

Principes d'Organisation des Fonctions Cognitives dans le Cortex Cérébral Humain

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Principes anatomo-fonctionnels fondamentaux

- Organisation du cortex cérébral: **emboîtée multi-niveaux**
- Hémisphère: architecture d'aires corticales
- Aire corticale: carte de macro-colonnes de neurones
 - » Opérateur de traitement de l'information
- Macro-colonne: ensemble de colonnes corticales (10.000 neurones, d=500 μm)
 - » Entité de codage fonctionnel
- Colonne corticale: groupe de circuits neuronaux micro-canoniques (100 neurones, d=30 μm)
 - » Entité informationnelle de base
- Circuit microcanonique
 - » Différentiation des connections cortico-corticale/sous-corticales définissant l'architecture corticale

Principes anatomo-fonctionnels fondamentaux

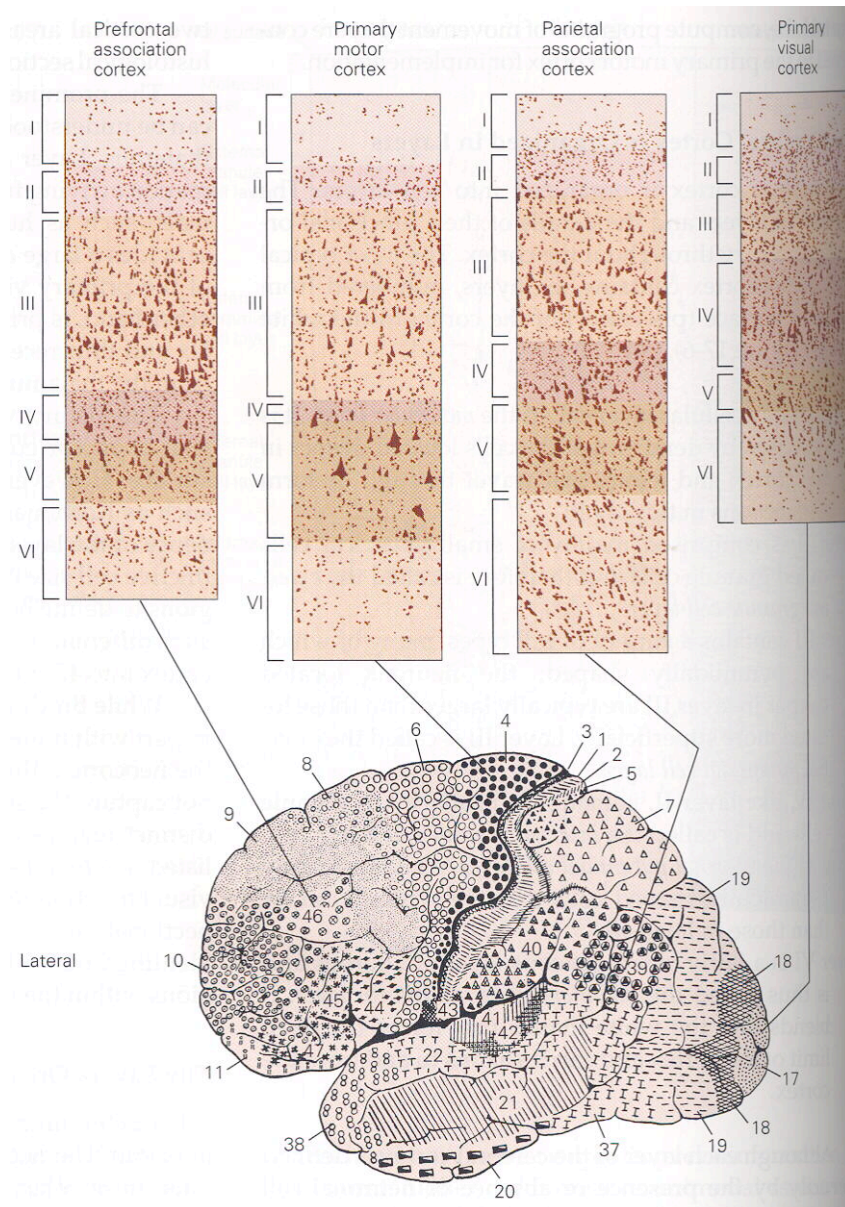
- Homologie fonctionnelle droite/gauche
- Différentiation droite/gauche en fonction de **l'échantillonnage relatif** des informations temporelles, spatiales ou constitutives

Sujet droitier:

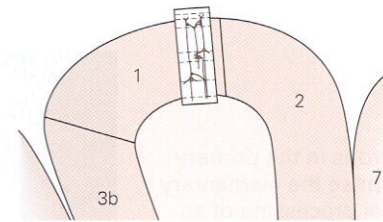
- Hémis. Gauche: hautes fréquences / local / parties
- Hémis. Droit: basses fréquences / global / tout
 - Ex: phoneme/intonation
 - Lecture syllabique/globale
 - Piano: main gauche -> accord / main droite -> mélodie

E	E
E	E
EEEE	
E	E
E	E

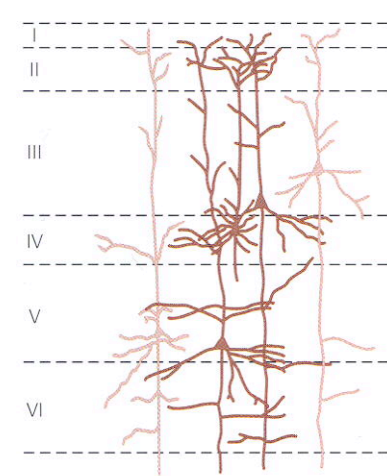
Aires cérébrales



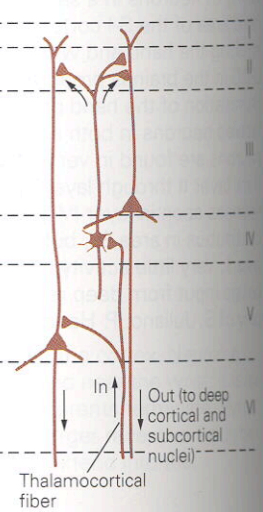
A Sagittal section of monkey S-I cortex



B Expanded view of cortical histology

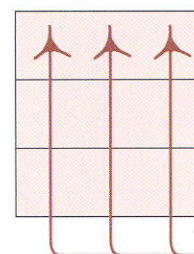


C Schematic cortical circuits

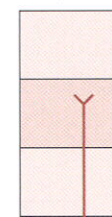


Ascending

Superficial layers (I-III)

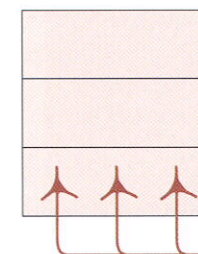


Layer IV



Descending

Infragranular layers (V, VI)



