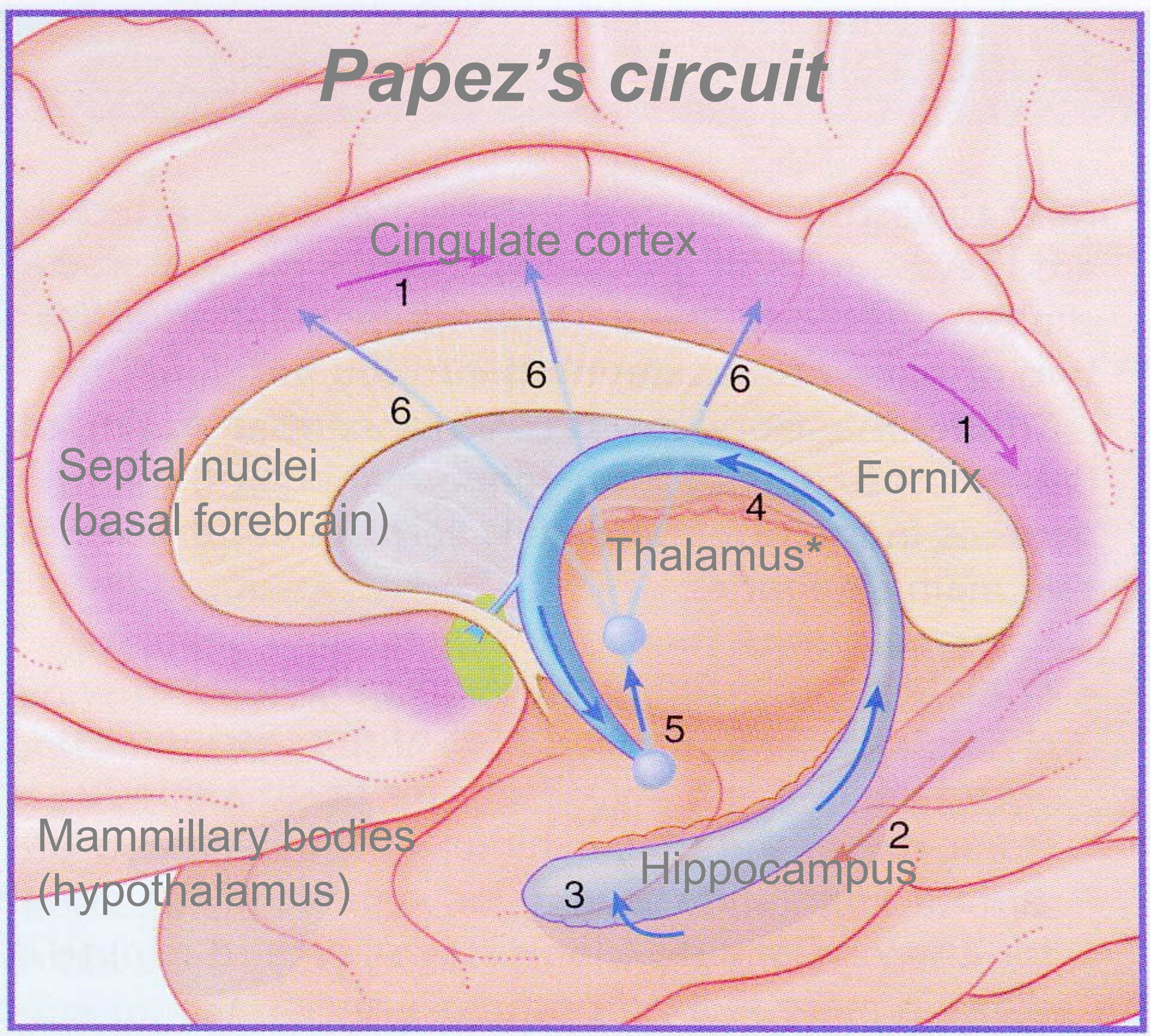
Kluver-Bucy Syndrome

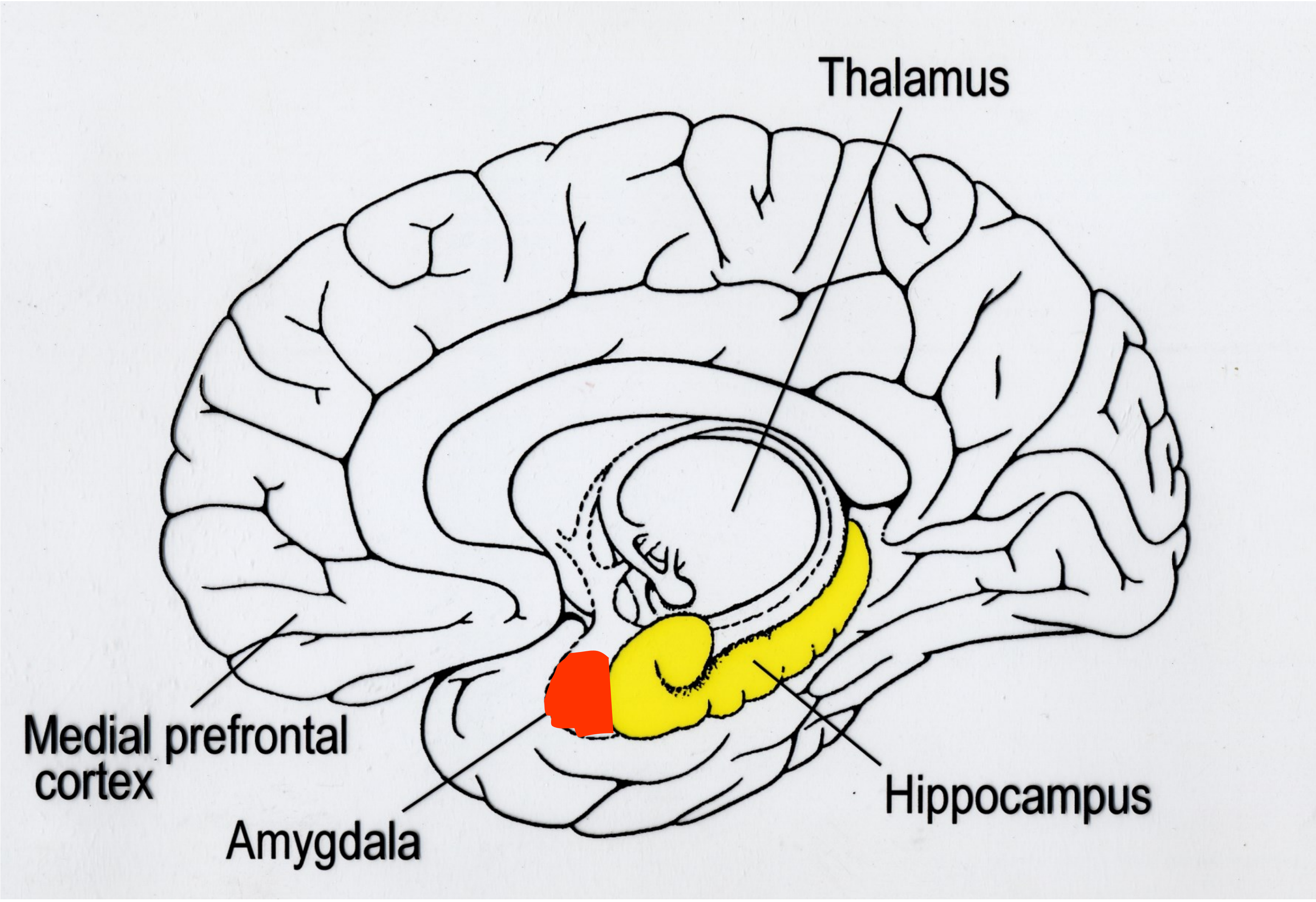
following bilateral temporal lobectomy in monkeys.

