# A role for the thalamus in early multisensory and sensorimotor integration?

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## Introduction

Although multisensory and sensorimotor integration is believed to take place essentially at cortical level along corticocortical streams converging at frontal lobe, there is also evidence that such integration may occur at more early stages of information processing, at subcortical levels. We tested anatomically the hypothesis that the thalamus is in position to contribute to early multisensory and sensorimotor integration.

## Materials and Methods

In two adult macaque monkeys, 6 neuroanatomical tracers were injected in the auditory cortex (AC: rostral and caudal parts), the areas PE/PE in area 5 of the posterior parietal cortex, and the premotor cortex (dorsal (PMd) and ventral (PMv) areas) in order to assess their connectivity with the thalamus.

## Conclusion

Our anatomical data support the notion that remote cortical areas exchange plurimodal information via cortico-thalamo-cortical loops, formed by a corticothalamic projection (e.g. area 5 to PuM) from layer V and terminating in PuM with giant endings (fast and secure synapse) prolonged by a thalamocortical projection from PuM to PMd or PMv, giving rapidly access to motor output. Such pathway for transthalamic sensorimotor (or multisensory) integration is believed to be faster and more secure than corticocortical streams of information with multiple synapse stages. A generalization of these data would allow rapid transfer of information from the AC to PM (and reciprocally from PM to AC) or from area 5 to AC (and reciprocally from AC to area 5).

Fig 1
Three hypothetical mechanisms for early multisensory and sensorimotor integration involving the thalamus

