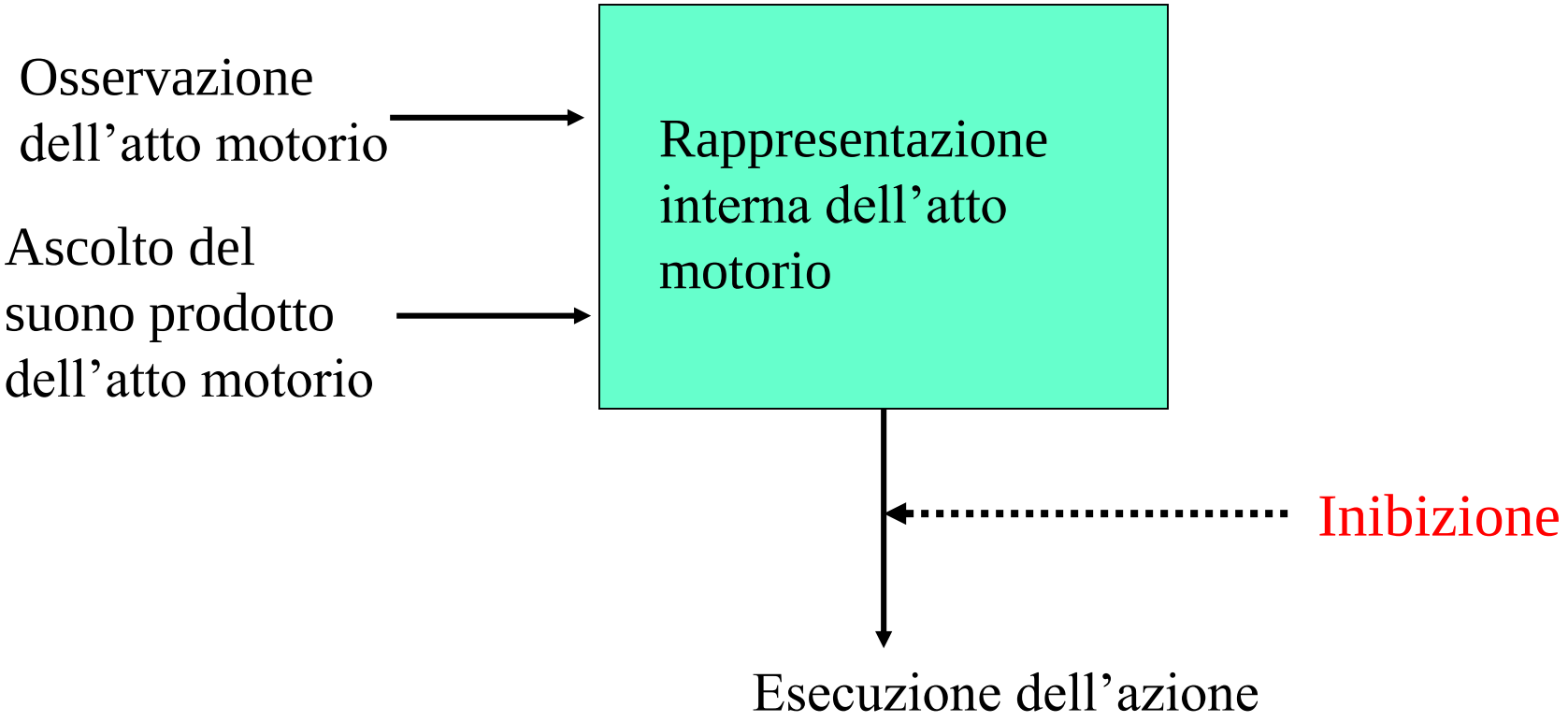
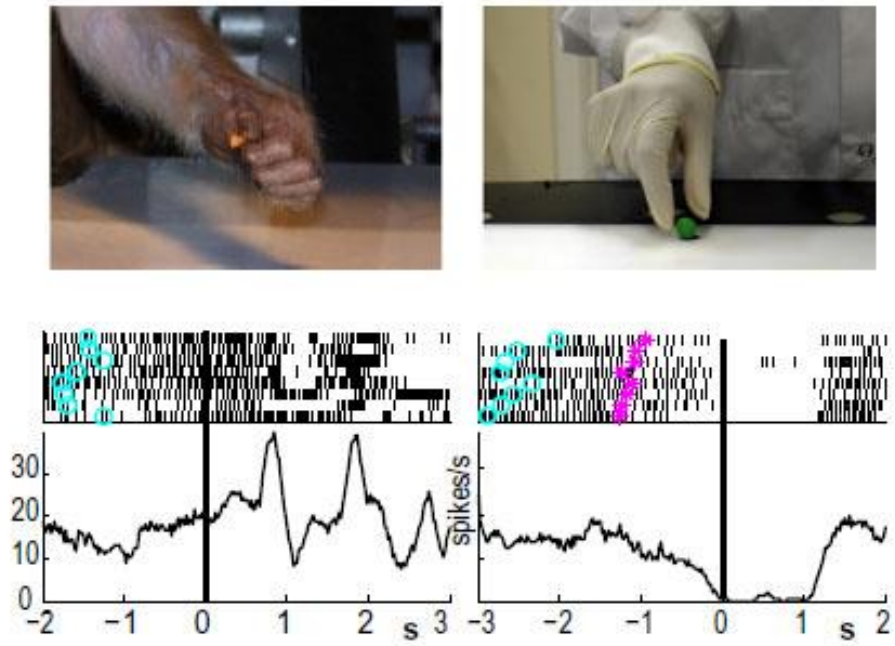
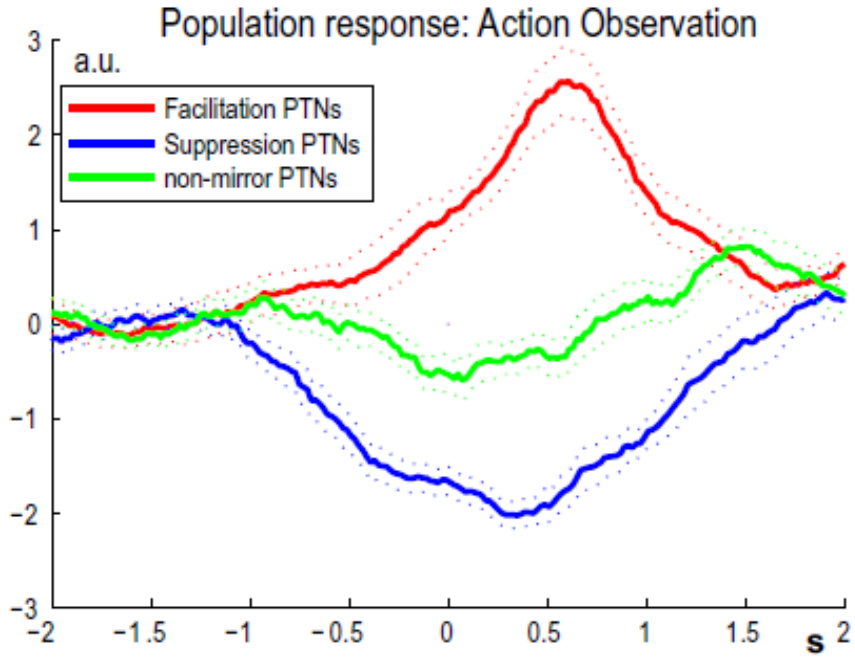
Sistema di comparazione diretta tra atto motorio osservato e atto eseguito: ci permette di comprendere gli atti motori svolti dagli altri



