



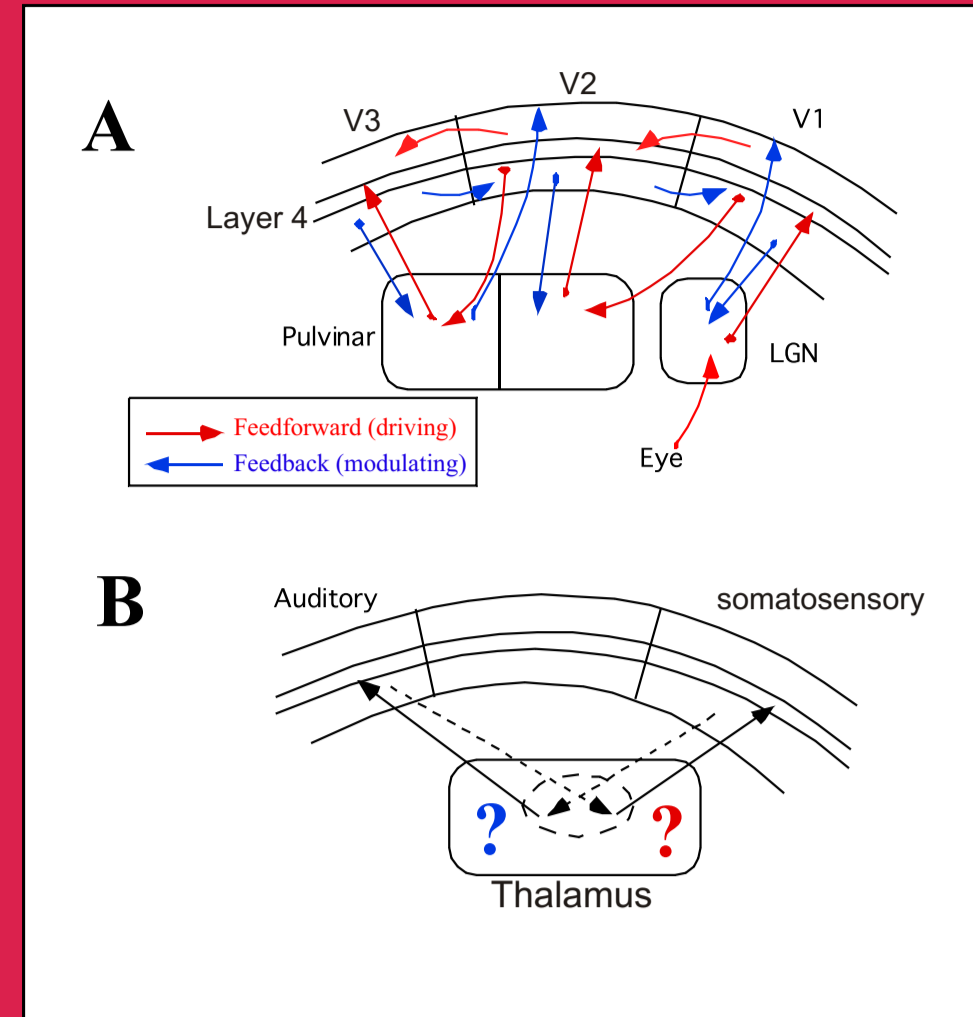
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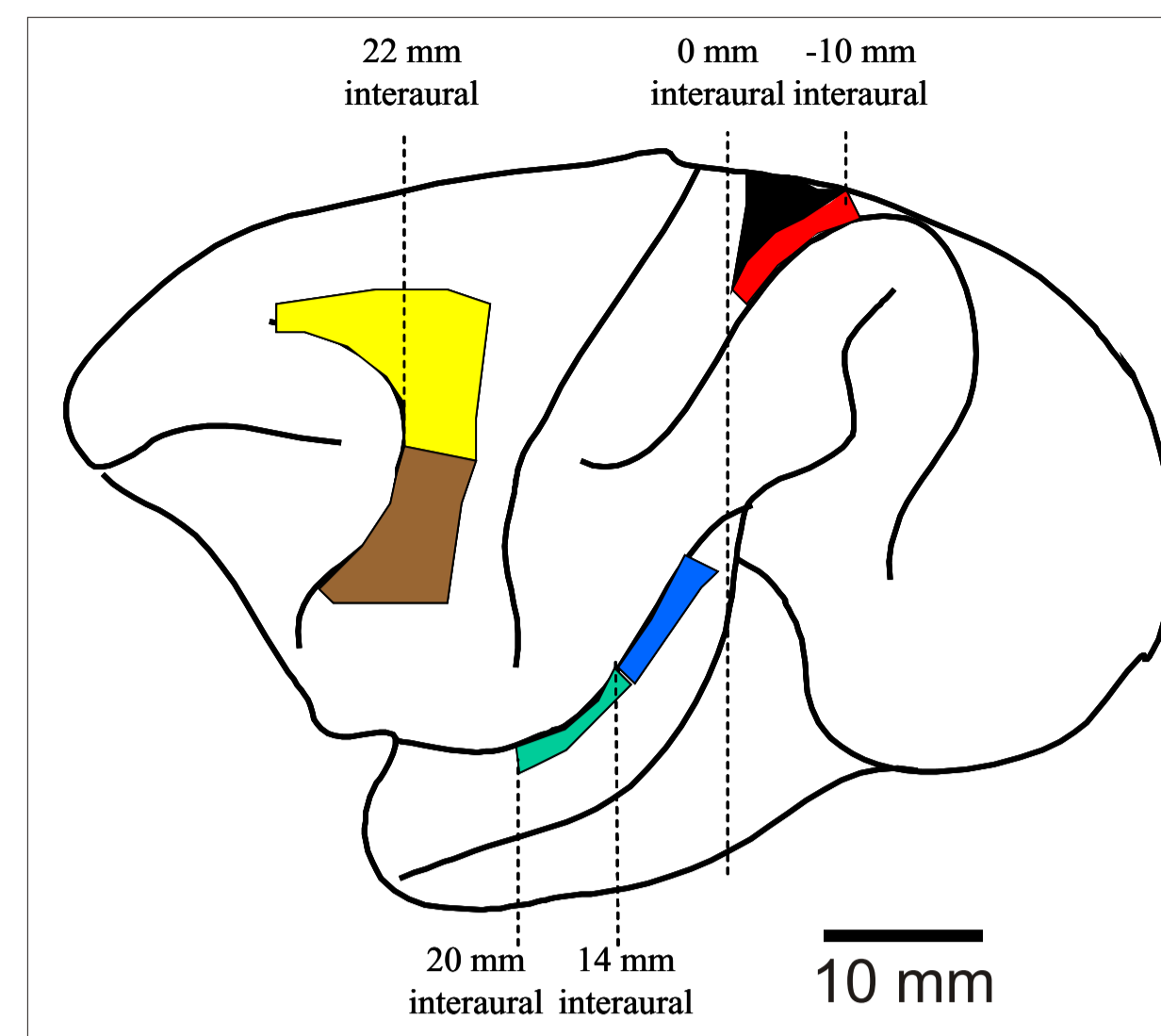
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Introduction

Although multisensory integration has been shown to take place essentially in the cerebral cortex and the superior colliculus, the thalamus may play a role as well. The aim of this study is to investigate thalamo-cortical networks possibly involved in multisensory integration.