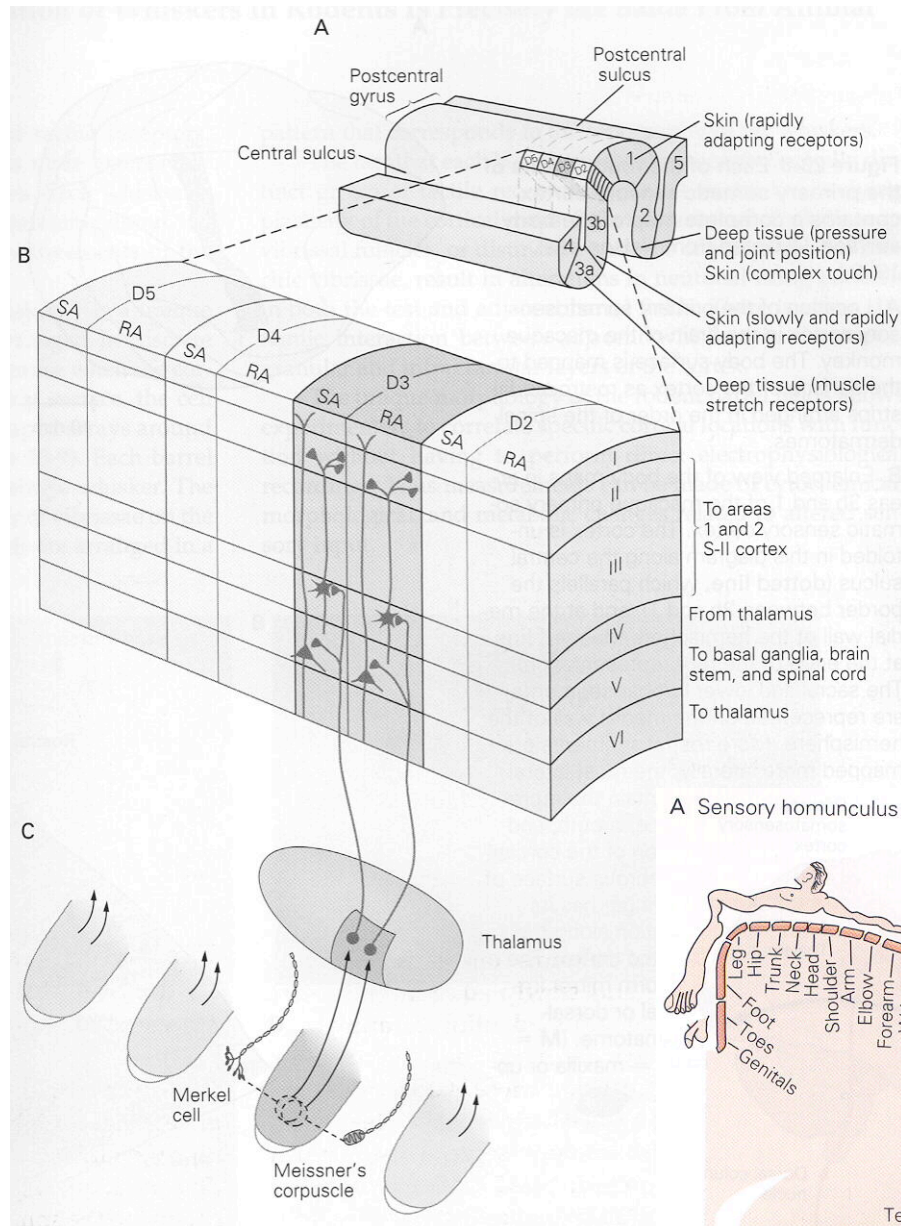
Multilaminar



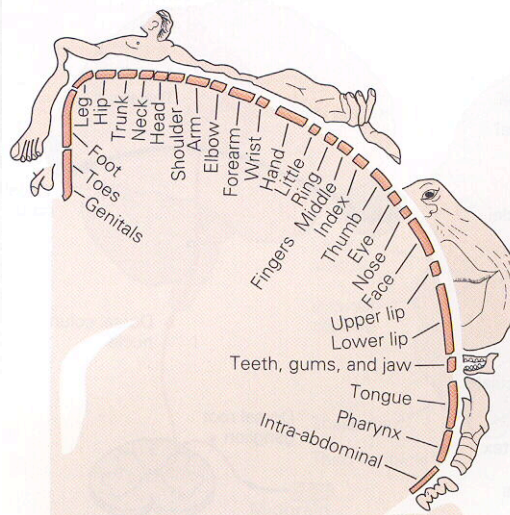
Cartes

Macro-colonnes

Colonnes



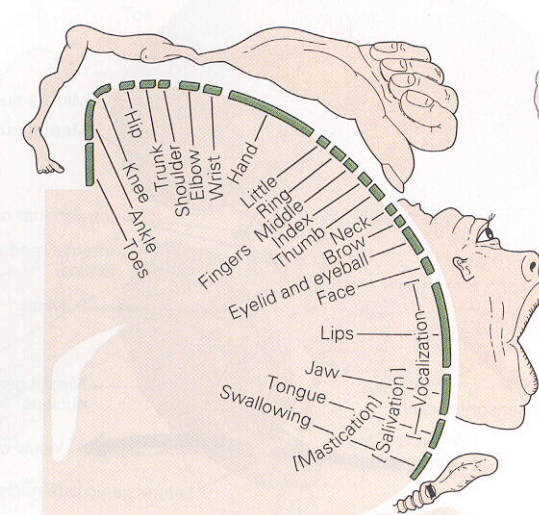
A Sensory homunculus



Medial

Lateral

B Motor homunculus

