# Common rules for anatomy and function in cortex

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Axonal projections made across the surface of cortex, revealed by injections of neural tracer, show an intriguing and poorly-understood pattern of clustered arbors. Maps of neural activity evoked in primary visual cortex by a stimulus of a single functional mode have an approximate periodic appearance, with isolated regions of high firing activity (functional domains) spaced at regular intervals. We compare the layout of these systems, one anatomical, the other functional, and find the spatial arrangement is indistinguishable.
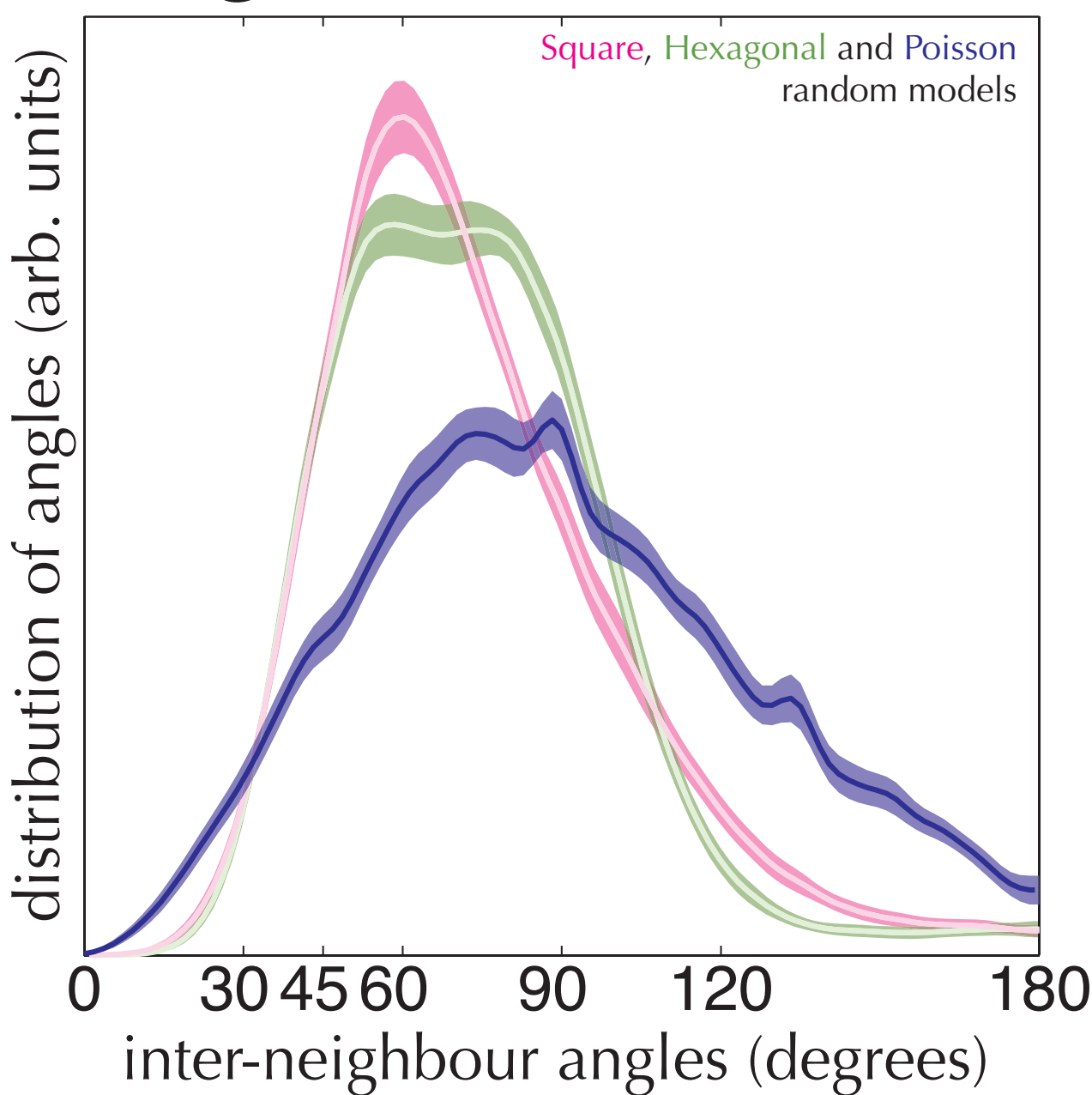
Functional domains
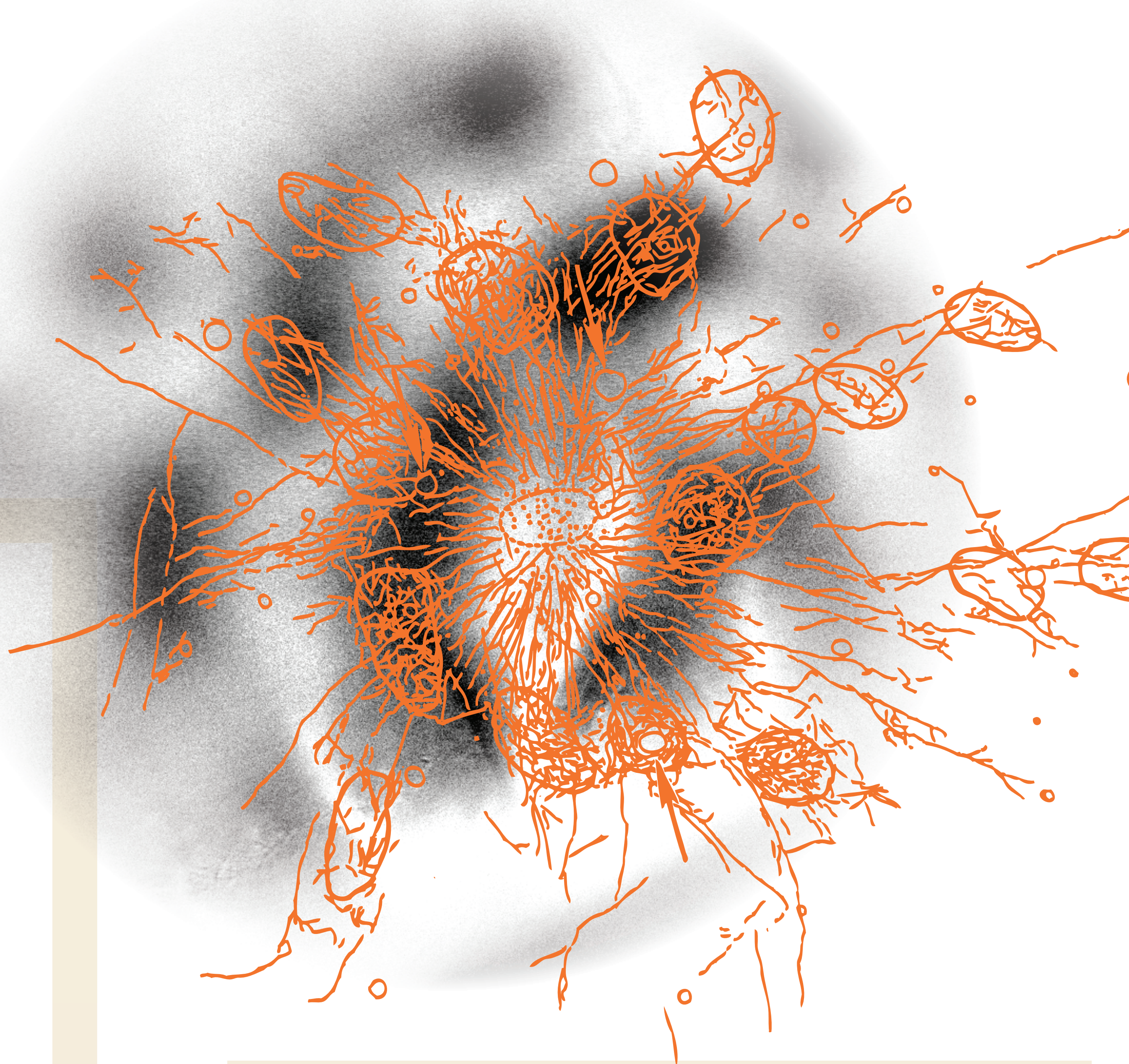
Optical imaging of the cortical