The perceptual world of the dog
Ádám Miklósí

in Dog Behaviour, Evolution, and Cognition

This chapter provides a short overview on the perceptual abilities of dogs. Vision, audition, and olfaction are described in detail, including the possible experimental methods which could be used for studying such phenomena as colour vision, form recognition, hearing acuity, or olfactory sensitivity. Understanding of perceptual abilities can be important in relating the animal's behaviour to its original (ancestral) environment, but also in designing experiments which rely on the dog's ability to perceive stimuli or events manipulated by the experimenter.

Neurobiology of olfactory communication in the honeybee
Maria Gabriela de Brito-Sanchez, Nina Deisig, Jean-Christophe Sandoz, and Martin Giurfa

in Sociobiology of Communication: an interdisciplinary perspective

Pheromones are chemical substances mediating intraspecific communication in a variety of behavioural contexts. Honeybees constitute a historic model for the study of pheromonal communication in insects so that much is known about the chemical structure of various pheromones, the context in which they are released, and the physiological effects they can exert on receiver bees of different castes. This chapter discusses the neurobiology of pheromone processing in the honeybee brain, from peripheral antennal detection, to central-level processing. It looks at modern electro- and opto-physiological recording techniques at different stages of the honeybee olfactory circuit and
asks whether or not the traditional distinction between labeled-line and across-fiber pattern processing applies to pheromone processing as compared to non-pheromonal odors. Finally, new research avenues for stimulating future work in this area are proposed.

Communication of mate quality in humans
S. Craig Roberts

in Sociobiology of Communication: an interdisciplinary perspective
Published in print: 2008 Published Online: September 2008
DOI: 10.1093/acprof:oso/9780199216840.003.0009

In most human societies, individuals compare between numerous potential mates. Recent research on biological determinants of mate preferences explores the idea that attractive physical characteristics might be cues of underlying good genes. The first half of this chapter summarises this work on physical cues of mate quality, including facial, bodily, vocal and olfactory traits. The second half of the chapter speculates on how broad principles that arise out of this research might be directly transposed to understand potential good-gene effects on behaviour and ‘body language’. Reliability of behavioural cues betraying mate quality is likely to determine how far biological interpretations on behaviour can be applied, and an outline for how researchers might tackle this issue is proposed.

Further Results of Sea Turtle Research and Conservation Biology
Frederick Rowe Davis

Published in print: 2007 Published Online: September 2007
DOI: 10.1093/acprof:oso/9780195310771.003.0009

Carr spent more than thirty years dedicated to the study of the ecology and migration of sea turtles. Many of the stories he had heard from the turtle captains had been confirmed through tag returns from all over the Caribbean. The riddle of the ridley had been solved and documented by an old, grainy film, but it virtually disappeared during the 1960s. Carr's research extended beyond Tortuguero and the Caribbean to include Ascension Island, and he collaborated with other scientists to produce
ambitious theories regarding olfaction, vision, and the role of seafloor spreading. Carr and his students participated in the Western Atlantic Turtle Symposium, an event that suggested growing interest in the ecology and conservation of sea turtles. Nevertheless, questions still remained. Sargassum mats had initially seemed promising as a refuge for sea turtles during their lost year, but oceanic zones of convergence (including sargassum) seemed to be a more promising explanation.

Pollination by Bats
Pat Willmer

in Pollination and Floral Ecology

This chapter focuses on pollination by bats, or chiropterophily. Bats are classified as two distinct and separately evolved orders, Megachiroptera and Microchiroptera. They are primarily nocturnal, and as flying endothermic mammals have extremely high energy demands. Furthermore, their flower visits often require hovering for short periods; this increases their energy demand further, albeit not by much. However, having rather large body masses, in practice the bat species that visit blossoms for a major part of their diet are linked with some unusual and very high-reward flowers. The chapter first provides an overview of the bat’s feeding apparatus, sensory capacities such as olfaction, and foraging behavior and learning before discussing different types of bat-pollinated flowers.