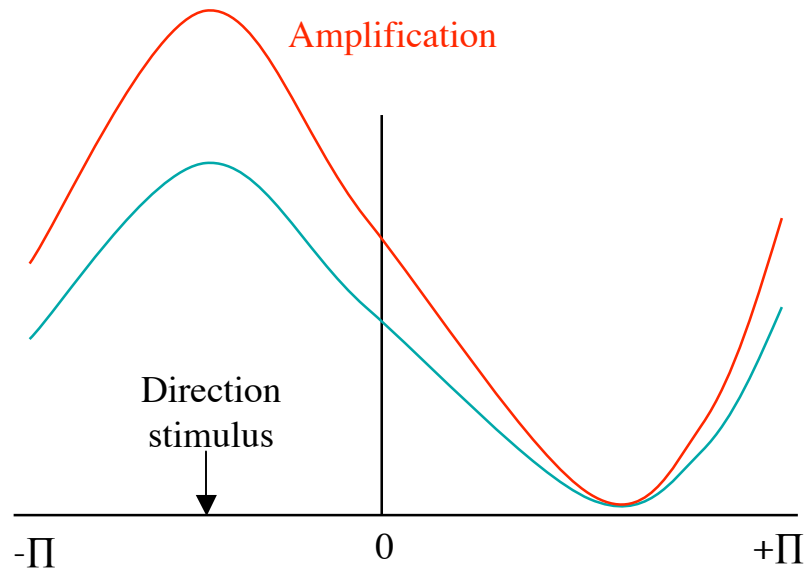


Medial

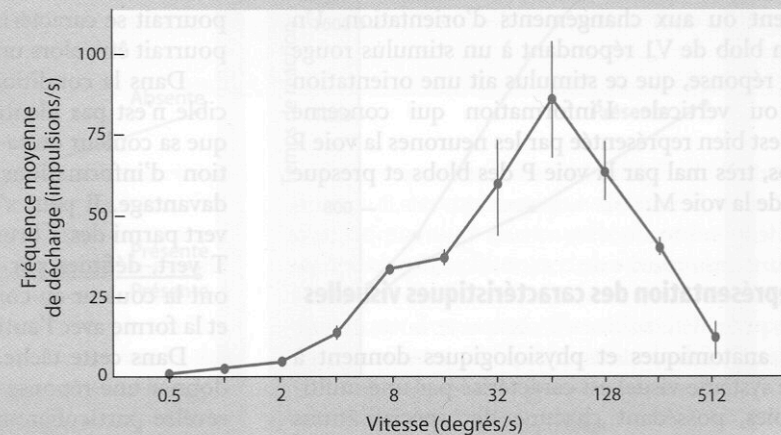
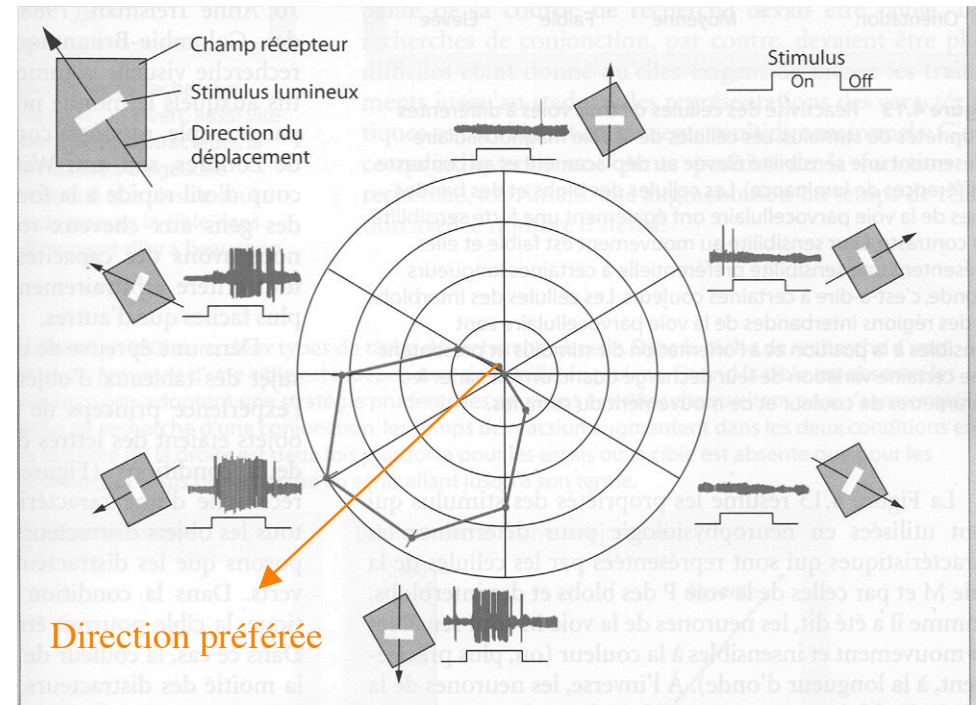
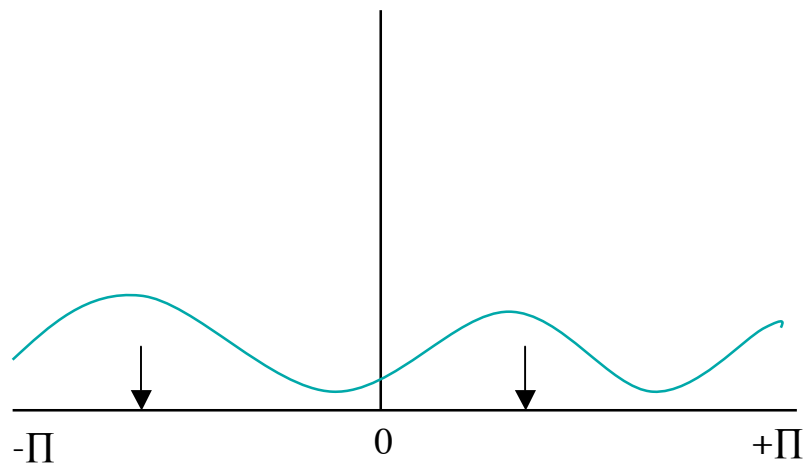
Lateral



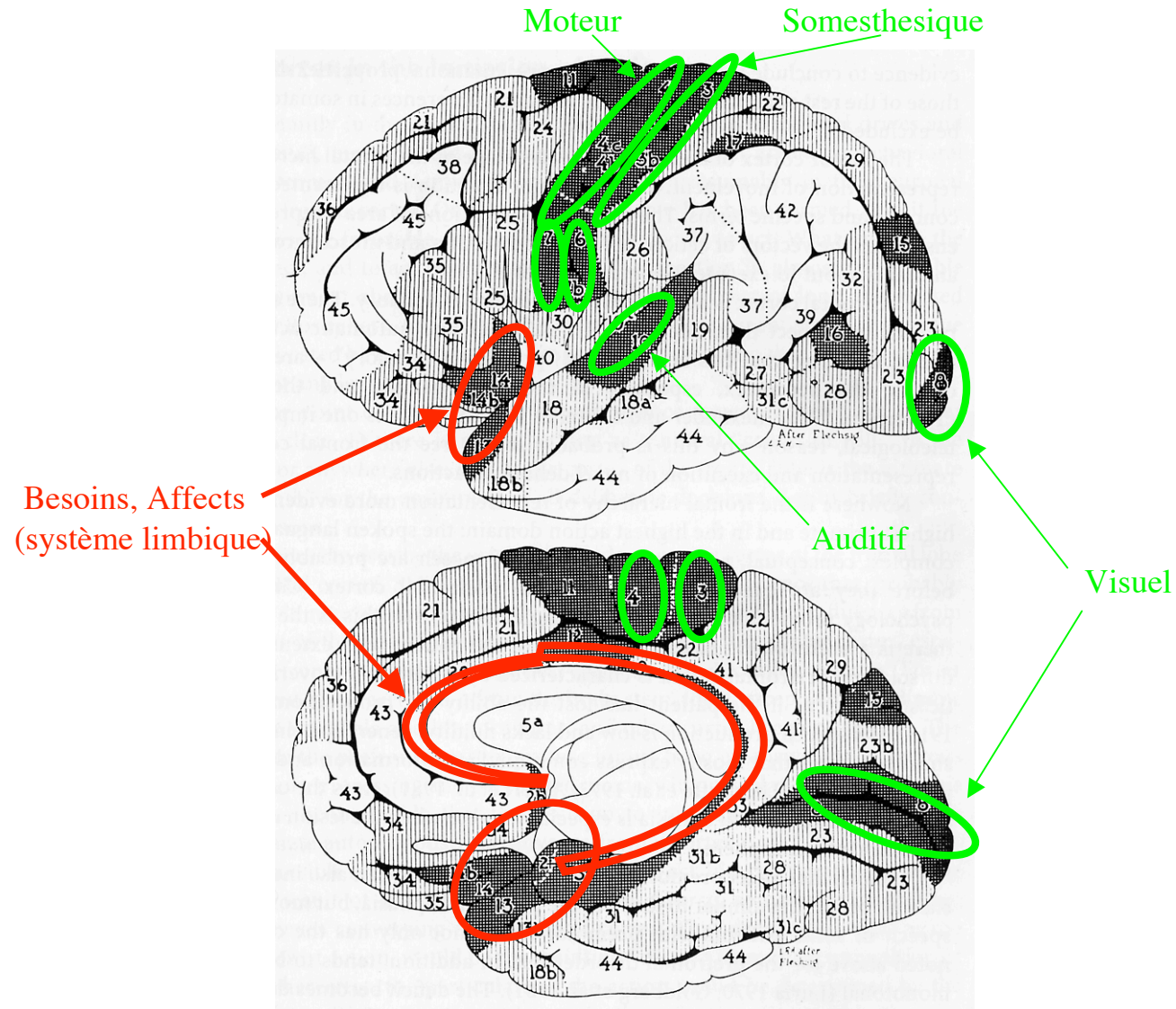
Codage par population (Macro-colonne)