Risposte visive inibitorie

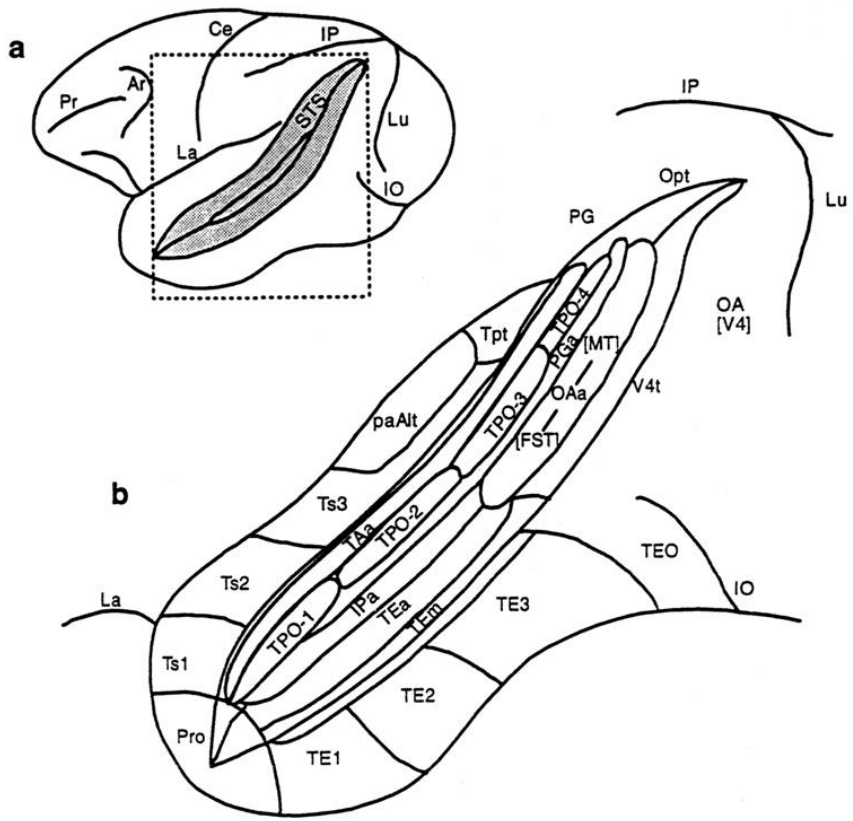
Esecuzione Osservazione

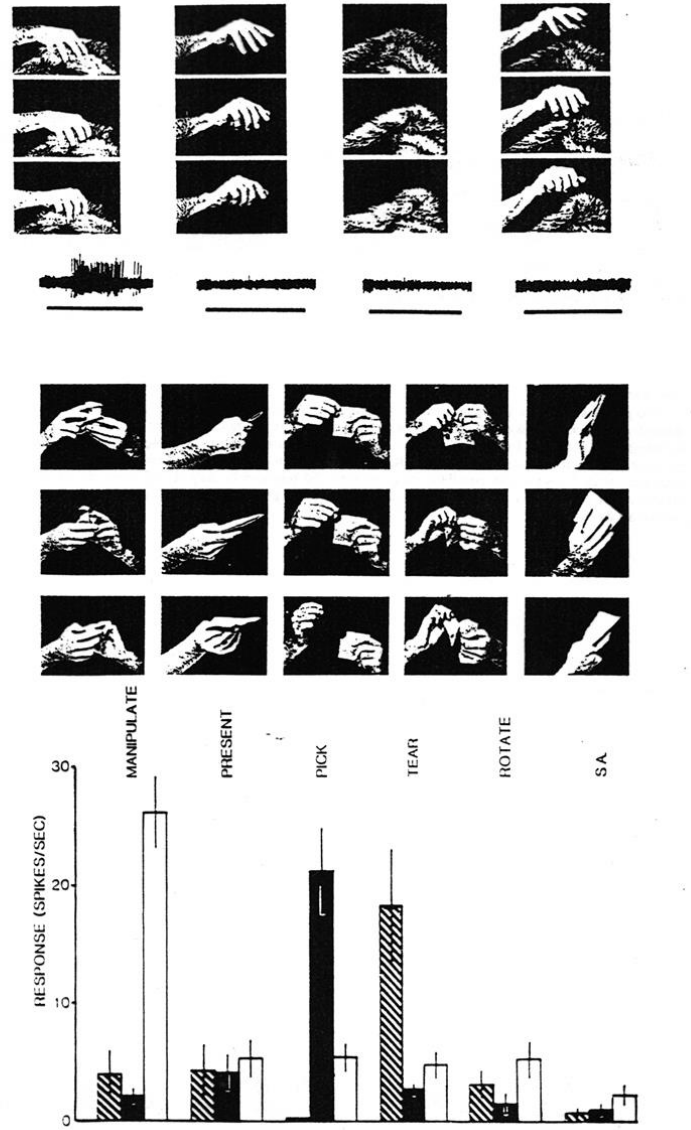




Kraskov et al. 2009

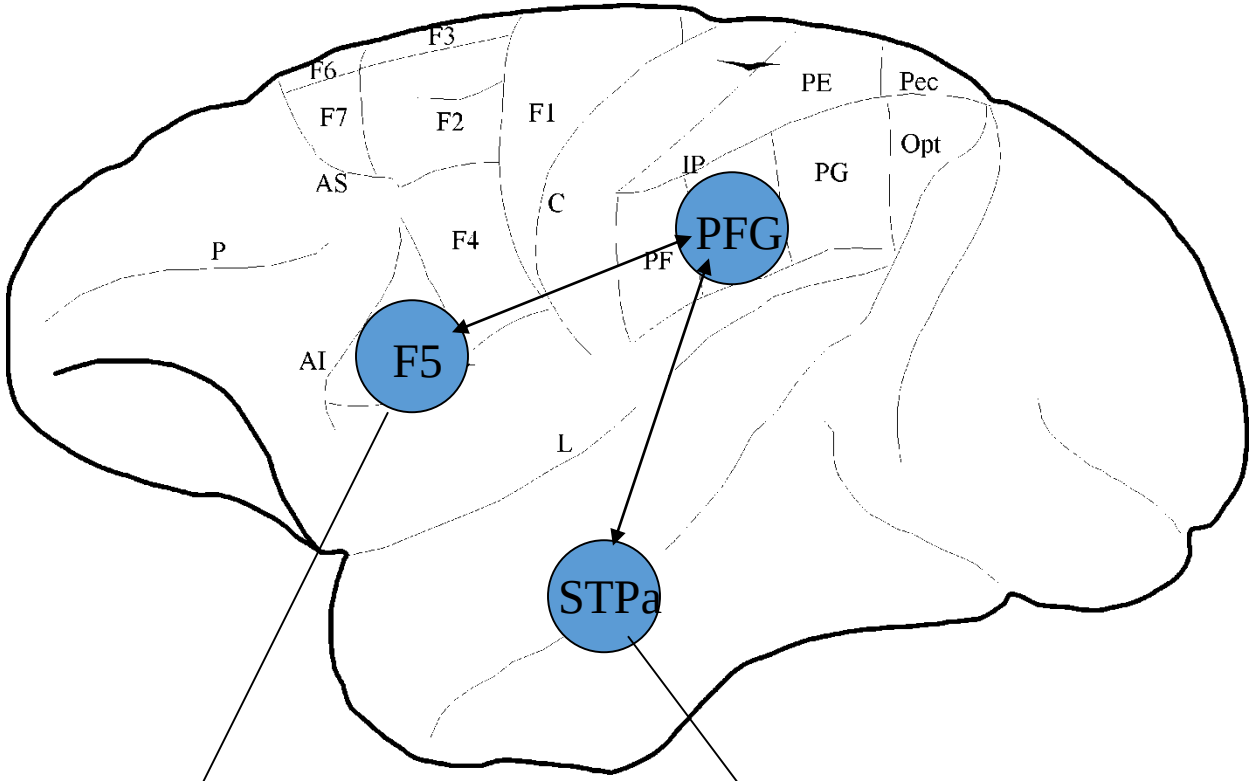
Neuroni del solco temporale superiore che rispondono al movimento biologico