Methods

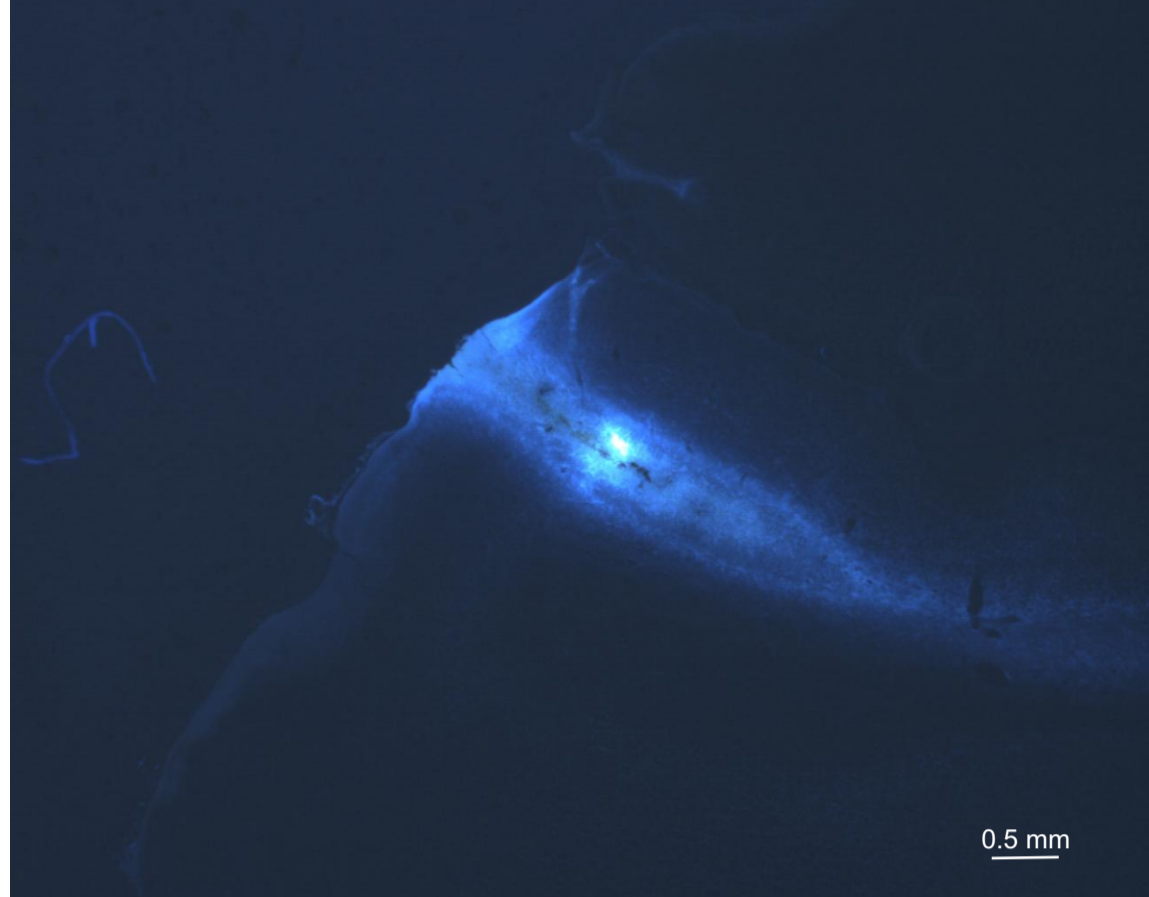


- Rostral auditory parabelt (RP): FE
- Caudal auditory parabelt (CP)+ caudal-medial belt area (CM)+ primary auditory area (A1): FB
- Dorsal premotor area (PMd): DY
- Ventral premotor area (PMv): CTB
- Caudal part of the parietal area (Area 5): BDA
- Medial intraparietal area (MIP): FR

Injections sites

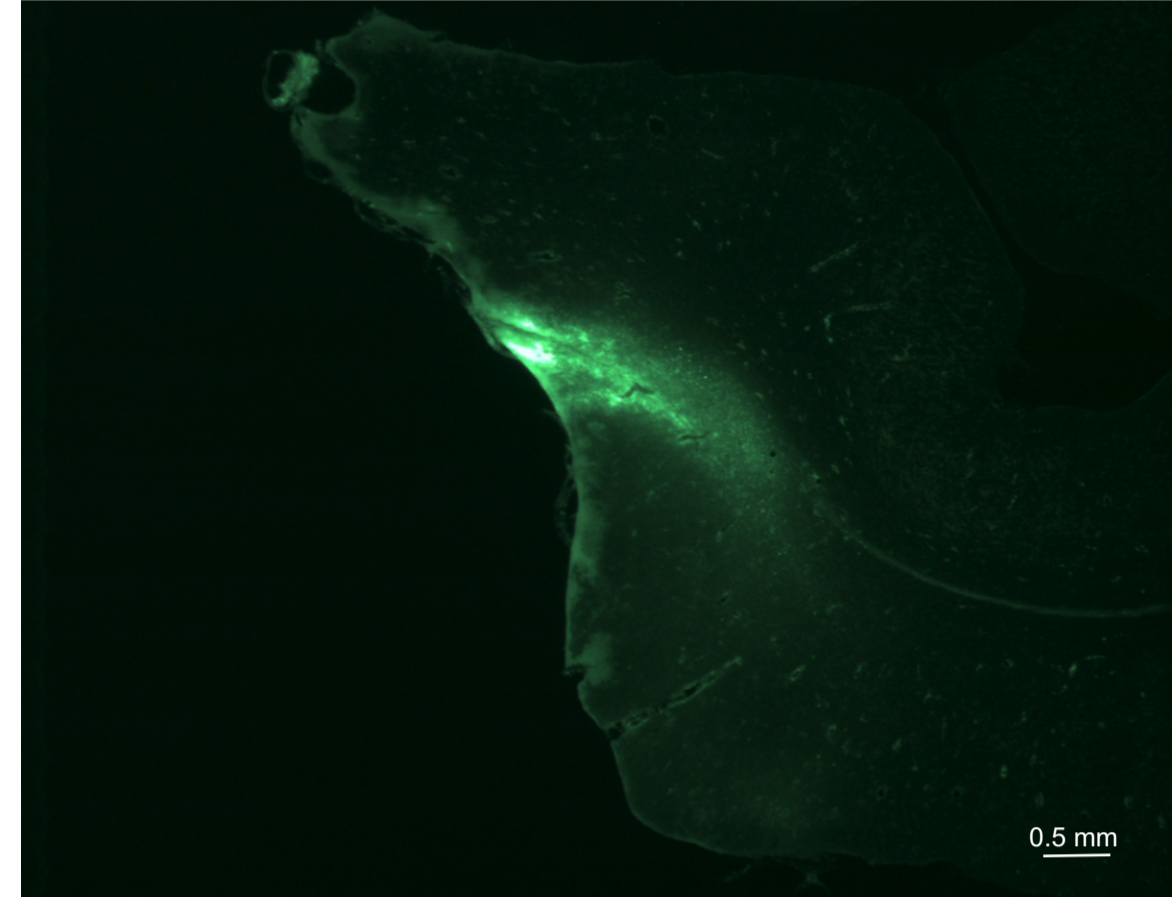
In one macaque monkey, seven neuroanatomical tracers were injected simultaneously in the auditory cortex (rostral -RP- and caudal -CP- parabelt areas), the posterior visual parietal cortex (medial intraparietal area (MIP)), the caudal part of parietal somatosensory area (Area 5) and the premotor cortex (the dorsal and ventral premotor areas (PMd and PMv)). The monkey was sacrificed by intracardiac perfusion with PFA mixture, the brain was removed, blocked and 40 microns thick sections were cut on a freezing microtome. Five series of sections were treated separately to visualize the different tracers and markers for cytoarchitecture. Retrogradely labeled neurons in the thalamus were plotted using a microscope assisted with NeuroLucida^R. Histochemical staining (acetylcholinesterase) was used to define architectonic borders and allocate labeled neurons to individual nuclei in the thalamus.

