

References

- Abdalla,F.C. and Cruz-Landim,C.** (2001) *Dufour glands in the hymenopterans (Apidae, Formicidae, Vespidae): a review.* Braz. J. Biol., 61, 95-106.
- Abel,R., Rybak,J. and Menzel,R.** (2001a) *Structure and response patterns of olfactory interneurons in the honeybee, Apis mellifera.* J. Comp Neurol., in press.
- Abel,R., Rybak,J. and Menzel,R.** (2001c) *Structure and response patterns of olfactory interneurons in the honeybee, Apis mellifera.* J. Comp Neurol., 437, 363-383.
- Abel,R., Rybak,J. and Menzel,R.** (2001b) *Structure and response patterns of olfactory interneurons in the honeybee, Apis mellifera.* J. Comp Neurol., 437, 363-383.
- Abel,R., Rybak,J. and Menzel,R.** (2001d) *Structure and response patterns of olfactory interneurons in the honeybee, Apis mellifera.* J. Comp Neurol., 437, 363-383.
- Akers,R.P. and Getz,W.M.** (1992) *A test of identified response classes among olfactory receptor neurons in the honey-bee worker.* Chem. Senses, 17, 2, 191-209.
- Akers,R.P. and Getz,W.M.** (1993) *Response of olfactory receptor neurons in honeybees to odorants and their binary mixtures.* J Comp Physiol [A], 173, 169-185.
- Arnold,G., Masson,C. and Budharugsa,S.** (1985) *Comparative study of the antennal lobes and their afferent pathway in the worker bee and the drone (Apis mellifera).* Cell Tissue Res., 242, 593-605.
- Ayasse,M., Paxton,R.J. and Tengo,J.** (2001) *Mating behavior and chemical communication in the order Hymenoptera.* Annu. Rev. Entomol., 46, 31-78.
- Bhagavan,S. and Smith,B.H.** (1997) *Olfactory conditioning in the honey bee, Apis mellifera: Effects of odor intensity.* Physiol. Behav, 61, 107-117.
- Bicker,G.** (1993) *Chemical architecture of antennal pathways mediating proboscis extension learning in the honeybee.* Apidologie, 24, 235-248.
- Bicker,G.** (1999) *Histochemistry of classical neurotransmitters in antennal lobes and mushroom bodies of the honeybee.* Microsc. Res. Tech., 45, 174-183.
- Bicker,G., Kreissl,S. and Hofbauer,A.** (1993) *Monoclonal antibody labels olfactory and visual pathways in Drosophila and Apis brains.* J. Comp. Neurol., 335, 413-424.
- Bornhauser,B.C. and Meyer,E.P.** (1997) *Histamine-like immunoreactivity in the visual system and brain of an orthopteran and a hymenopteran insect.* Cell Tissue Res., 287, 211-221.

- Brockmann,A. and Brückner,D.** (1995) *Projections of poreplate sensory neurones in the antennal lobe of the drone, Apis mellifera*. In Elsner,N. and Menzel,R. (eds.), Göttingen Neurobiology Report 1995. G. Thieme, Stuttgart, New York, pp. 342.
- Chalansonnet,M. and Chaput,M.A.** (1998) *Olfactory bulb output cell temporal response patterns to increasing odor concentrations in freely breathing rats*. Chem. Senses, 23, 1-9.
- Cinelli,A.R., Hamilton,K.A. and Kauer,J.S.** (1995) *Salamander olfactory bulb neuronal activity observed by video rate, voltage-sensitive dye imaging. III. Spatial and temporal properties of responses evoked by odorant stimulation*. J. Neurophysiol., 73, 2053-2071.
- Clyne,P.J., Warr,C.G., Freeman,M.R., Lessing,D., Kim,J. and Carlson,J.R.** (1999) *A novel family of divergent seven-transmembrane proteins: candidate odorant receptors in Drosophila*. Neuron, 22, 327-338.
- Dani,F.R., Jones,G.R., Corsi,S., Beard,R., Pradella,D. and Turillazzi,S.** (2005) *Nestmate Recognition Cues in the Honey Bee: Differential Importance of Cuticular Alkanes and Alkenes*. Chem. Senses.
- de Bruyne,M., Foster,K. and Carlson,J.R.** (2001) *Odor coding in the Drosophila antenna*. Neuron, 30, 537-552.
- Ditzen,M., Evers,J.F. and Galizia,C.G.** (2003) *Odor similarity does not influence the time needed for odor processing*. Chem. Senses, 28, 781-789.
- Duchamp-Viret,P., Chaput,M.A. and Duchamp,A.** (1999) *Odor Response Properties of Rat Olfactory Receptor Neurons*. Science, 284, 2171-2174.
- Dudareva,N. and Pichersky,E.** (2000) *Biochemical and molecular genetic aspects of floral scents*. Plant Physiol, 122, 627-633.
- Dudareva,N., Pichersky,E. and Gershenzon,J.** (2004) *Biochemistry of plant volatiles*. Plant Physiol, 135, 1893-1902.
- Egelhaaf,M. and Borst,A.** (1995) *Calcium accumulation in visual interneurons of the fly: Stimulus dependence and relationship to membrane potential*. J. Neurophysiol., 73, 2540-2552.
- Esslen,J. and Kaissling,K.-E.** (1976) *Zahl und Verteilung antennaler Sensillen bei der Honigbiene (Apis mellifera L.)*. Zoomorphol., 83, 227-251.
- Faber,T., Joerges,J. and Menzel,R.** (1999) *Associative learning modifies neural representations of odors in the insect brain*. Nat. Neurosci., 2, 74-78.

