

VISION MONOCULAIRE ET STRUCTURE TRI-DIMENSIONNELLE DES OBJETS

Guy A. Orban

Chaire européenne 2006-2007

Cours 7

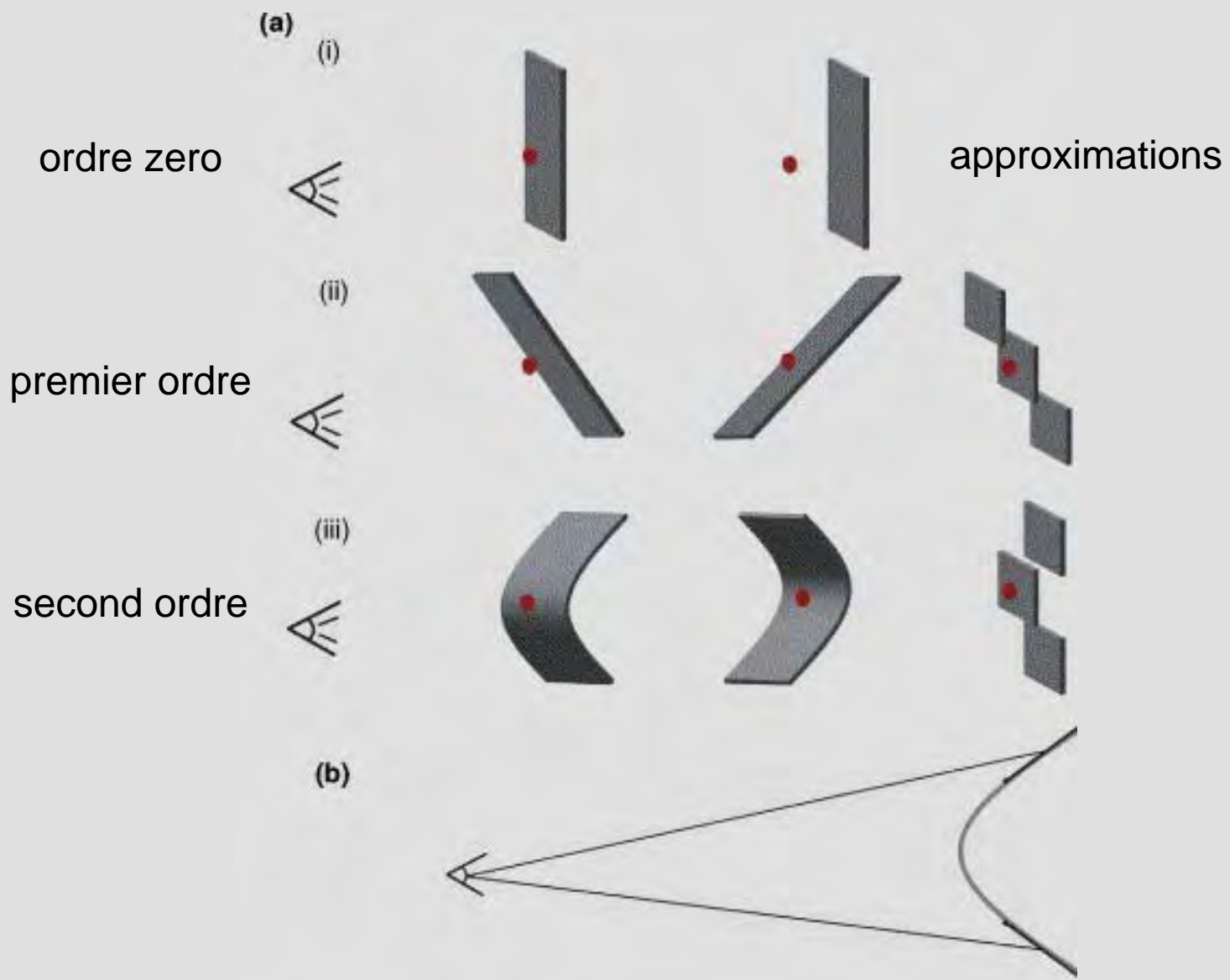


COLLÈGE
DE FRANCE
— 1530 —

KATHOLIEKE UNIVERSITEIT
LEUVEN






ORDRES DE DISPARITE: DERIVEES SPATIALES DE LA DISPARITE

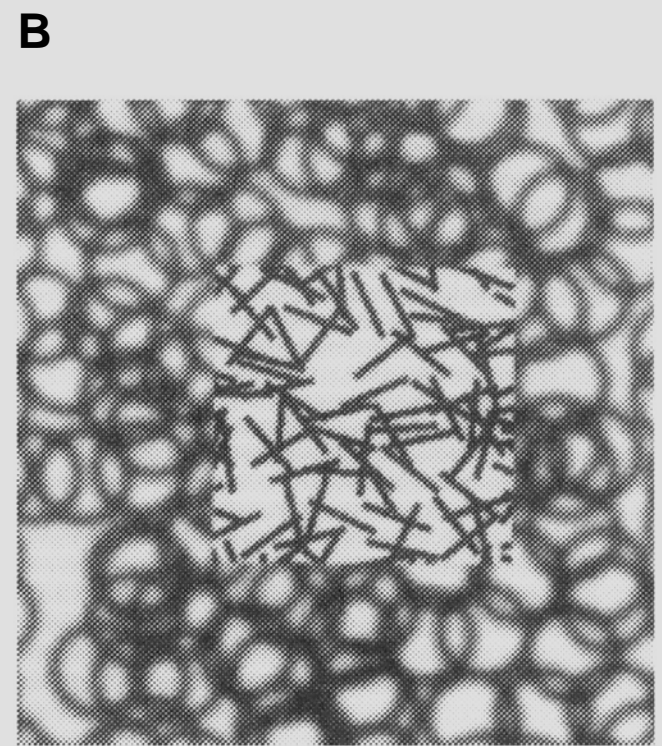
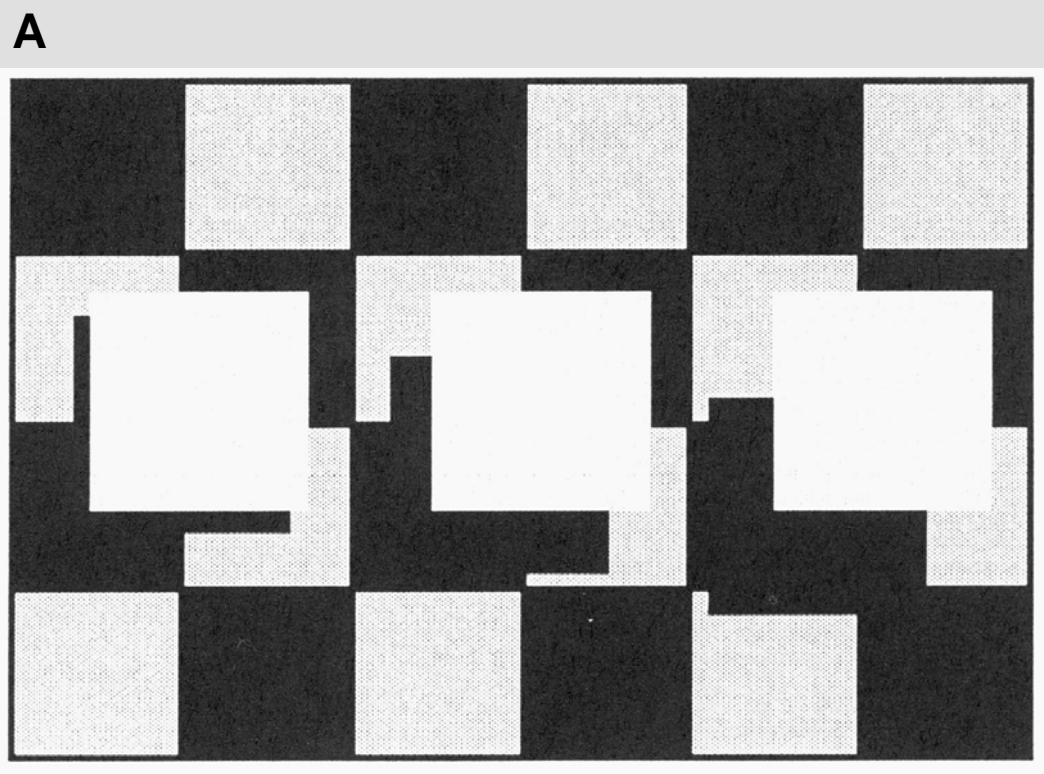


SOURCE D'INFORMATION FORME 3D

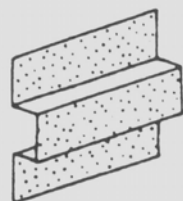
Monoculaire

	Stereo	Mouvement (Δ vitesse) (mouvement relatif: parallax)	Texture (Δ taille relative elements) (flou)	Ombrage (Δ luminance) (ombres)
ordre zero 	×	×	-	-
premier ordre 	×	×	×	-
second ordre 	×	×	×	×

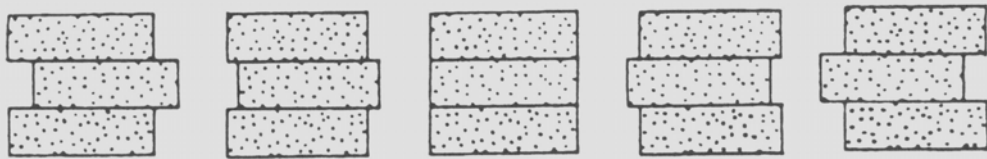
PERCEPTION: DISTANCE RELATIVE



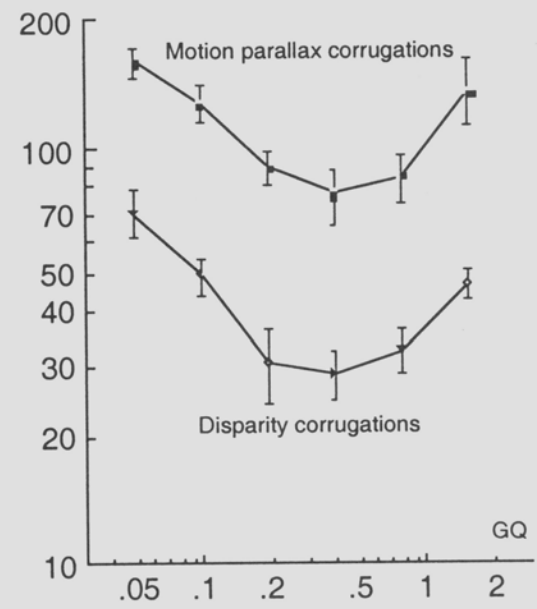
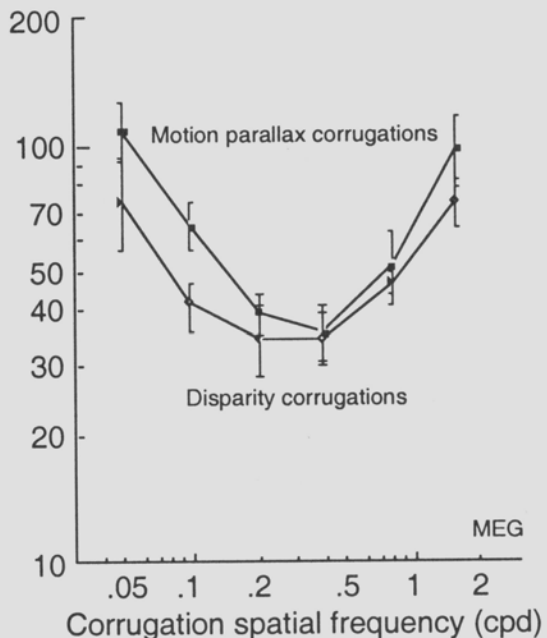
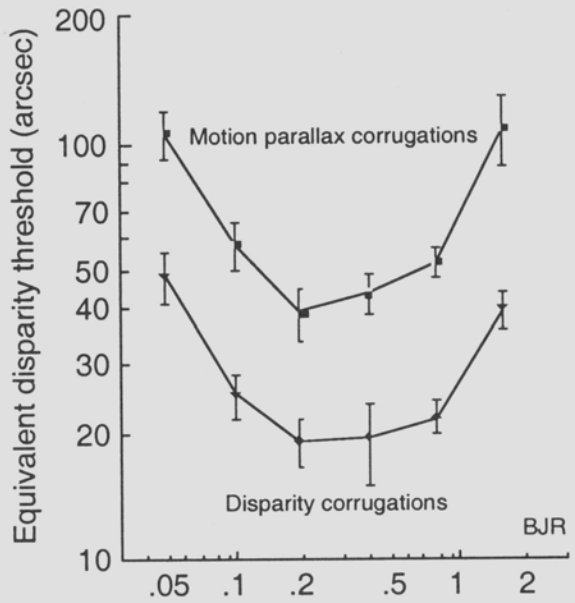
PERCEPTION: DISTANCE RELATIVE



(a)

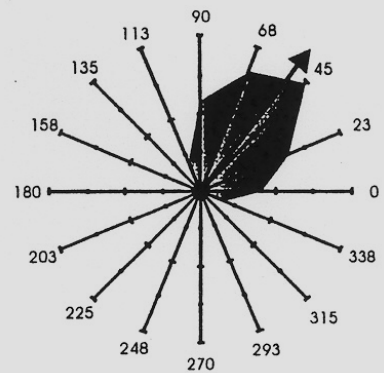
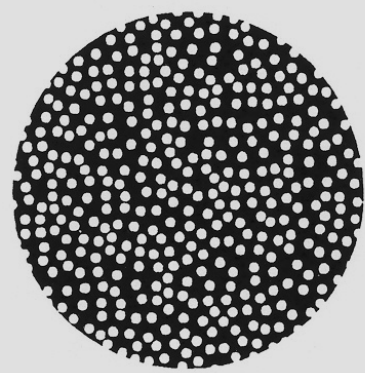