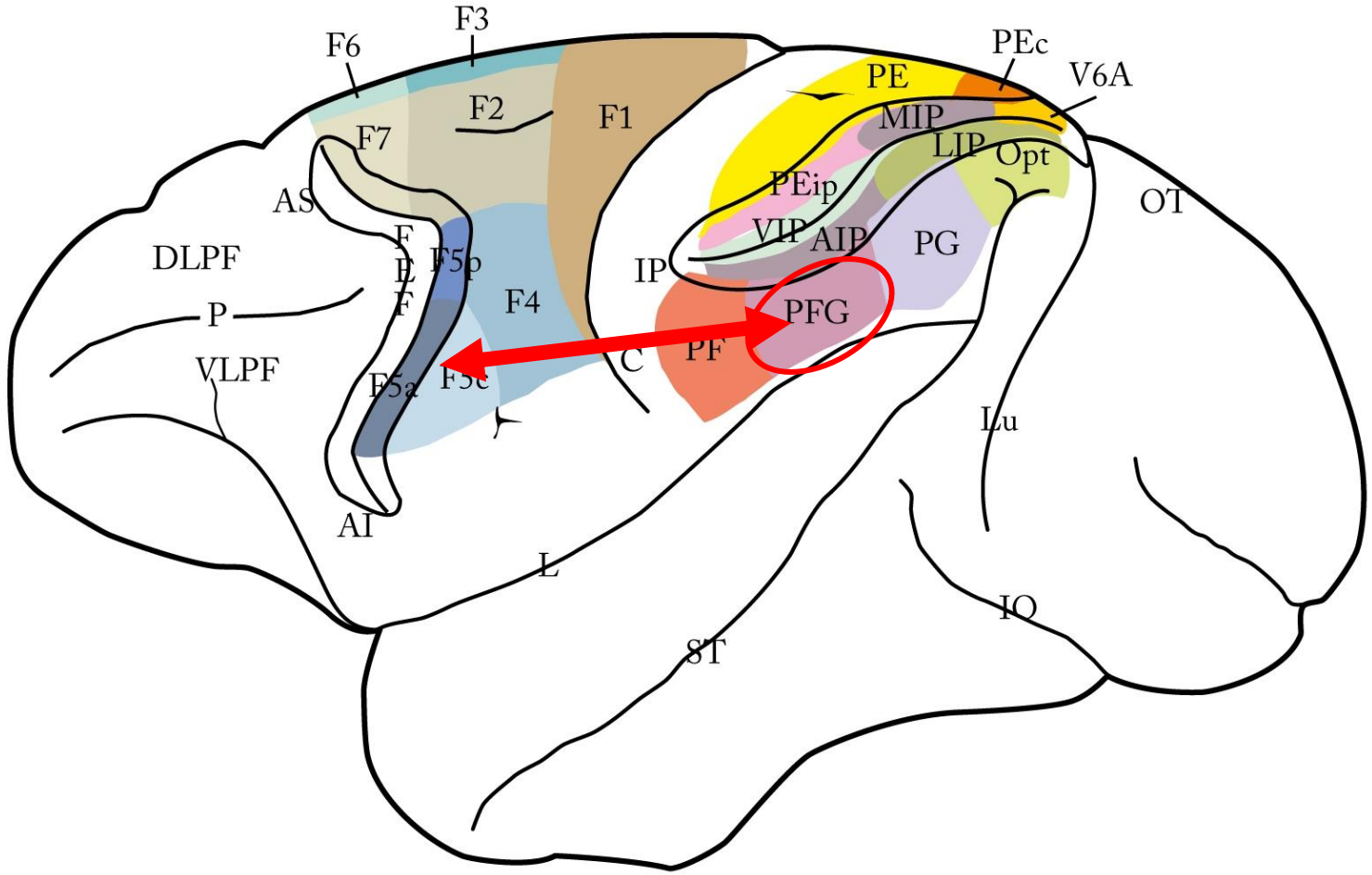
Perrett et al. 1989

Il sistema di matching temporo-parieto-frontale

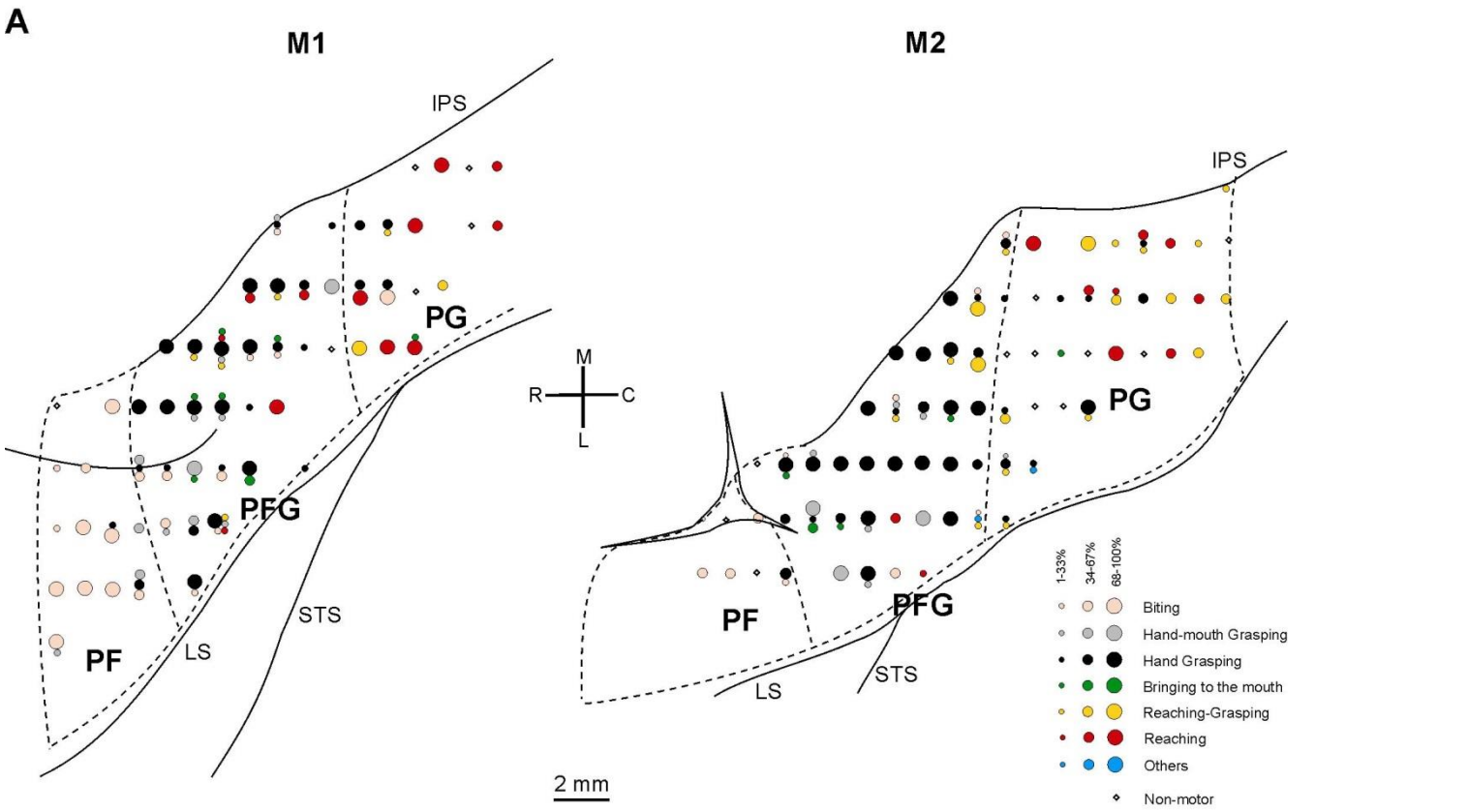


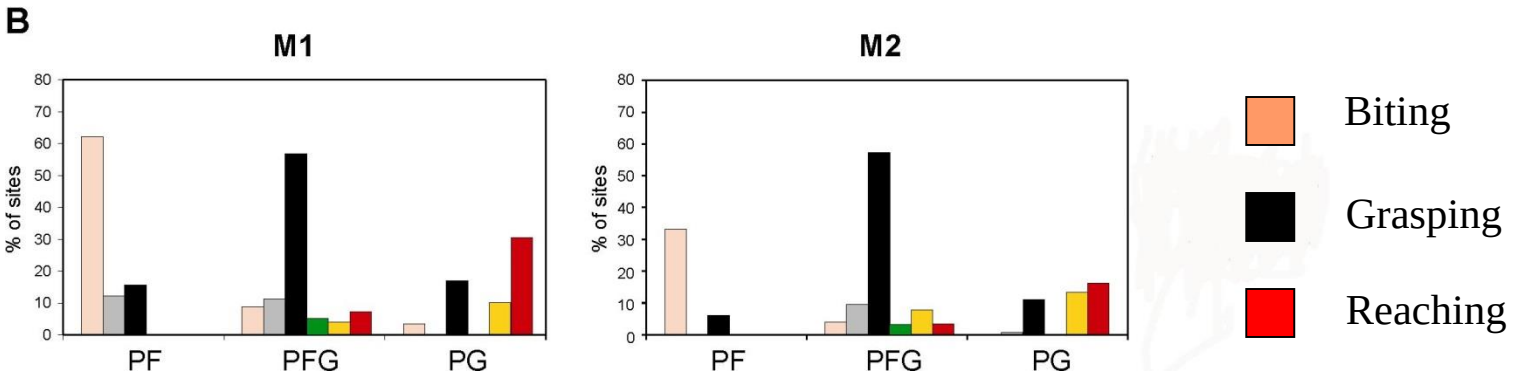
Rappresentazione motoria delle azioni

Descrizione pittorica delle azioni

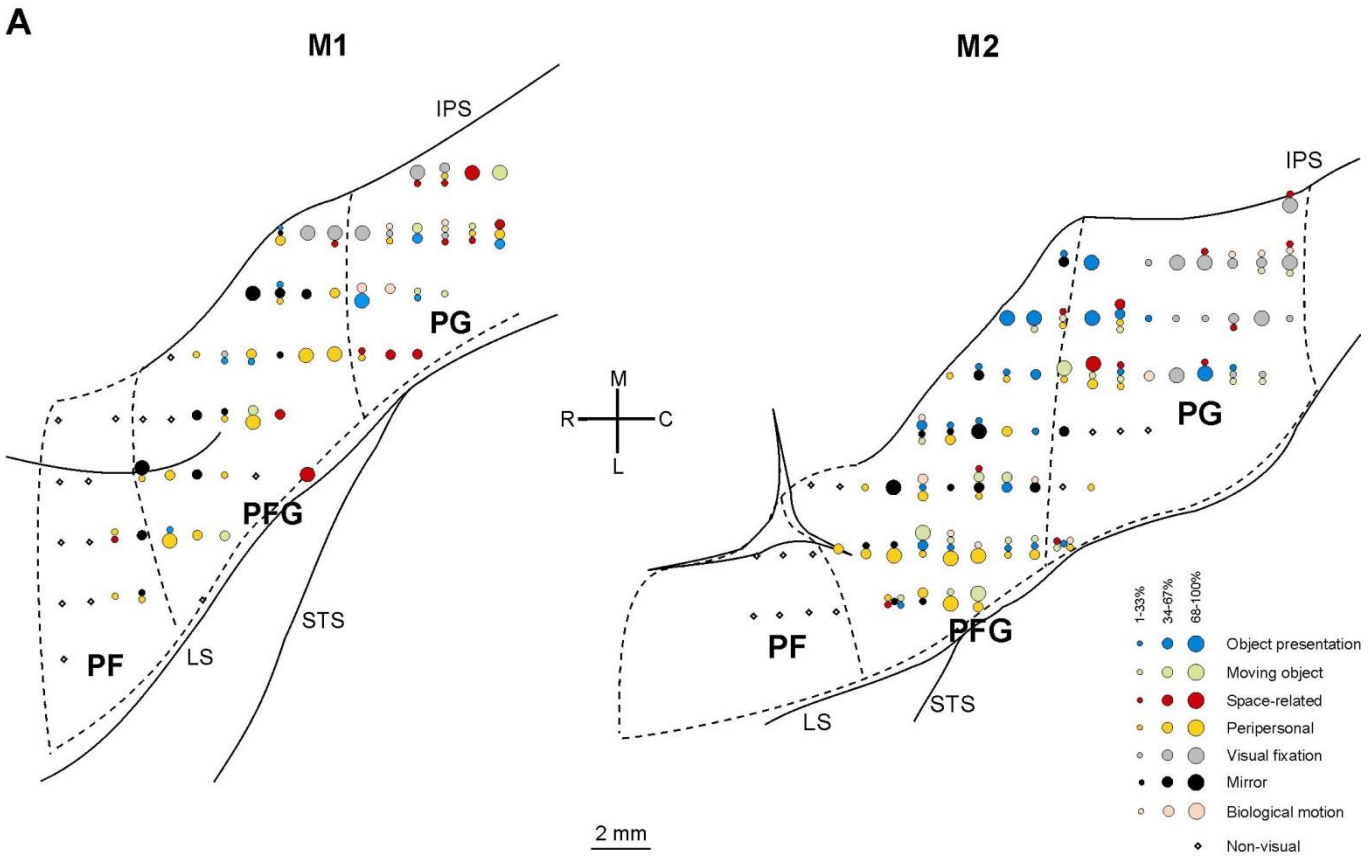

F6
F3
F2
F1
F7
AS
DLPF
P
VLPF
F5p
F4
F5a
AI
C
PE
PEc
V6A
MIP
LIP
Opt
PEip
VIP
AIP
PG
OT
IP
PFG
PF
Lu
L
IO
ST

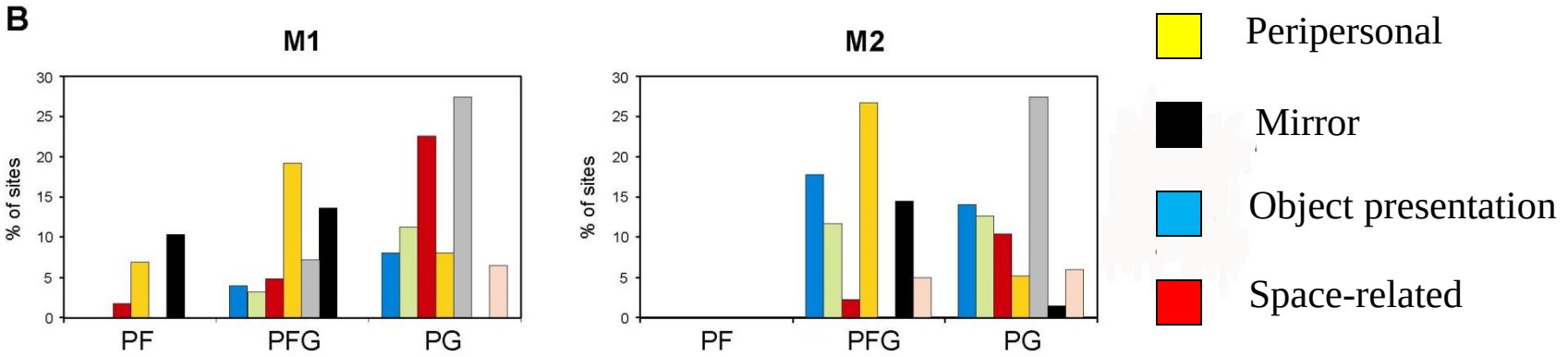
Mappe motorie nel lobulo parietale inferiore