Main components are:

visual defects,
oral tendencies, and
changes in emotional behaviour
(hypersexuality, hypo-emotionality)

Papez's circuit





Thalamus
Medial prefrontal cortex
Amygdala
Hippocampus

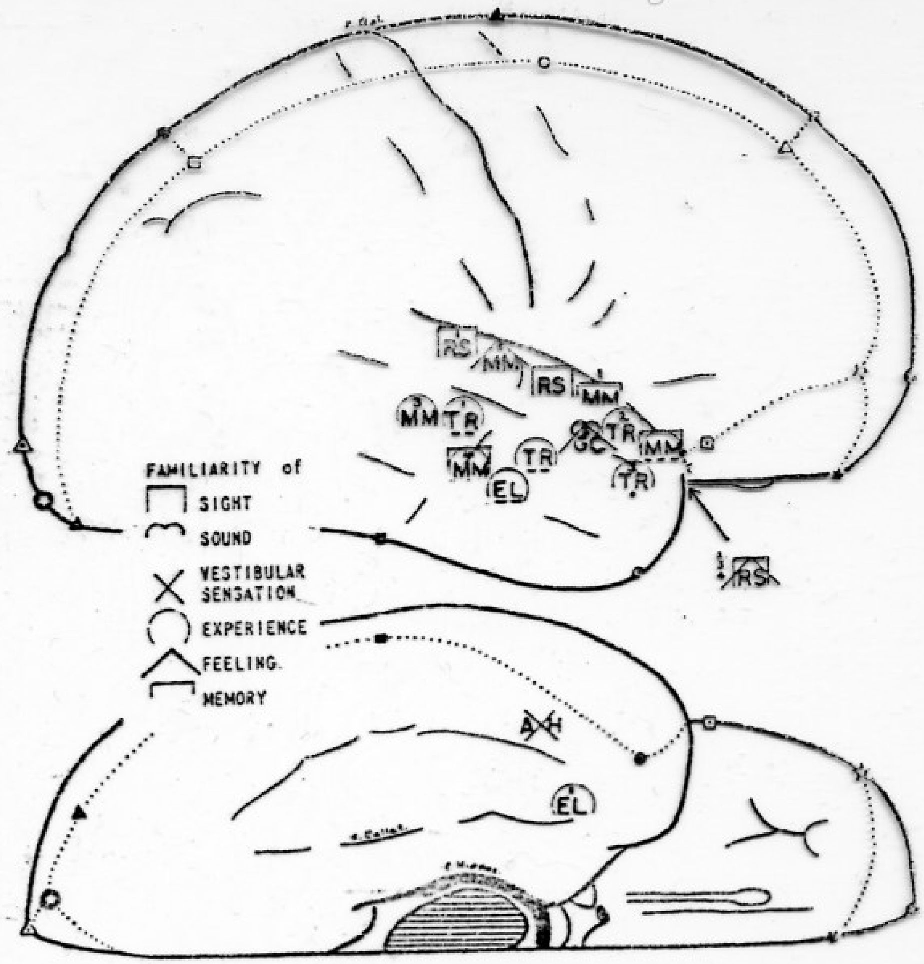
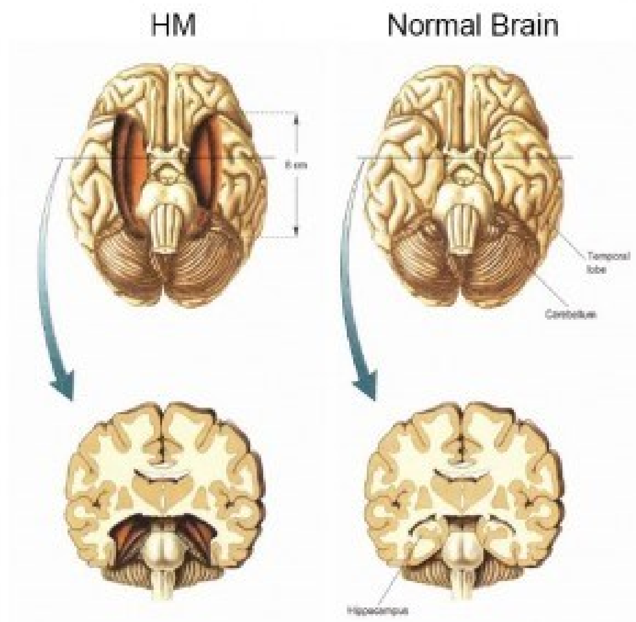
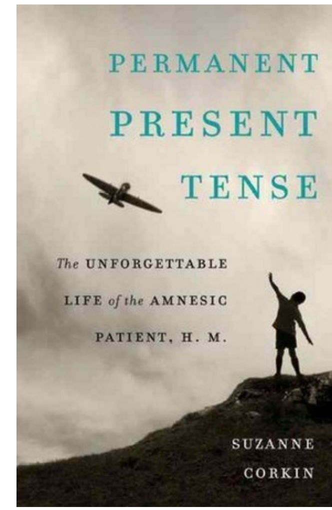