(b)

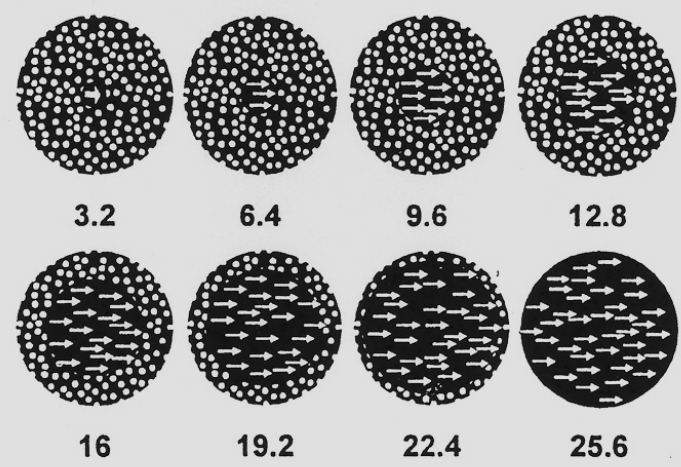


Tests de base pour exploration des neurones MT/V5

Sélectivité pour la direction



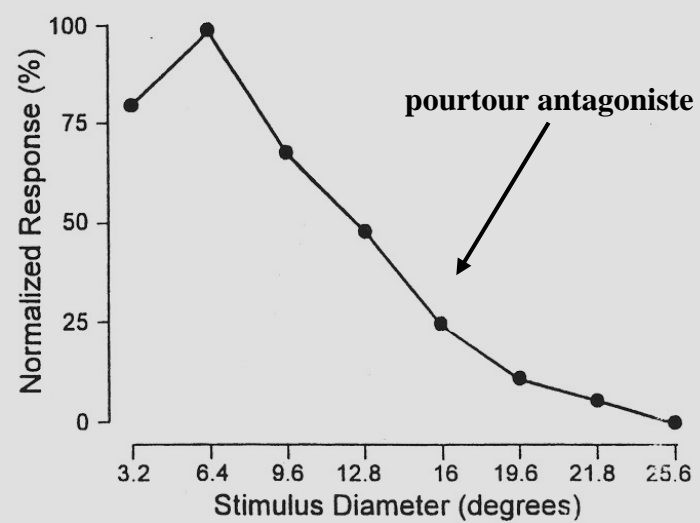
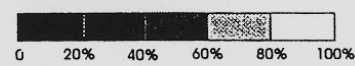
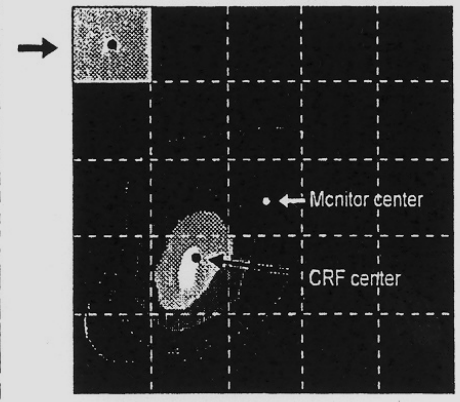
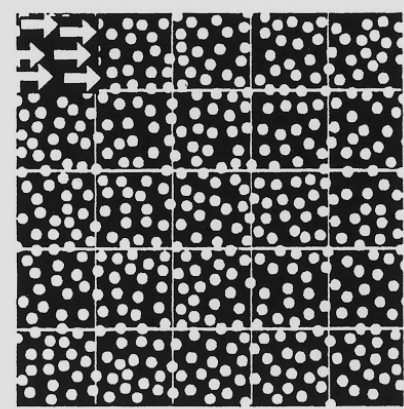
Test de Sommation



