Entire Set of Printable Figures For

Landmark-Based Spatial Memory in Pigeons

Cheng and Spetch

Footnote 1. The Transformational Approach

The notion of transformation originated in geometry. A transformation is a function that maps a set of points onto another set. Transformations preserve certain geometric properties, but change others. In the nineteenth century, geometer Felix Klein (Klein, 1939) used transformations to define classes of geometric properties. For instance, euclidean properties are those properties remaining invariant after any euclidean transformation, which consists of a displacement optionally coupled with a reflection. Cheng and Gallistel (1984) took this idea to the psychology of spatial cognition. Transformations were effected on spaces to test what classes of geometric properties rats were sensitive to. The geometric module was discovered using this approach.

Footnote 2. Rats in the reference memory task make rotational errors as well, at least during acquisition. In fact, over 80% of the errors made are rotational errors, with chance level being 33.3%. This pattern of errors again indicates the use of a geometric module. Learning to re-orient using nongeometric cues seems to be a separate task for rats, much slower to acquire than the use of the geometric module.

Footnote 3. Development and the Geometric Module

research on children (Hermer & Spelke, 1994, 1996) shows that young children fail to use nongeometric cues only in re-orienting after being disoriented. Oriented children do use nongeometric cues, and dis-oriented children doing some task other than re-orientation also use nongeometric cues. These contrasting results rule out motivational and attentional explanations for the rotational error. The geometric module is thus modular at both input and output ends. At the input end, only the broad shape of the environment enters. At the output end, it is primarily used for re-orienting after being disoriented.

Videos can't be printed.

Footnote 4. Mechanisms of Averaging

We should emphasize in what way the averaging takes place. The dictates of different landmarks, or different dimensions of experience, are averaged , in a weighted fashion, to come up with a single intermediate criterion as a basis for responding. The different dictates are not 'fighting' directly over the control of the muscular outputs. This is what can generate a single-peaked search distribution at an intermediate location, rather than two different peaks, one appropriate for each dictate. The weights dictate just which intermediate position becomes the target criterion.