Directions préférées des neurones
dans la macro-colonne

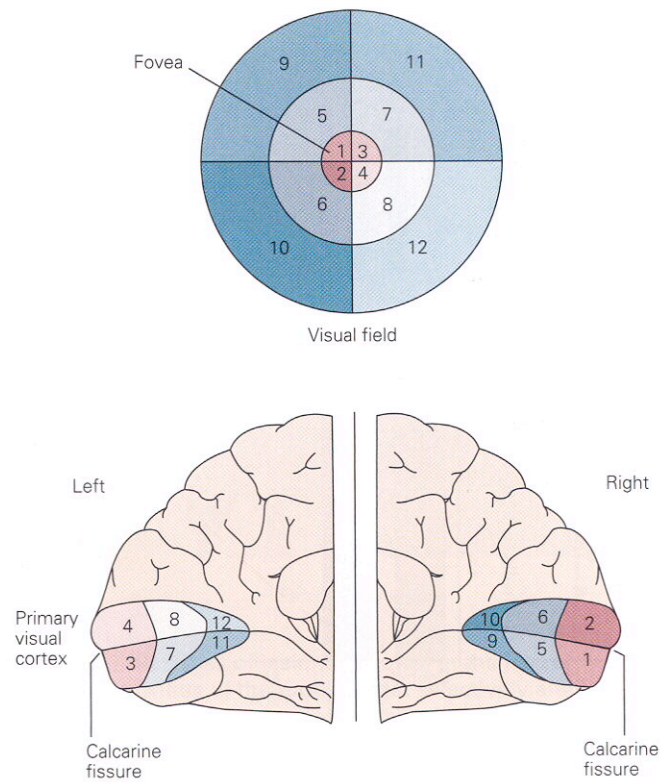


Aires corticales primaires

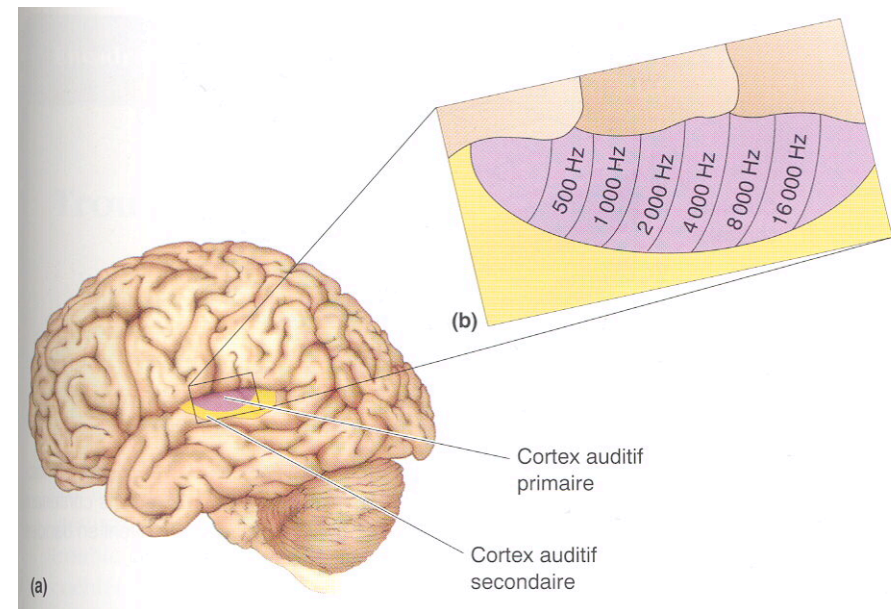


Cartes corticales des cortex visuel et auditif primaires

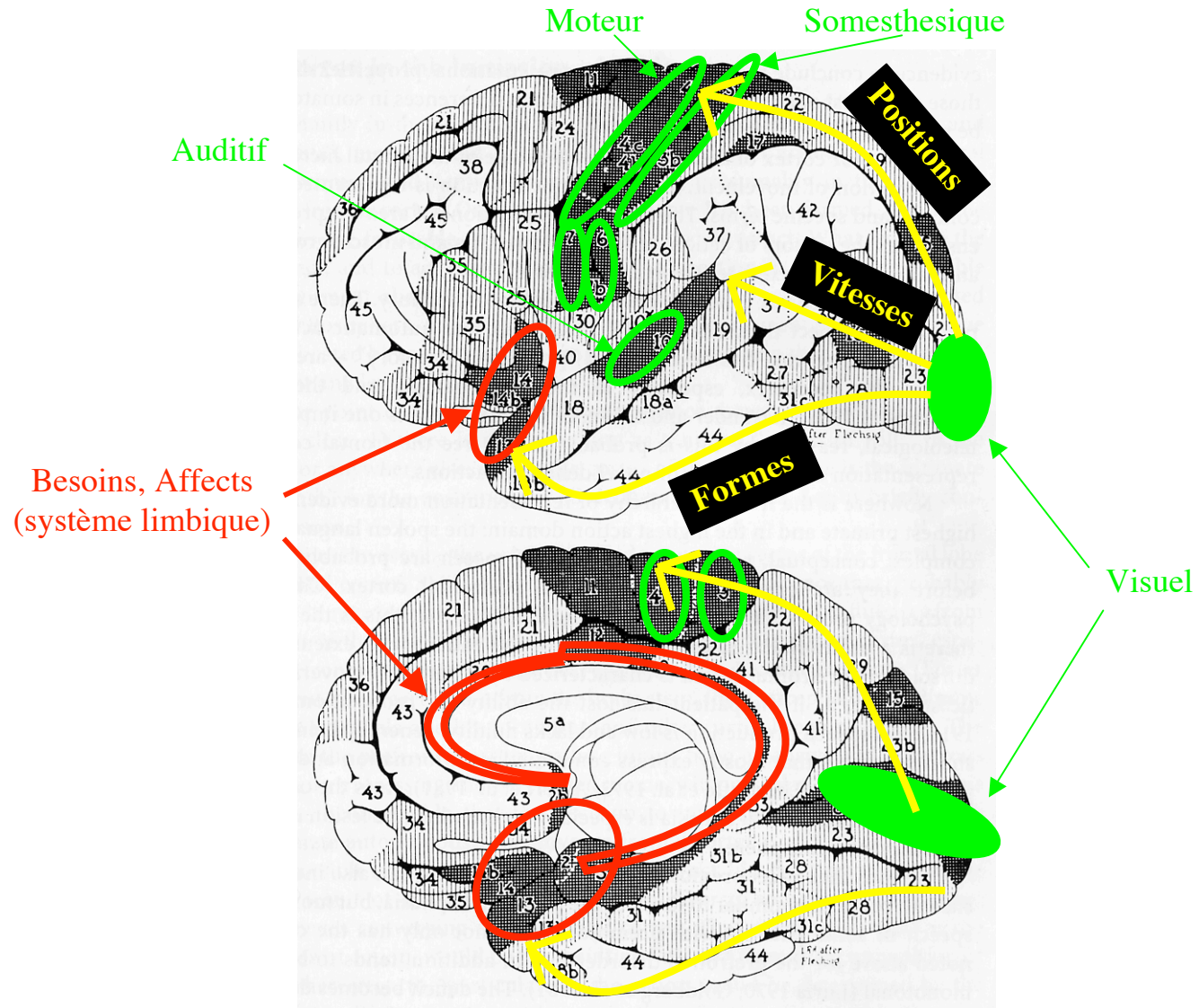
Topographique