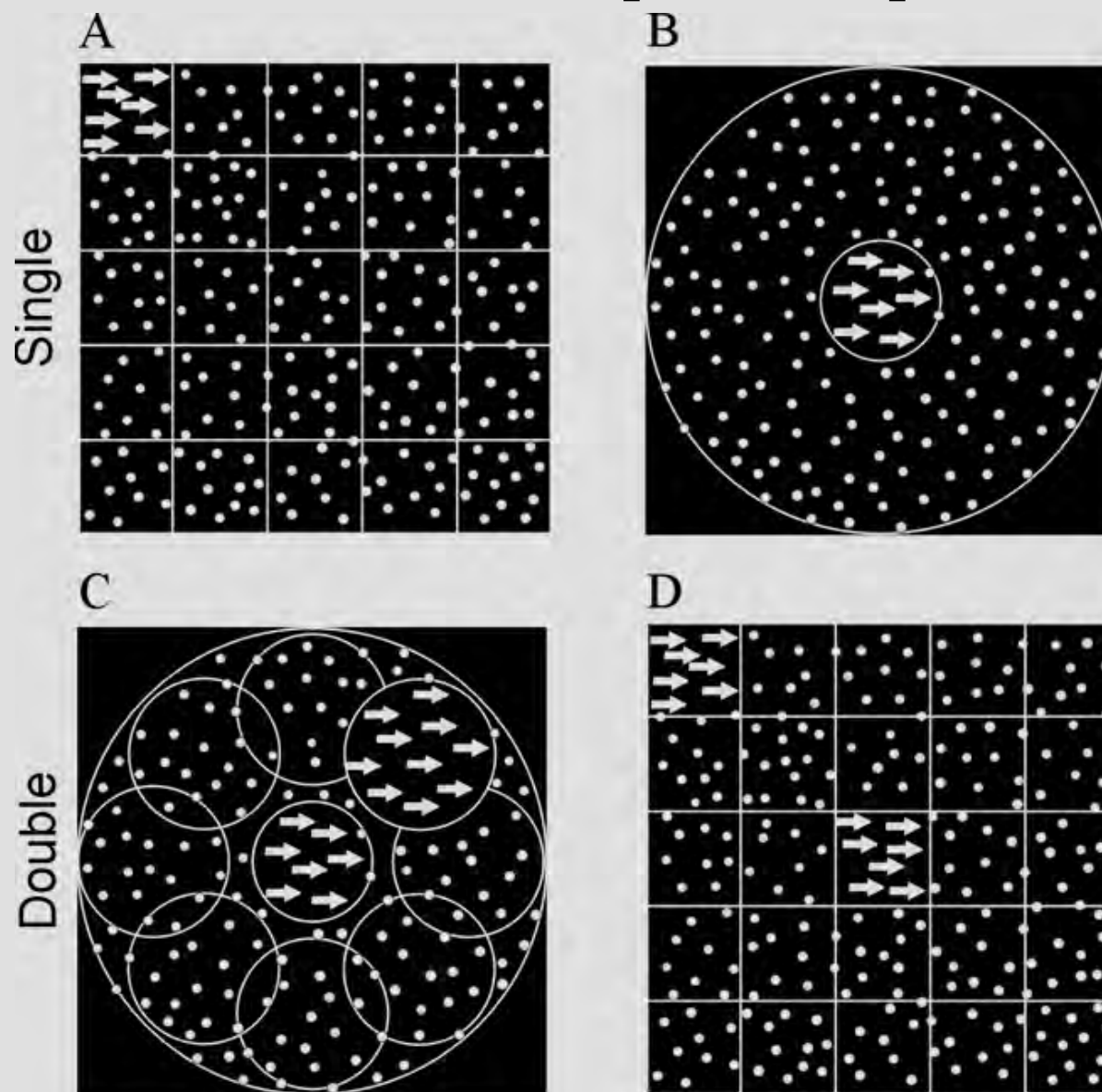
Champ récepteur

Stimulus

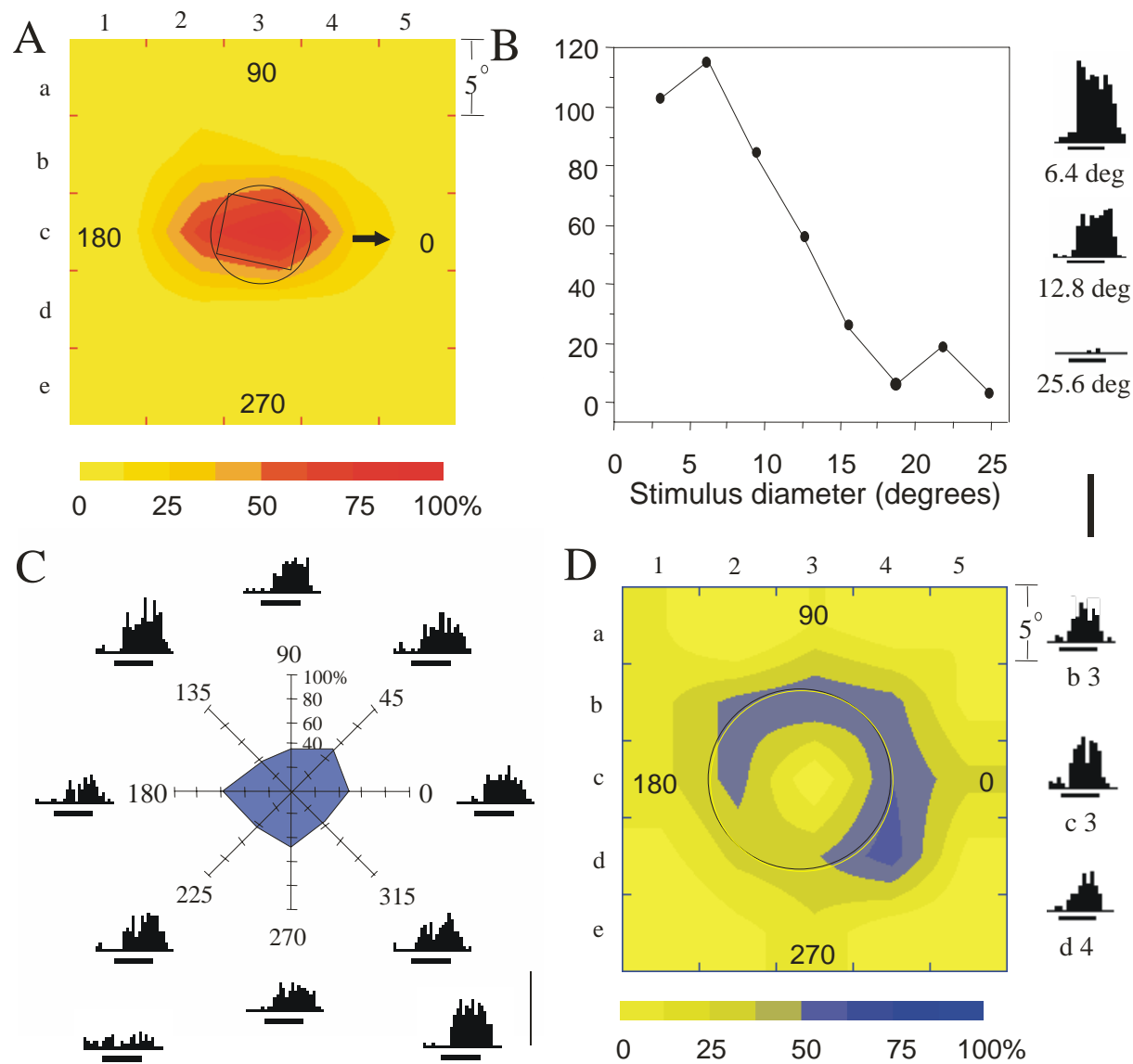
Isoresponsive contour plot



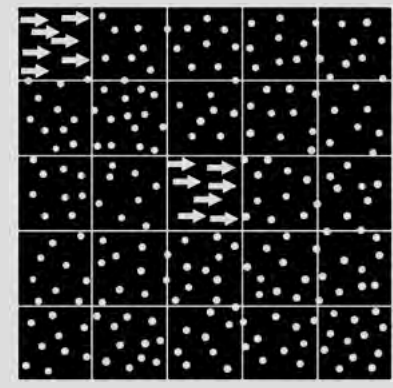
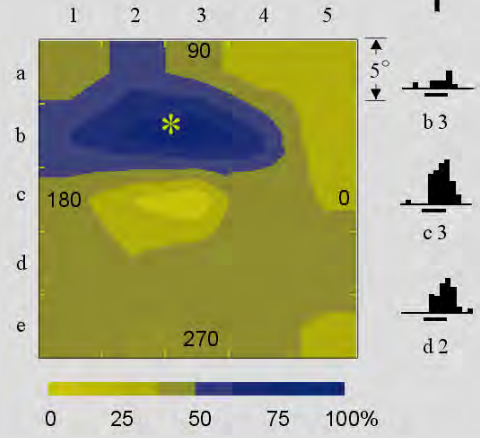
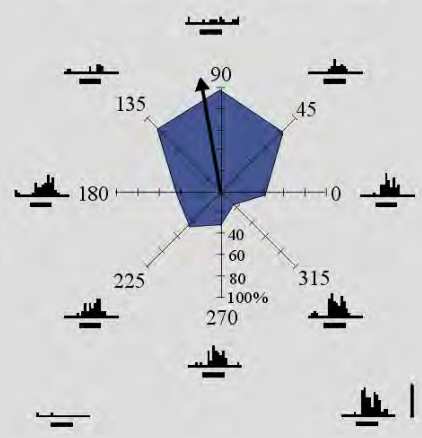
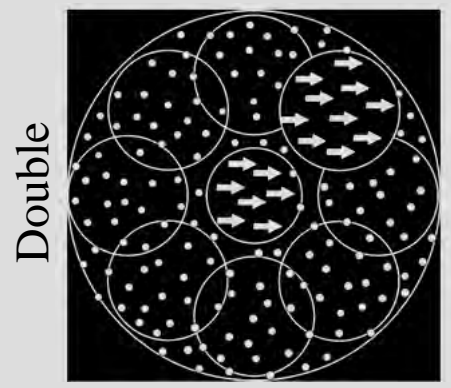
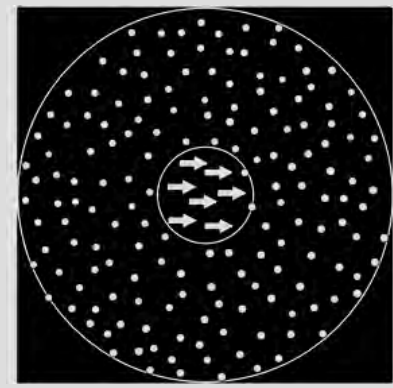
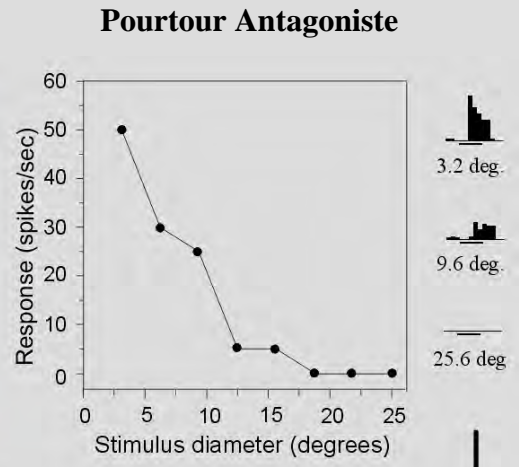
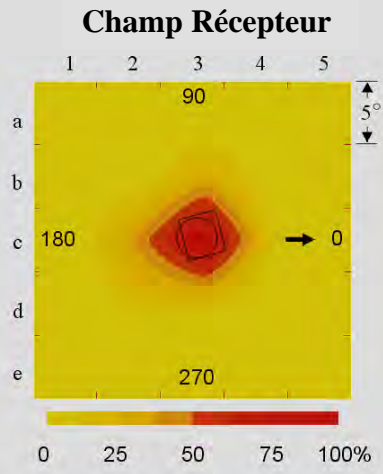
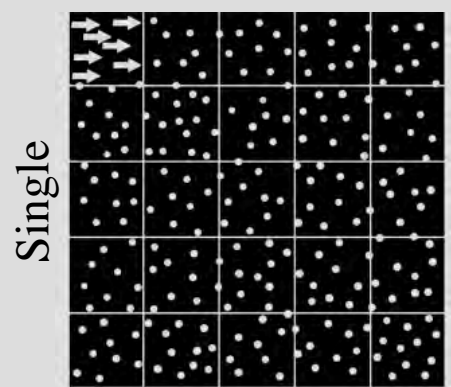
Tests d'exploration de la structure spatiale du pourtour antagoniste



Neurones de MT/V5 à pourtour complet

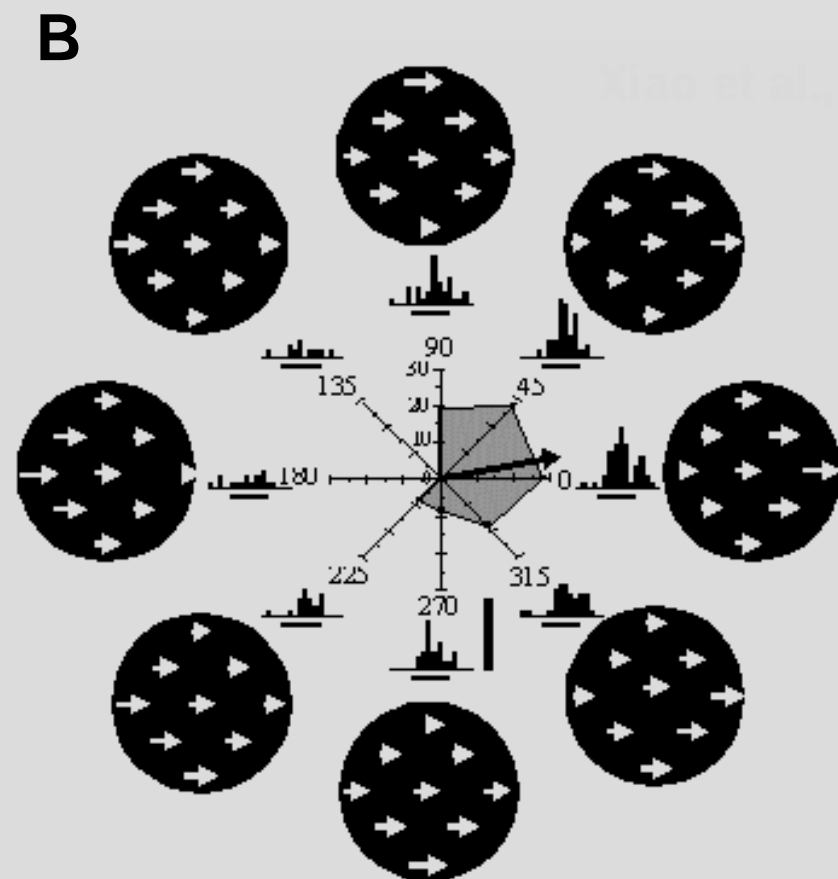
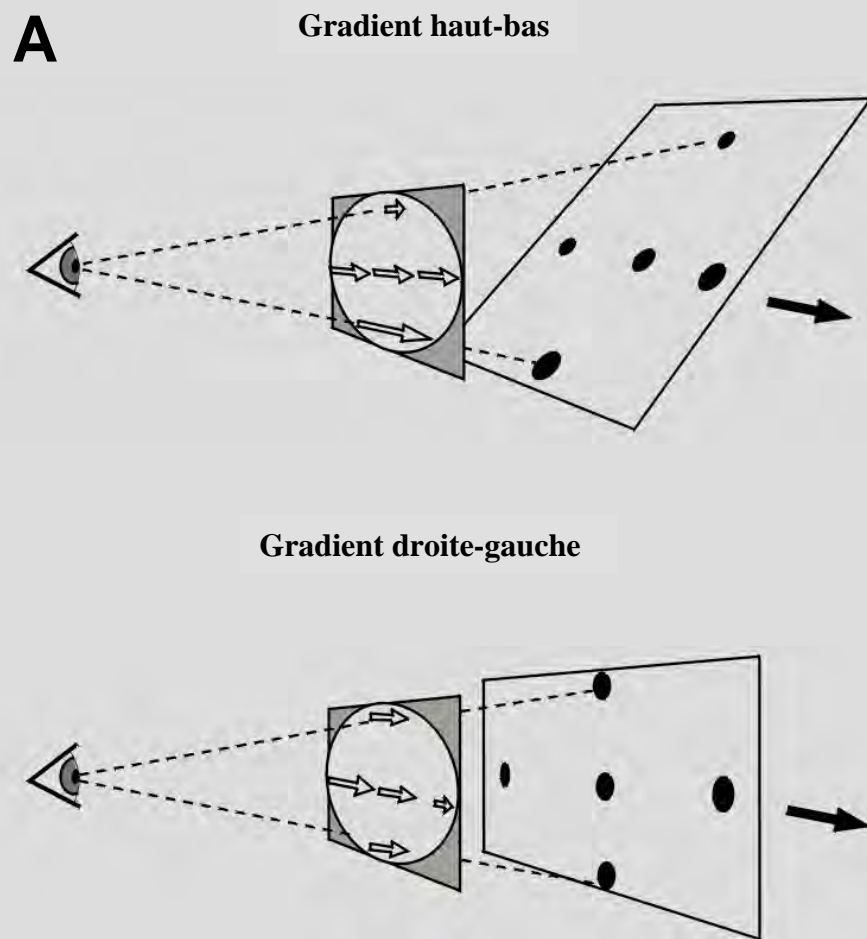


Neurone MT/V5 avec pourtour antagoniste asymétrique

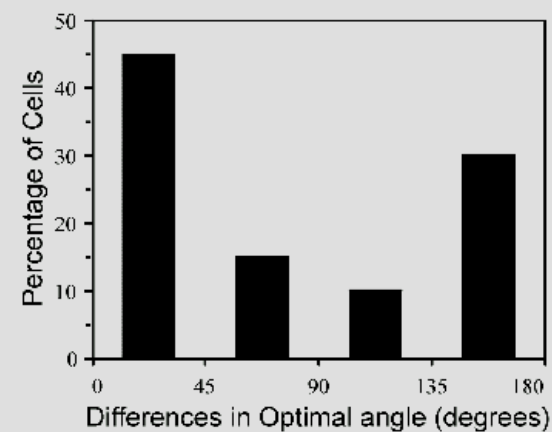
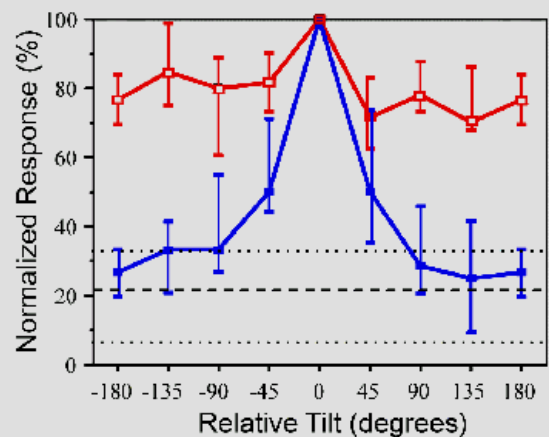
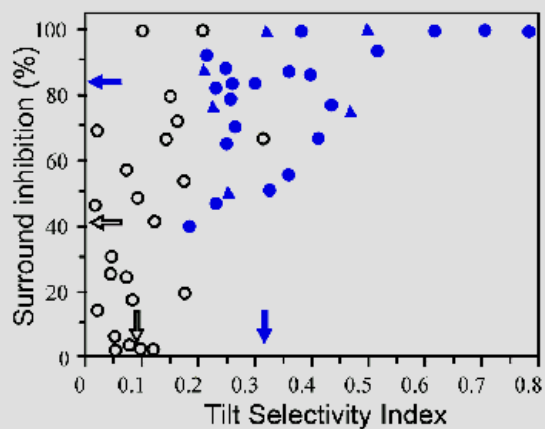


asymétrie pourtour

Neurone MT/V5 sélectif pour le gradient de vitesse et, indirectement, pour la direction du tilt (inclinaison en profondeur)

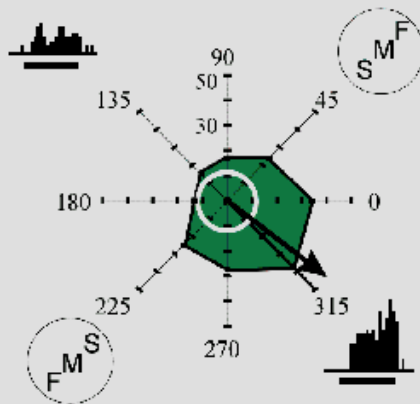


Sélectivité pour gradient de vitesse et pourtour antagoniste

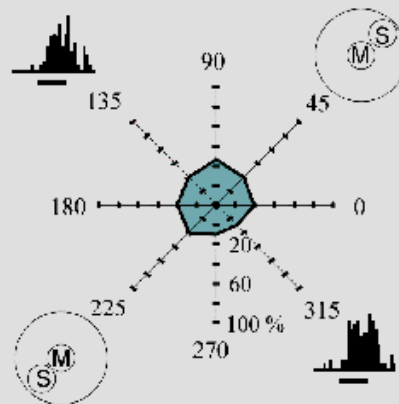


Prédiction de la sélectivité pour le gradient de vitesse

Speed gradient



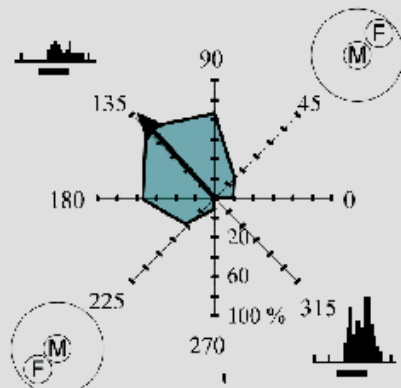
SAST



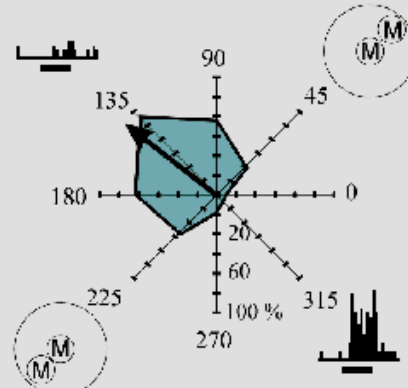
Slower

CONCLUSION

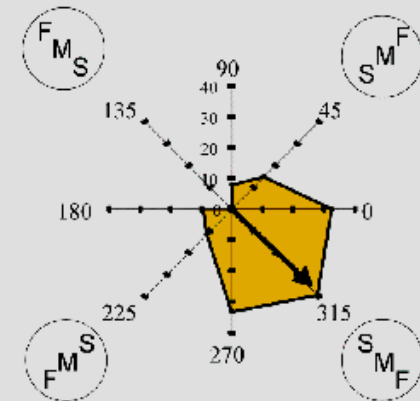
The speed-dependent, non-uniform antagonistic surround endows MT neurones with the ability to signal the orientation in depth of a motion-defined plane