Auditory cortex: caudal parabelt



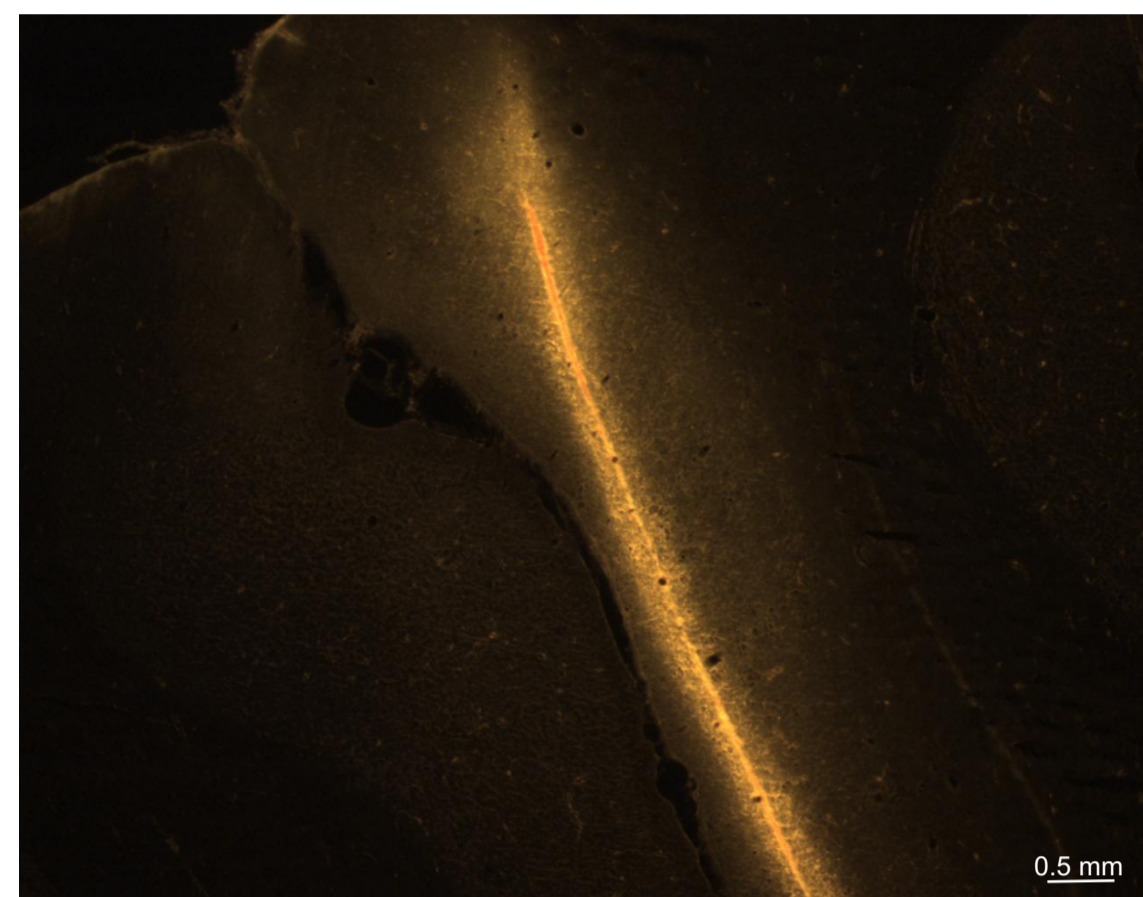
A Fast Blue (FB) injection site seen on a frontal section in the ventral bank of lateral sulcus corresponding to CM and to the caudal auditory parabelt.

Auditory cortex: rostral parabelt



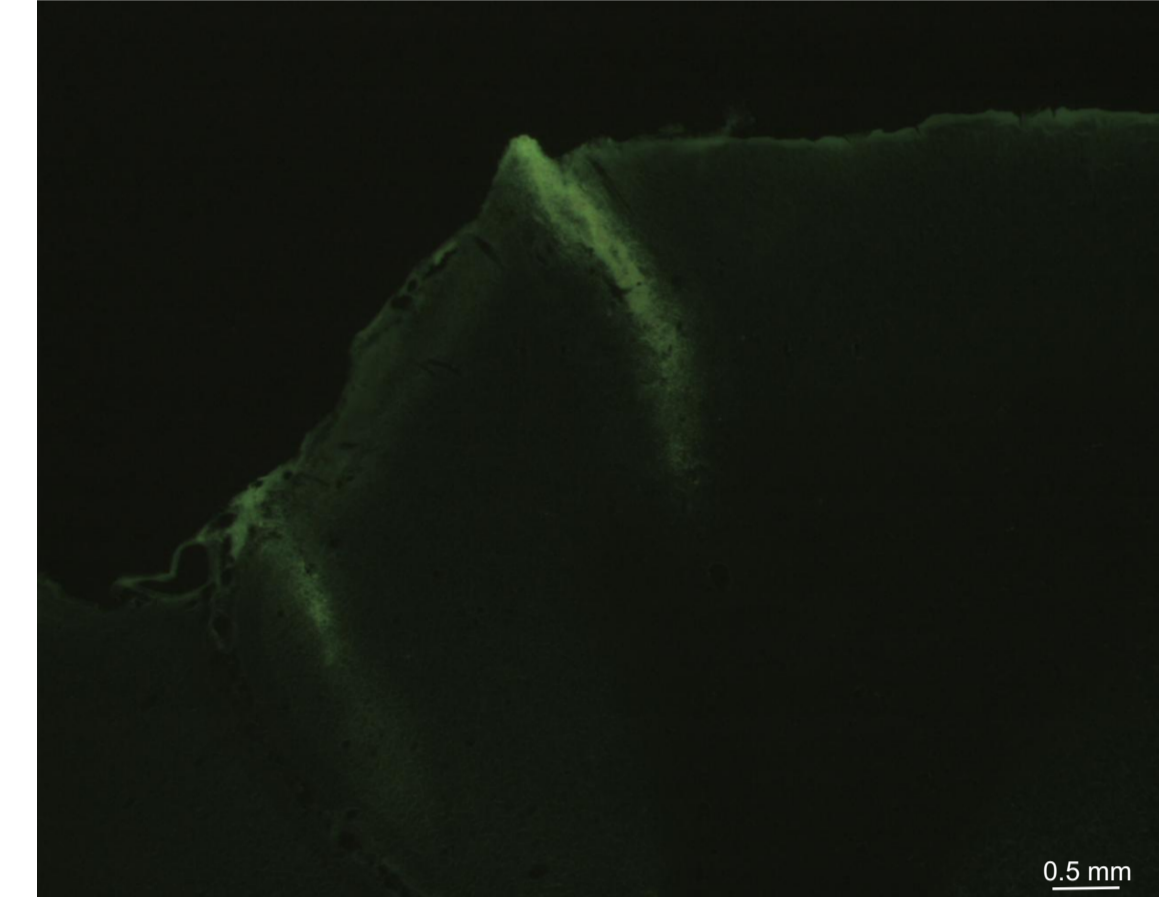
A Fluoroemerald (FE) injection site seen on a frontal section in the ventral bank of lateral sulcus corresponding to the rostral auditory parabelt.

