Calvin's Darwin Machine Theory

CORTICAL SURFACE

A minicolumn is a hundred neurons which share a common dendritic bundle.

0.03 mm

Axon terminations of the deep-layer pyramidal cells do not have preferred spacings.

Macrocolumns are also the size of the superficial pyramid axon skip spacing.

0.5 mm

INTERNAL — IN — OUT Box

I II III IV V VI

WHITE MATTER

MUTUAL EXCITATION every 0.5 mm

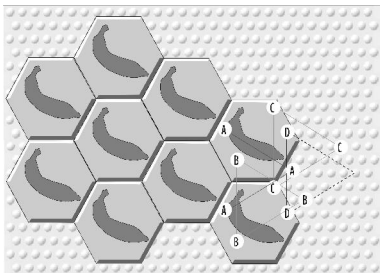Layer 2-3 pyramidal neurons have the unusual clustering of axon terminals that re-excites and synchronizes.

Monkey superficial pyramidal neuron, McGuire et al, J. Comp. Neurol. 1991

The gap (i.e., the annuli radius) sets the length of triangle grid edges.

GIVEN standard length excitatory axons,

entrained

...recurrent excitation between some cell pairs produces entrained firing patterns.

An entrained pair tends to recruit additional cells that are equidistant...

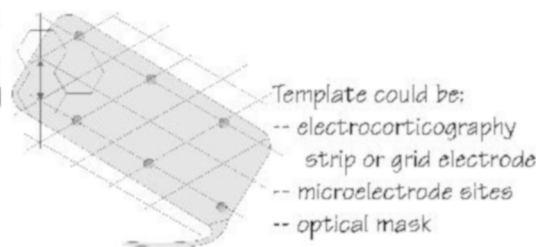"hot spot"

...and so create a TRIANGULAR ARRAY.
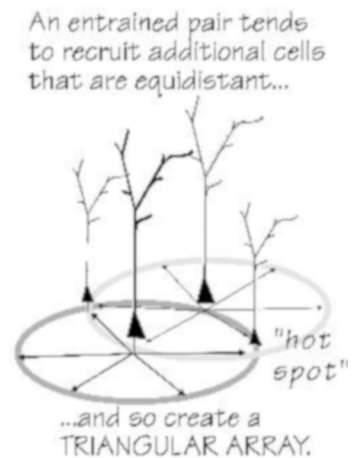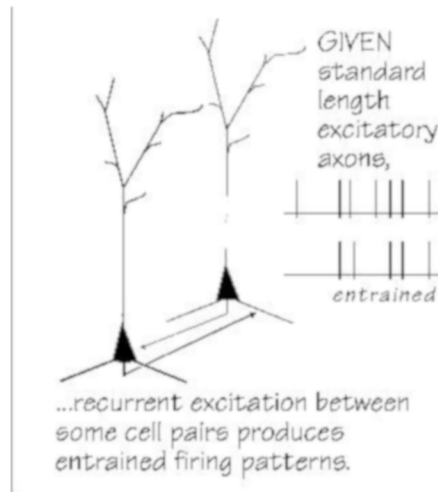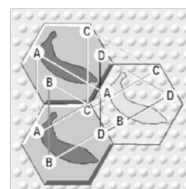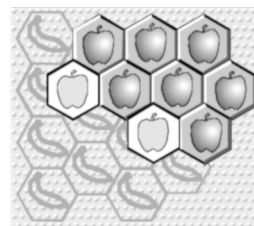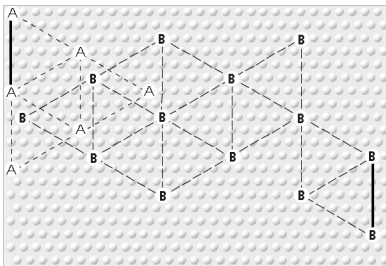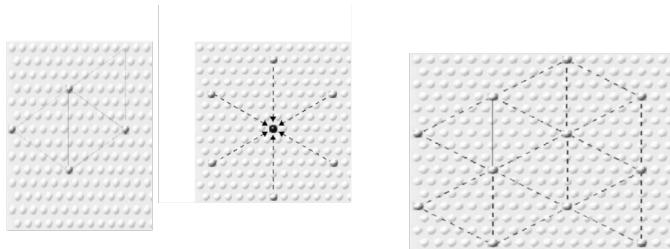
DATA ANALYSIS needs a template at both the correct orientation and the correct size of the local triangular array.

Rotate through 60 degrees around a hot spot.
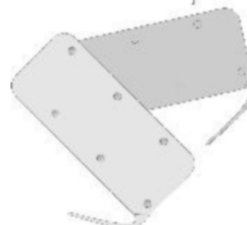
Try various sizes (easier with optical recording and post-processing)

Template could be:
-- electrocorticography strip or grid electrode
-- microelectrode sites
-- optical mask

PREDICTED tuning curves for various template sizes, assuming triangular array is maintained during the test.

$$\sum V_i \quad max$$

angle

All images from The Cerebral Code, 1996