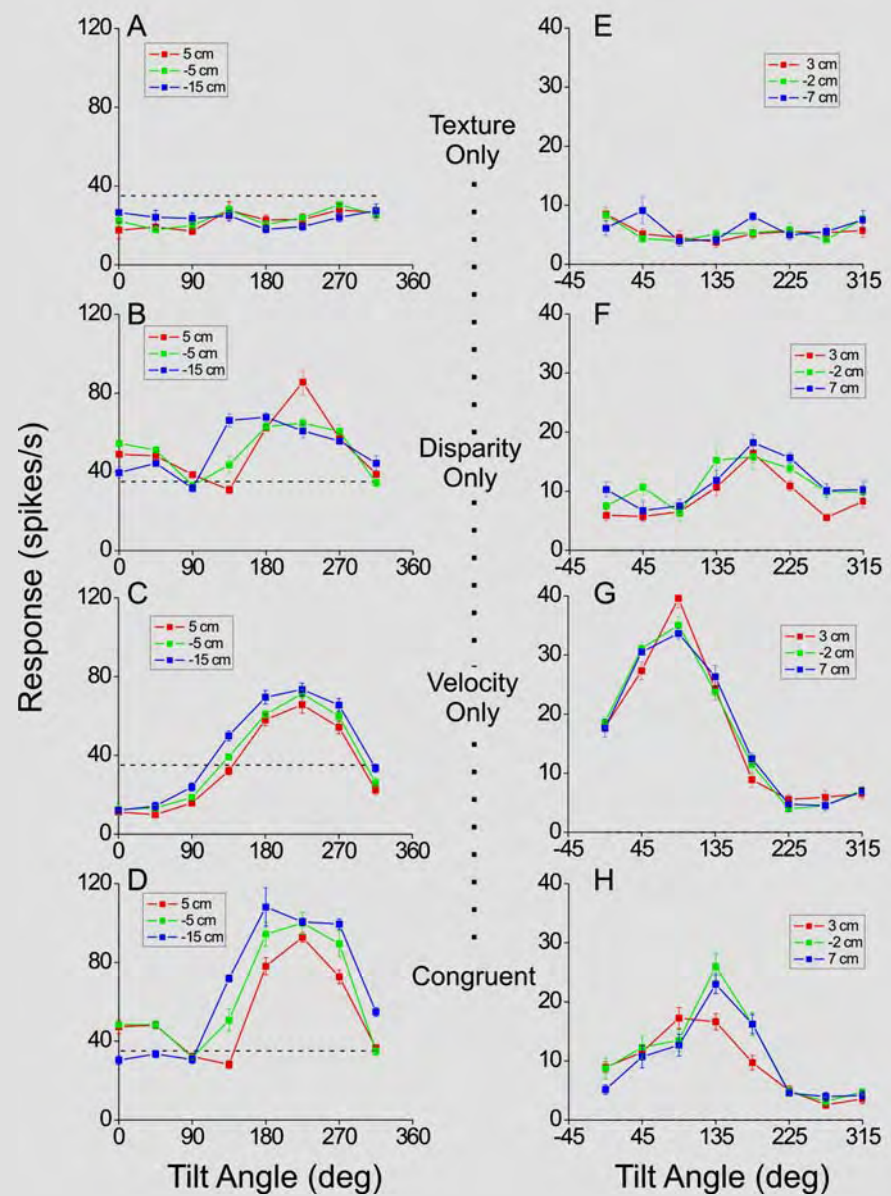
Faster



Optimal



Sélectivité des neurones MT pour l'angle d'inclinaison (singé éveillé)

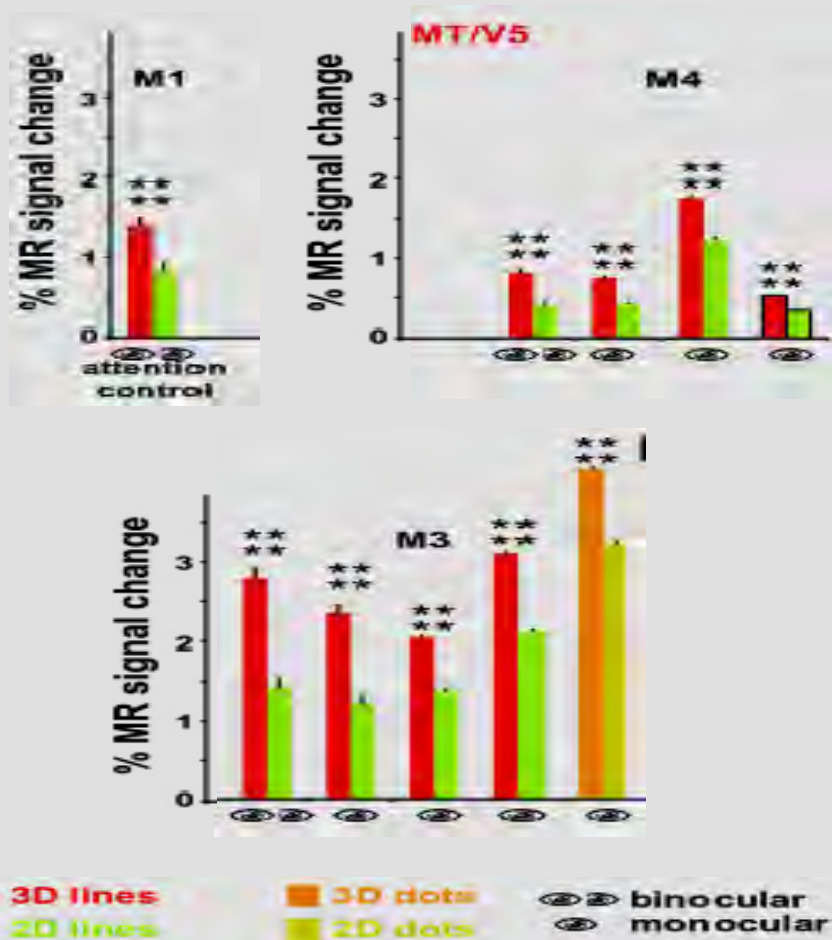




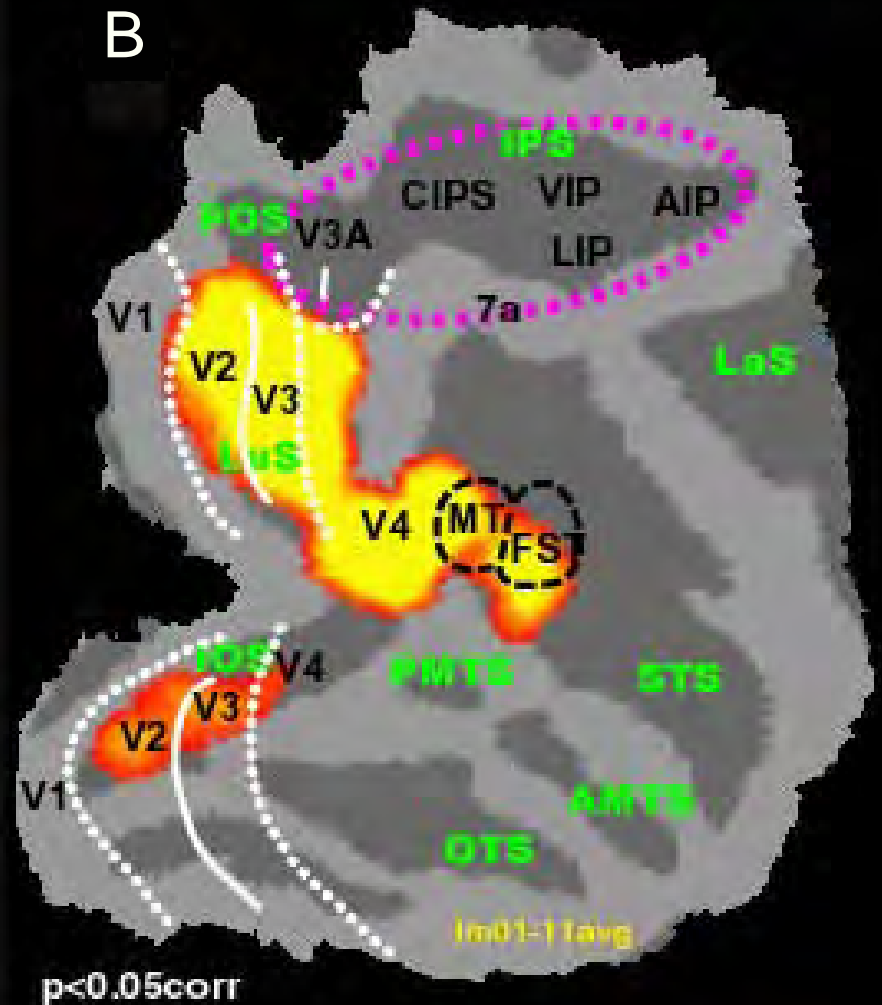
RANDOM LINES

EXTRACTION DE LA FORME 3D DU MOUVEMENT: fMRI SINGE EVEILLE

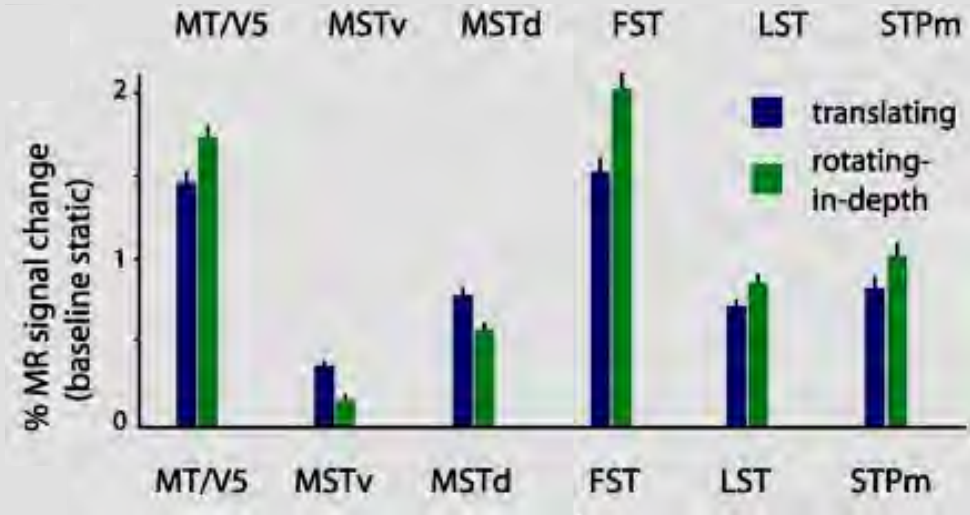
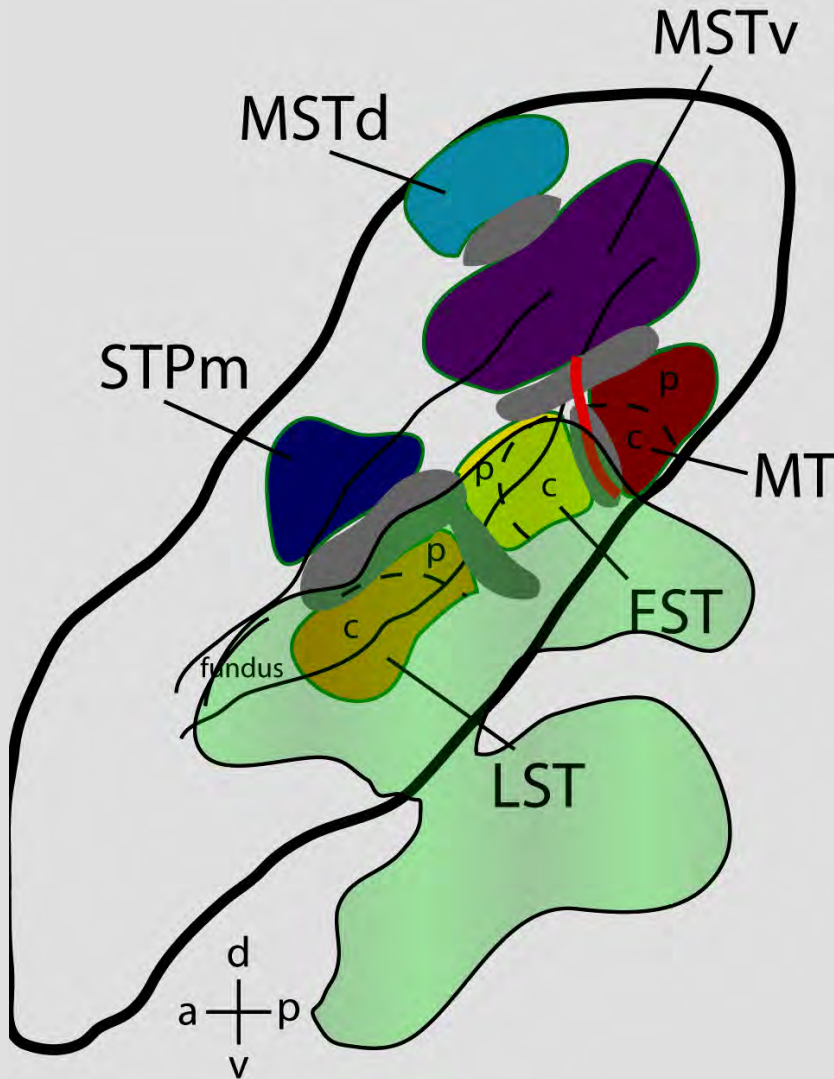
A