Parietal cortex : MIP



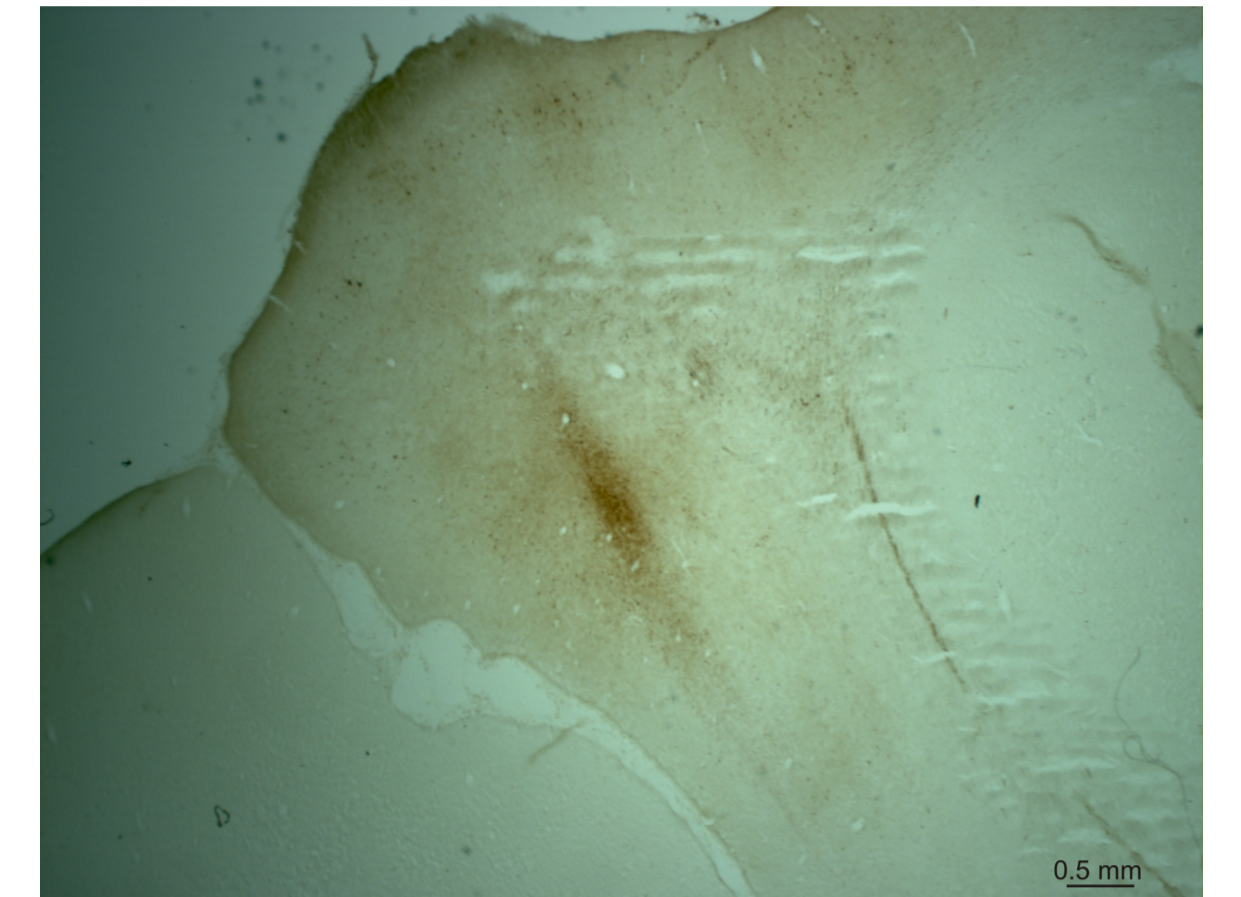
A Fluororuby (FR) injection site seen on a frontal section in the posterior visual parietal cortex (medial intraparietal area (MIP)).

Premotor cortex: dorsal part



A Diamidino-Yellow (DY) injection site seen on a frontal section in the dorsal premotor cortex (PMd).

