



# Functional architecture of the foveal confluence in macaque visual cortex



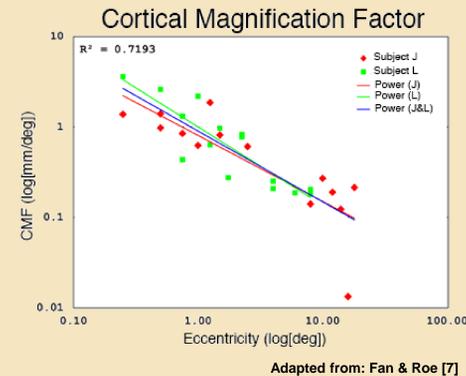
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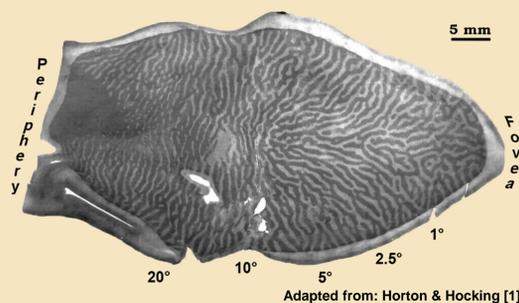
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## Introduction

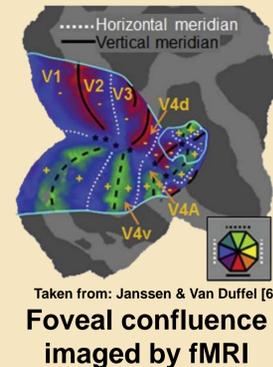
The fovea is crucial for providing high spatial acuity needed for tasks such as reading, form identification, face recognition, and is key to natural visual attentional behavior. Despite its importance, surprisingly little is known about its cortical representation. Given the known specialized functions performed by the fovea, we expect differences in central versus peripheral cortical organization. Our goal is, through the use of intrinsic optical imaging, to explore these differences by examining the idea that the foveal confluence is structured as a single specialized cortical region shared by the early visual areas as well as investigating the representation of blue color in the foveal confluence.



Foveal representation is anatomically distinct in addition to qualitatively unique. This is apparent in the OD columns of V1 where foveal column width is larger than peripherally represented columns [1,2]. Large cortical magnification also distinguishes foveal representation.

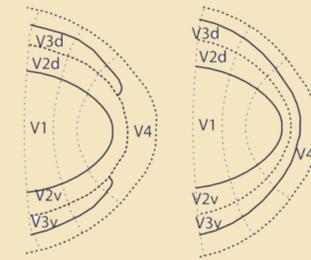


## What is the foveal confluence?



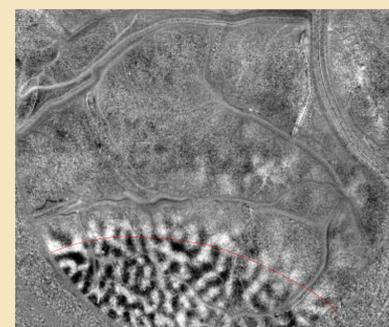
**Foveal confluence imaged by fMRI**

Early visual areas converge along cortex that represents central vision forming the foveal confluence [4]. There are two major models for the organization of the foveal confluence: one in which V2 and V4 share a border and one in which a continuous V3 separates V2 from V4 [3]. We propose that the foveal confluence is a special structure shared by all of these cortical areas. If it is simply a cortical meeting place, then we would expect to find the presence of multiple topographic reversals, however, if it is a distinct cortical area then we may not observe such reversals.