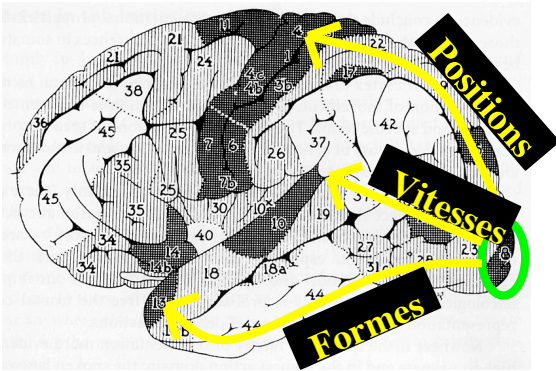
Tonotopique



Voies visuelles



Système visuel



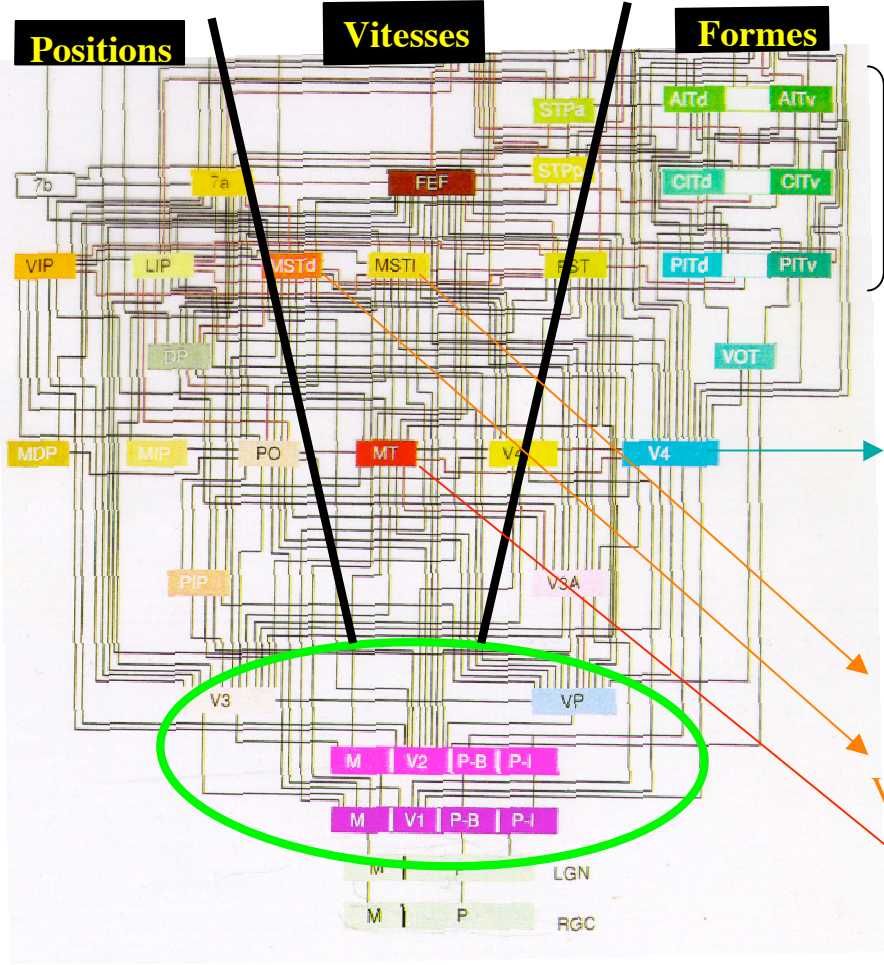
Transformation de coordonnées

Motrice

Corps

Tête

Rétinienne



Personnes
Animaux
Objects, outils...

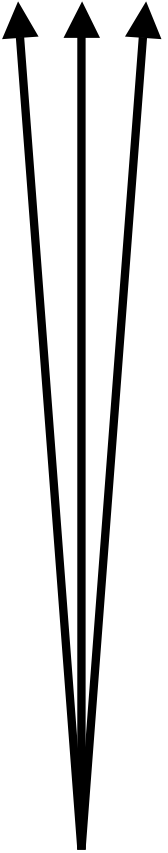
Espace des couleurs
Formes locales primitives