Parietal cortex : Area 5

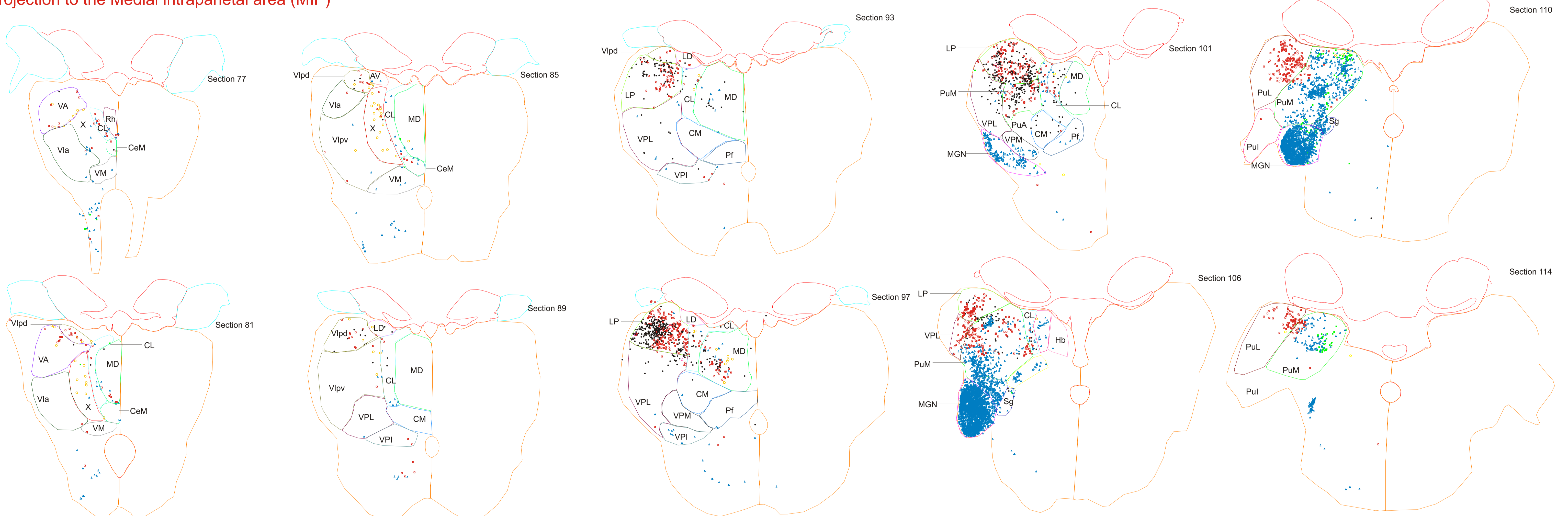


A BDA injection site seen on a frontal section in the caudal part of parietal somatosensory area (Area 5).

Results

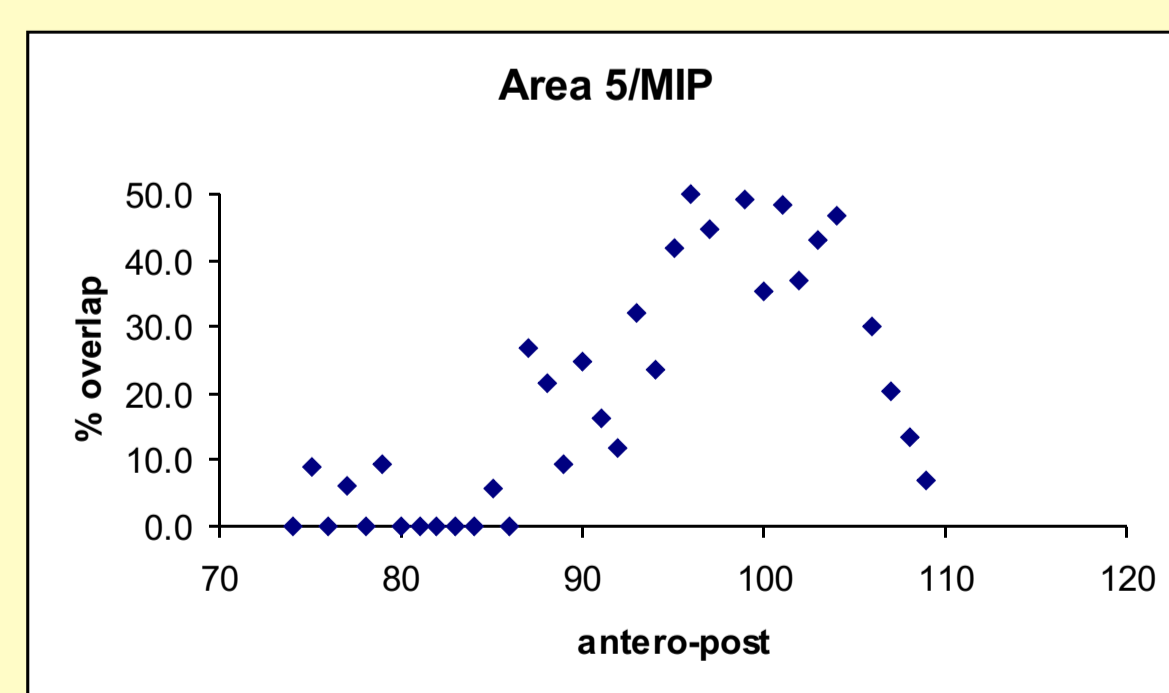
Projection to the rostral auditory parabelt (RP)
Projection to the caudal auditory parabelt (CP)+CM+A1
Projection to the Medial intraparietal area (MIP)

Projection to the dorsal premotor area (PMd)
Projection to the posterior parietal area (Area 5)