response, Monkey V1 (David Omer and Amiram Grinvald)
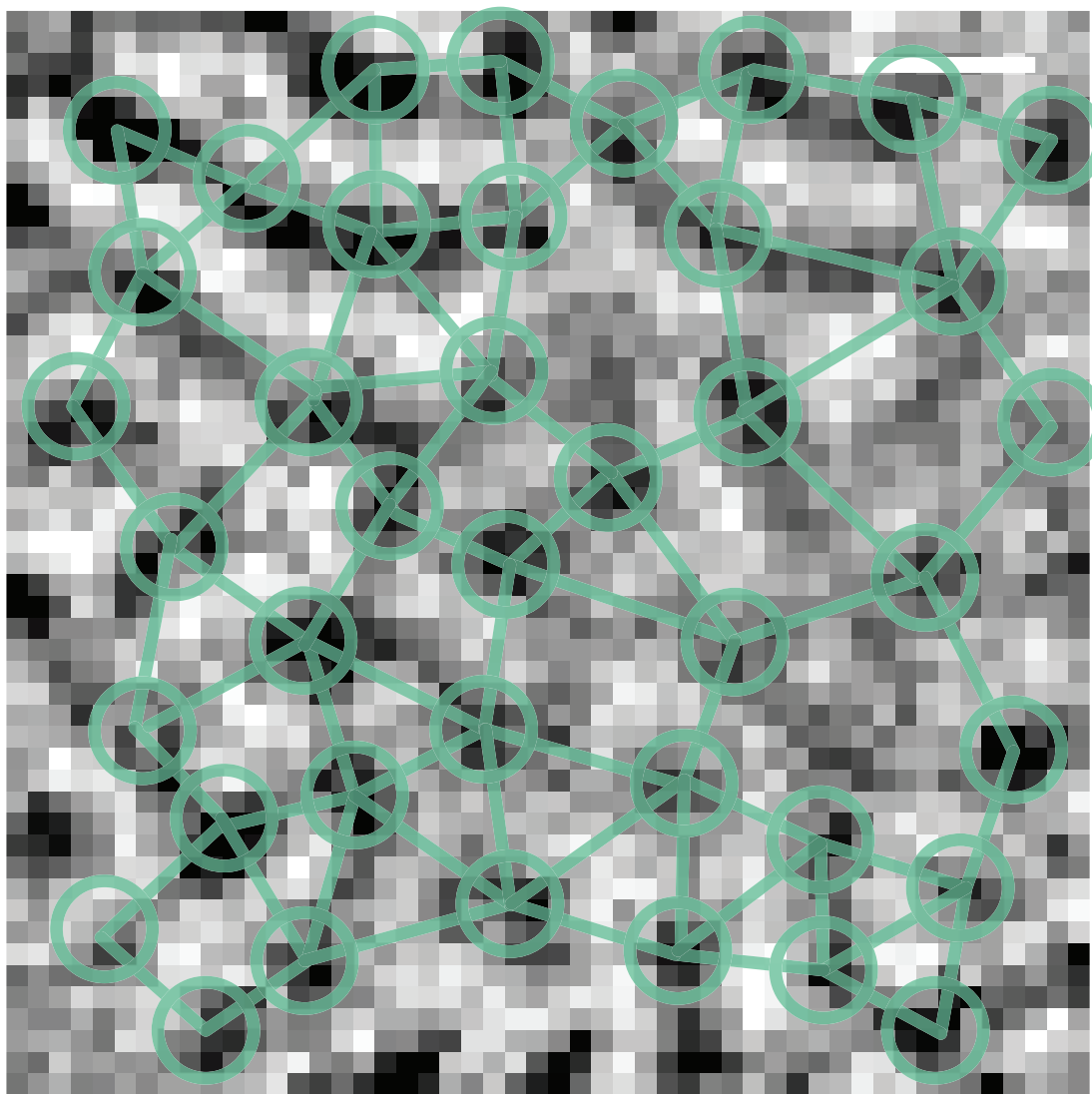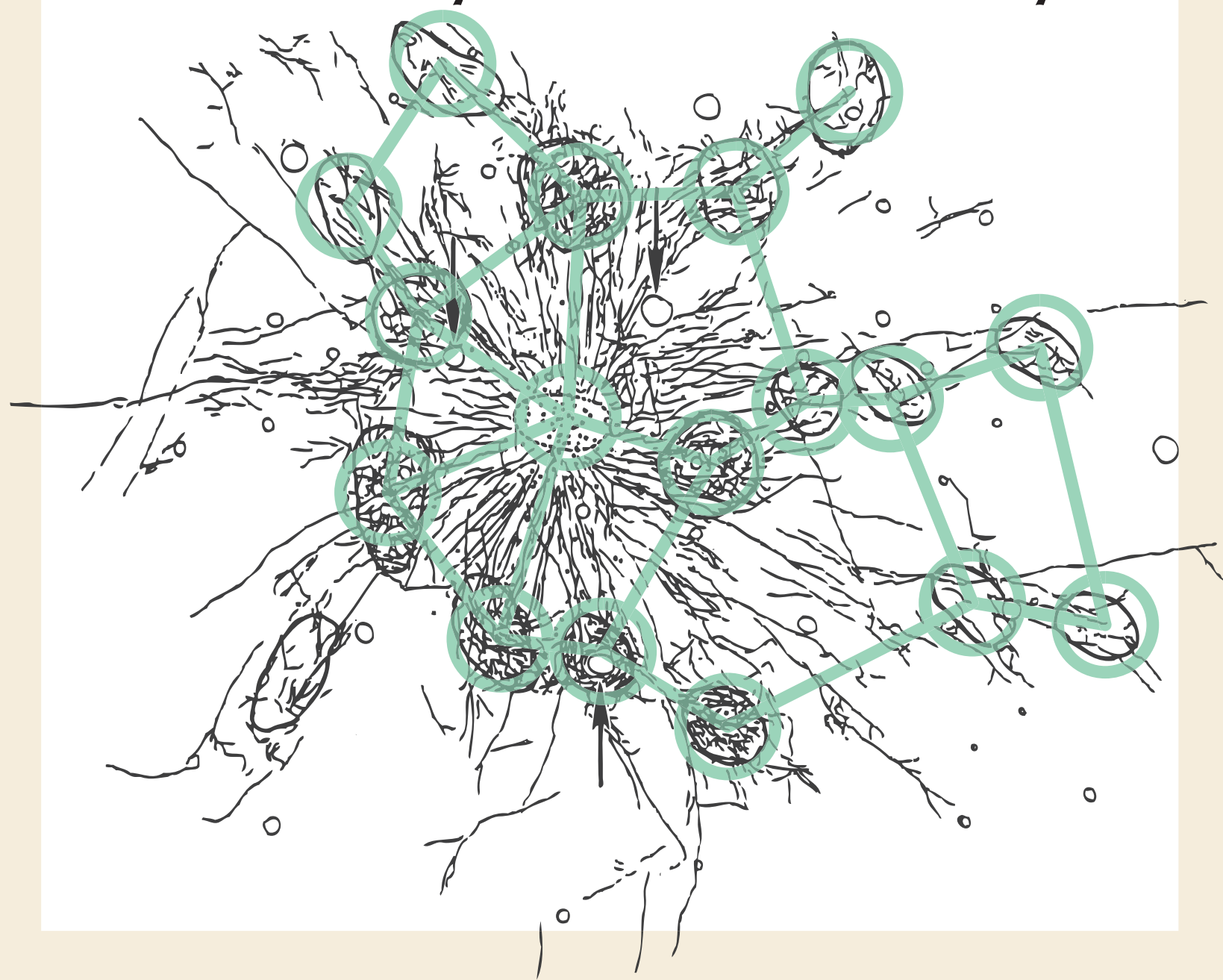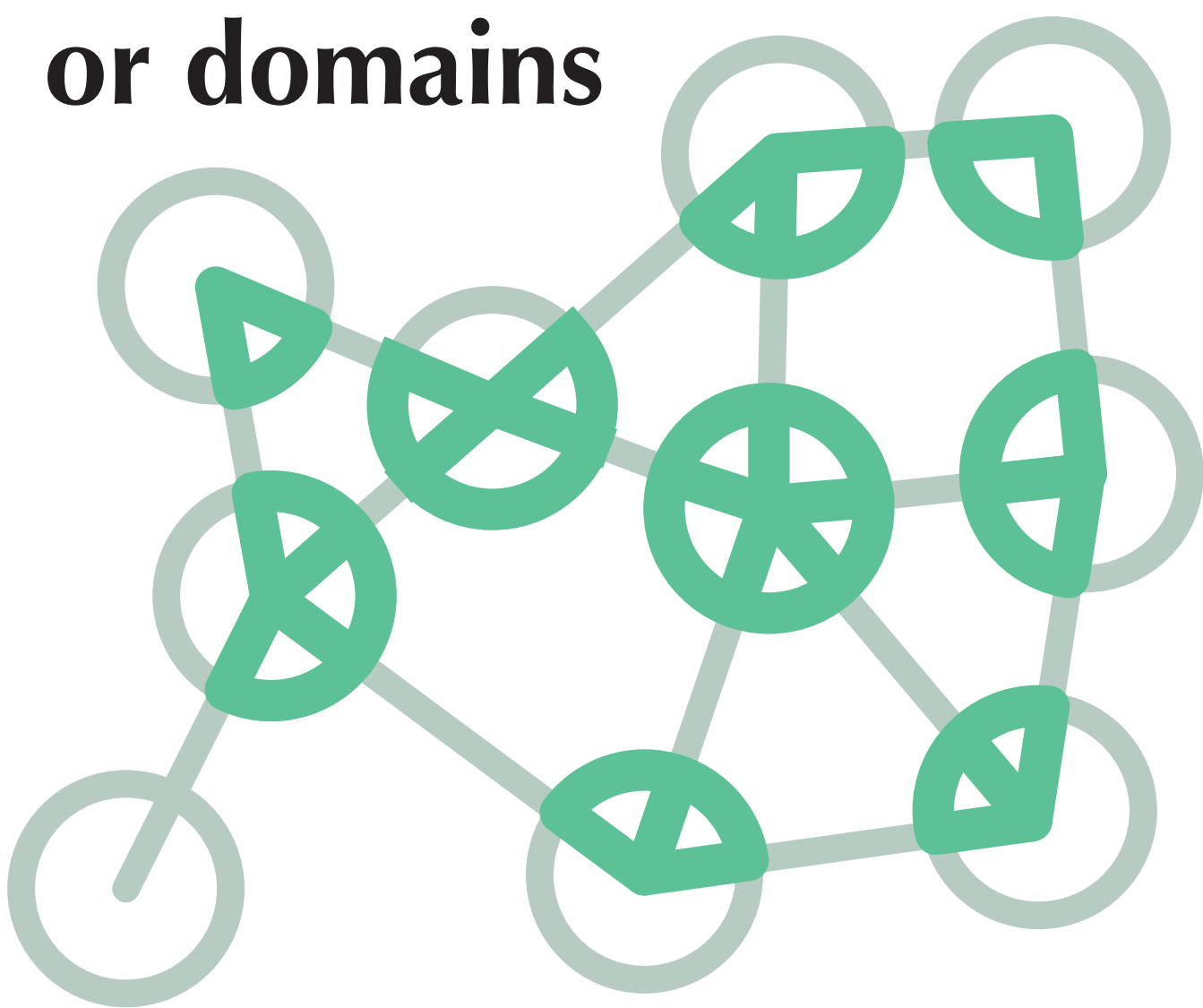
Angle distributions