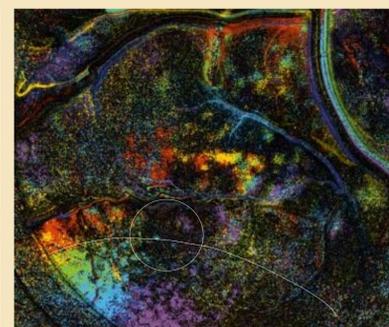


**Two major models of the foveal confluence**

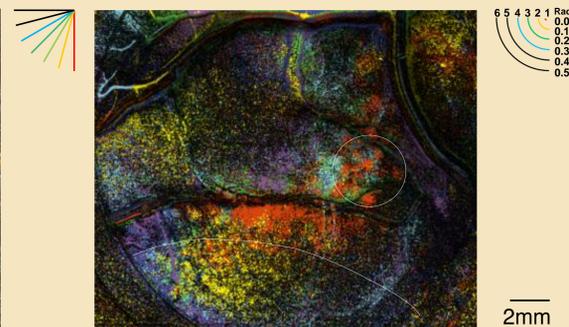
## Is the foveal confluence a unified and distinct cortical area?



**V1/V2 border identified by ocular dominance columns**

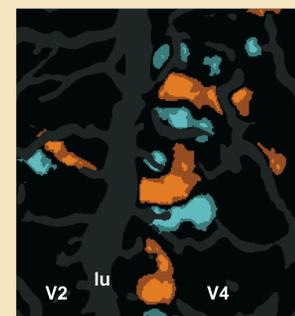


**Foveal orientation map reflects equal weighting of vectors**

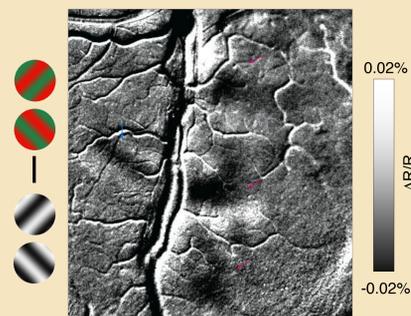


**Arc stimuli are used to create eccentricity maps of visual cortex**

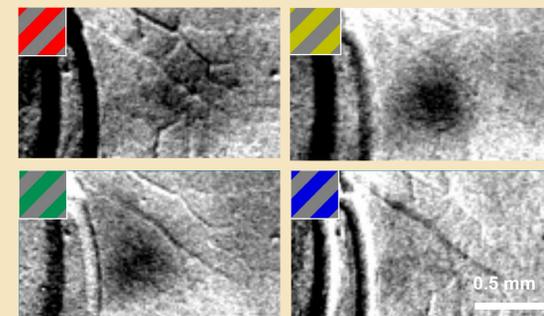
## Is blue color represented in foveal cortex?



**V4 luminance and color maps have V2 origins**



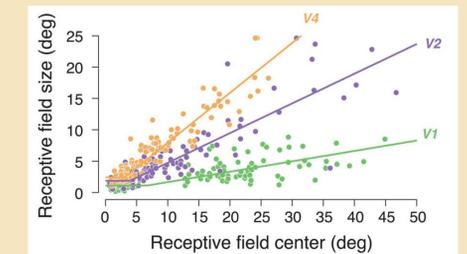
**Color and luminance gratings are used to map foveal V4**



**All isoluminant color gratings other than blue activate color domains**

## Summary

The extremely small receptive field size of central vision makes studying the foveal confluence particularly difficult. As a result, relatively little is known about the cortical representation of the fovea. We bring some open questions regarding the function of the foveal confluence to light as well as beginning a preliminary investigation.



### Foveal receptive fields are very small

We examine the possibility that at the foveal confluence there are no clear borders between cortical areas as well as the possibility of blue color representation.

We ask:

- 1) Is the foveal confluence a unified and distinct cortical area with marked by functional specialization and reduced cortical wiring need?
- 2) Is there blue color representation in foveal cortex?

## References

- [1] J. C. Horton & D. R. Hocking. *Intrinsic variability of ocular dominance column periodicity in normal macaque monkeys*. J. Neurosci., 16(22):7228-7239, Nov 1996.
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## Acknowledgements

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