Fig. 7. Sites of stimulation producing an illusion of familiarity. Deep stimulations indicated as in Fig. 1. Note the temporal localization of all the responses. No responses were obtained from the right, nondominant hemisphere; left temporal stimulation never produced this response. (From Mullan and Penfield, 1959)

Henry Molaison

1926-2008

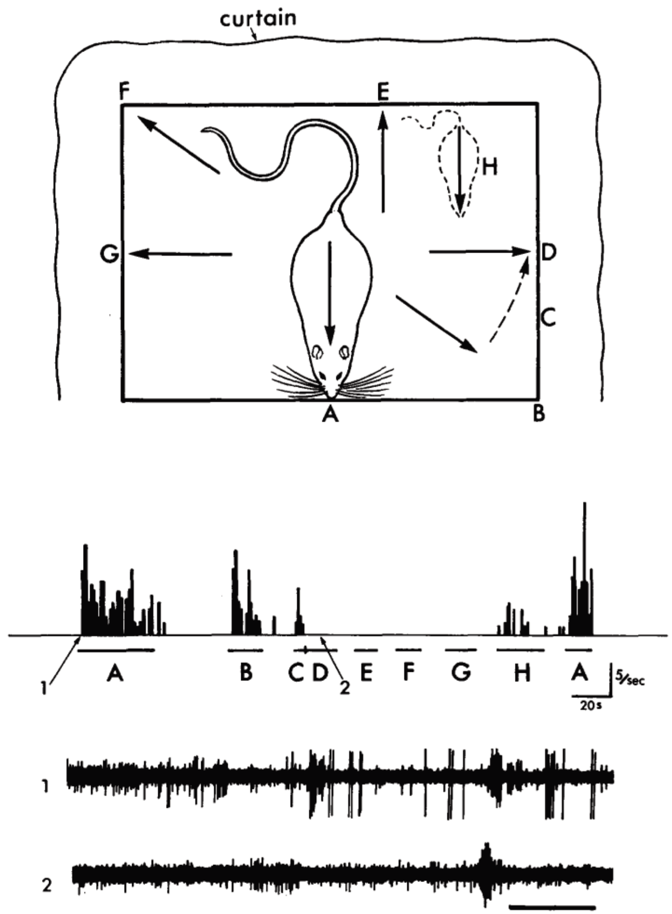




"… He … cannot recall anything that relied on personal experience, such as a specific Christmas gift this father had given him. He retained only the gist of personally experienced events, plain facts but no recollection of specific episodes." Corkin, p 219

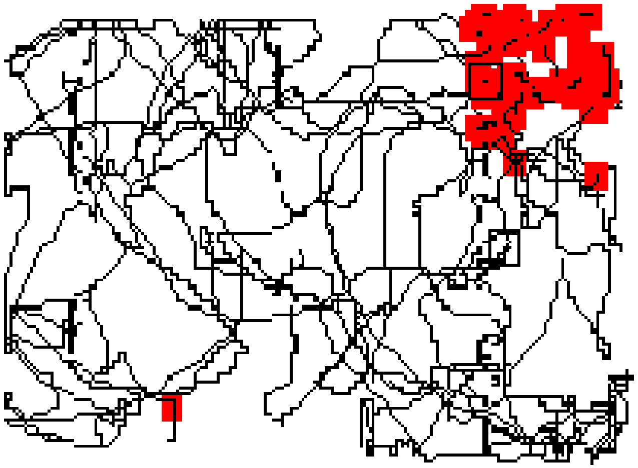
Short Communications

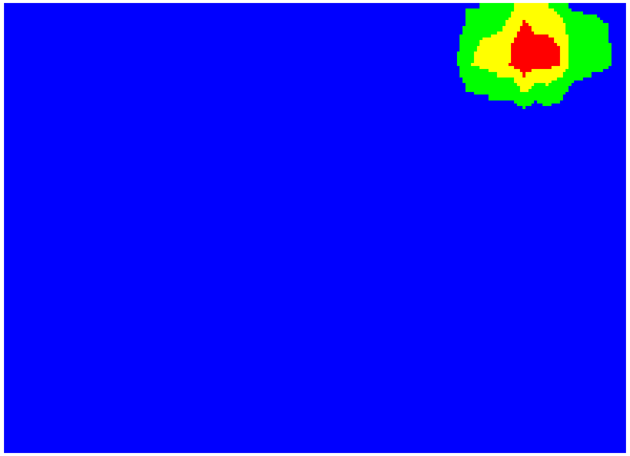
The hippocampus as a spatial map. Preliminary evidence from unit activity in the freely-moving rat