The chemical senses
Jay A. Gottfried, Dana M. Small, and David H. Zald

in The Orbitofrontal Cortex

The orbitofrontal cortex (OFC) is described as secondary olfactory and gustatory cortex. This chapter reviews the location of chemosensory processing in the OFC as defined by anatomical and neurophysiological methods in nonhuman primates, and neuroimaging and lesion data in humans. The human neuroimaging data suggest that broader areas of the OFC are involved in chemosensory processing than would be
predicted from a strict anatomical analysis of input from primary olfactory/gustatory cortex. The properties of chemosensory processing in the OFC are discussed in terms of the breadth of tuning of sensory cells, the role of hedonics, and the dynamic nature of coding (response to satiety). Issues of functional lateralization and medial vs. lateral distinctions in hedonic processing are also covered. Finally, topics related to multisensory integration are covered.

INTRODUCTION
Janice Carlisle

in Common Scents: Comparative Encounters in High-Victorian Fiction
Published in print: 2004 Published Online: September 2007

By examining Victorian assumptions about the senses promulgated by psychophysiologists and popular commentators, this introductory chapter examines the cultural values attached to sensory experience, particularly as they are evidenced by representations of odors in Victorian fiction of the 1860s. Such instances of olfaction typically mark the inferior party involved in a comparative encounter, a meeting of individuals of unequal status. But depictions of odors may also signal what this study calls an exchange, a reversal of the conventional values that define one person as better than another. Analysis of a passage from George Eliot's Felix Holt indicates the extent of her characters' awareness that an osmology, a categorization of smells, can reveal the workings of class as a practice of everyday life. Finally, this section of the study introduces the wide variety of smells registered in this fiction and their relatively mild and inoffensive quality, even when they emanate from working-class men.

AFTERWORD
Janice Carlisle

in Common Scents: Comparative Encounters in High-Victorian Fiction
Published in print: 2004 Published Online: September 2007

This afterword comments briefly on Eliot's Middlemarch to indicate the political conclusion to which the argument of this study leads. Although the preceding chapters analyze the plots of the fiction of the 1860s by treating the politics of class in relation to the practices
of everyday life, Middlemarch, a novel begun in the last years of that
decade, suggests the extent to which such texts also open themselves to
more institutionally specific political readings. The debates surrounding
the 1866 and 1867 franchise reform bills involved on a national
scale the kind of exchange that Victorian novels enact on the level
of relations between individuals, and the argument with which this
study concludes, like those in the previous chapters, is based on the
olfactory data provided by the many novels surveyed earlier and the
perspectives on materiality that they offer. The evocative smells of
Middlemarch exemplify the relationship between matter and spirit in
high-Victorian fiction, and the case of one of its characters connects
olfactory experience to the larger, presumably inodorate arena of
institutional politics.

The role of olfaction in human multisensory development
Benoist Schaal and Karine Durand

in Multisensory Development

Olfaction is an unavoidable and ubiquitous source of perceptual
experience from the earliest stages of mammalian development. This
chapter summarizes current understanding of how olfaction functions
in concert with the other senses during human development, and the
various ways early multisensory effects involving the chemical senses
operate. This chapter first summarises aspects of current biological and
psychological knowledge concerning olfaction in humans in order to
provide some functional principles useful to understand the development
of chemosensation in the context of multisensory processes. Finally,
the available results concerning odour-based intersensory effects are
reviewed.

The development and decline of multisensory flavour
perception
Charles Spence

in Multisensory Development

Page 5 of 11
This chapter reviews the evidence concerning the development and decline of multisensory flavour perception. The emphasis is on the role of visual cues, especially colour. Taken together, the available research suggests that the influence of visual cues on multisensory flavour perception decline during the course of childhood, and increases once again in old age. The latter developmental change is presumably driven by the decline of gustation and olfaction increasingly seen in people who live past the age of 60–70 years. Limitations with the interpretation of previous studies are highlighted and numerous suggestions for future research made. The tricky question of whether vision’s influence on multisensory flavour perception is best conceptualized in terms of multisensory integration or expectation effects is also discussed.

Introduction
Richard J. Stevenson

in The Psychology of Flavour
Published in print: 2009 Published Online: February 2010
Item type: chapter

This introductory chapter begins with a brief discussion of flavour and its function in omnivores. It then presents an overview of the subsequent chapters. This is followed by a discussion of food and drink; oral anatomy, mastication, and swallowing; interoceptive flavour senses — olfaction, gustation, and somatosensation.