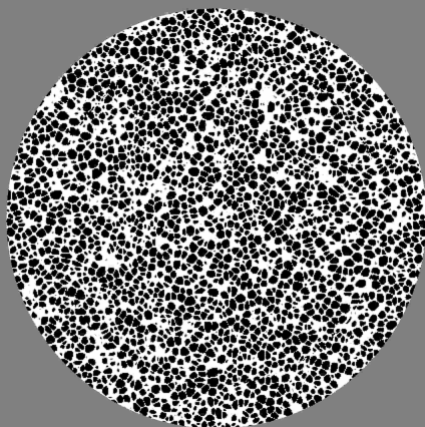
B



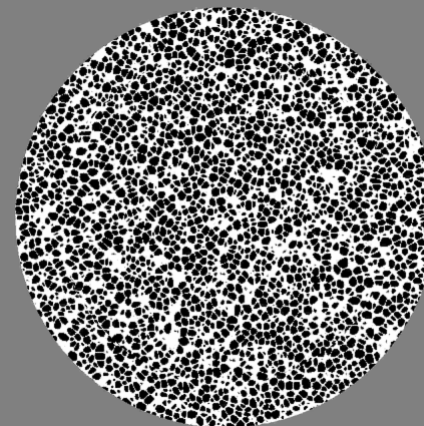
Aires sensibles au mouvement et extraction de la forme 3D du mouvement



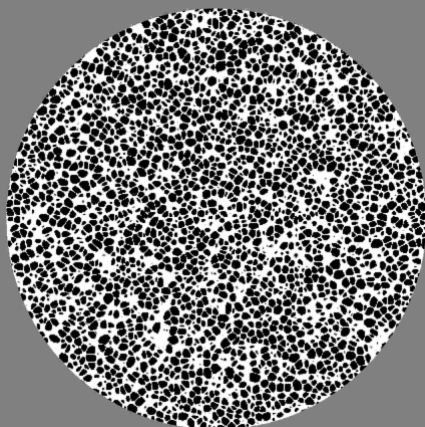
Tests pour les neurones FST



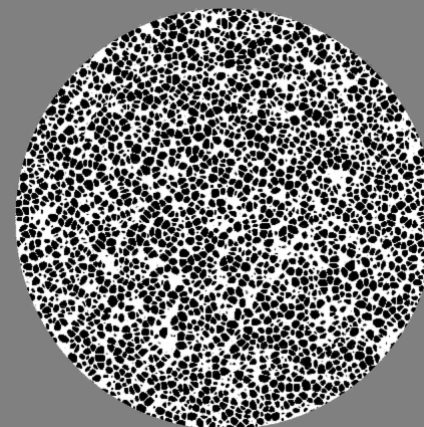
Premier Ordre: surface inclinée
(8 orientations)



Second ordre: surface cylindrique
(4 orientations)



Second ordre: bosse



Second ordre: selle
(2 orientations)

Design factoriel: dimensionnalité de la forme
(2x2)

Rigidité

2D rigide

3D rigide

2D non rigide

3D non rigide

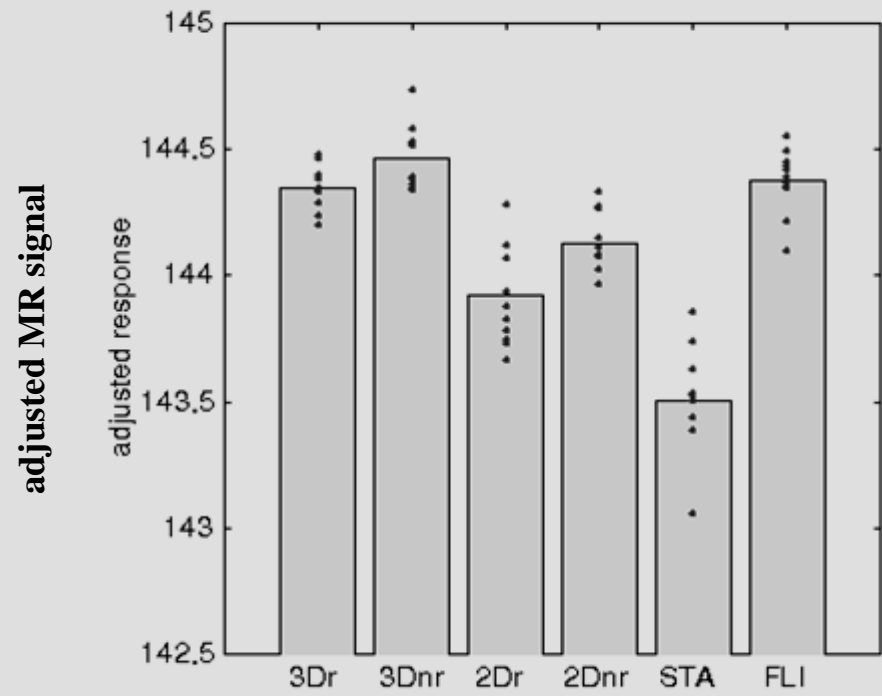
Contrôles:

statique

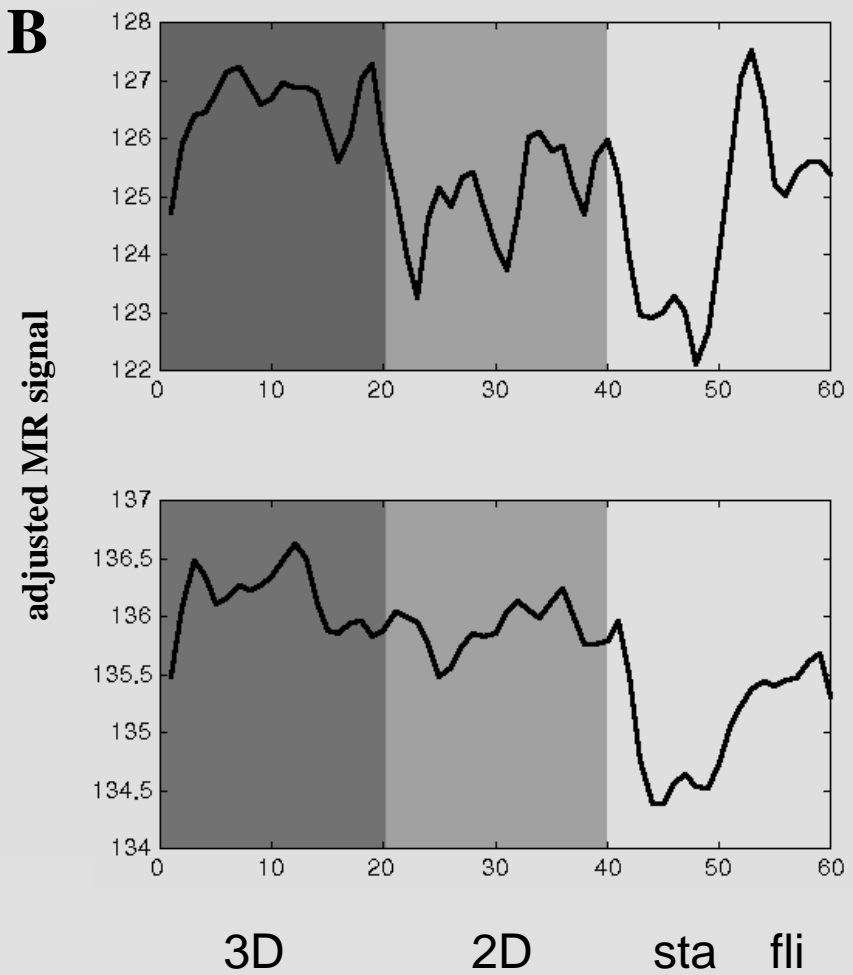
scintillement

Signaux MR de hMT/V5₊ droit

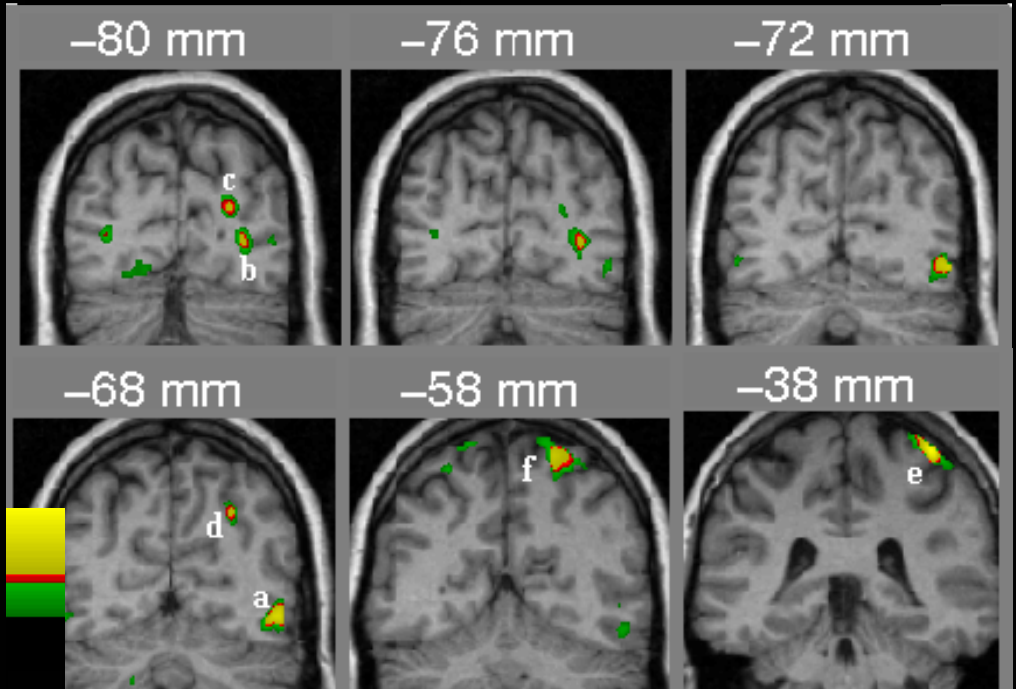
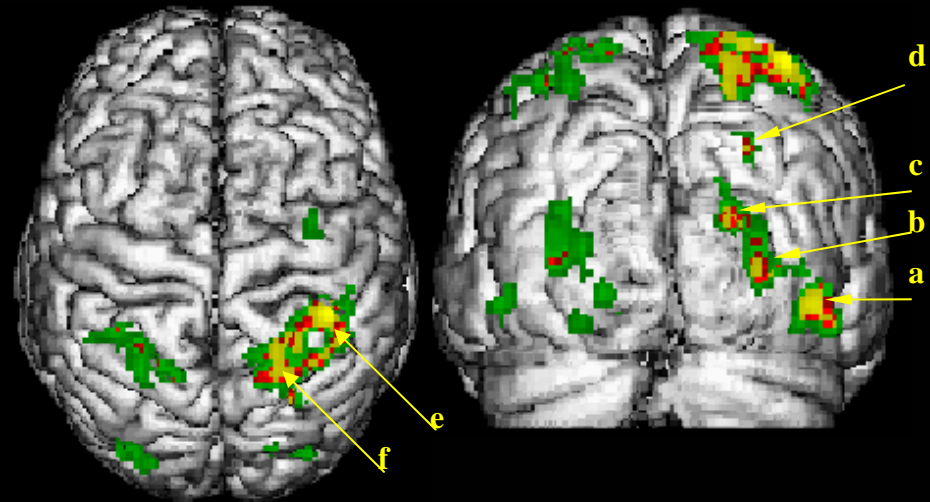
A



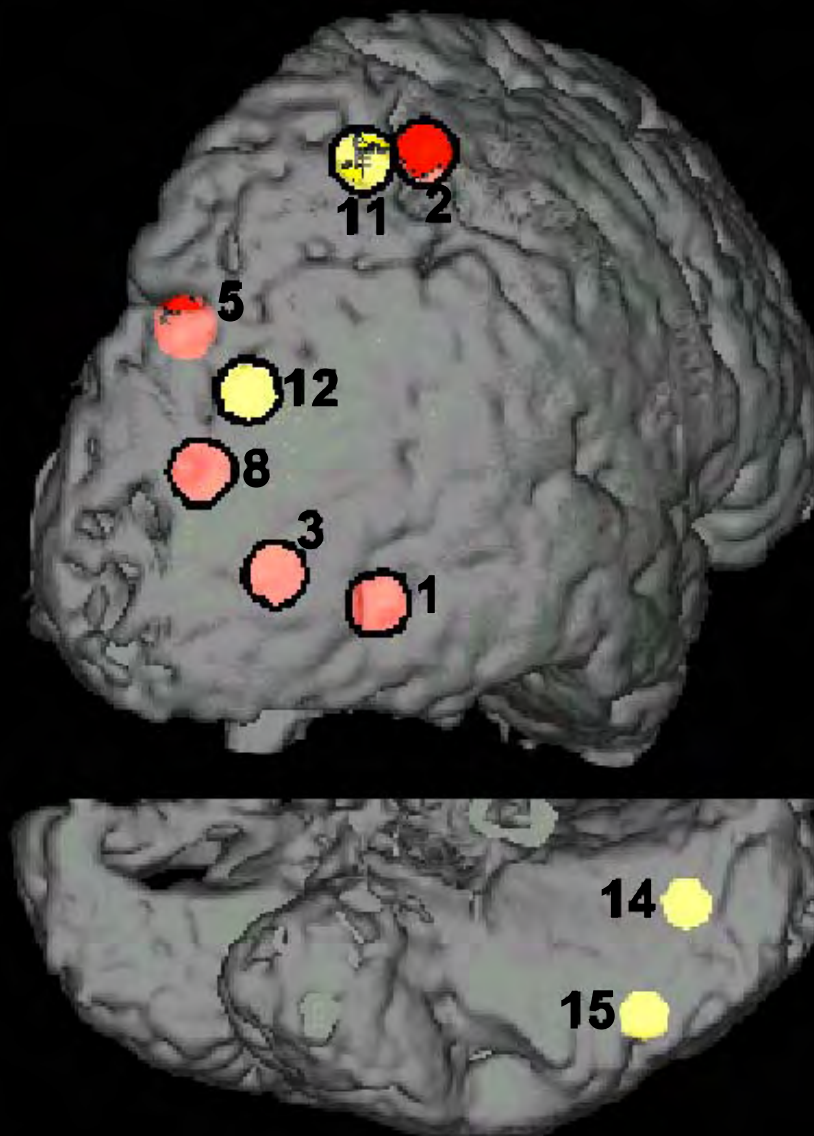
B



Sujet unique: 3D-2D



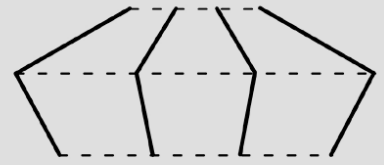
Activation generale: 3D-2D



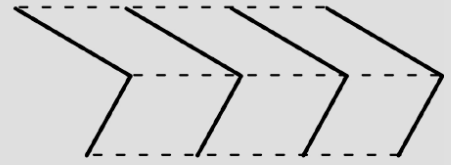
- 1 : hMT/V5₊
- 3 : LOS
- 8 : V3A
- 12: VIPS
- 5 : POIPS
- 11: DIPSM
- 12: DIPSA
- 14: sillon collatéral
- 15: fusiforme