O'Keefe & Dostrovsky 1971

Place Cells

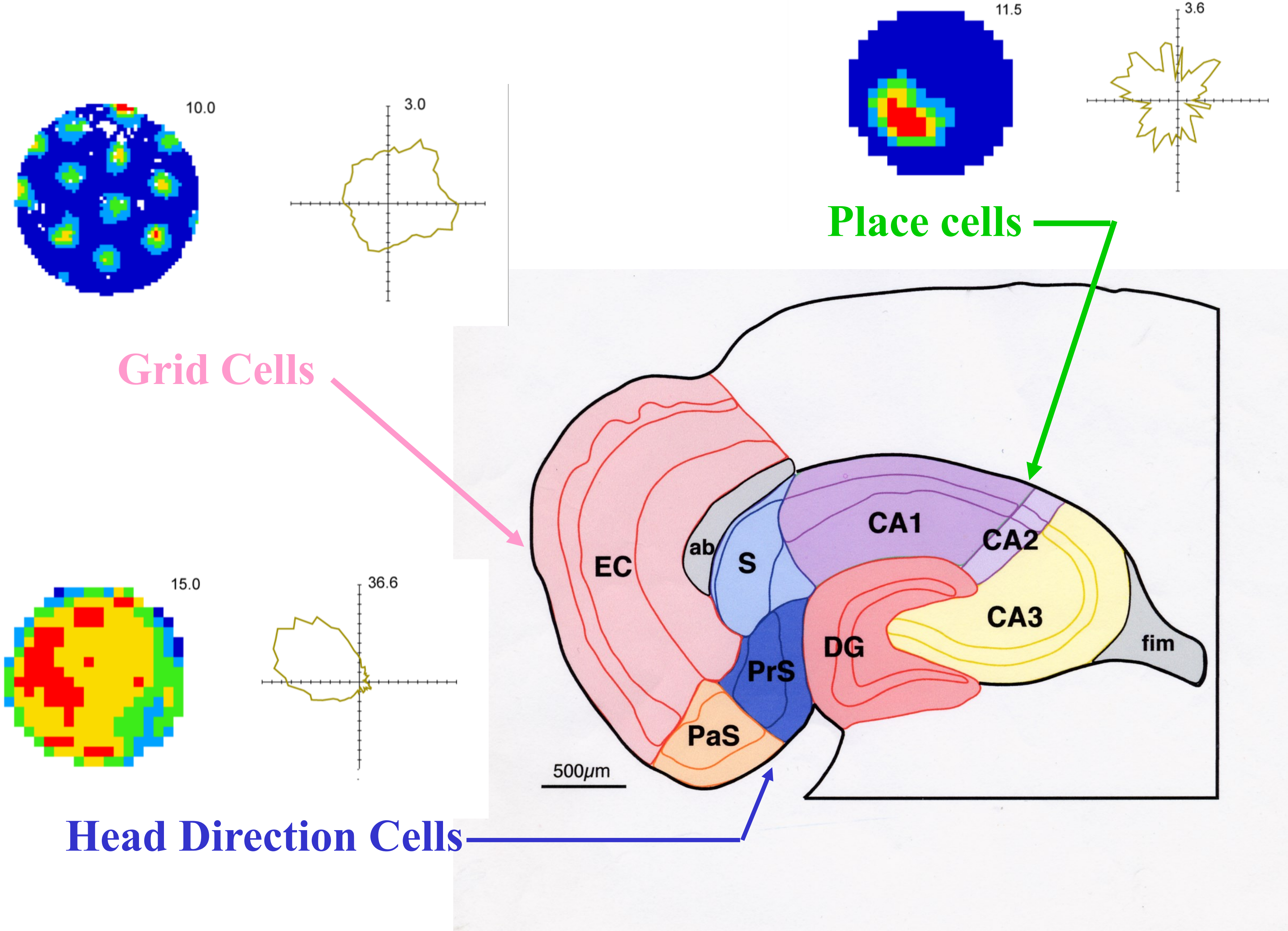




Typically, cells are recorded while a rat moves around foraging in a box (arena).

A given cell only fires when the rat is in a particular part of the arena (the place field)

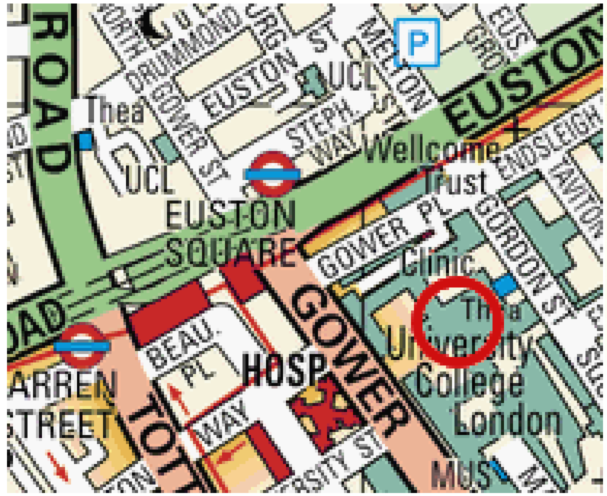
Spatial cells in the hippocampal formation

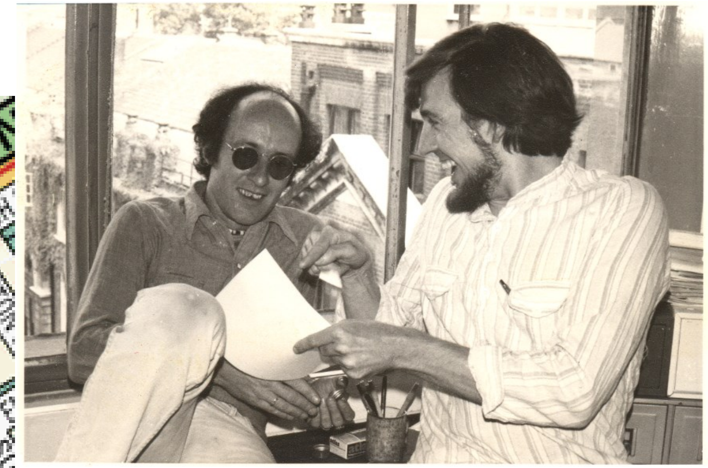


THE
HIPPOCAMPUS
AS A COGNITIVE MAP

JOHN O'KEEFE
AND
LYNN NADEL

1978
CLARENDON PRESS · OXFORD





SPACE
plays a role in all our behaviour.

We live in it, move through it, explore it, defend it.

We find it easy enough to point to bits of it:
the room,
the mantle of the heavens,
the gap between two fingers,
the place left behind when the piano
finally gets moved.