Edgar D. Adrian: Coding in the Nervous System
Stanley Finger

in Minds Behind the Brain: A history of the pioneers and their discoveries
Published in print: 2005 Published Online: January 2010
Item type: chapter

Edgar Douglas Adrian once remarked: “The history of electrophysiology has been decided by the history of electrical recording instruments”. Little was known about how the nerves coded their messages when Adrian began to work on the nature of the nerve impulse early in the 20th century. The problem was that researchers did not have the tools needed to amplify and record small, rapid electrical changes with sensitivity or fidelity. The scientists of the early 1900s, however, were not without galvanometers and other measurement tools. One piece of
apparatus they used was known as the capillary electrometer. A later instrument was called the string electrometer. To appreciate how the newer instruments came into being, and how they were used by Adrian to unlock more secrets of the working nervous system, this chapter looks at his teacher, a brilliant and creative English physiologist by the name of Keith Lucas. This chapter also discusses Adrian's work on the cerebellar cortex, electroencephalogram, olfaction, and motor neurons.

Gordon M. Shepherd
Larry R. Squire

in The History of Neuroscience in Autobiography: Volume 7

Gordon Shepherd has carried out fundamental studies of the integrative properties of dendrites, dendritic spines, and synaptic microcircuits, using the olfactory bulb as a model system. His contributions include the first physiologically-based circuit diagram of a brain region; electrophysiological analysis and computational prediction with Wilfrid Rall of dendrodendritic synaptic interactions for feedback and lateral inhibition; discovery of the representation of odors by spatial activity patterns in the olfactory glomerular layer; and databases and neuroinformatics tools for dendritic properties, computational neuronal models, and brain microcircuits. Among his books are The Synaptic Organization of the Brain (5th ed), Neurobiology (3rd ed), Foundations of the Neuron Doctrine, Creating Modern Neuroscience, and Handbook of Brain Microcircuits.

Evolutionary psychology and perfume design
S. Craig Roberts and Jan Havlicek

in Applied Evolutionary Psychology

We argue that the process of perfume design would be enhanced if it was developed with greater understanding of the communicative value of the underlying body odour of the individual who uses it? Evolutionary psychology has, and will continue to, produce insights into the informative capacity of body odour in human perception and
its role in social interactions, in five main areas: individual recognition
cueing and kin-related behaviour, cues of current state, mediation of
female reproductive physiology, cues of underlying good-genes, and
cues of complementary genes in partner choice. Since these cues have
been shaped by selection over evolutionary time, and play a role in co-
ordination of key social interactions, incorporation of this knowledge into
perfume design could potentially provide a springboard for transforming
the success of specific perfumes. We discuss several promising possible
avenues to take this process forward, as well as possible problems
with the approach. On balance, we see potential to harness insights
from evolutionary psychology to increase both the potency of perfume
function and the strategies employed in its marketing.

Food reward value, pleasure, hunger, and appetite
Edmund T. Rolls

in Emotion and Decision-making Explained
Published in print: 2013 Published Online: January 2014
Publisher: Oxford University Press
Item type: chapter

The taste, olfactory, flavour, and food texture processing in the brain
that produces food reward and appetite, and the ways in which this
processing is involved in hunger, body weight regulation, and obesity,
are described.

Sensory Transduction
Gordon L. Fain

Published in print: 2019 Published Online: December 2019
Publisher: Oxford University Press
Item type: book

Sensory Transduction provides a thorough and easily accessible
introduction to the mechanisms that each of the different kinds of
sensory receptor cell uses to convert a sensory stimulus into an electrical
response. Beginning with an introduction to methods of experimentation,
sensory specializations, ion channels, and G-protein cascades, it
provides up-to-date reviews of all of the major senses, including touch,
hearing, olfaction, taste, photoreception, and the “extra” senses of
thermoreception, electroreception, and magnetoreception. By bringing
mechanisms of all of the senses together into a coherent treatment, it
facilitates comparison of ion channels, metabotropic effector molecules,
second messengers, and other components of signal pathways that
are common themes in the physiology of the different sense organs. With its many clear illustrations and easily assimilated exposition, it provides an ideal introduction to current research for the professional in neuroscience, as well as a text for an advanced undergraduate or graduate-level course on sensory physiology.