EXTRACTION DE LA FORME 3D DU MOUVEMENT: fMRI HUMAIN

3D Rigid



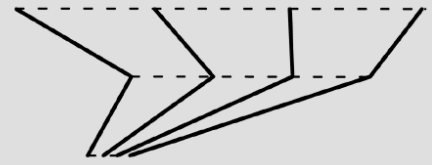
2D Rigid (Translation)



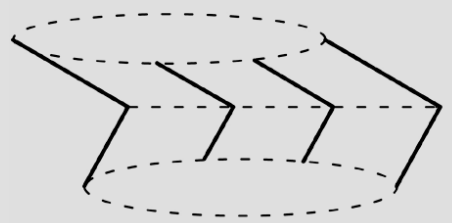
3D Nonrigid



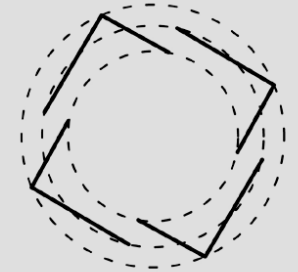
2D Nonrigid (Shear)



Size Change



2D Rigid (Rotation)



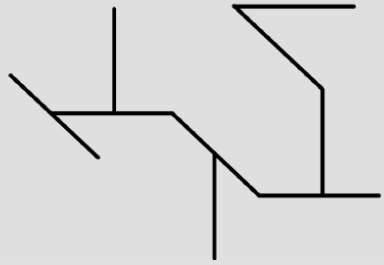
3 types de contrôles

1) caractéristiques mouvement bas niveau

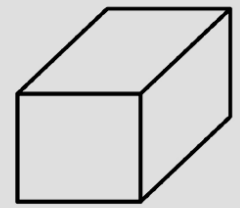
2) mouvement plus forme 3D

3) attention

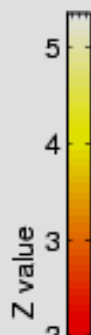
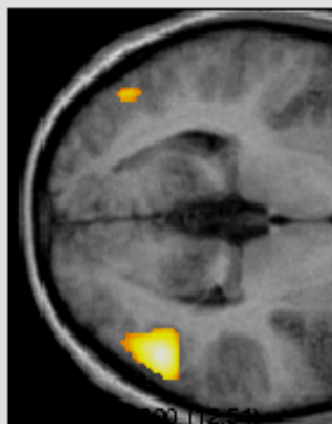
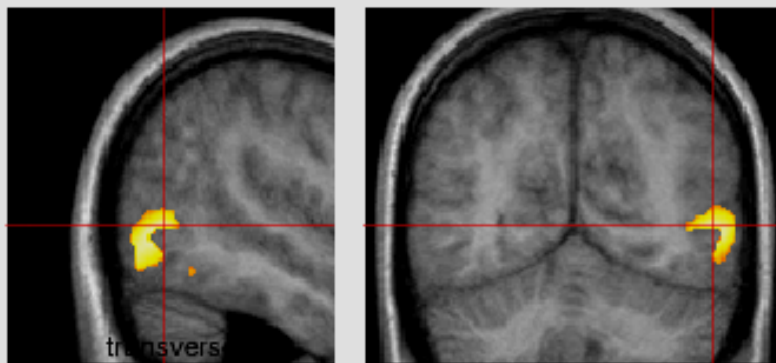
Random



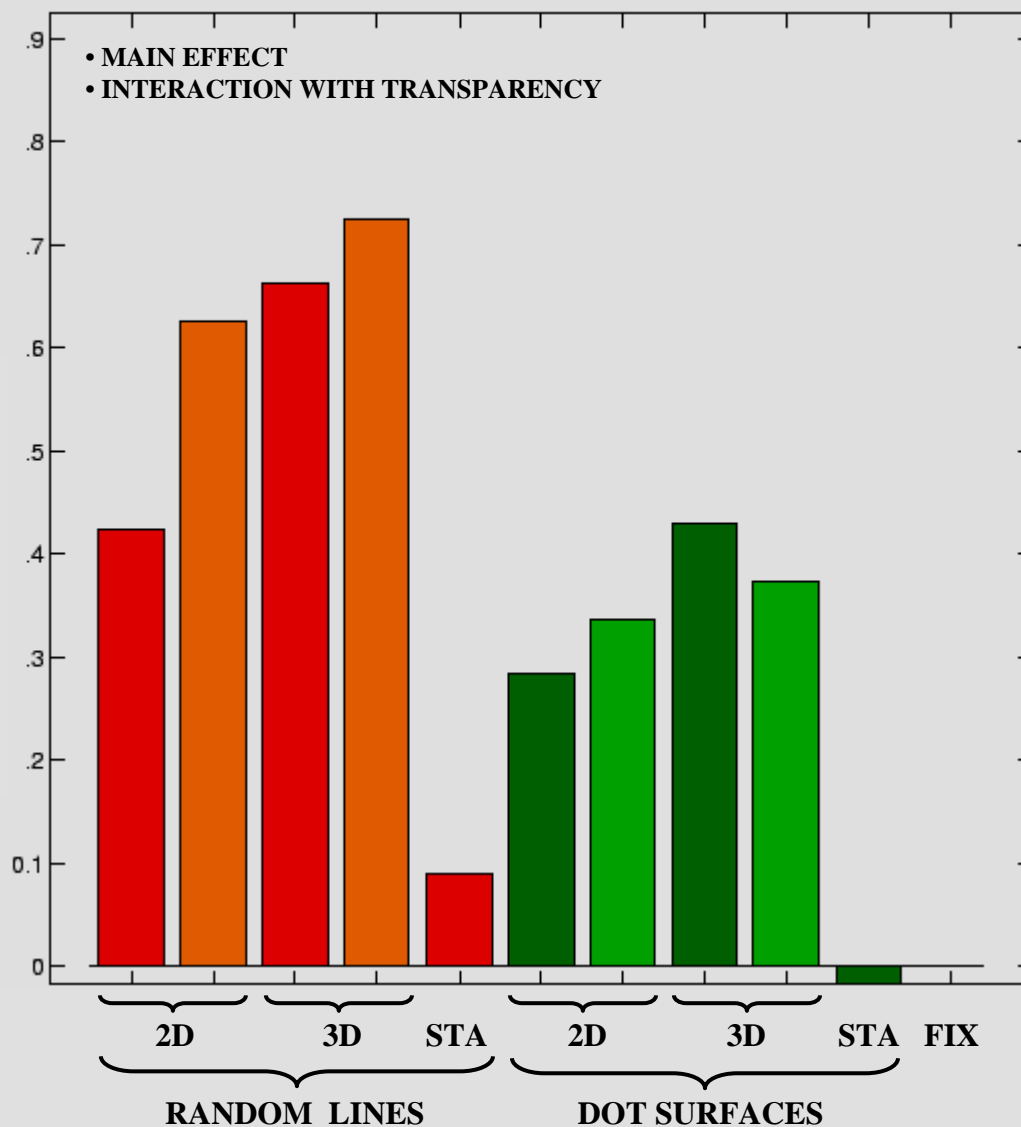
Polyhedra



Effets du type de stimulus et transparence

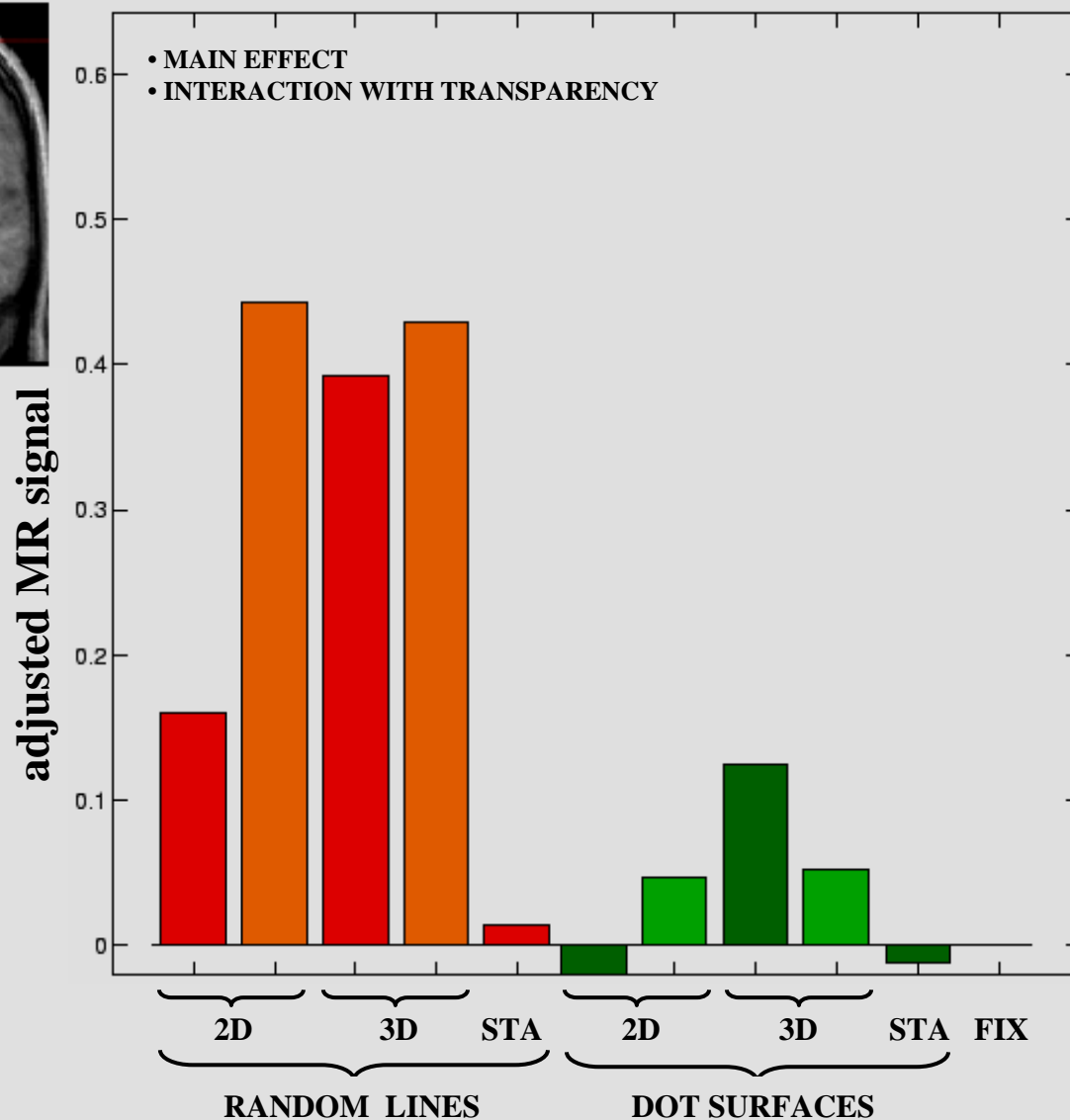
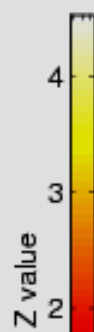
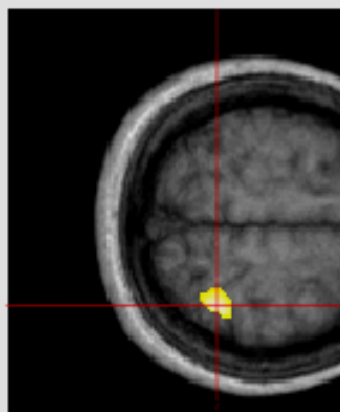
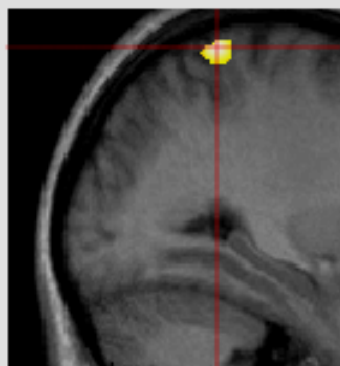
R hMT/V5₊