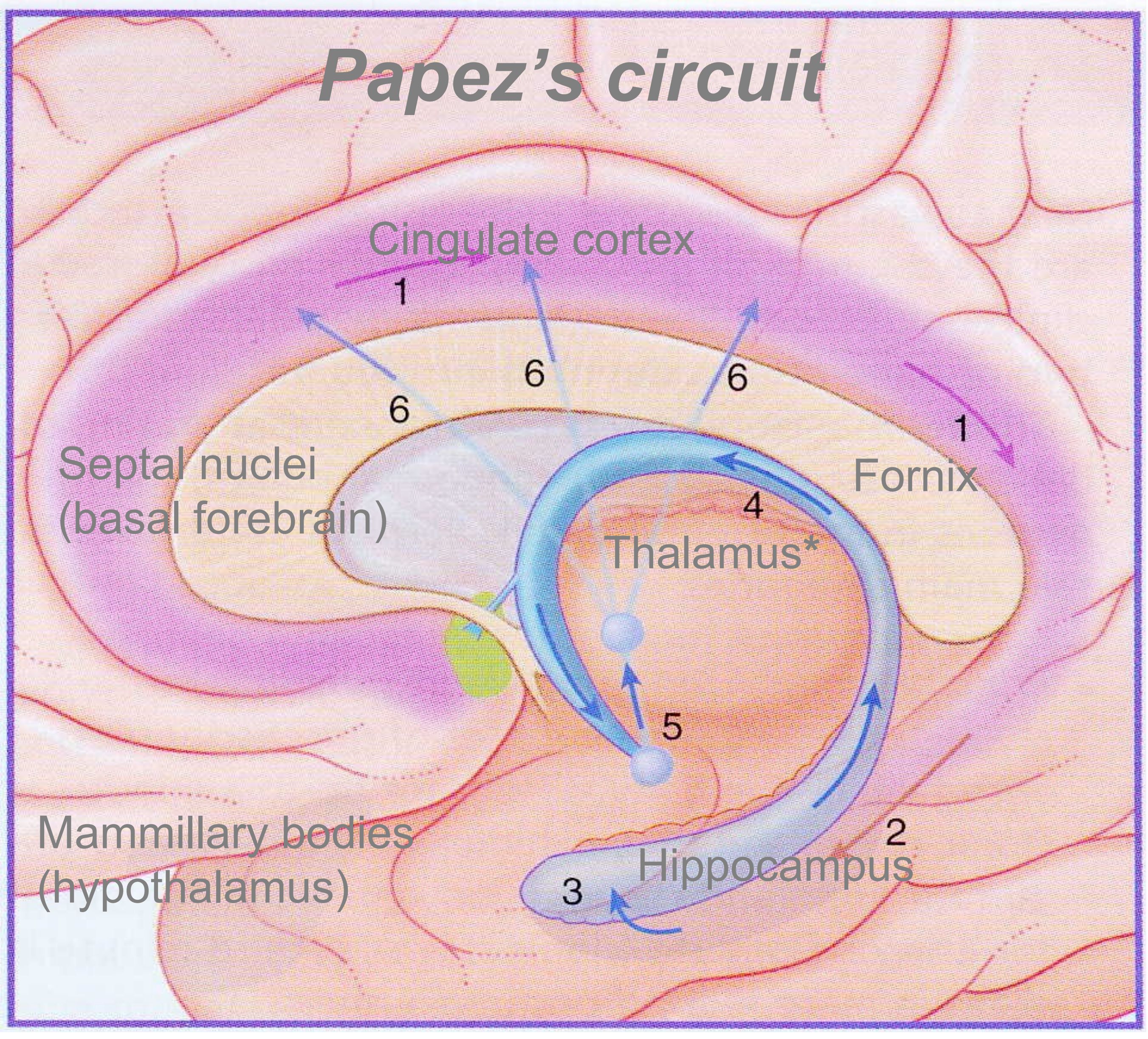
Existence of hippocampal signals coding direction, distance and speed of movement