Vitesse induite
par déplacement

Vitesse relative objet/fond

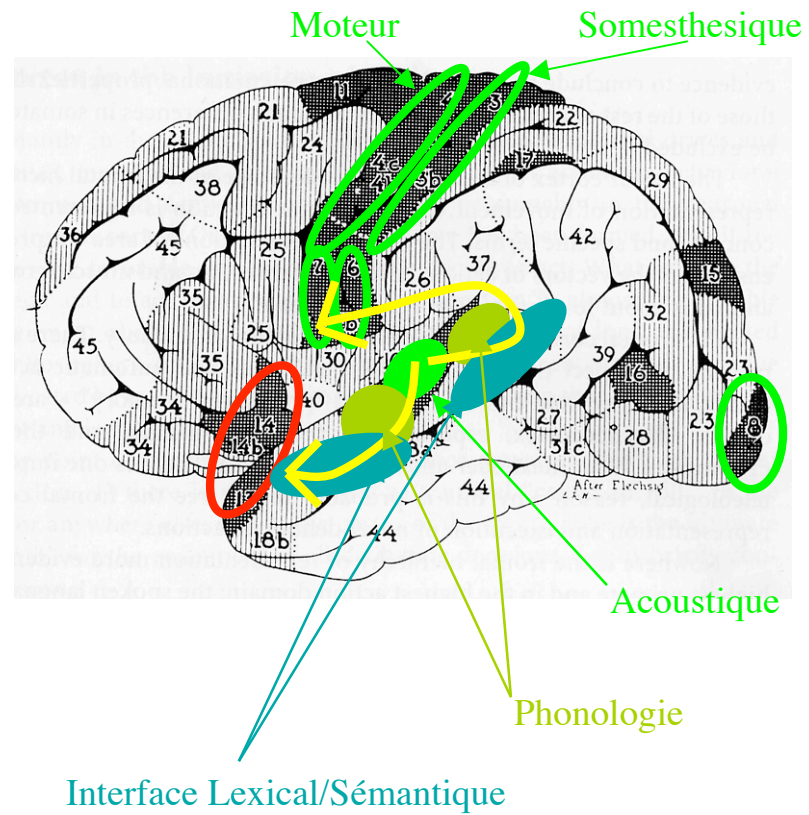
Champ de vitesse
topographique

Topologies
internes

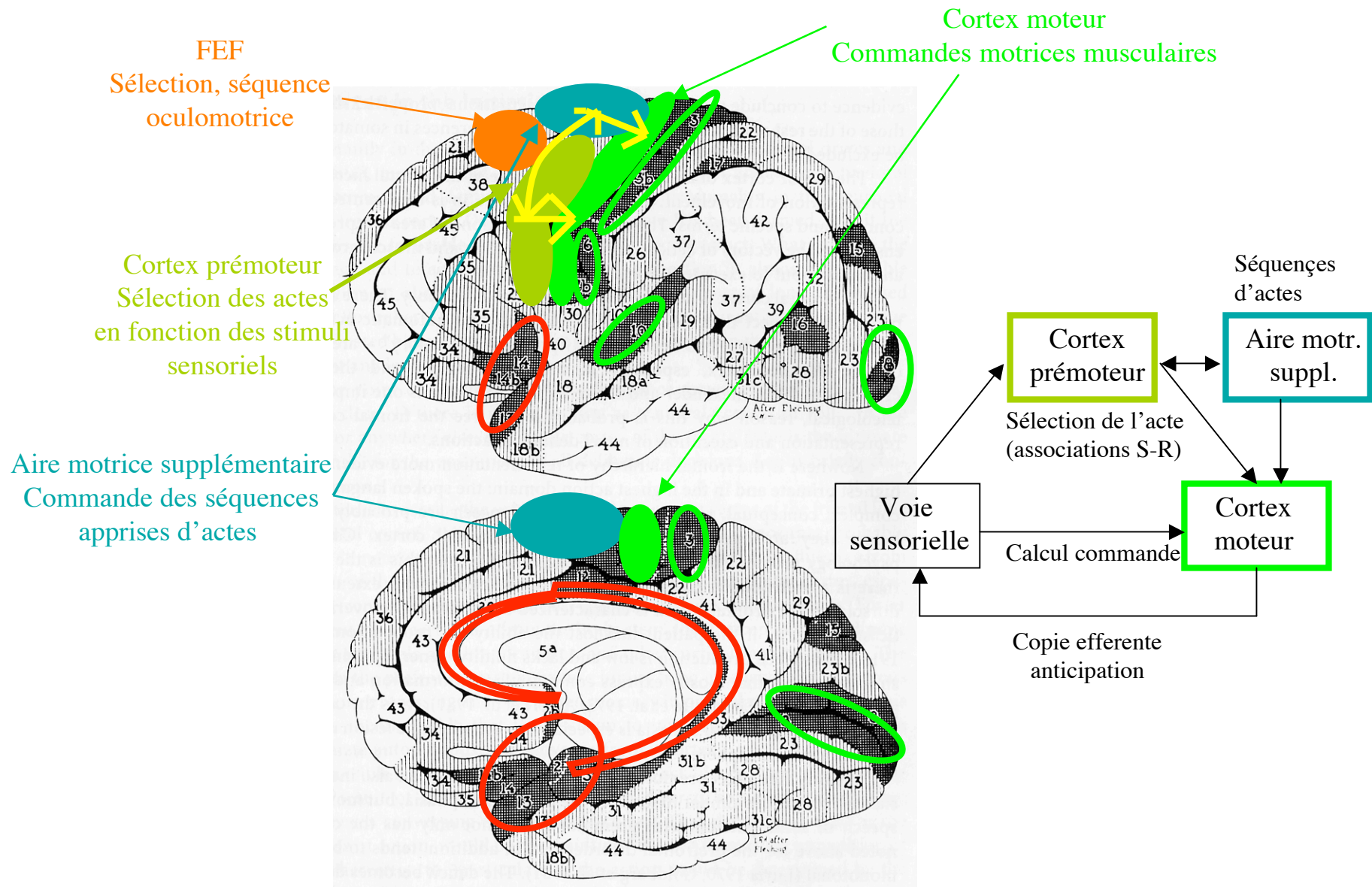


Topologie
spatiale

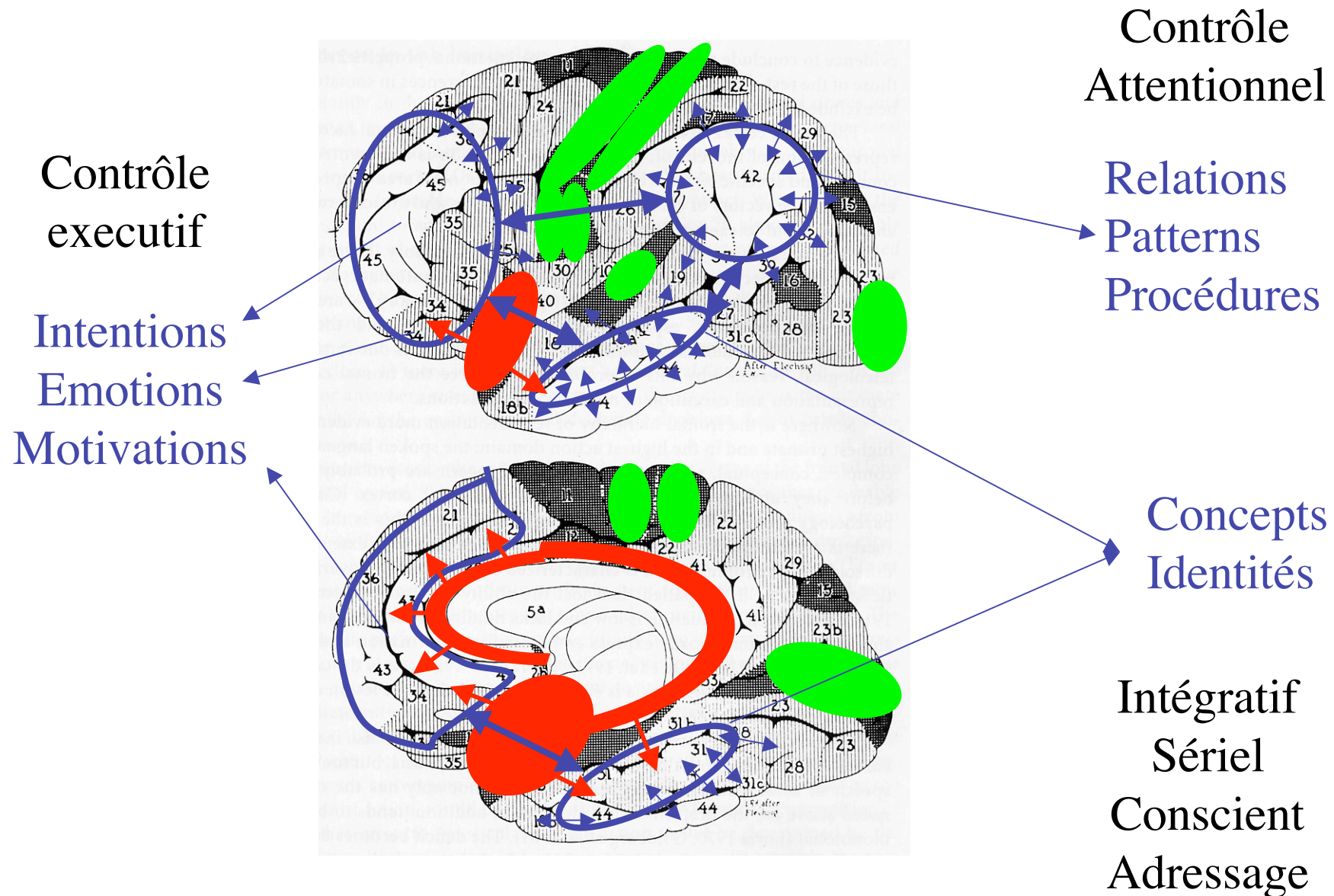
Voies auditives



