Preface to Volume 3

THE world is perceived by vertebrates through an array of sensory systems, often with one or two systems predominating. Thus, while auditory and chemosensory systems are a part of the human sensory tool kit, vision so dominates that the perception of a concept often is accompanied by the exclamation "Oh I *see* what you mean". Among amphibians, vision also predominates for most frogs and salamanders but plays a minor, or no role at all, for caecilians. Because of our own visual bias, our perception of different sensory systems in other organisms often are not intuitive. So, while a female salamander's willingness to mate might be increased by pheromones wafted to her from a male, we do not perceive these odours and do not as readily empathize with their effect on her mating behaviour. Finally, certain sensory systems, like the gravistatic and acceleration-sensitive parts of the inner ear or muscle spindles give personal positional information that is mediated nearly subconsciously.

Some sensory systems are not utilized, or are not even present, in all vertebrates. The lateral line system and electroreceptors function only in fishes and aquatic amphibians. Magnetoreception has been found in a few amphibians and a handful of other vertebrates. Amphibians as a group possess the entire array of vertebrate sensory systems and research with these animals has helped reveal a blueprint of basic vertebrate structure and function, as well as some intriguing and unique evolutionary solutions.

The present volume consists of seven chapters that consider the similarities and differences among the sensory systems of the different groups of amphibians, indicates how these systems relate to different life styles, and finally compares them with the systems of other vertebrates.

In Chapter 1, the nasal chemical senses, olfaction and the vomeronasal system, are examined. The nasal chemical senses are perhaps the simplest of the cranial senses with relatively few cell types comprising the sensory epithelium, and with olfactory and vomeronasal receptors both synapsing directly with the telencephalon.

The other major chemical sense, taste, is reviewed in Chapter 2. Taste and smell differ structurally in many fundamental ways, from the morphology of receptor cells to patterns of innervation, but are rather similar physiologically. Although some behavioural information is available about how amphibians may use their sense of smell, taste is more of an unknown.

The complexities of vision are examined in detail in Chapter 3; this system is perhaps, the best known, and extensive tract-tracing and intracellular recording have produced a reasonably clear picture of the neuronal guidance of feeding behaviour. Studies of vision have focused nearly exclusively on its role in feeding. Chapter 3 also touches on extraoptic light perception via the pineal complex.

Chapter 4 reviews the octavolateralis system, including structure and function of the inner and middle ears and of the lateral line. Although audition has been most thoroughly investigated in anurans, this chapter also indicates the unique combinations of adaptations resulting from divergent evolutionary pathways among the different amphibian orders.

The sensations of pressure, touch, temperature, pain, noxious chemicals, stretch, and body position that reside in the skin and muscles are covered in Chapters 5 and 6. Because many amphibians hatch at early developmental stages, separate and sometimes transient sensory pathways develop in the early stages. Thus, embryos and young larvae (Chapter 5) and adults (Chapter 6) are considered separately.

Finally, magnetoreception, covered in Chapter 7, is solely known through behavioural studies of navigation, while the location of receptors and the nature of transduction mechanisms are surely yet to be determined.

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