Deficits in place learning, navigation, and exploration

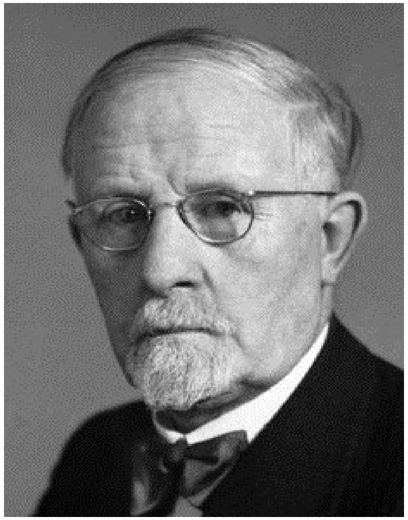
www.cognitivemap.net

O'Keefe & Nadel 1978

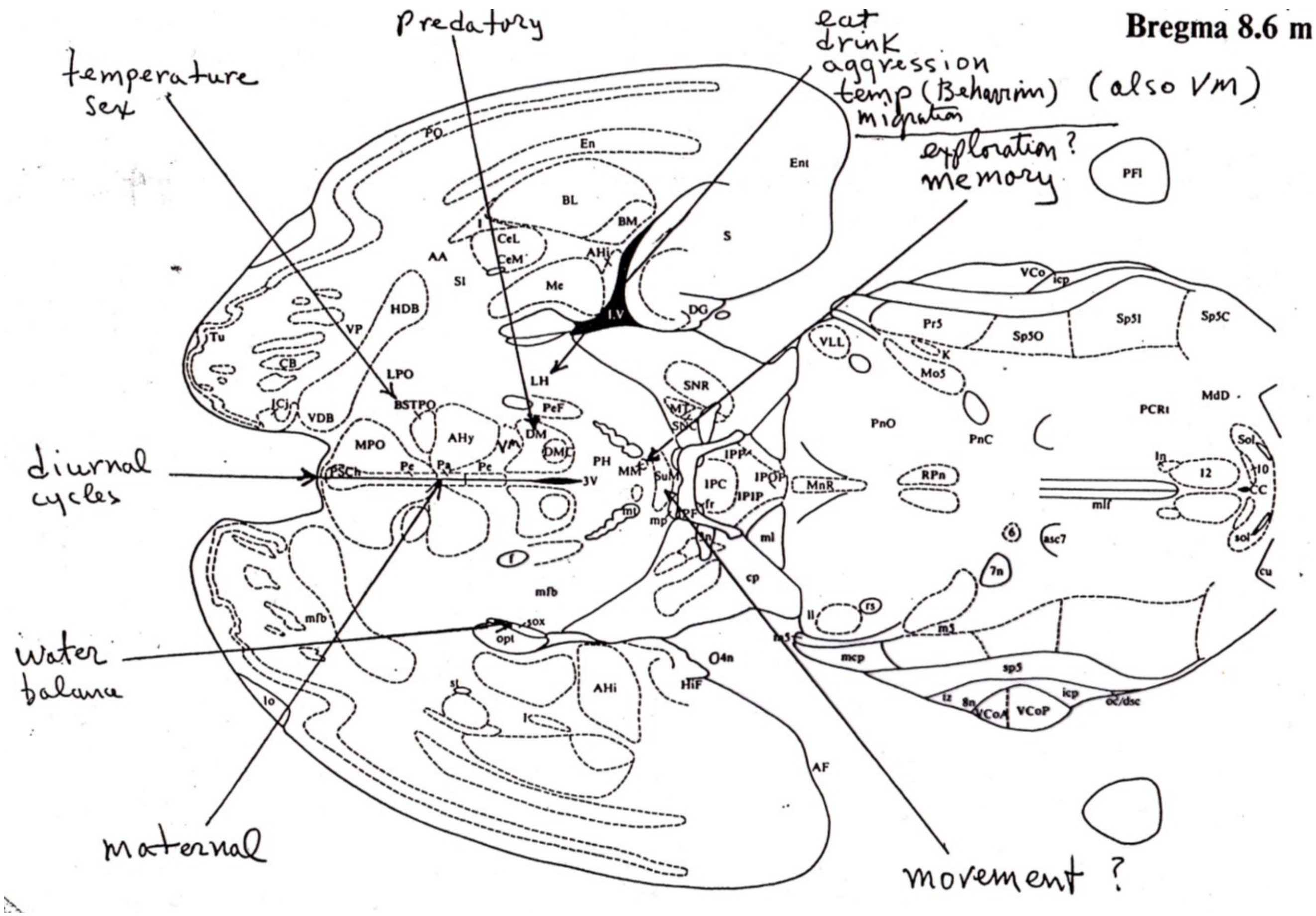
Papez's circuit



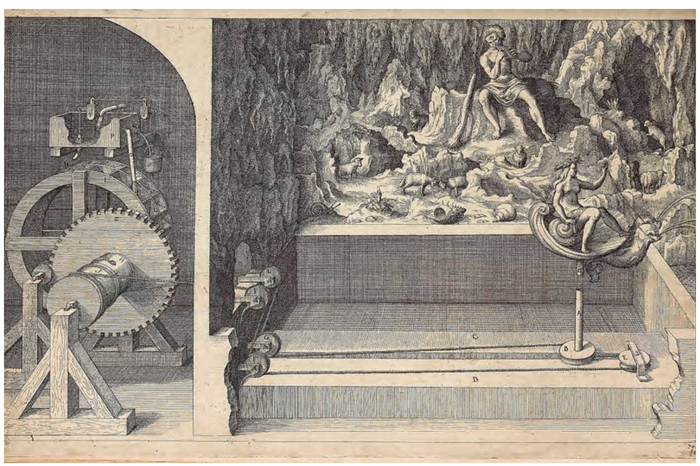
By stimulating the hypothalamus, he could induce behaviors from excitement to apathy; depending on the region of stimulation. He found that he could induce different types of responses when stimulating the anterior (lateral) hypothalamus compared to stimulating the posterior ventromedial hypothalamus. When stimulating the anterior part, he could induce fall of blood pressure, slowing of respiration and responses such as hunger, thirst, micturition (urination) and defecation. On the other hand, stimulation of the posterior part led to extreme excitement and defense-like behavior.[3] Hess also found that he could induce sleep in cats — a finding that was highly controversial at the time.



W R Hess


Bregma 8.6 m
Predatory
temperature
sex
eat
drink
aggression
temp (Behavrim) (also VM)
migration
exploration ?
memory
diurnal cycles
water balance
maternal
movement ?
PO
En
Ent
BL
BM
S
PFl
CeL
CeM
AA
SI
AHi
Me
DG
LV
HDB
VP
Tu
CB
LPO
BSTPO
LH
VDB
MPO
AHy
PeF
DM
DMC
PH
MM
SNR
SuM
IPC
IPIP
MnR
PnO
PnC
RPn
Pr5
Sp5O
Sp5I
Sp5C
VLL
Mo5
PCRt
MdD
VCo
icp
mlf
mfb
opt
sox
AHi
HiF
AF
mcp
sp5
VCoP
3V
12
10
cp
ml
7n
rs

R Descartes



Now as these spirits enter thus into the cavities of the brain, so they pass thence into the pores of its substance and from these pores into the nerves. And according as they enter or even only as they tend to enter more or less into this or that nerve they have the power of changing the form of the muscle into which the nerve is inserted and by this means making the limbs move. You may have seen in the grottoes and fountains which are in our royal gardens that the simple force with which the water moves in issuing from its source is sufficient to put into motion various machines and even to set various instruments playing or to make them pronounce words according to the varied disposition of the tubes which convey the water.

And, indeed, one may very well compare the nerves of the machine which I am describing with the tubes of the machines of these fountains, the muscles and tendons of the machine with the other various engines and springs which serve to move these machines and the animal spirits, the source of which is the heart and of which the ventricles are the reservoirs, with the water which puts them in motion.[8]

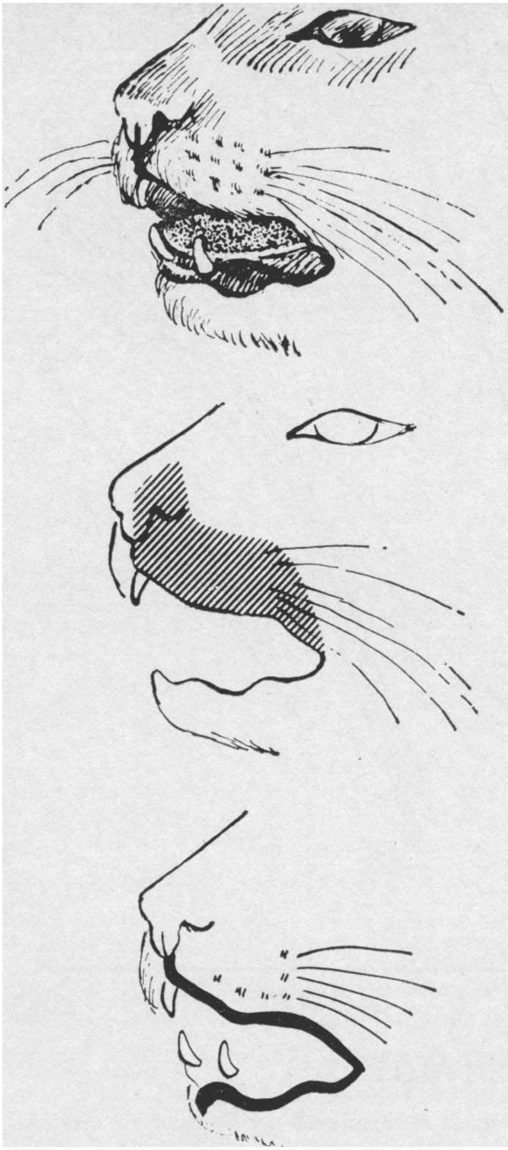
External objects, which by their mere presence act upon the organs of sense of the machine and which by this means determine it to move in several different ways according as the parts of the machine's brain are disposed, may be compared to strangers, who