Mappe visive nel lobulo parietale inferiore

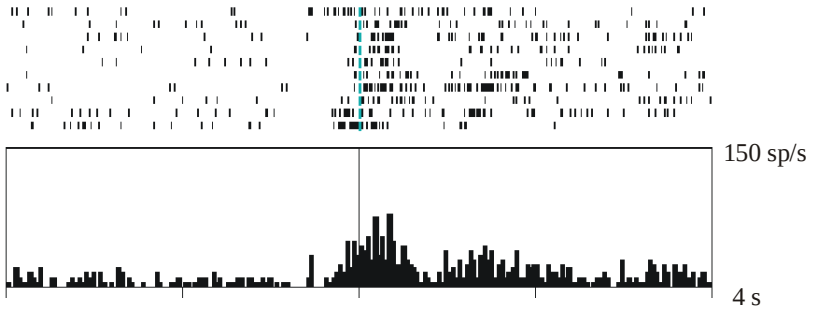




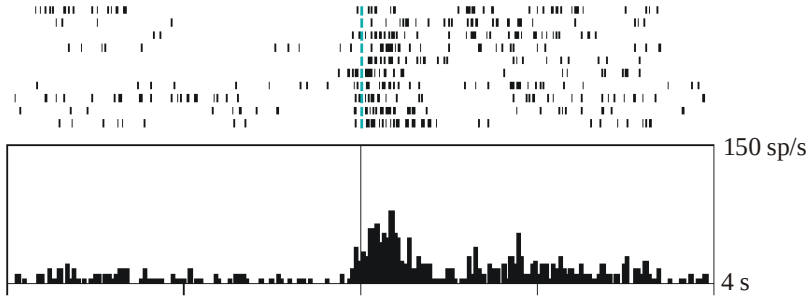
Esempi di neuroni motori parietali

UNIT 8

Monkey grasps food with the hand

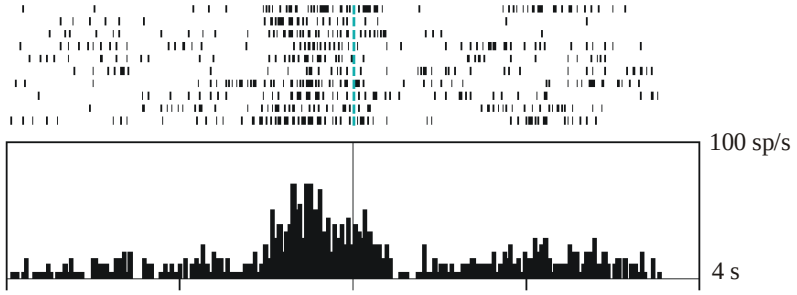


Monkey grasps food with the mouth

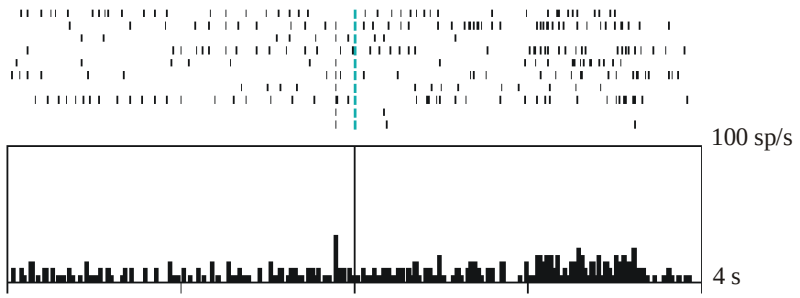


UNIT 75

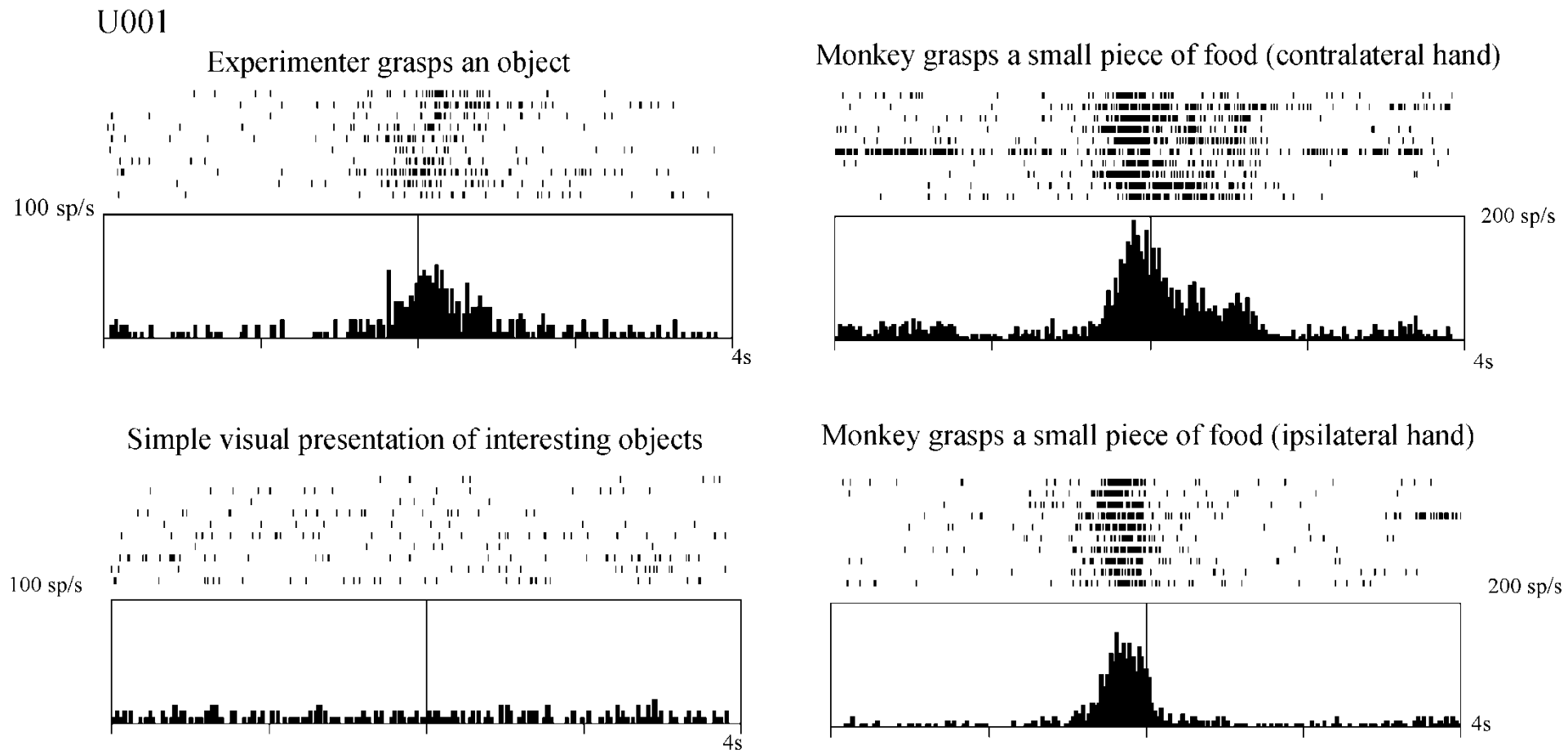
monkey reaches and grasps an object



Monkey pushes a vertical plate



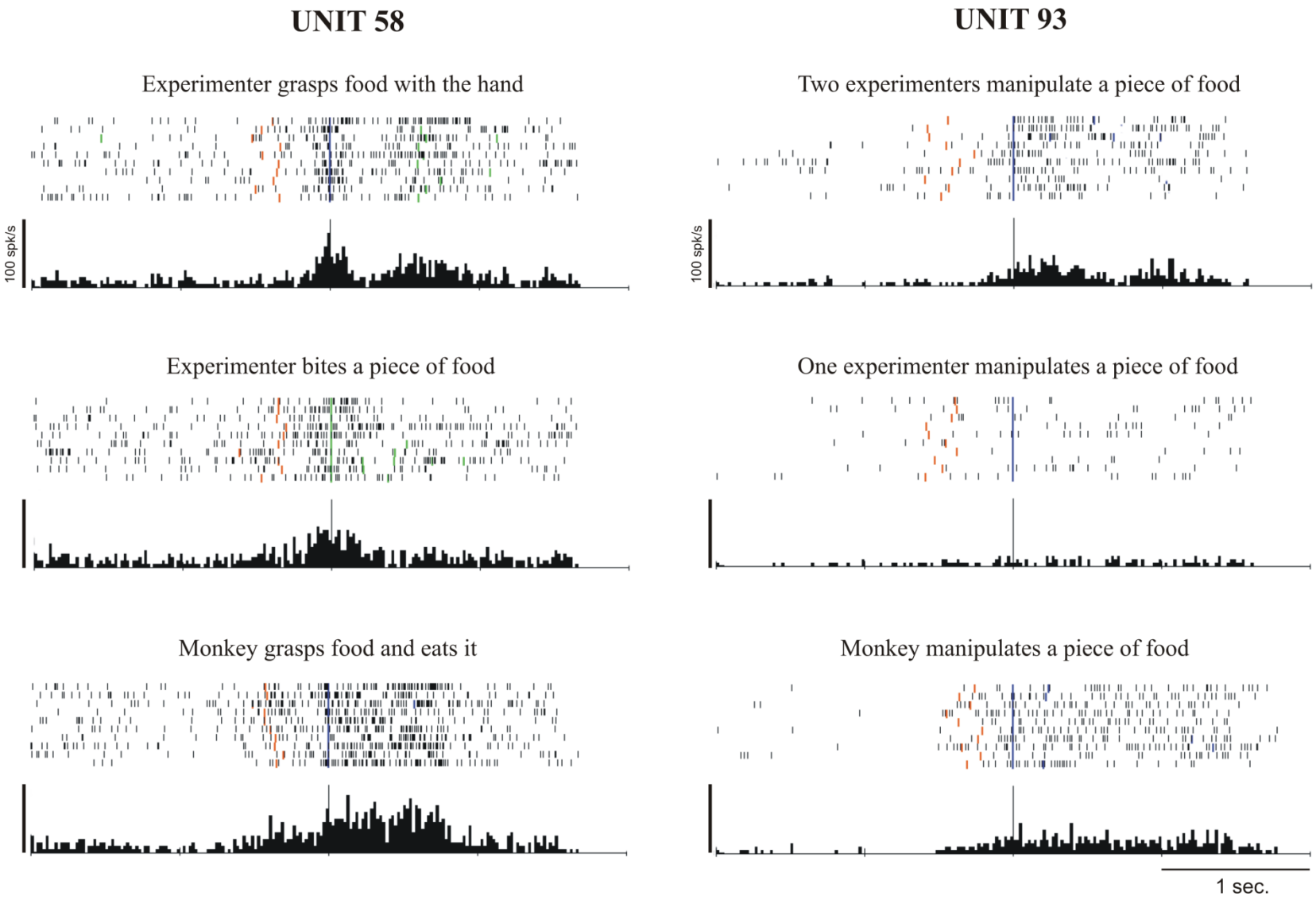
Parietal mirror neuron