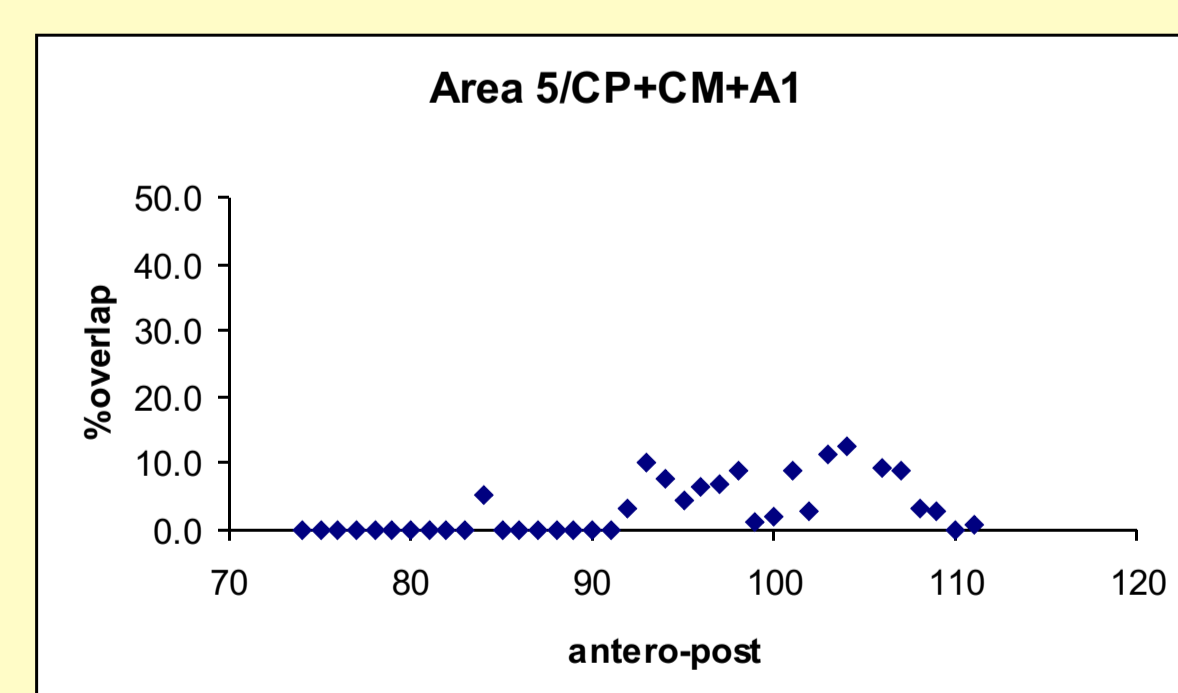


Overlap vs. Segregation of thalamocortical projections

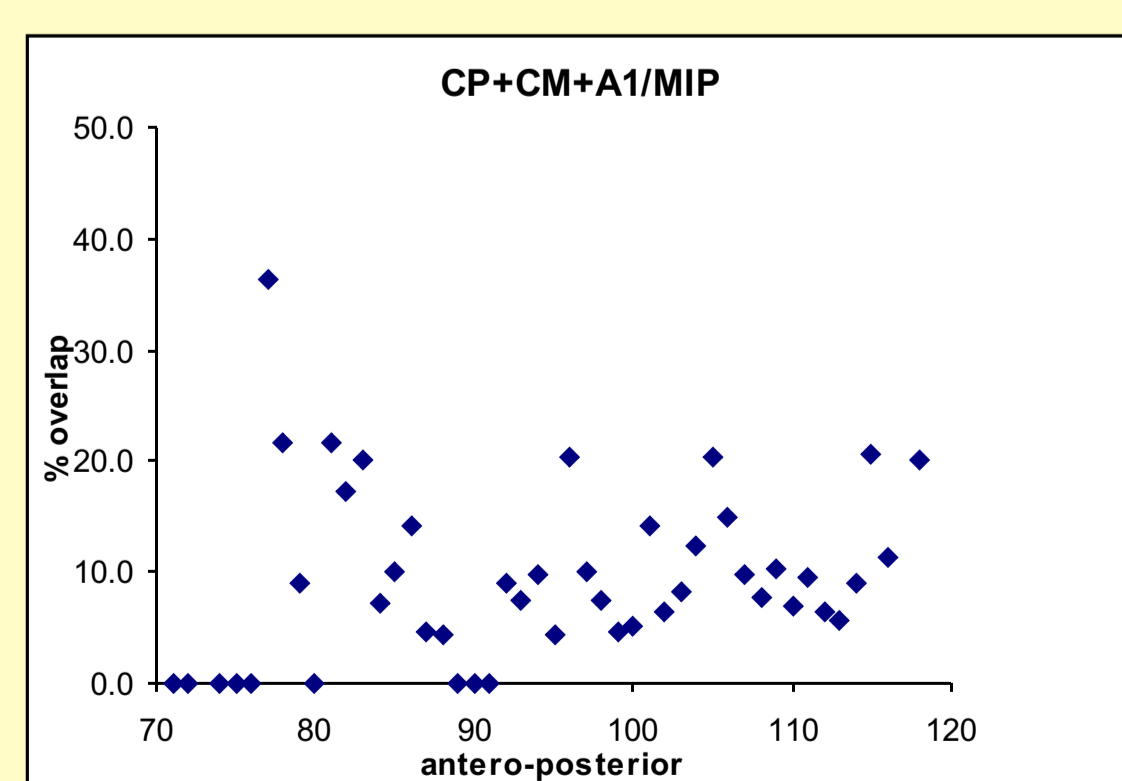
Representations of the degree of overlap vs. segregation of neurons labelled by paired injections in different cortical areas.