adjusted MR signal

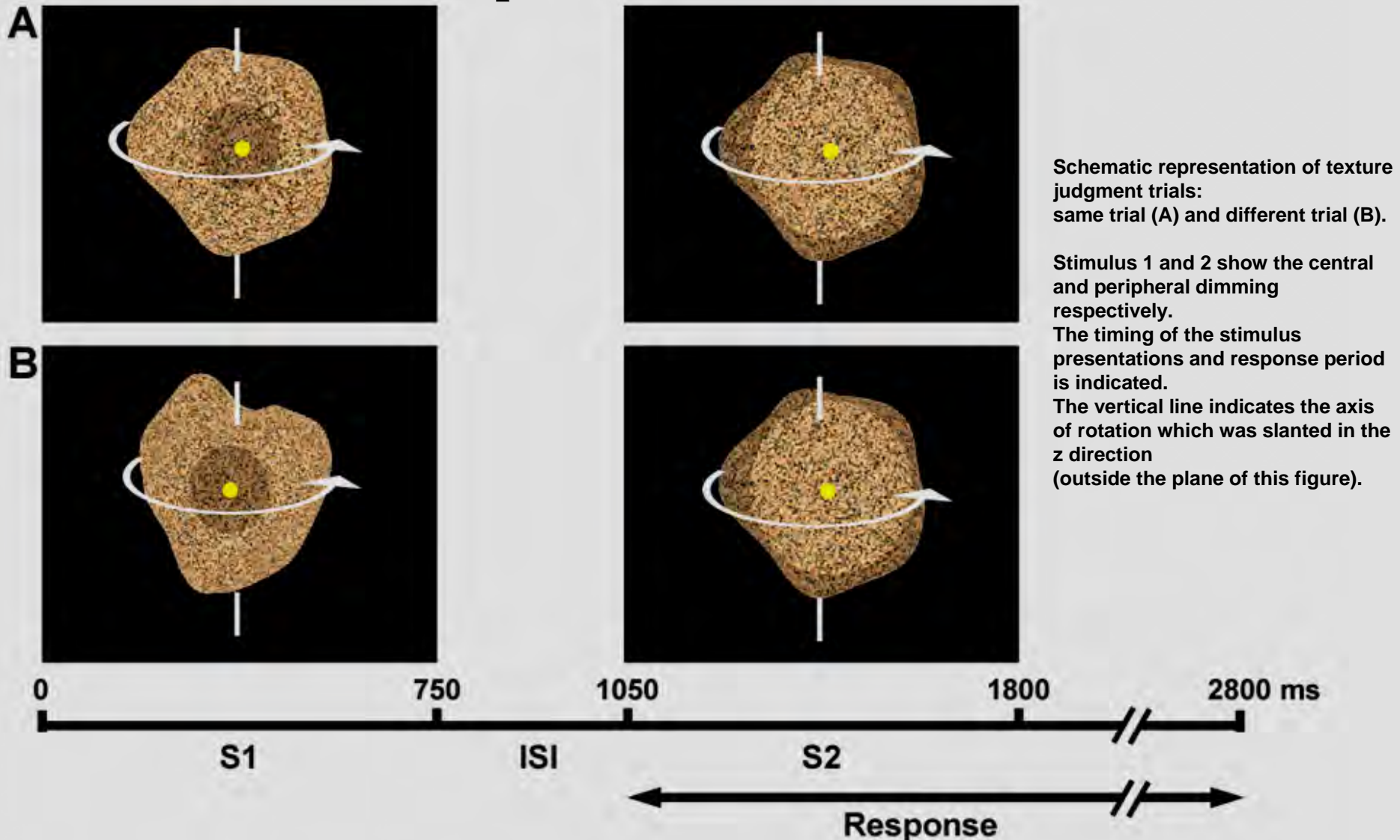


Effets du type de stimulus et transparence

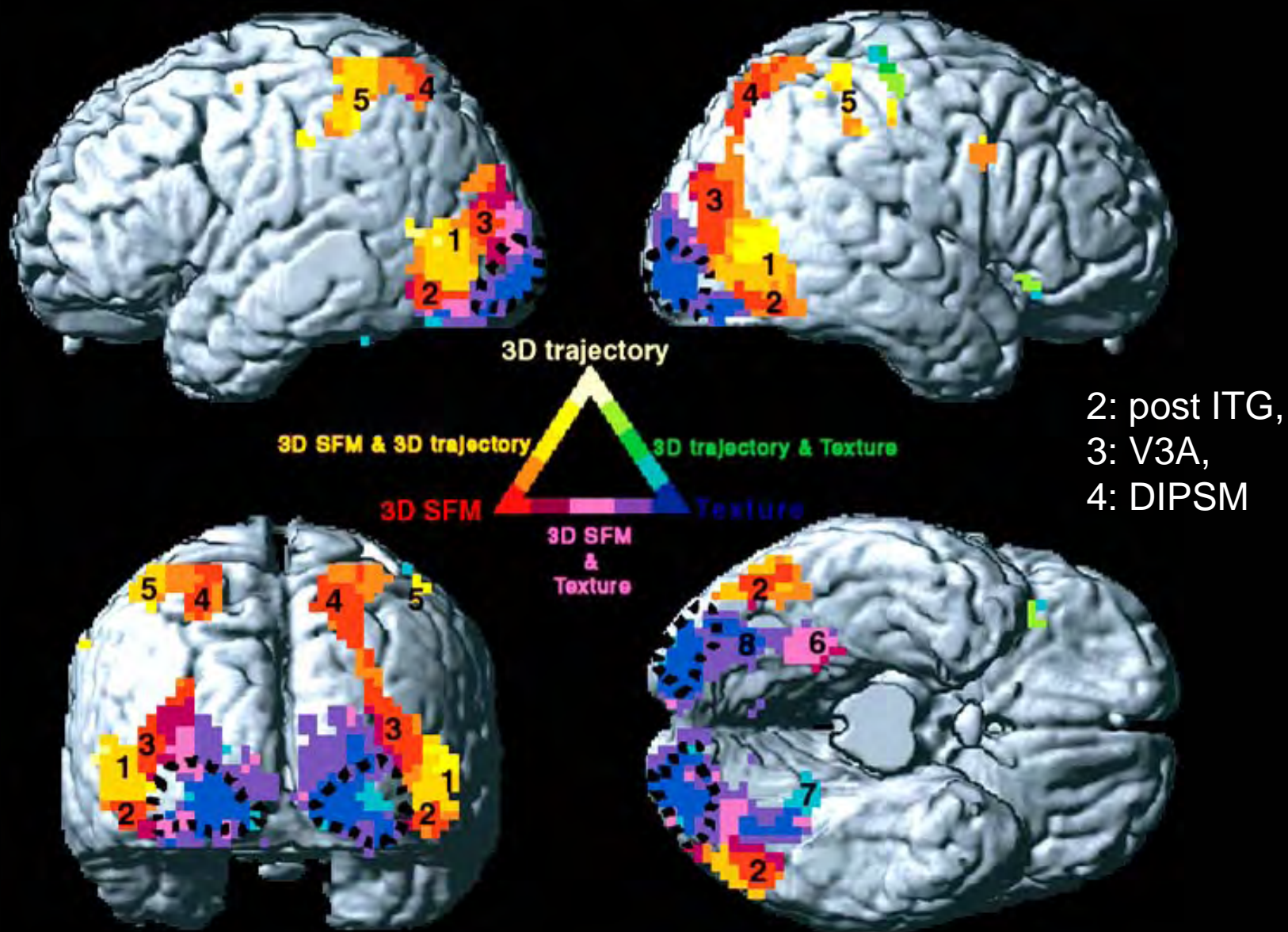
R DIPSA



Distinguer la forme 3D extraite du mouvement de la configuration spatiale du mouvement



EXTRACTION DE LA FORME 3D DU MOUVEMENT: fMRI HUMAIN



hMT/V5+ (1) et DIPSA-hAIP (5) sont sensibles aux deux aspects

STIMULI: LIGNES ALEATOIRES

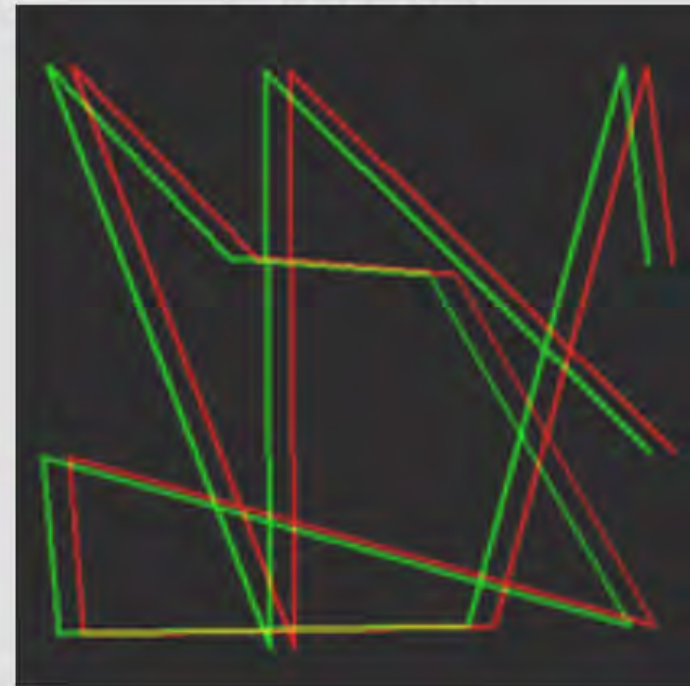
Structure en profondeur

3D structure
(2nd- and 1st-order depth)