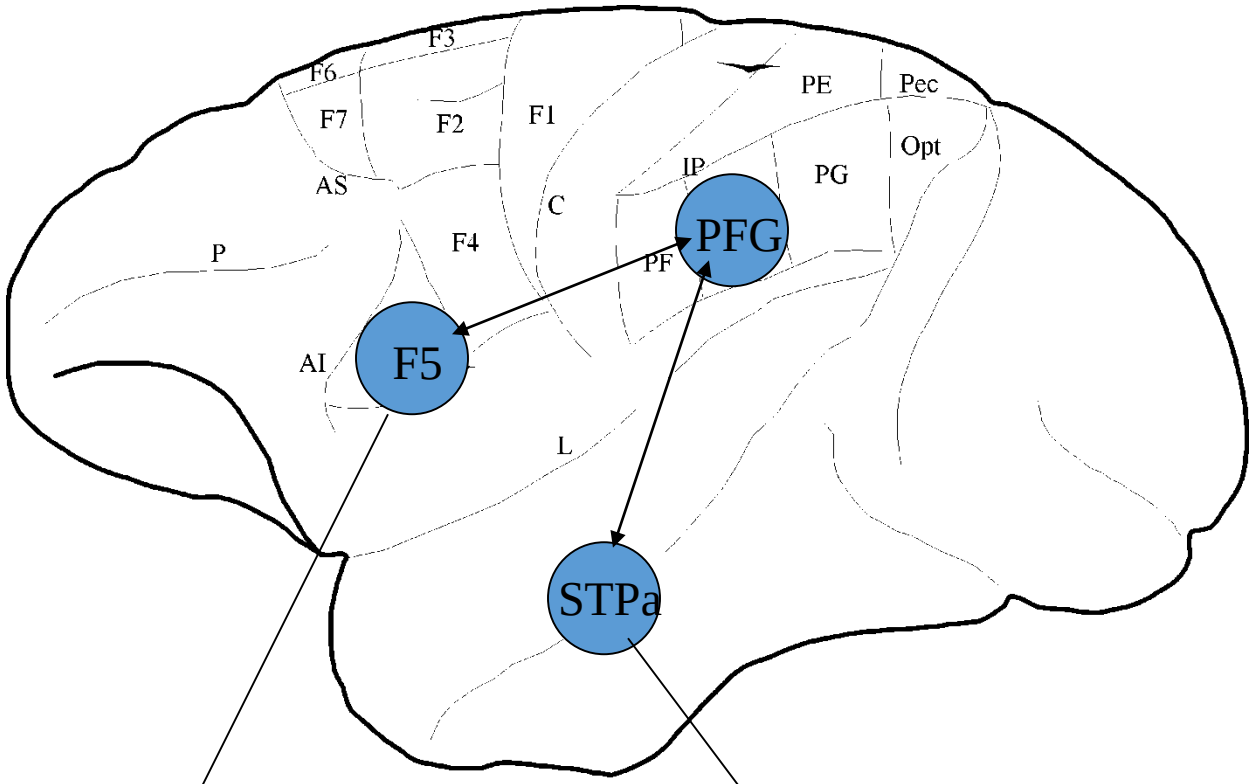
Neuroni specchio parietali

Observed motor act	N° of neurons
Grasping	30
Two-hands interaction	20
Manipulating	7
Placing	6
Breaking or tearing	5
Taking away	4
Trying to grasp	4
Others	1
Grasping/Manipulating	10
Grasping/Holding	7
Grasping/Placing	5
Grasping/Others	6
Manipulating/Others	6
Mouth or Mouth/hand	17
Others	6
Tot.	**134**

Neuroni specchio parietali



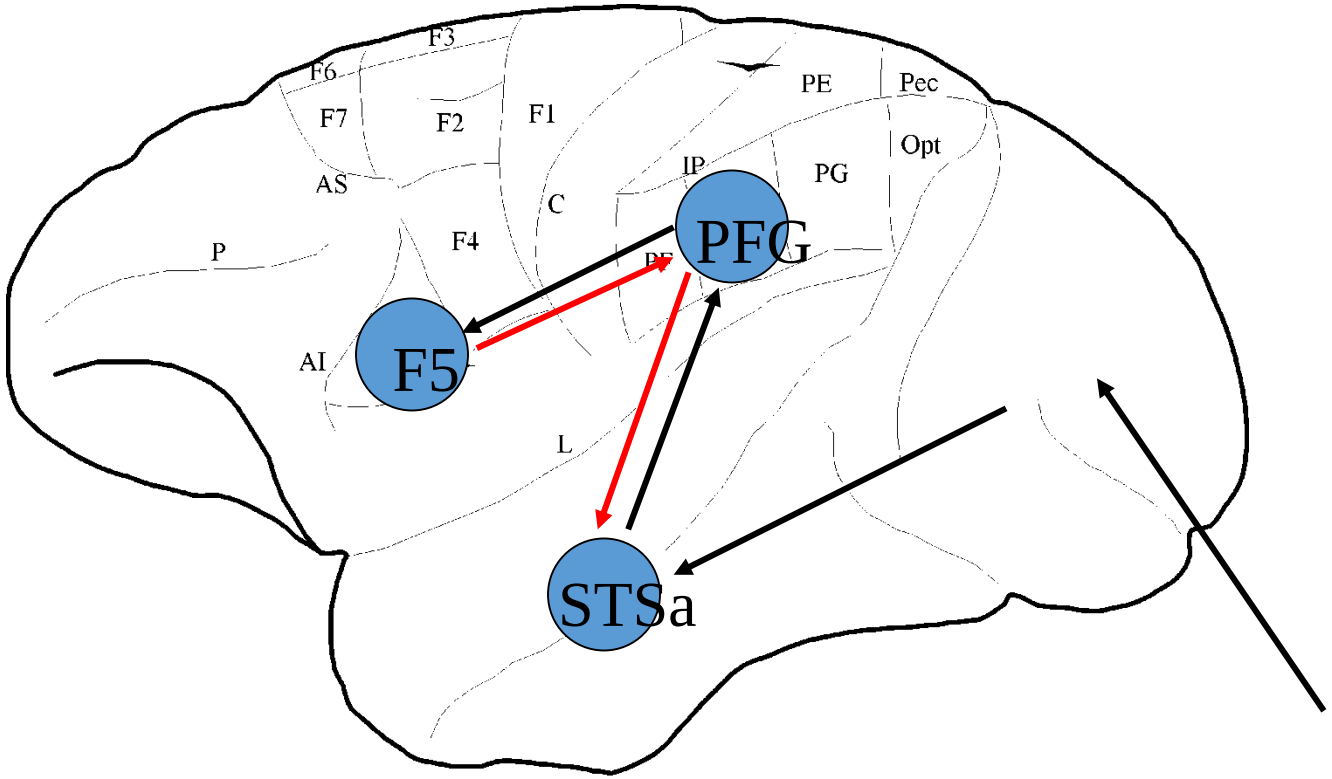
Il sistema di matching temporo-parieto-frontale