Voies motrices



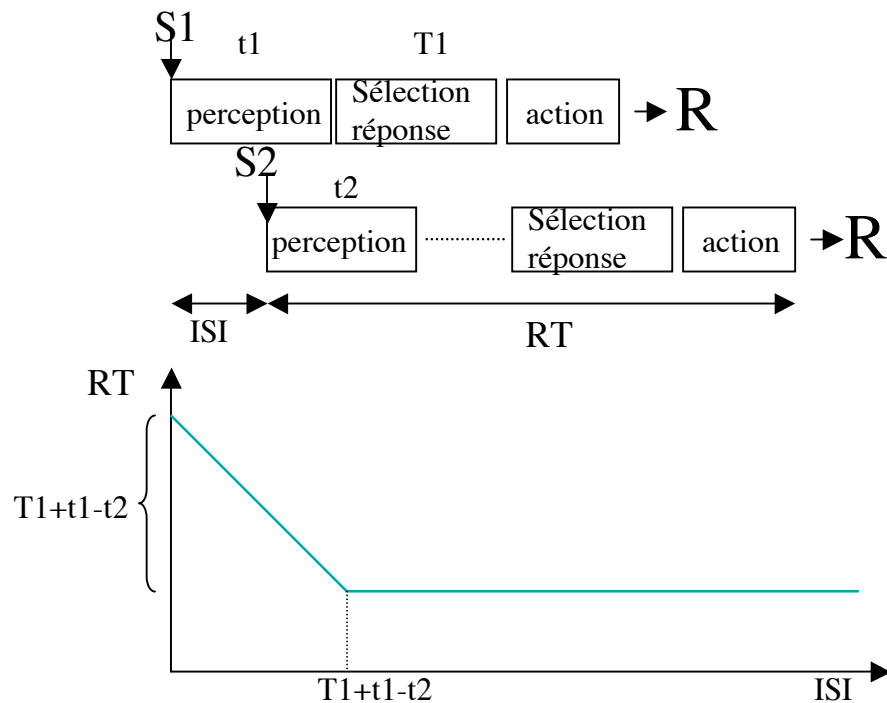
Centres associatifs polymodaux



Sérialité du contrôle

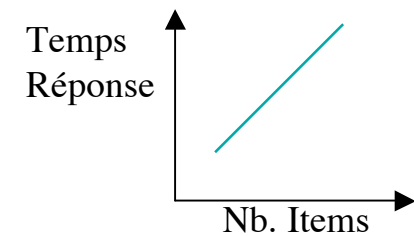
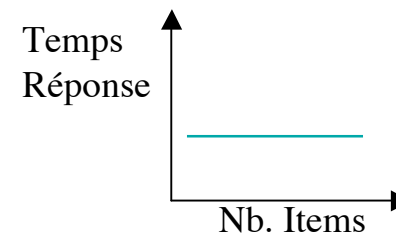
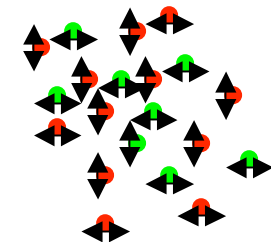
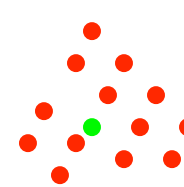
Executif