The distribution of angles is a statistical fingerprint of spatial arrangement.

Patch system anatomy

Bulk injection of biocytin, Monkey V1 (Yoshioka et al. 1996)

Neighbouring patches or domains

Interior angle measurement

We construct graphs of neighbouring patches from bulk injections and neighbouring functional domains from intrinsic imaging, in monkey and cat visual cortex. The interior angles formed by this graph are a statistical measure of patch and domain arrangement. We compare the layout of anatomy and function by comparing distributions of interior angles.

Comparison of structure and function
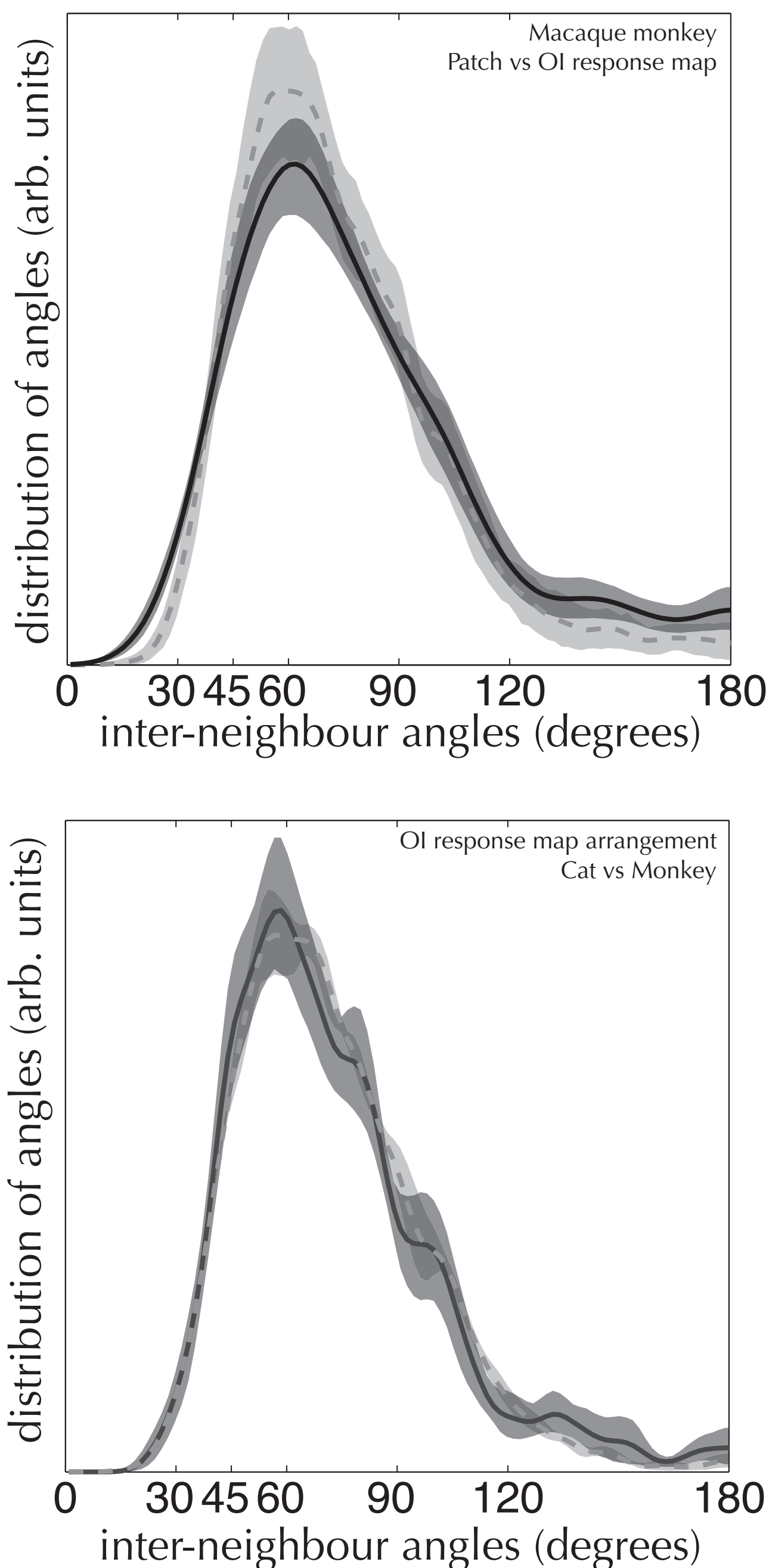
Conclusion

The **spatial arrangement** (indicated by the distribution of inter-patch angles) of **anatomical patches** is **indistinguishable** from that of **functional domains** in **monkey area V1**. [p_{KS}=0.39, n=27 injections, 108 re-sampled maps]

The arrangement of **anatomical patches** is **indistinguishable** between **monkey area V1** and **cat area 17**, despite a factor of about 1.5 difference in scale between the two systems. [p_{KS}=0.228, n=27 injections in monkey V1, n=13 injections in cat area 17]

The rules for laying out function are highly conserved between cat and monkey. Our results suggest a role for the patch system in laying out functional domains in cortex.