- Flanagan,D. and Mercer,A.R.** (1989) *An atlas and 3-D reconstruction of the antennal lobes in the worker honey bee, Apis mellifera L. (Hymenoptera: Apidae)*. Int. J. Insect Morphol. &Embryol., 18, 145-159.
- Freeman,W.J.** (1991) *The physiology of perception*. Sci. Am., 264, 78-85.
- Friedrich,R.W. and Korsching,S.I.** (1997) *Combinatorial and chemotopic odorant coding in the zebrafish olfactory bulb visualized by optical imaging*. Neuron, 18, 737-752.
- Galizia,C.G. and Kimmerle,B.** (2004) *Physiological and morphological characterization of honeybee olfactory neurons combining electrophysiology, calcium imaging and confocal microscopy*. J. Comp Physiol A Neuroethol. Sens. Neural Behav. Physiol, 190, 21-38.
- Galizia,C.G., McIlwrath,S.L. and Menzel,R.** (1999a) *A digital three-dimensional atlas of the honeybee antennal lobe based on optical sections acquired using confocal microscopy*. Cell Tissue Res., 295, 383-394.
- Galizia,C.G. and Menzel,R.** (2001) *The role of glomeruli in the neural representation of odours: results from optical recording studies*. J. Insect Physiol, 47, 115-130.
- Galizia,C.G., Nägler,K., Hölldobler,B. and Menzel,R.** (1998) *Odour coding is bilaterally symmetrical in the antennal lobes of honeybees (Apis mellifera)*. Eur. J. Neurosci., 10, 2964-2974.
- Galizia,C.G., Sachse,S., Rappert,A. and Menzel,R.** (1999b) *The glomerular code for odor representation is species-specific in the honeybee Apis mellifera*. Nat. Neurosci., 2, 473-478.
- Ganeshina,O. and Menzel,R.** (2001) *GABA-immunoreactive neurons in the mushroom bodies of the honeybee: an electron microscopic study*. J. Comp Neurol., 437, 335-349.
- Gao,Q., Yuan,B. and Chess,A.** (2000) *Convergent projections of Drosophila olfactory neurons to specific glomeruli in the antennal lobe*. Nat. Neurosci., 3, 780-785.
- Gascuel,J. and Masson,C.** (1991) *A quantitative ultrastructural study of the honeybee antennal lobe*. Tissue Cell, 23, 341-355.
- Gatellier,L., Nagao,T. and Kanzaki,R.** (2004) *Serotonin modifies the sensitivity of the male silkworm to pheromone*. J. Exp. Biol., 207, 2487-2496.
- Gerber,B., Tanimoto,H. and Heisenberg,M.** (2004) *An engram found? Evaluating the evidence from fruit flies*. Curr. Opin. Neurobiol., 14, 737-744.
- Getz,W.M. and Akers,R.P.** (1993) *Olfactory response characteristics and tuning structure of placodes in the honey bee Apis mellifera L.* Apidologie, 24, 195-217.