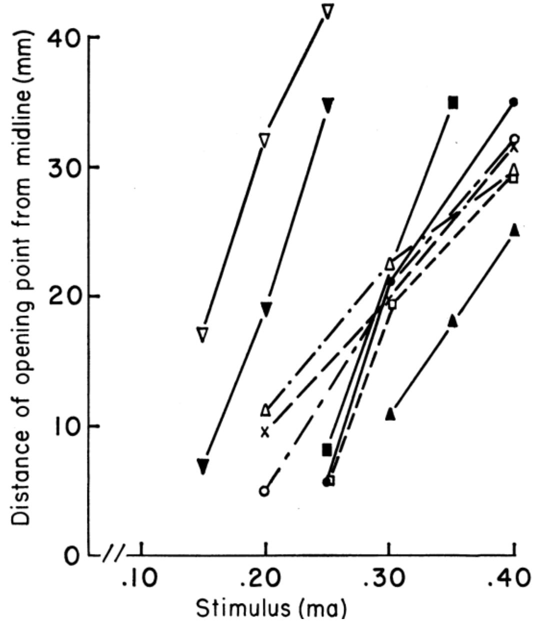
entering into one of the grottoes containing many fountains, themselves cause, without knowing it, the movements which they witness. For in entering they necessarily tread on certain tiles or plates, which are so disposed that if they approach a bathing Diana, they cause her to hide in the rosebushes, and if they try to follow her, they cause a Neptune to come forward to meet them threatening them with his trident.

would be possible by the application of "two very certain tests" to determine whether or not they were real men. In the first place, such automata could never use speech appropriately in order to reply to anything that might be said to them. In the second place, inasmuch as these machines do not act from knowledge but from "the disposition of their organs," they could act only in those situations for which they were prepared; that is, it would be "morally impossible that there should be sufficient diversity in any machine to allow it to act in all events of life in the same way as our reason causes us to act." By the application of these two tests it would be possible to distinguish between men who possess souls infused in them by the Deity, and brutes which are to be regarded as clock-like automata.

Kuo, Z. Y. (1930). The genesis of the cat's responses to the rat. *Journal of Comparative Psychology, 11*(1), 1-36.

Specifically, the author sought to determine the effects of the following conditions on the behavior of the cat toward the rat, including under the term rat wild mice, albino rats, and wild rats: (1) raising kittens in isolation, (2) raising kittens in a rat-killing environment, (3) raising kittens in the same cage with rats, (4) difference in food-habit, i.e., vegetarianism versus non-vegetarianism, (5) difference in hunger condition, (6) use of reinforcing stimuli such as seeing another cat kill a rat, (7) use of different kinds of rats, and (8) training by the conditioned response method that would make the cat fear the rat. Results included the following: (1) of the kittens raised in isolation, 54% killed rats without the so-called learning; (2) of the kittens raised in a rat-killing environment 85% killed rats before the age of four months, always the kind of rat they had seen their mothers kill, and some killed other kinds as well; (3) of the kittens raised with rats as cagemates none killed other kinds; (4) vegetarianism had no effect on rat-killing but did affect rat-eating; (5) hunger conditions appeared to have no effect either on rat-killing or rat-eating; and (6) not all the cats used learned to fear the rat, i.e., to run away from the rat. The author believes that the organismic pattern (by which he does not mean neural pattern) or bodily make-up is sufficient to explain why a cat behaves like a cat, i.e., why it possesses certain behavior patterns that are usually known as instinctive. He is completely opposed to explanations of behavior in instinctive terms.





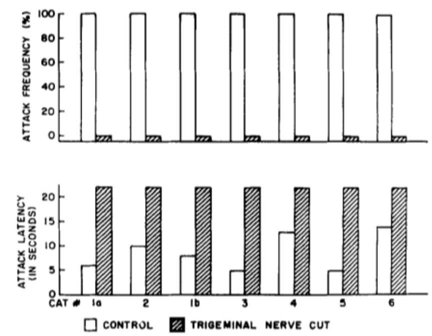


FIGURE 2. In these seven instances, the frequency of attack, which is defined as biting or striking a rat, fell from 100% to zero when two branches of the trigeminal nerve were cut.

