

## After the sensory analysers: Problems with concepts and terminology

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The mechanisms involved in visual pattern recognition have been investigated in a comprehensive way by Ewert and his collaborators. I regard their studies of feature analysis in toads as being of sufficient importance to form the central example of sensory analysis mechanisms for students of behaviour (Broom 1981, pp. 42-48). The work summarised in the target article provides additional information about the link between sensory analysers and motor responses; but there would seem to be much still to be discovered about this link, and Ewert's explanations and terminology are sometimes confusing.

So long as the results are explained in a descriptive way, they are interesting and uncontroversial; as soon as terms like innate, fixed action pattern, and command releasing system are used, however, there will be differences in the meanings ascribed to each by readers. Ewert (1980) stated that the word innate "does not mean that the environment is totally irrelevant in the development of fixed action patterns and releasing mechanisms as well" (p. 58). Many readers, however, will interpret innate as meaning genetically determined and independent of environmental effects. In the target article (sect. 3.5.3) Ewert chooses "something that is phylogenetically adapted" as a meaning of innateness and he mentions that "genes alone may not be sufficient for the expression of a property." These explanations devalue the word innate to the point of being largely useless, since embryological and other developmental studies indicate that the expression of all genes involves interactions with environmental factors and that every characteristic of an organism is, to some extent, phylogenetically adapted. Hence it would make explanation clearer if the word innate were not used at all. A more descriptive statement is always possible; for example, in Section 3.3.3. it would be better to state that the worm/antiworm preference is present even after a wide variety of early rearing conditions (Traud 1983). Work like that of Burghagen (1979) has shown that, given appropriate previous experience, prey-catching behaviour may be directed at large black square objects, so Ewert does not call the avoidance response innate. There is little value in calling the worm/antiworm preference innate.

The persistence of some confusion about terminology concerning sensory analysis and motor output is exemplified by Ewert's explanation of sign stimulus (Appendix). There is no necessity to refer to fixed action patterns when explaining the term sign stimulus. Ewert (1980) uses fixed to mean genetically determined when he speaks of fixed action patterns. This usage is uncommon now, and indeed the word fixed seems quite redundant. It is better to refer only to "action patterns," for only very brief sequences of movements (generally < 1 second) are immutable once initiated (Broom 1981, p. 62 ff.).

The factors affecting prey-catching behaviour in toads are discussed by Ewert in Section 6.4. Motivation is not, as Ewert states, solely concerned with homeostasis, but prey-catching is clearly influenced by motivational state, attentional mechanisms, and learning. Having said this, it is difficult to see why Ewert is willing to present a rather simple diagram of his command releasing system in Figure 22. There is an implication that the output circuits, such as "orient prey," are merely

released, but much more is in fact involved than just triggering. The data presented do go some way toward explaining how the sensory-motor links are made in the toad's brain, but the models are, as yet, too simple and there are still many unknowns in the process.