- Getz, W.M. and Akers, R.P.** (1994) *Honeybee olfactory sensilla behave as integrated processing units*. *Behav. Neural Biol.*, 61, 191-195.
- Goldman, A.L., van der Goes van Naters, Lessing, D., Warr, C.G. and Carlson, J.R.** (2005) *Coexpression of two functional odor receptors in one neuron*. *Neuron*, 45, 661-666.
- Griesbeck, O.** (2004) *Fluorescent proteins as sensors for cellular functions*. *Curr. Opin. Neurobiol.*, 14, 636-641.
- Guerrieri, F., Schubert, M., Sandoz, J.C. and Giurfa, M.** (2005) *Perceptual and neural olfactory similarity in honeybees*. *PLoS. Biol.*, 3, e60.
- Hallem, E.A., Ho, M.G. and Carlson, J.R.** (2004) *The molecular basis of odor coding in the Drosophila antenna*. *CELL*, 117, 965-979.
- Hammer, M.** (1997) *The neural basis of associative reward learning in honeybees*. *Trends Neurosci.*, 20, 245-252.
- Hildebrand, J.G. and Shepherd, G.M.** (1997) *Mechanisms of olfactory discrimination: Converging evidence for common principles across phyla*. *Annu. Rev. Neurosci.*, 20, 595-631.
- Joerges, J., Küttner, A., Galizia, C.G. and Menzel, R.** (1997) *Representations of odours and odour mixtures visualized in the honeybee brain*. *Nature*, 387, 285-288.
- Kreissl, S. and Bicker, G.** (1989) *Histochemistry of acetylcholinesterase and immunocytochemistry of an acetylcholine receptor-like antigen in the brain of the honeybee*. *J. Comp. Neurol.*, 286, 71-84.
- Laurent, G., Wehr, M. and Davidowitz, H.** (1996) *Temporal representations of odors in an olfactory network*. *J. Neurosci.*, 16, 3837-3847.
- Leitch, B. and Laurent, G.** (1996) *GABAergic synapses in the antennal lobe and mushroom body of the locust olfactory system*. *J. Comp. Neurol.*, 372, 487-514.
- Linster, C., Johnson, B.A., Yue, E., Morse, A., Xu, Z., Hingco, E.E., Choi, Y., Choi, M., Messiha, A. and Leon, M.** (2001) *Perceptual correlates of neural representations evoked by odorant enantiomers*. *J. Neurosci.*, 21, 9837-9843.
- Malnic, B., Hirono, J., Sato, T. and Buck, L.B.** (1999) *Combinatorial receptor codes for odors*. *CELL*, 96, 713-723.
- Margrie, T.W., Sakmann, B. and Urban, N.N.** (2001) *Action potential propagation in mitral cell lateral dendrites is decremental and controls recurrent and lateral inhibition in the mammalian olfactory bulb*. *Proc. Natl. Acad. Sci. U. S. A.*, 98, 319-324.

- Marin, E.C., Jefferis, G.S., Komiyama, T., Zhu, H. and Luo, L.** (2002) *Representation of the glomerular olfactory map in the Drosophila brain*. CELL, 109, 243-255.
- Mobbs, P.G.** (1982) *The brain of the honeybee Apis mellifera I. The connections and spatial organization of the mushroom bodies*. Phil. Trans. R. Soc. Lond. B, 298, 309-354.
- Mombaerts, P.** (1996) *Targeting olfaction*. Curr. Opin. Neurobiol., 6, 481-486.
- Mombaerts, P.** (2004) *Odorant receptor gene choice in olfactory sensory neurons: the one receptor-one neuron hypothesis revisited*. Curr. Opin. Neurobiol., 14, 31-36.
- Müller, D., Abel, R., Brandt, R., Zöckler, M. and Menzel, R.** (2002) *Differential parallel processing of olfactory information in the honeybee, Apis mellifera L.* J Comp Physiol [A], 188, 359-370.
- Nezlin, L.P. and Schild, D.** (2005) *Individual olfactory sensory neurons project into more than one glomerulus in Xenopus laevis tadpole olfactory bulb*. J. Comp Neurol., 481, 233-239.
- Ng, M., Roorda, R.D., Lima, S.Q., Zemelman, B.V., Morcillo, P. and Miesenbock, G.** (2002) *Transmission of olfactory information between three populations of neurons in the antennal lobe of the fly*. Neuron, 36, 463-474.
- Pelz, C., Gerber, B. and Menzel, R.** (1997) *Odorant intensity as a determinant for olfactory conditioning in honeybees: Roles in discrimination, overshadowing and memory consolidation*. J. Exp. Biol., 200, 837-847.
- Perez-Orive, J., Mazor, O., Turner, G.C., Cassenaer, S., Wilson, R.I. and Laurent, G.** (2002) *Oscillations and sparsening of odor representations in the mushroom body*. Science, 297, 359-365.
- Pinching, A.J. and Powell, T.P.** (1971) *The neuropil of the glomeruli of the olfactory bulb*. J. Cell Sci., 9, 347-377.
- Ressler, K.J., Sullivan, S.L. and Buck, L.B.** (1994) *Information coding in the olfactory system: Evidence for a stereotyped and highly organized epitope map in the olfactory bulb*. CELL, 79, 1245-1255.
- Rubin, B.D. and Katz, L.C.** (1999) *Optical imaging of odorant representations in the mammalian olfactory bulb*. Neuron, 23, 499-511.
- Ruther, J., Sieben, S. and Schrick, B.** (2002) *Nestmate recognition in social wasps: manipulation of hydrocarbon profiles induces aggression in the European hornet*. Naturwissenschaften, 89, 111-114.
- Sachse, S. and Galizia, C.G.** (2002) *Role of inhibition for temporal and spatial odor representation in olfactory output neurons: a calcium imaging study*. J. Neurophysiol., 87, 1106-1117.