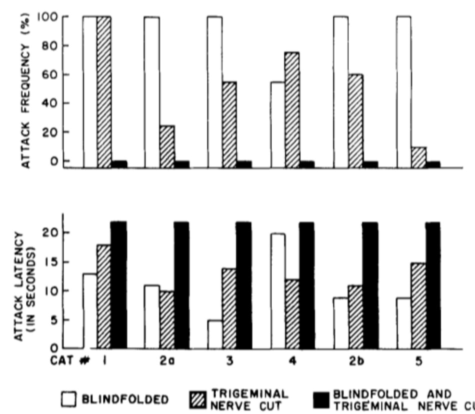
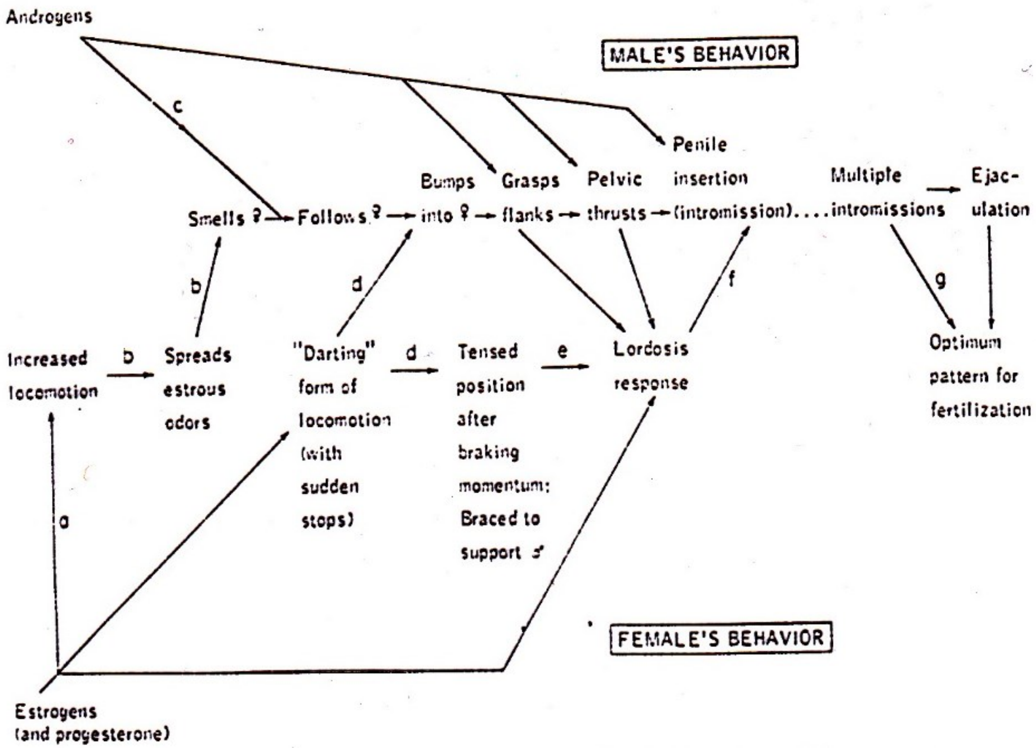
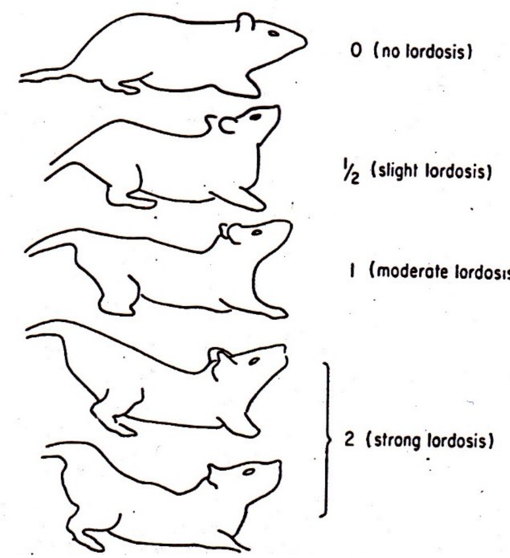


FIGURE 3. In these six instances, cutting the trigeminal nerves did not abolish attack. Blindfolding alone did not abolish it, either. When the nerves had been cut and the cats were then blindfolded, attack dropped to zero.

J P Flynn


Androgens
MALE'S BEHAVIOR
c
Penile insertion
Bumps into ♀
Grasps flanks
Pelvic thrusts
Multiple intromissions
Ejac-ulation
Smells ♀
Follows ♀
(intromission)
b
d
f
g
Increased locomotion
b
Spreads estrous odors
"Darting" form of locomotion (with sudden stops)
d
Tensed position after braking momentum: Braced to support ♂
e
Lordosis response
Optimum pattern for fertilization
a
FEMALE'S BEHAVIOR
Estrogens (and progesterone)


0 (no lordosis)
½ (slight lordosis)
1 (moderate lordosis)
2 (strong lordosis)

D Pfaff

POSITIVE REINFORCEMENT PRODUCED BY ELECTRICAL STIMULATION OF SEPTAL AREA AND OTHER REGIONS OF RAT BRAIN

James Olds and Peter Milner
McGill University 1954

TABLE 1

Acquisition and Extinction Scores for All Animals Together with Electrode Placements and Threshold Voltages Used during Acquisition Tests

Animal's No.	Locus of Electrode	Stimulation Voltage r.m.s.	Percentage of Acquisition Time Spent Responding	Percentage of Extinction Time Spent Responding
32	septal	2.2–2.8	75	18
34	septal	1.4	92	6
M-1	septal	1.7–4.8	85	21
M-4	septal	2.3–4.8	88	13
40	c.c.	.7–1.1	6	3
41	caudate	.9–1.2	4	4
31	cingulate	1.8	37	9
82	cingulate	.5–1.8	36	10
36	hip.	.8–2.8	11	14
3	m.l.	.5	0	4
A-5	m.t.	1.4	71	9
6	m.g.	.5	0	31
11	m.g.	.5	0	21
17	teg.	.7	2	1
9	teg.	.5	77	81

KEY: *c.c.*, *corpus callosum*; *hip.*, hippocampus; *m.l.*, medial lemniscus; *m.t.*, Mammillothalamic tract; *m.g.*, medial geniculate; *teg.*, tegmentum.

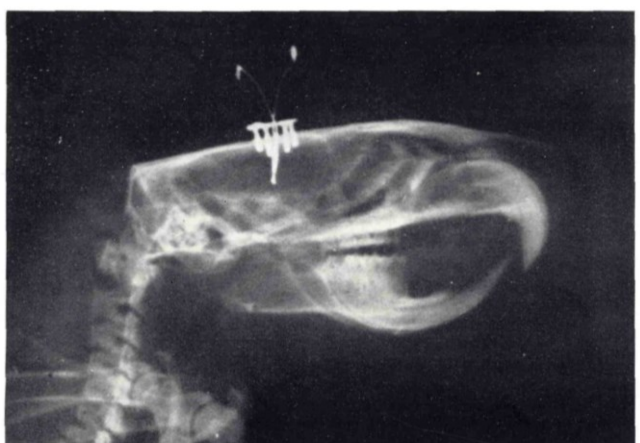


FIG. 2. X ray showing electrode in place in intact animal. There are two wires insulated completely
om each other, stimulating the brain with their tips.

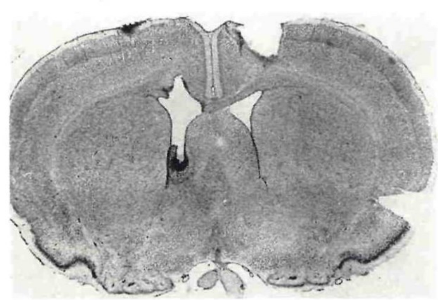


FIG. 3. Photomicrograph showing the electrode track in a cresyl-violet–stained brain section. The section is 1 mm. in front of the anterior commissure. The electrode protruded through the lateral ventricle and its stimulating tip was in the septal area.