**Physiology of squid olfaction**

Mary T. Lucero

in Cephalopod Neurobiology: Neuroscience Studies in Squid, Octopus and Cuttlefish

Published in print: 1995 Published Online: March 2012
DOI: 10.1093/acprof:oso/9780198547907.003.0355
Item type: chapter

This chapter focuses on the characterization of the squid olfactory system in terms of morphology, behaviour, and electrophysiology. There have been many discussions regarding usage of the specific vertebrate-oriented labels of “taste” and “olfaction” in relation to the various chemosensory systems of invertebrates, especially marine and aquatic species. One classification scheme suggests that contact chemoreception, which can often be mediated by receptors distributed over a large portion of the body, can be considered the aquatic equivalent to taste, whereas chemoreception of dissolved chemicals originating from a distant source falls into the category of olfaction. Squid are predatory animals with highly developed visual, vestibular, auditory, and tactile systems. They are also prey for fish and marine mammals. To avoid predation, squid have developed a very effective escape-jetting response. Although escape jetting is an alarm response, it is not clear to what degree the squid perceive danger by visual, tactile, auditory, and chemical cues. The anatomical descriptions of a putative olfactory organ in cephalopods first appeared in early literature, but it has only recently been shown that squid have chemosensory capabilities.

**The Sensory Ecology of Birds**

Graham R. Martin

Published in print: 2017 Published Online: May 2017
DOI: 10.1093/oso/9780199694532.001.0001
Item type: book

The natural world contains a huge amount of constantly changing information. Limitations on, and specializations within, sensory systems mean that each species receives only a small part of that information.
In essence, information is filtered by sensory systems. Sensory ecology aims to understand the nature and functions of those filters for each species and sensory system. Fluxes of information, and the perceptual challenges posed by different natural environments, are so large that sensory and behavioural specializations have been inevitable. There have been many trade-offs in the evolution of sensory capacities, and trade-offs and complementarity between different sensory capacities within species. Many behavioural tasks may have influenced the evolution of sensory capacities in birds, but the principal drivers have been associated with just two tasks: foraging and predator detection. The key task is the control of the position and timing of the approach of the bill towards a target. Other tasks, such as locomotion and reproduction, are achieved within the requirements of foraging and predator detection. Information that guides behaviours may often be sparse and partial and key behaviours may only be possible because of cognitive abilities which allow adequate interpretation of partial information. Human modifications of natural environments present perceptual challenges that cannot always be met by the information available to particular birds. Mitigations of the negative effects of human intrusions into natural environments must take account of the sensory ecology of the affected species. Effects of environmental changes cannot be understood sufficiently by viewing them through the filters of human sensory systems.

How does path integration interact with olfaction, vision, and the representation of space?

Ariane S. Etienne

in The Neurobiology of Spatial Behaviour

Published in print: 2003 Published Online: March 2012
Item type: chapter

This chapter examines how path integration acts in concert with other navigational processes. It specifically investigates the interplay between motion cues and other sensory cues. It then turns to the way in which location-based cues (mainly visual) and path integration can cooperate in orienting the animal. The first part of this chapter specifically deals with route-based navigation in itself. The second part discusses how rodents complement route-based direction and position information with location-based references from the familiar environment. In addition, it describes how the internal compass and path integration offers the subject with a directional and positional reference frame for the selection and use of local cues. It ends with current data and hypotheses on the
role of path integration and the internal sense of direction in building up and using a map of the environment, and, conversely, how the internal representation of space may facilitate the performance of a journey that is planned through path integration. The data generally confirm that in mammals, navigation is controlled by an integrated system.

**Postscript: Conclusions, Implications, and Comment**

Graham R. Martin

in The Sensory Ecology of Birds

Published in print: 2017 Published Online: May 2017

DOI: 10.1093/oso/9780199694532.003.0010


Item type: chapter

The natural world contains a huge amount of constantly changing information but specializations within sensory systems mean that each species receives only a small part of that information. Information is filtered by sensory systems. We cannot assume what a bird can detect—it is important to measure its sensory capacities and to quantify the sensory challenges posed for the conduct of tasks in different environments. No sensory system can function adequately throughout the full ranges of stimuli that are found in the natural world. There have been many trade-offs in the evolution of particular sensory capacities and tradeoffs and complementarity between different sensory capacities within a species. Birds may often be guided by information at the limits of their sensory capacities. Information that guides behaviours may often be sparse and partial. Key behaviours may only be possible because of cognitive abilities which allow adequate interpretation of such partial information.