% overlap on all thalamus = 20
% overlap from section 90 to 107 = 36



% overlap on all thalamus = 3
% overlap from section 103 to 107 = 11

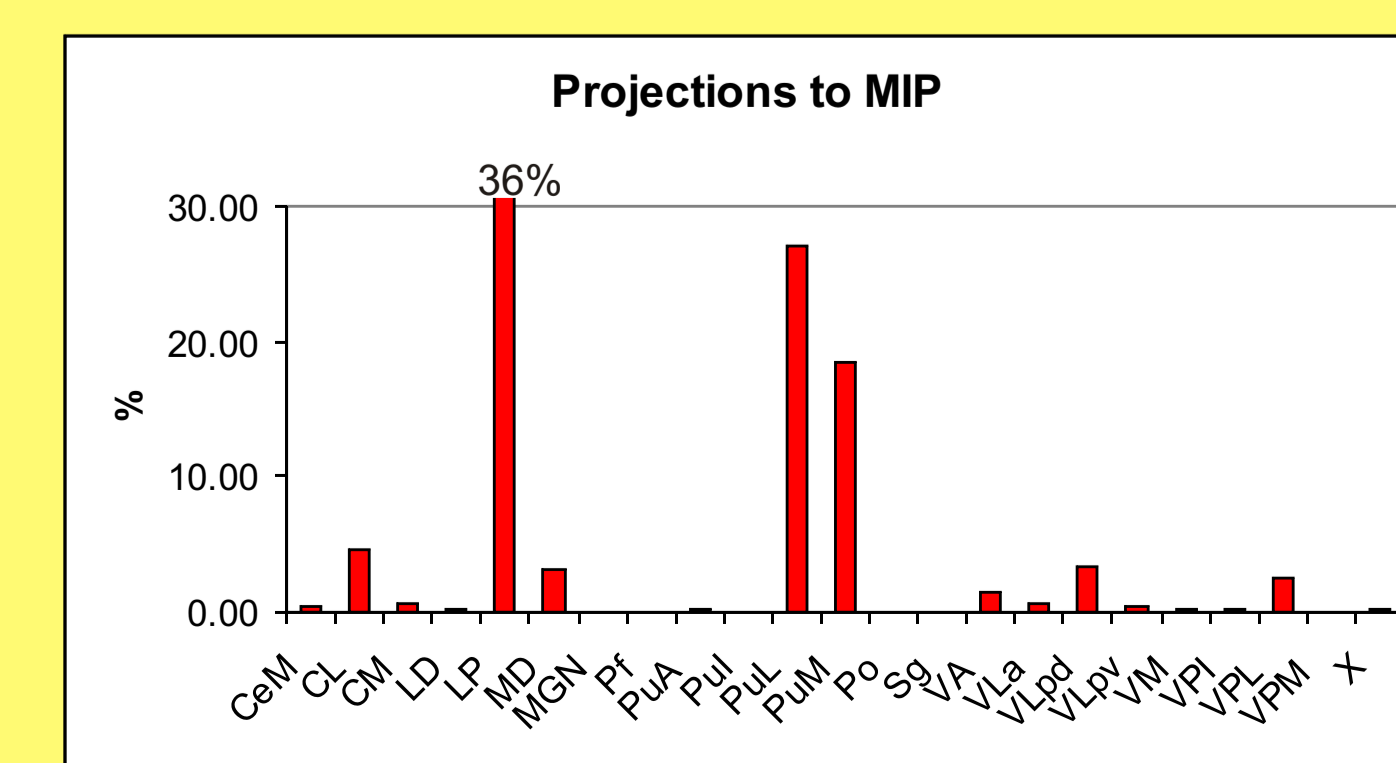
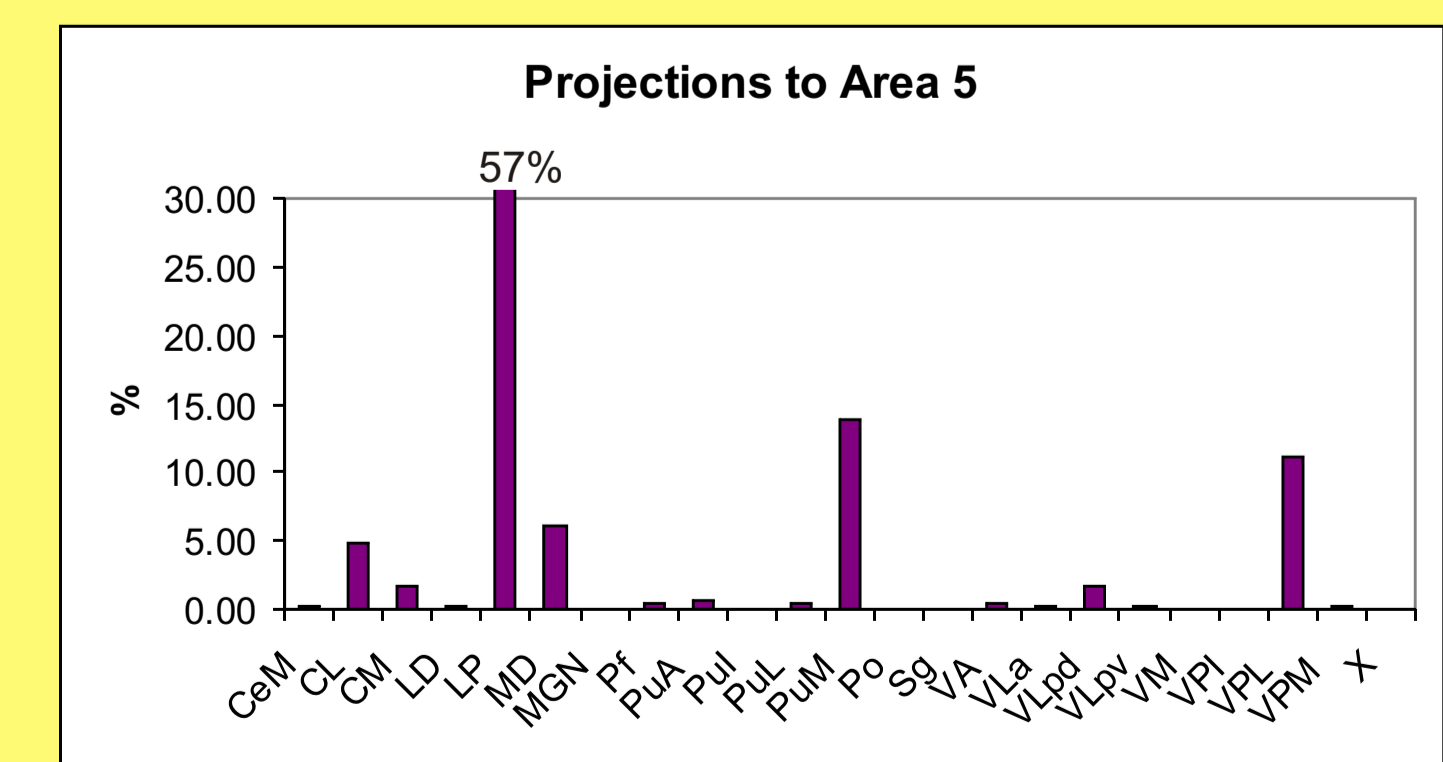
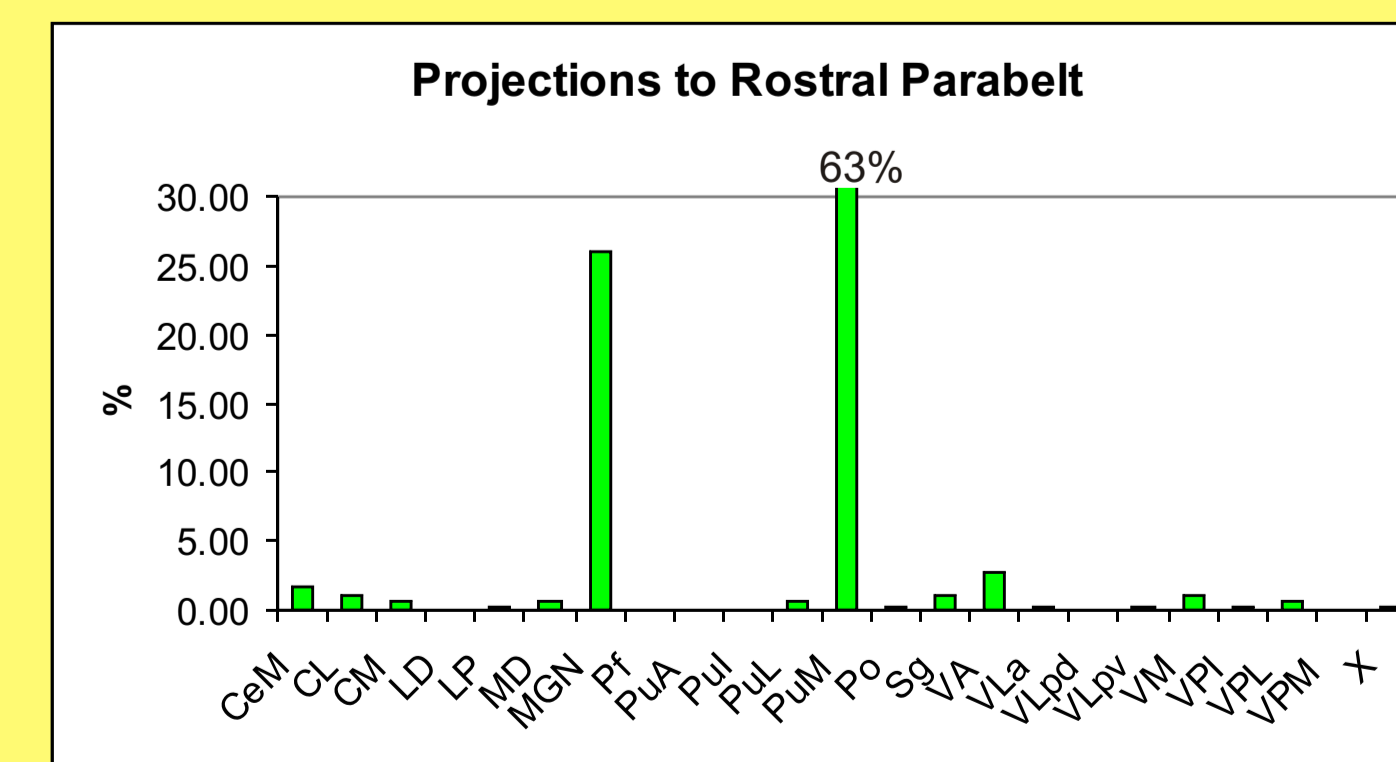
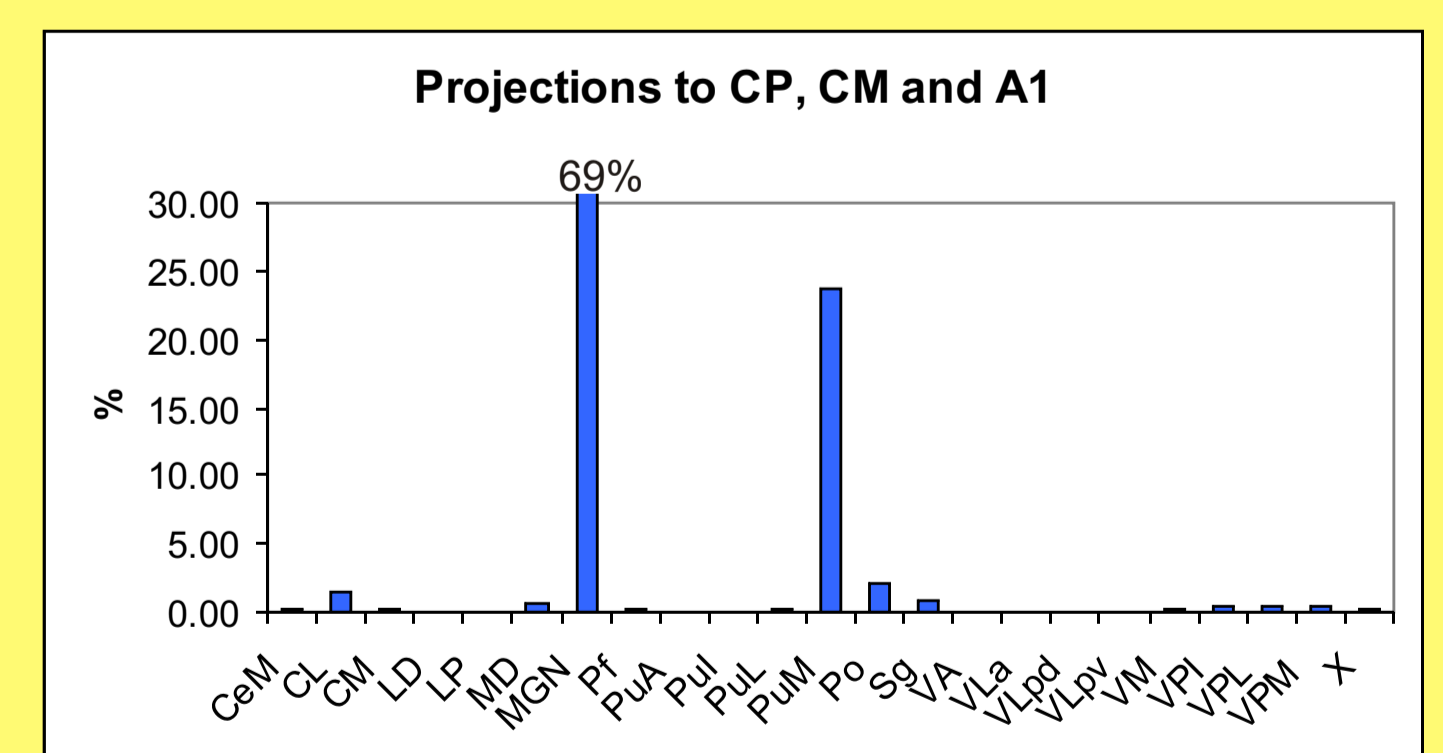
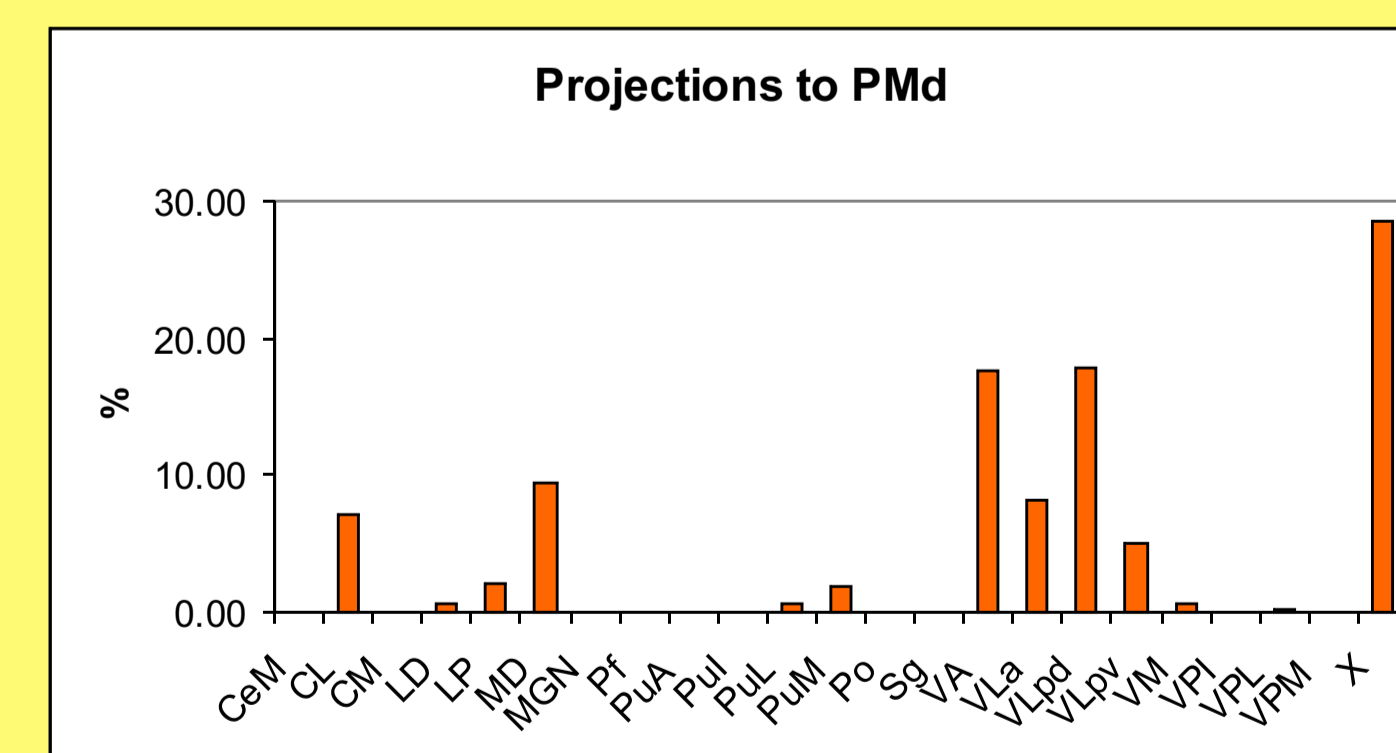


% overlap on all thalamus = 10
% overlap from section 76 to 88 = 13

These representations allow to assess quantitatively the degree of overlap between the territories of origin of thalamo-cortical projections to different sensory and/or motor cortical areas.

Thalamocortical projections

Histograms of the percentages of labelled cells in each thalamic nucleus reported as a function of the total number of cells in the thalamus labelled by each of the injected cortical areas.



Thus, the main nuclei projecting in parallel to PMd, CP, CM, A1, RP, area 5 and MIP are the medial pulvinar nucleus (PuM), the dorsal division of the ventral lateral posterior nucleus (VLpd) and the central lateral nucleus (CL).

Conclusion

The present results are consistent with the presence of thalamic territories possibly integrating different sensory modalities with motor attributes. Thus, our results suggest that the thalamus could represent an alternative pathway to the cortico-cortical networks by which information can be transferred between cortical areas belonging to different sensory and/or motor modalities.