Impossibilité de décider de deux actions à la fois



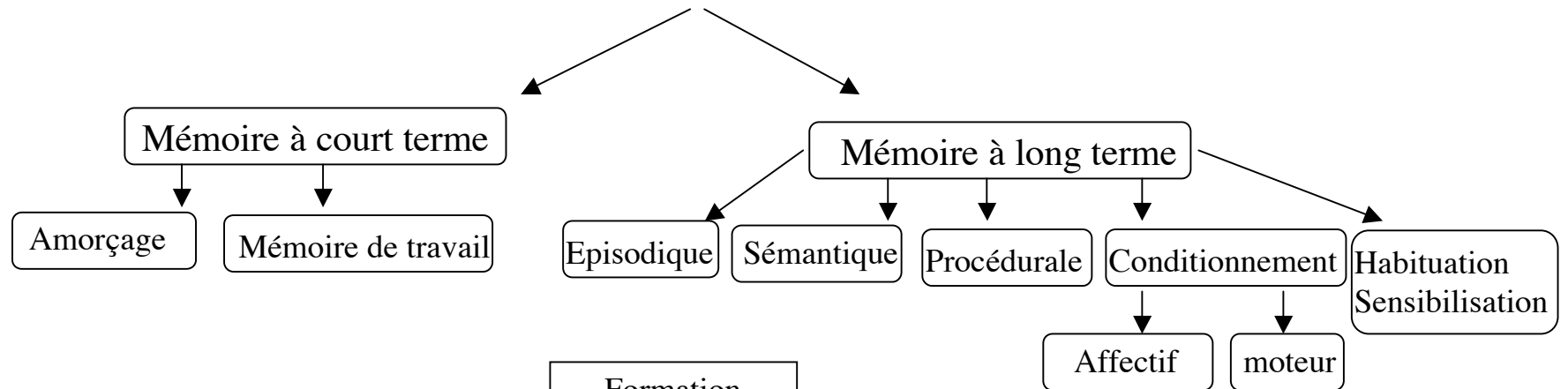
Attentionnel

Priorité donnée à un flux sensoriel sur les autres

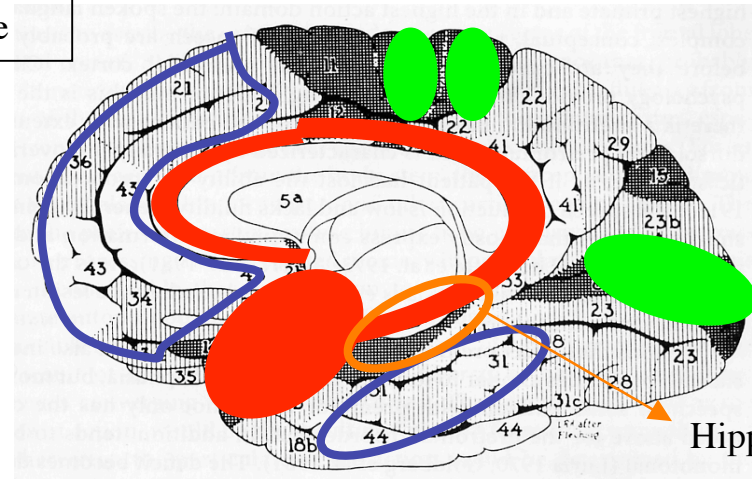
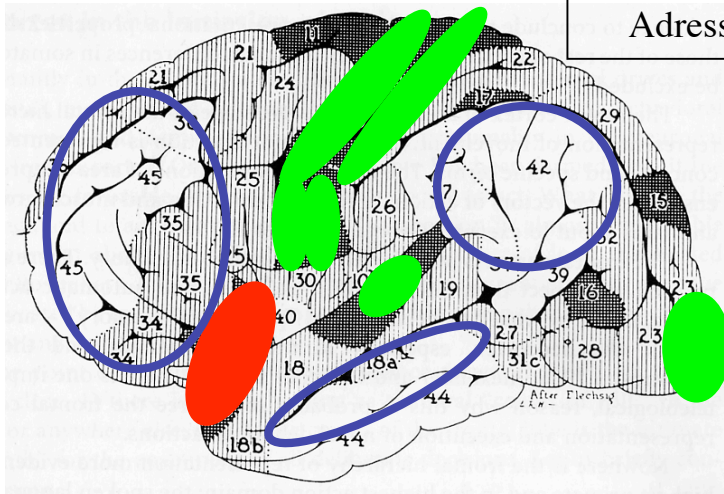


Cerveau et mémoires

Rétention d'information



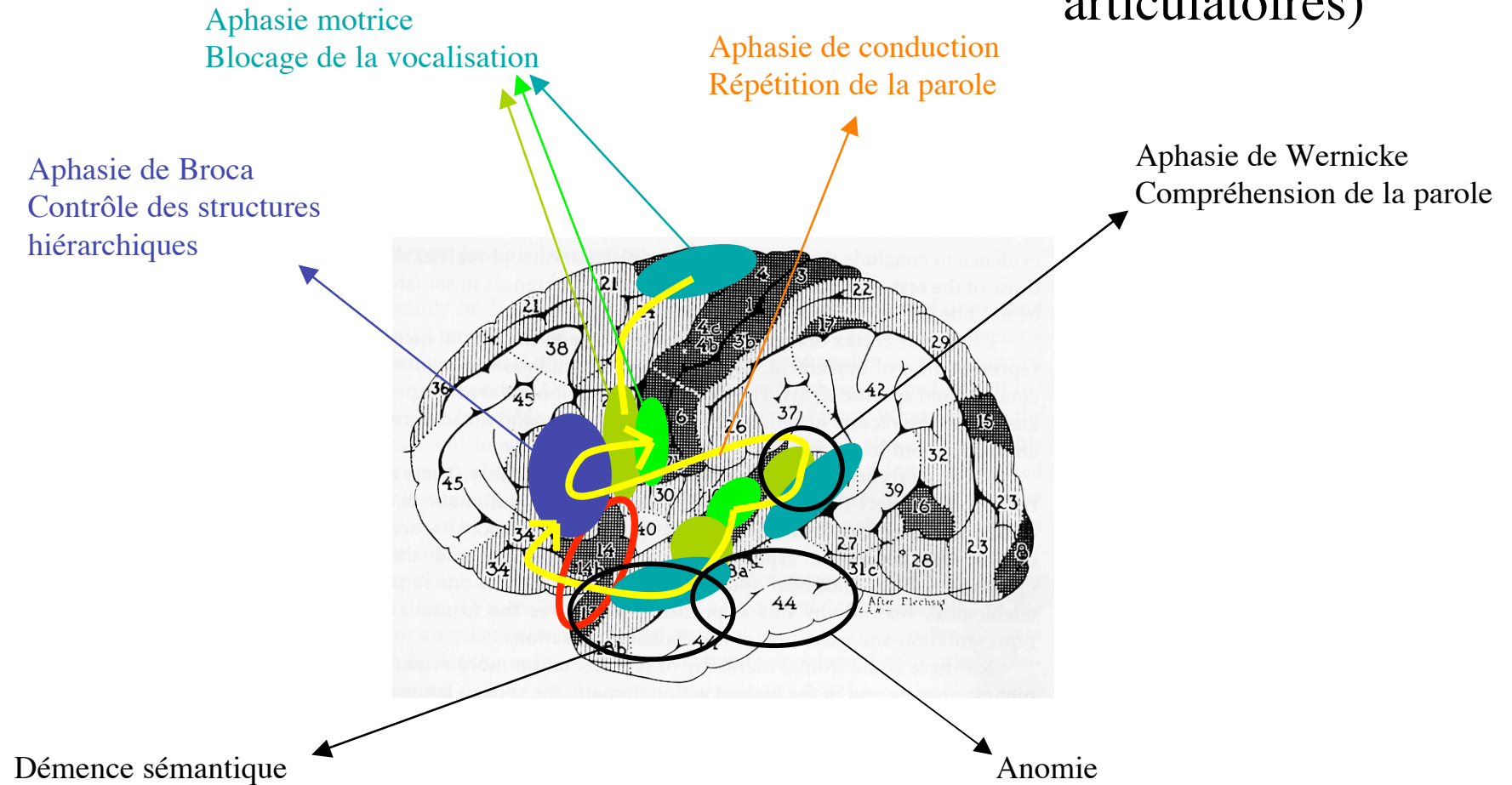
Formation
Stockage
Reconnaissance
Adressage



Hippocampe

Cerveau et langage

Hémisphère gauche dominant (traitement des phonèmes auditifs et articulatoires)



Principes fonctionnels fondamentaux

