Key Note

# Chapter 13: Recognising faces

## Key note 13C: Some characteristics of the responses of face cells

Face cells have attracted much experimental and theoretical attention. This note describes how the meaning of their responses may change over time, and how their interactions may sharpen the recognition process.

Usually, experimenters characterise the response of a face-sensitive cell by averaging the number of action potentials which it produces in response to a face over some time period. Sugase et al. (1999) showed that the frequency of responses at different times after stimulus onset coded different types of information about the face. These experimenters identified cells as face cells if they did not response to other shapes. As well as geometrical shapes (squares, circles, etc.), the cells were presented with monkey and human faces, which could differ in identity and expression. The monkey faces differed in the extent to which the mouth was open, perhaps corresponding to the expressions on the human faces: neutral, happy, surprised and angry. It turned out that differences in stimulus category (whether a monkey, human or shape) were coded by firing rate in the early part of the response (peaking at about 117 ms after presentation) – as the authors put it, the global stimulus property. Differences in identity (e.g. which monkey) or in expression (e.g. angry), on the other hand, were coded in the later part of the response (peaking at about 165 ms after presentation). In the population of cells, human expression and monkey identity produced less pronounced peaks than did the other aspects of identity. It also seems that interactions between face cells may be important in face recognition. Face cells responding vigorously to a particular face may inhibit activity in other cells less excited by that face, so enhancing the neural response to the face (Eifuku et al., 2004).

Sugase Y, Yamane S, Ueno S, Kawano K (1999) Global and fine information coded by single neurons in the temporal visual cortex. *Nature* 400: 869–887.

Eifuku S, De Souza WC, Tamura R, Nishijo H, Ono T (2004) Neuronal correlates of face identification in the monkey anterior temporal cortex. *Journal of Neurophysiology* 91: 38–371.