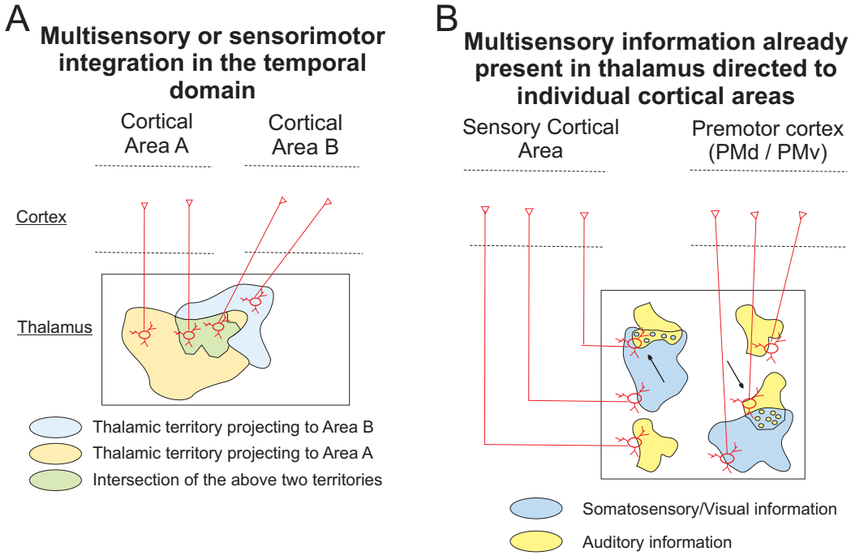



Fig 2
Injections sites

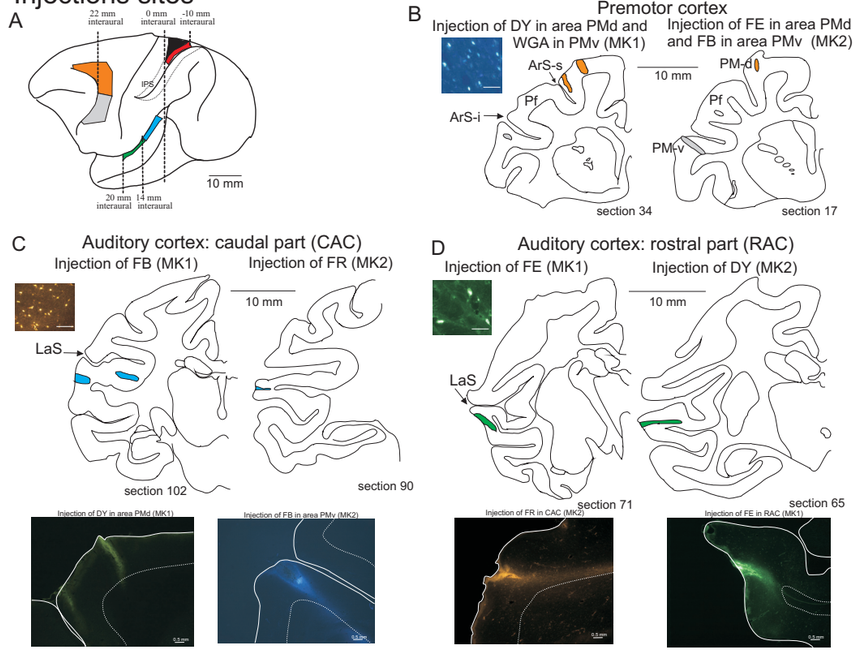



Fig 3
Distribution of labelling in the thalamus

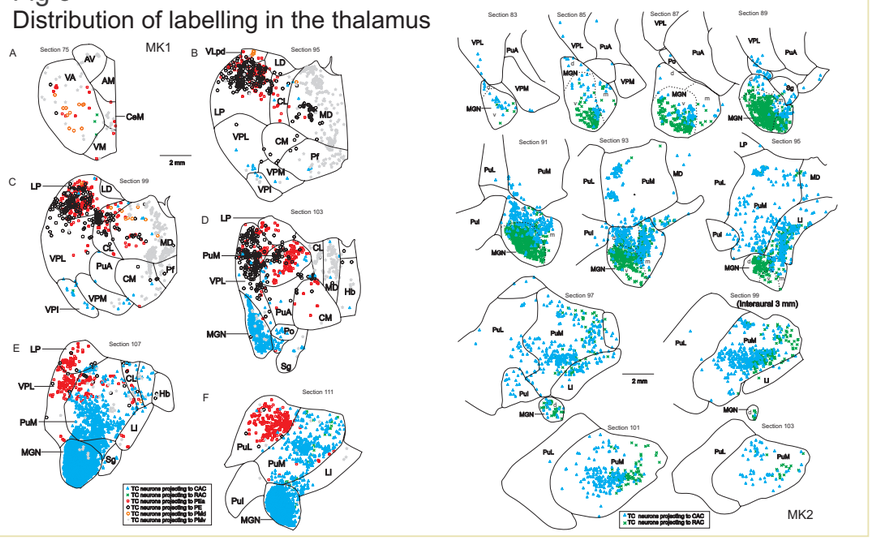



Fig 4
Thalamo-cortical projections to AC, PM and area 5.

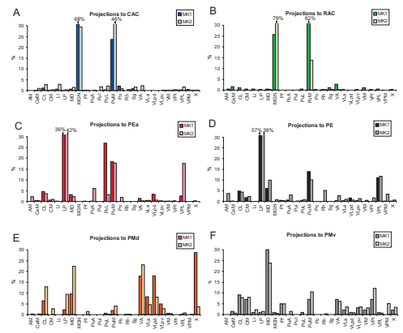
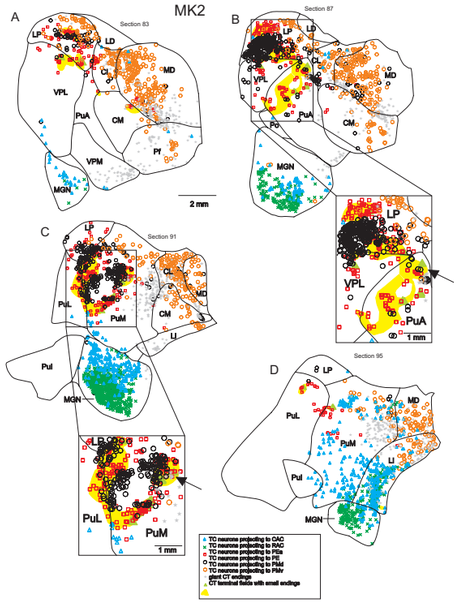
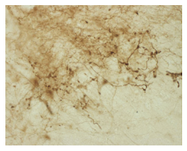



Fig 5
Thalamocortical (TC) and corticothalamic (CT) projections of area 5.



Giant CT endings from area 5 in VPL

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