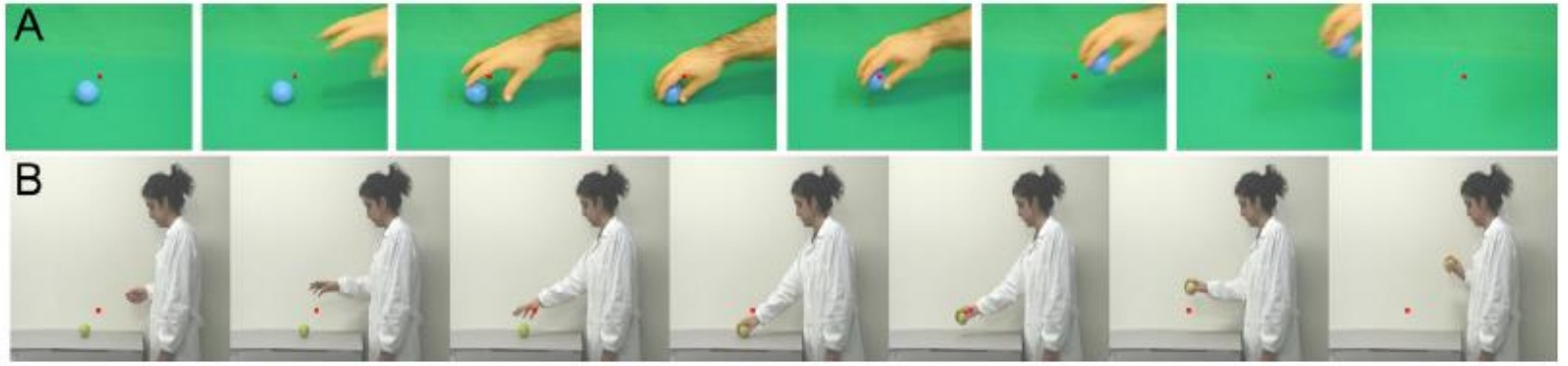


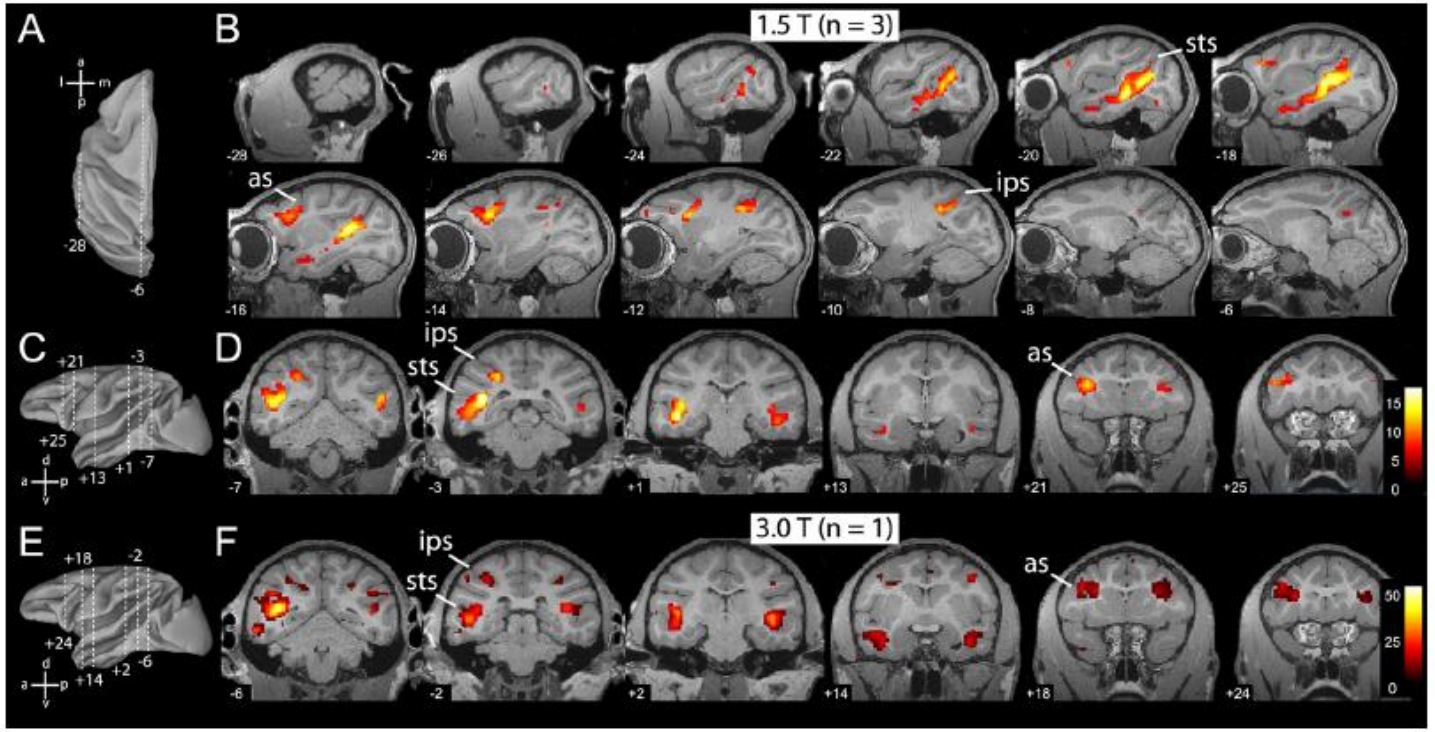
Rappresentazione motoria delle azioni

Descrizione pittorica delle azioni

I neuroni specchio contribuiscono alla codifica dei dettagli dei movimenti osservati, probabilmente attraverso proiezioni a feedback