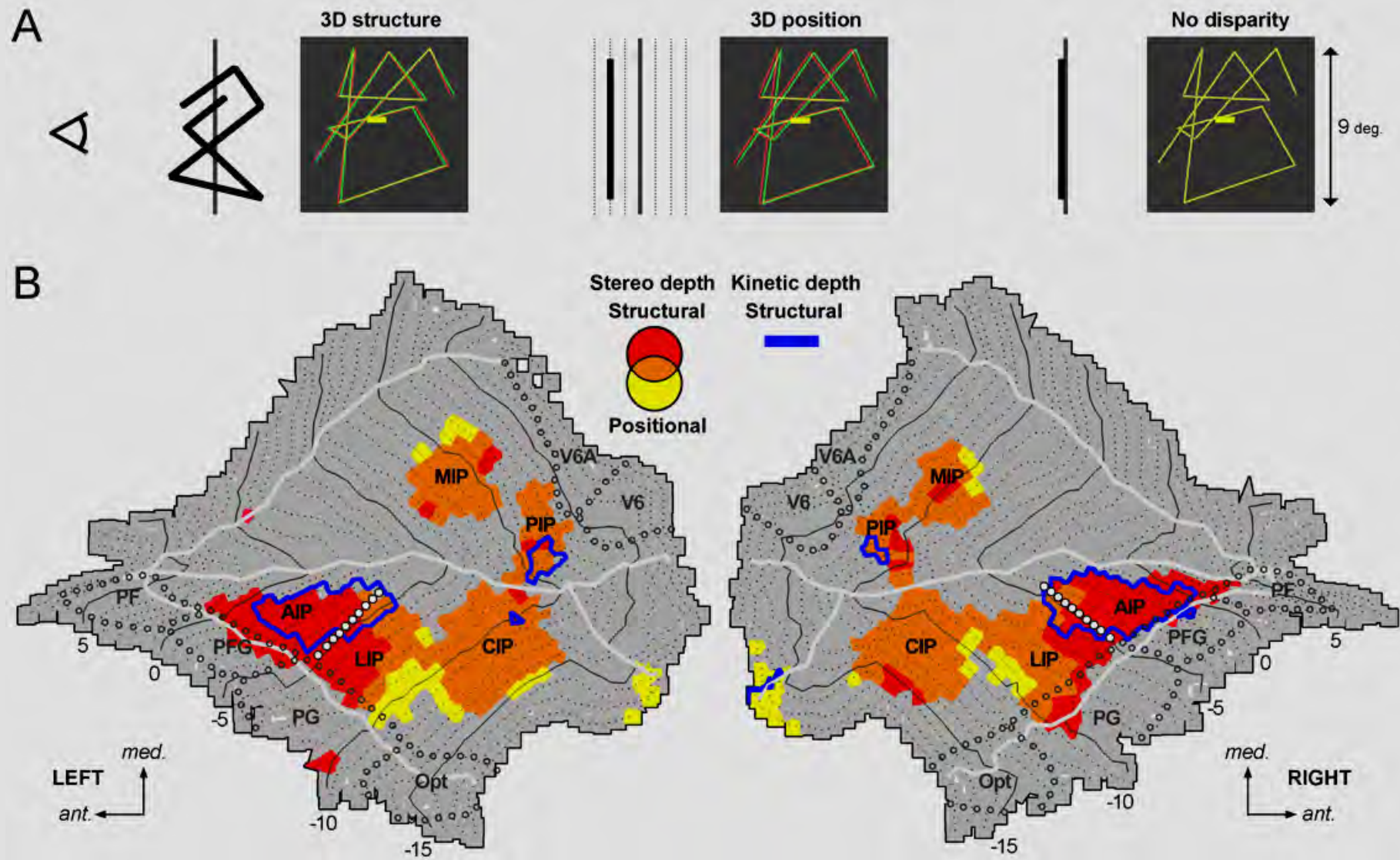


Position en profondeur

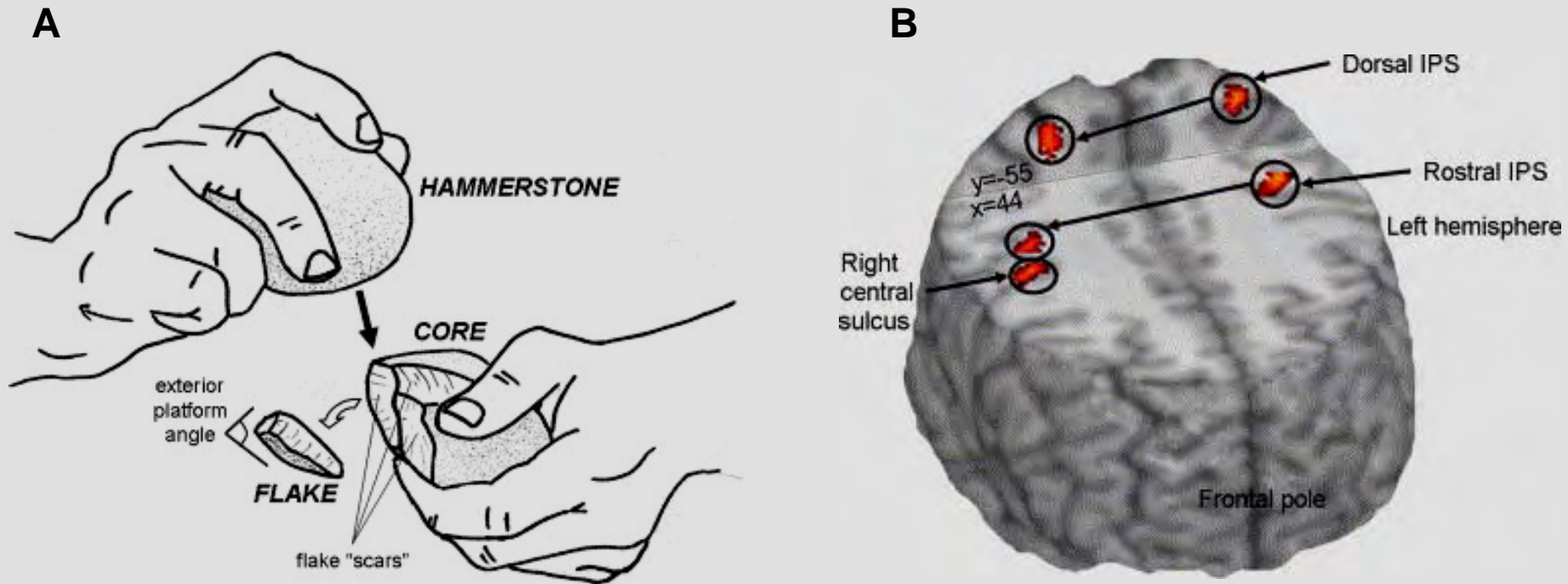
3D position
(0-order depth)



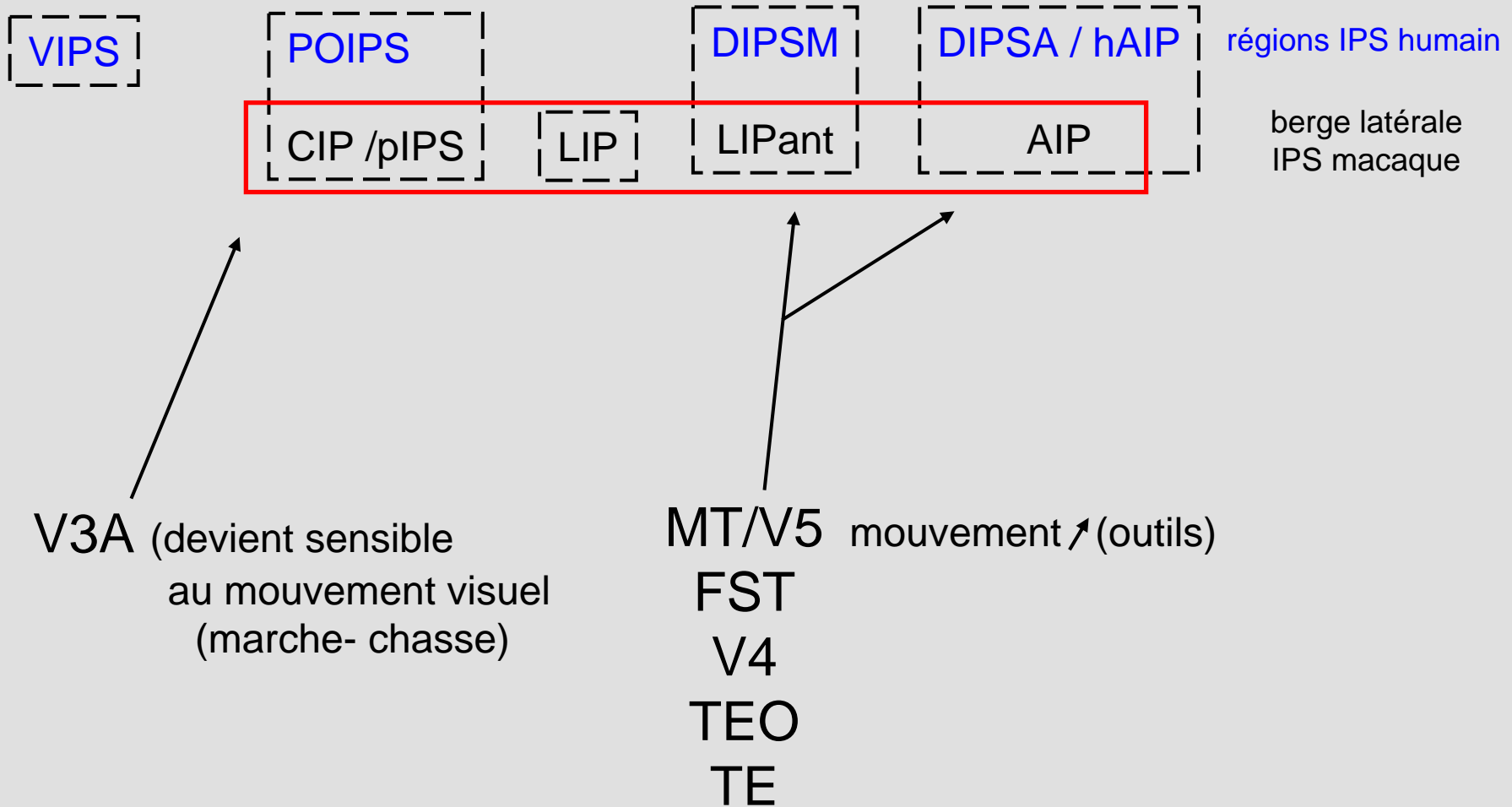
SENSIBILITE A LA COURBURE DANS L'IPS



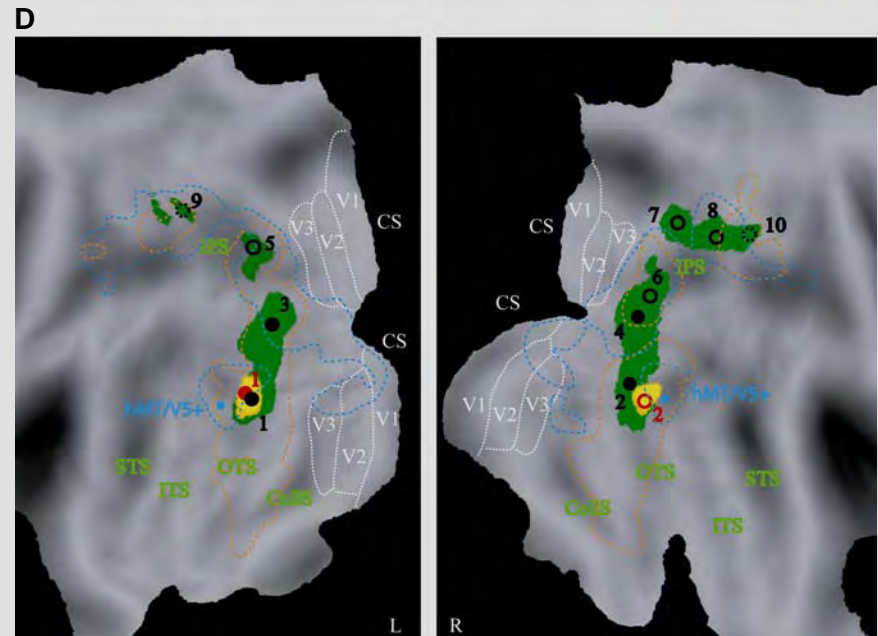
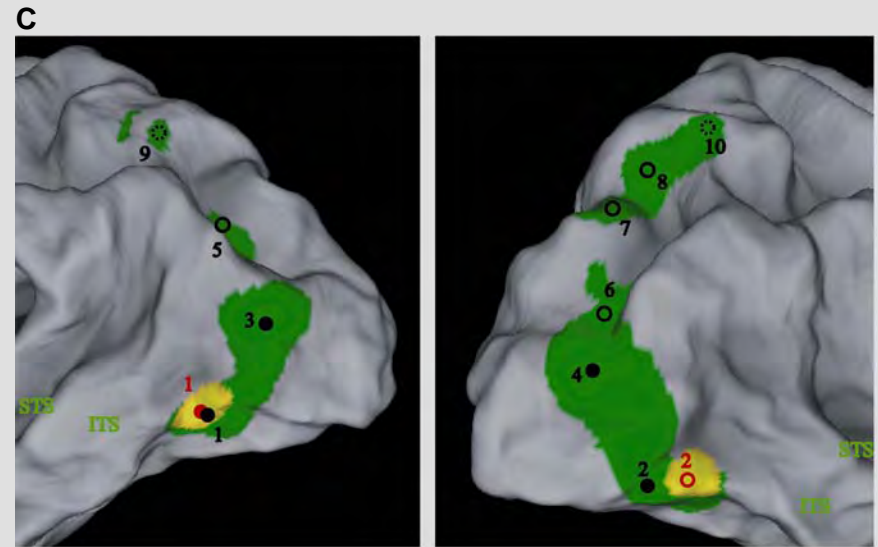
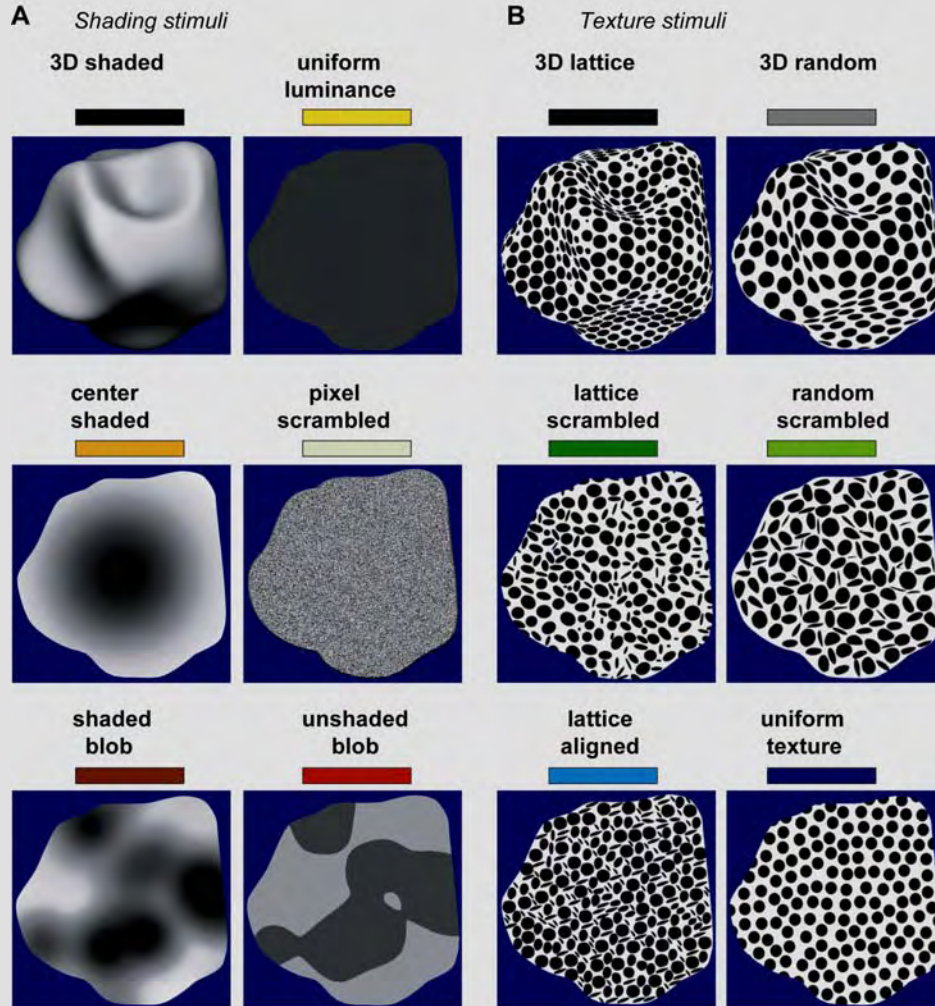
Utilisation des outils: TEP



Afférences régions pariétales



Activation générale: conjonctions (n=18)



CONCLUSIONS

- 1) Extraction de la forme 3D du mouvement se fait dans MT/V5 et FST des primates humains et non humains: sélectivité pour gradients de premier et second ordre**
- 2) Différence d'espèces dans les régions pariétales, surtout postérieures: plus de sensibilité à la forme 3D du mouvement chez les sujets humains: Effets de l'utilisation des outils et du mode de vie ambulatoire**
- 3) Extraction de la forme 3D de la texture et de l'ombrage réseaux différents: Texture ~ mouvement Ombrage seulement ITG postérieur**
- 4) Lieux de convergence des différentes sources d'information
Pariétal antérieur: AIP
ITG postérieur (homme)**

La triade: extraction de la forme tridimensionnelle du mouvement

RANDOM LINES

Macaque

Human