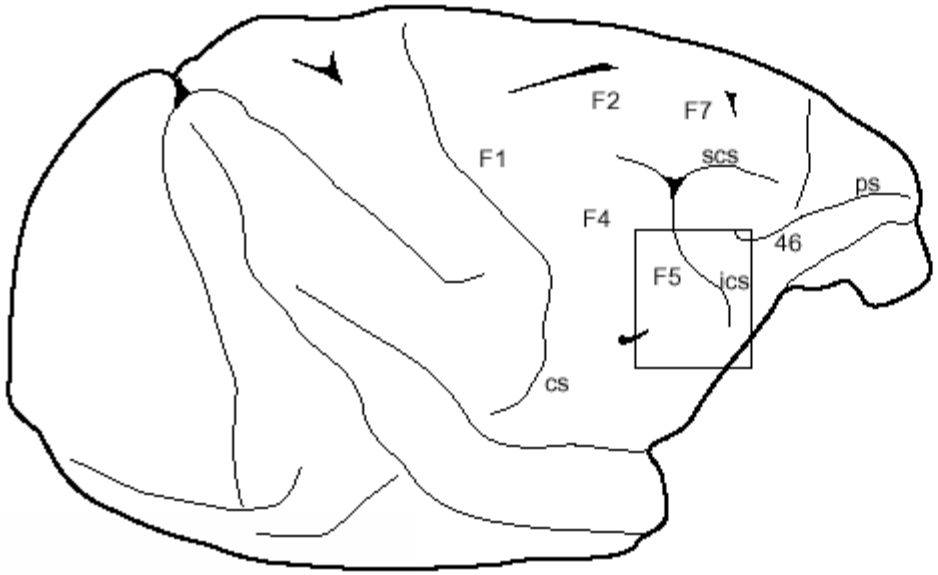


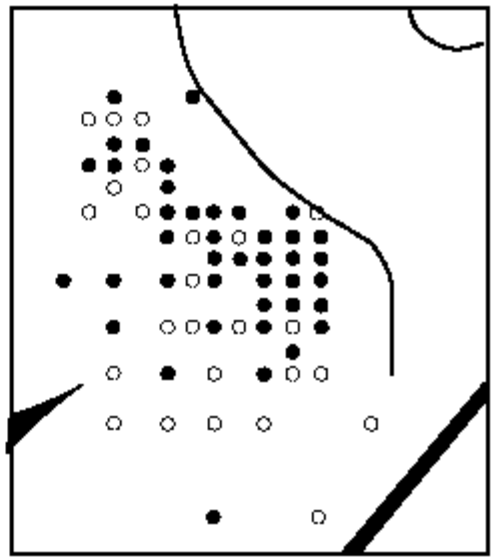




Nelissen et al. 2011

I neuroni mirror che si attivano all'osservazione degli atti di bocca

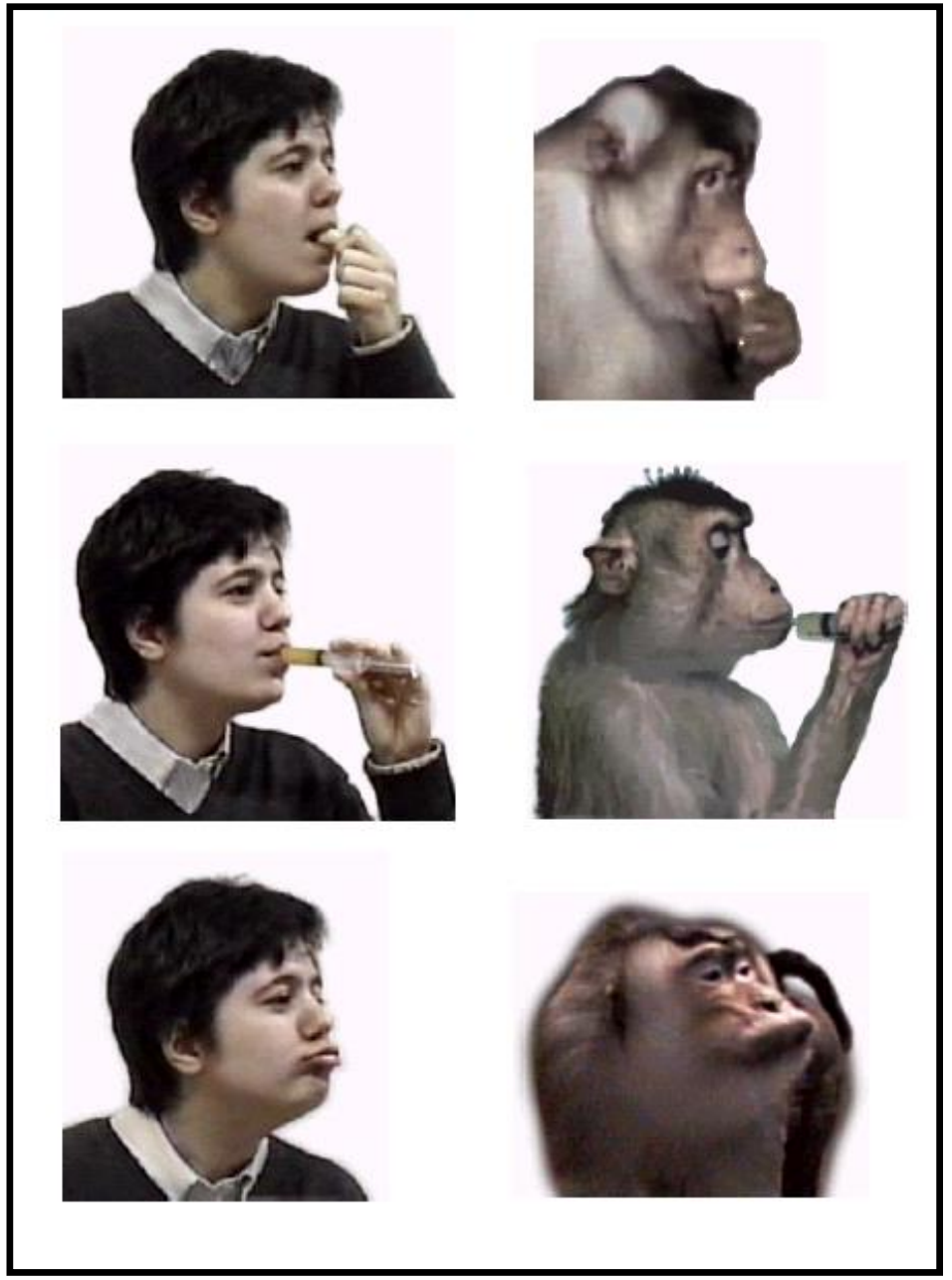




Ferrari et al. 2003

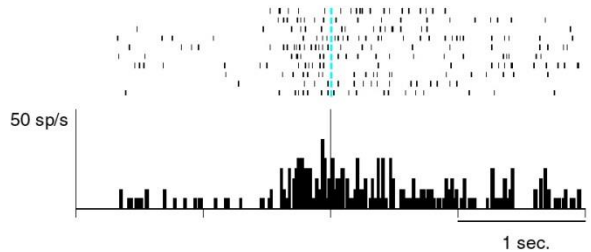
Ingestivi

Comunicativi

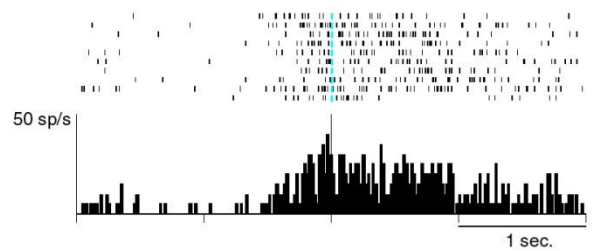


U087

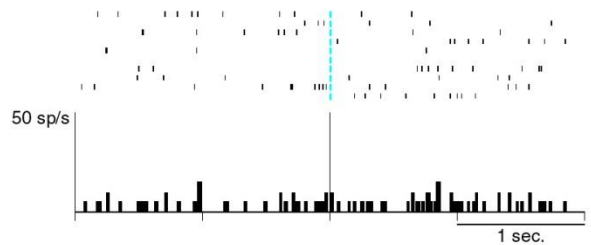
Experimenter grasps food with the mouth



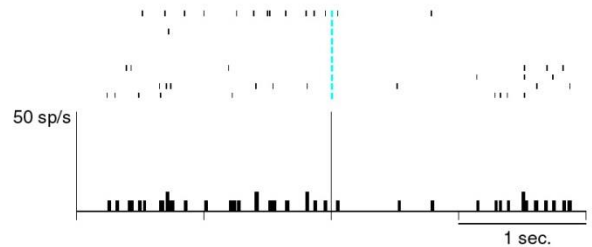
Monkey grasps food with the mouth



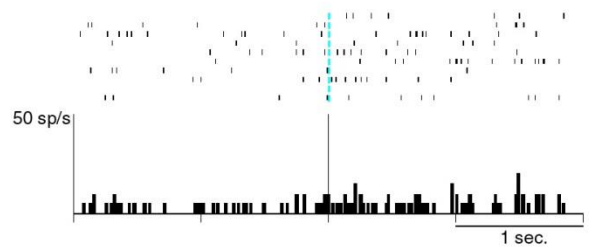
Experimenter sucks from a syringe



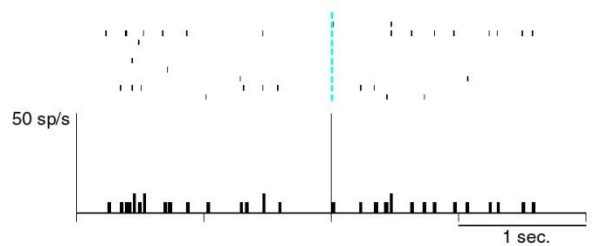
Monkey sucks from a syringe



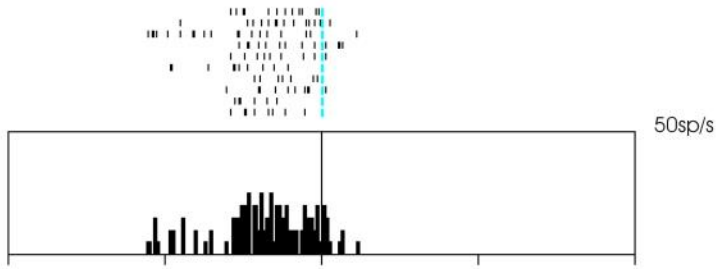
Experimenter mimes grasping food with the mouth



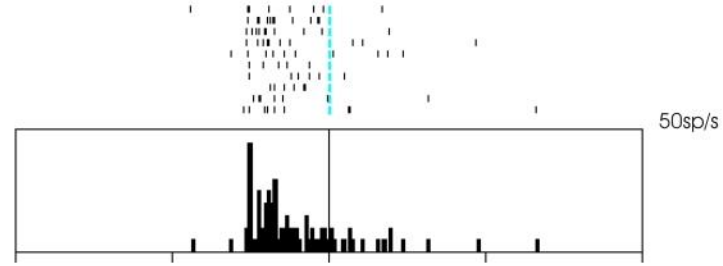
Food presentation



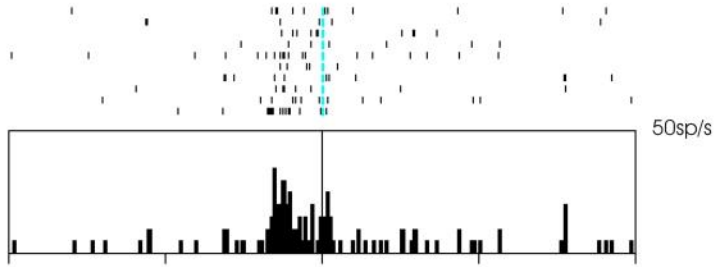
Experimenter grasps food with the hand



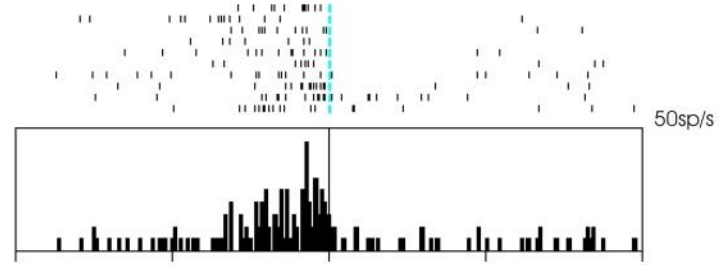
Experimenter grasps food with the mouth



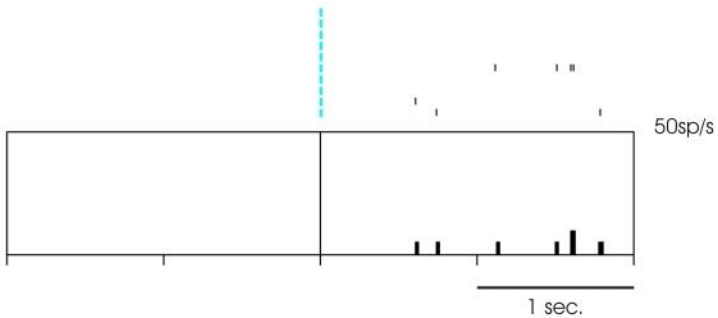
Monkey grasps food with the hand



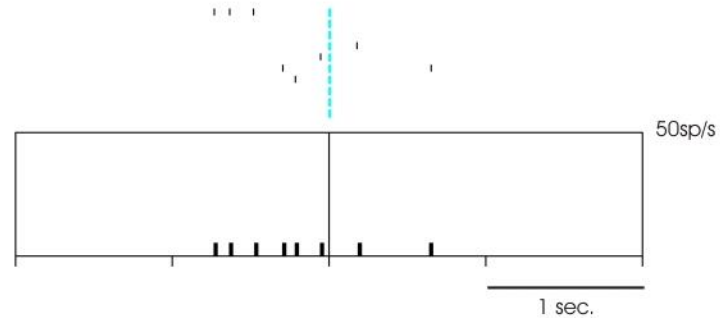
Monkey grasps food with the mouth

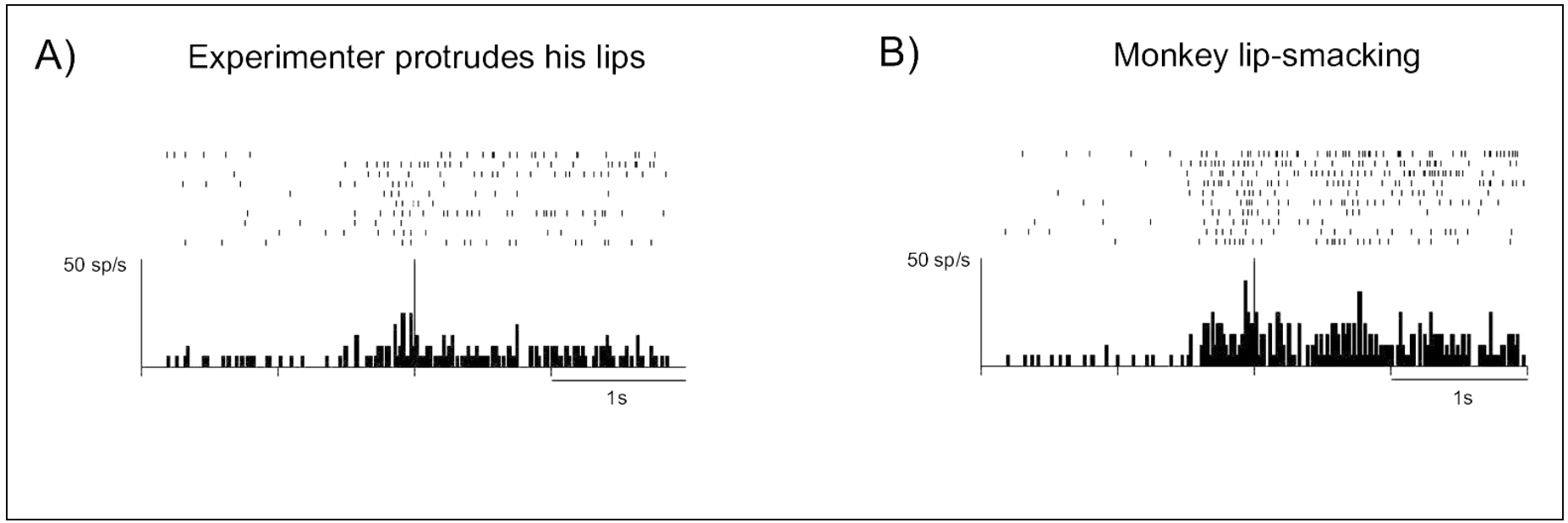


Food presentation



Experimenter mimes grasping food with the mouth




A)
Experimenter protrudes his lips
50 sp/s
1s
B)
Monkey lip-smacking
50 sp/s
1s

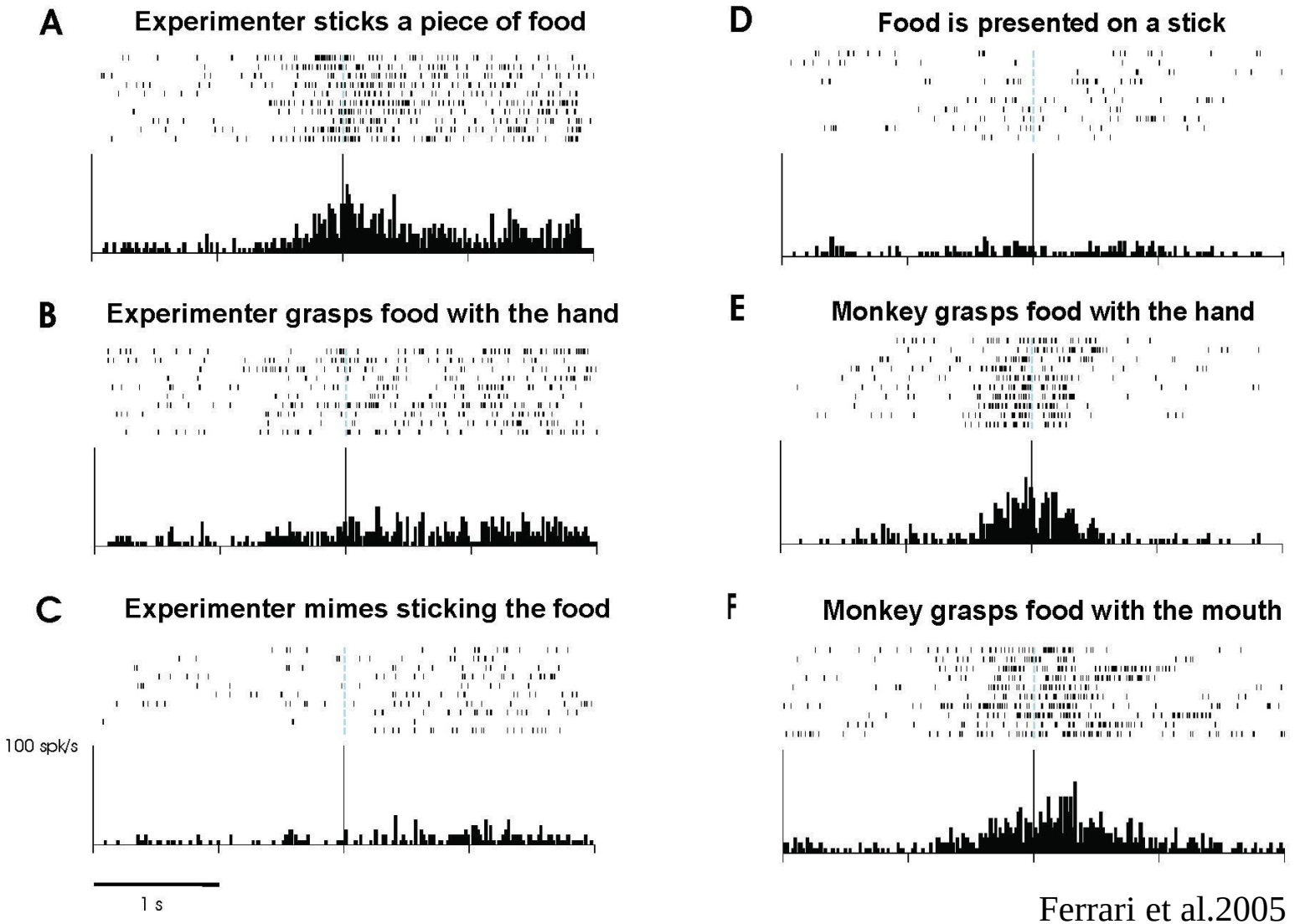
I gesti comunicativi possono essere derivati dalle azioni ingestive

Ipotesi di Van Hoof (1962, 1967) sulla ritualizzazione dei gesti ingestivi per scopi comunicativi.

La conoscenza comune a colui che comunica e al ricettore della comunicazione sul cibo e sulle azioni ingestive è diventata il terreno comune per la comunicazione sociale.

Neuroni mirror che rispondono alle azioni eseguite con utensili

U088

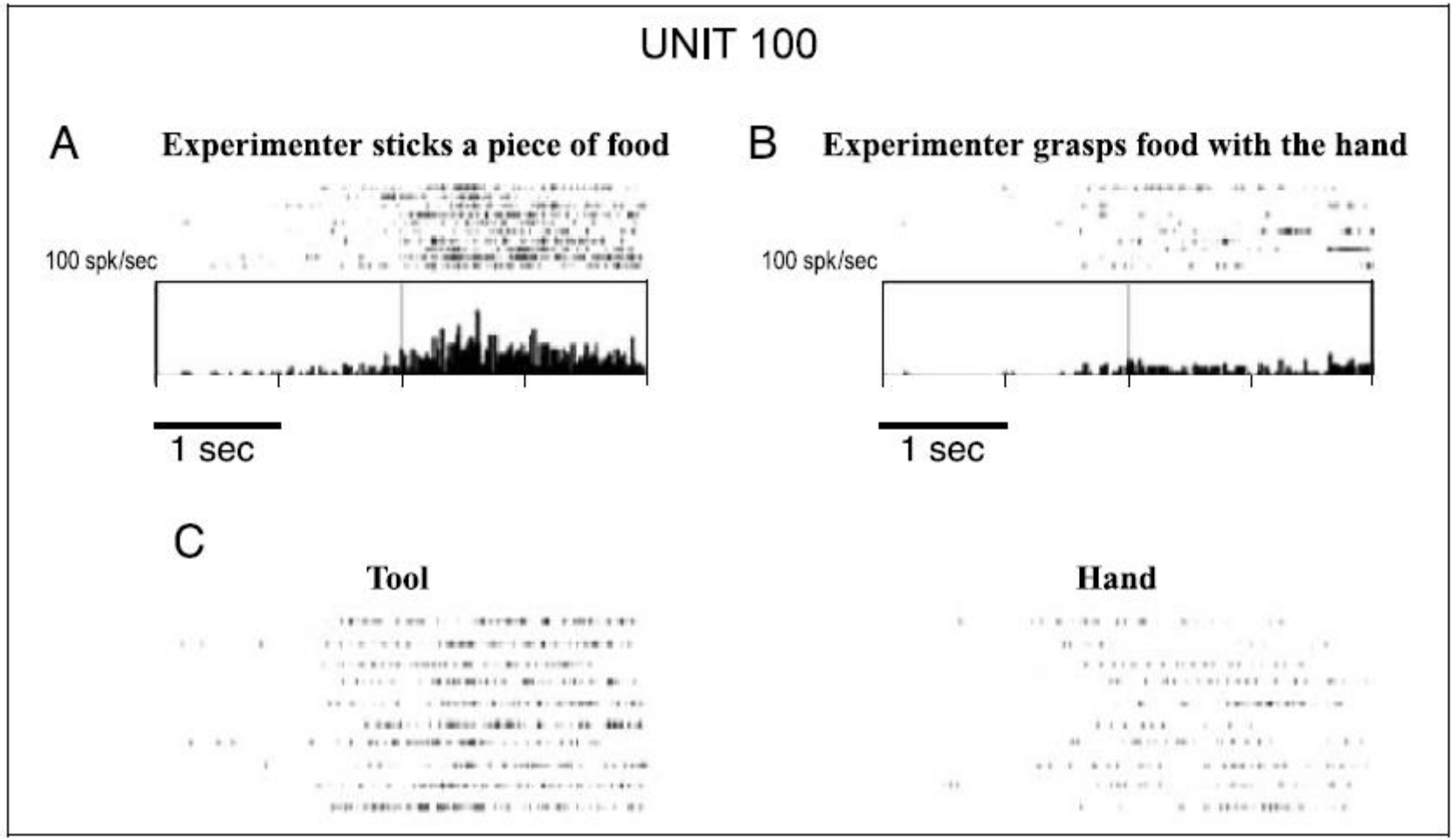


Ferrari et al.2005

Table 1. Tool-Responding Mirror Neurons Subdivided According to the Most Effective Observed Actions in Activating Them

Category	*Number of Neurons*
Sticking	5
Holding	4
Others	4
Sticking or grasping*/holding	13
Sticking/manipulating	2
Approaching/sticking	2
Others	3
Total	33

*The term *grasping* is referred to action made with pliers.


UNIT 100
A
Experimenter sticks a piece of food
100 spk/sec
1 sec
B
Experimenter grasps food with the hand
100 spk/sec
1 sec
C
Tool
Hand

I neuroni che si attivano selettivamente per gli strumenti si trovano in una posizione laterale di F5 dove c'è una notevole frequenza di neuroni motori mano-bocca