- Sachse,S. and Galizia,C.G.** (2003) *The coding of odour-intensity in the honeybee antennal lobe: local computation optimizes odour representation*. Eur. J. Neurosci., 18, 2119-2132.
- Sachse,S., Rappert,A. and Galizia,C.G.** (1999) *The spatial representation of chemical structures in the antennal lobe of honeybees: steps towards the olfactory code*. Eur. J. Neurosci., 11, 3970-3982.
- Sachse,S., Rappert,A., Galizia,C.G. and Menzel,R.** (1998) *Alcohols of similar carbon chain length elicit similar activity patterns in the honeybee brain*. Eur. J. Neurosci., 10, Suppl.10, 358.
- Sandoz,J.C.** (2003) *[Olfactory perception and learning in the honey bee (Apis mellifera): calcium imaging in the antenna lobe]*. J. Soc. Biol., 197, 277-282.
- Sato,T., Hirono,J., Tonoike,M. and Takebayashi,M.** (1994) *Tuning specificities to aliphatic odorants in mouse olfactory receptor neurons and their local distribution*. J. Neurophysiol., 72, 2980-2989.
- Schäfer,S. and Bicker,G.** (1986) *Distribution of GABA-like immunoreactivity in the brain of the honeybee*. J. Comp. Neurol., 246, 287-300.
- Schäfer,S., Bicker,G., Ottersen,O.P. and Storm-Mathisen,J.** (1988) *Taurine-like immunoreactivity in the brain of the honeybee*. J. Comp. Neurol., 268, 60-70.
- Scheidler,A., Kaulen,P., Brüning,G. and Erber,J.** (1990) *Quantitative autoradiographic localization of [¹²⁵I] α -bungarotoxin binding sites in the honeybee brain*. Brain Res., 534, 332-335.
- Single,S. and Borst,A.** (2002) *Different mechanisms of calcium entry within different dendritic compartments*. J. Neurophysiol., 87, 1616-1624.
- Sivan,E. and Kopell,N.** (2004) *Mechanism and circuitry for clustering and fine discrimination of odors in insects*. Proc. Natl. Acad. Sci. U. S. A, 101, 17861-17866.
- Slotnick,B. and Bisulco,S.** (2003) *Detection and discrimination of carvone enantiomers in rats with olfactory bulb lesions*. Neuroscience, 121, 451-457.
- Slotnick,B.M., Bell,G.A., Panhuber,H. and Laing,D.G.** (1997) *Detection and discrimination of propionic acid after removal of its 2-DG identified major focus in the olfactory bulb: a psychophysical analysis*. Brain Res., 762, 89-96.
- Spors,H. and Grinvald,A.** (2002b) *Spatio-temporal dynamics of odor representations in the mammalian olfactory bulb*. Neuron, 34, 301-315.
- Spors,H. and Grinvald,A.** (2002a) *Spatio-temporal dynamics of odor representations in the mammalian olfactory bulb*. Neuron, 34, 301-315.

- Stopfer, M., Bhagavan, S., Smith, B.H. and Laurent, G.** (1997) *Impaired odour discrimination on desynchronization of odour-encoding neural assemblies*. *Nature*, 390, 70-74.
- Stopfer, M., Jayaraman, V. and Laurent, G.** (2003) *Intensity versus identity coding in an olfactory system*. *Neuron*, 39, 991-1004.
- Tanaka, N.K., Awasaki, T., Shimada, T. and Ito, K.** (2004) *Integration of chemosensory pathways in the Drosophila second-order olfactory centers*. *Curr. Biol.*, 14, 449-457.
- Thomas, D., Tovey, S.C., Collins, T.J., Bootman, M.D., Berridge, M.J. and Lipp, P.** (2000) *A comparison of fluorescent Ca²⁺ indicator properties and their use in measuring elementary and global Ca²⁺ signals*. *Cell Calcium*, 28, 213-223.
- Vassar, R., Chao, S.K., Sitcheran, R., Nunez, J.M., Vosshall, L.B. and Axel, R.** (1994) *Topographic organization of sensory projections to the olfactory bulb*. *CELL*, 79, 981-991.
- Vedin, V., Slotnick, B. and Berghard, A.** (2004) *Zonal ablation of the olfactory sensory neuroepithelium of the mouse: effects on odorant detection*. *Eur. J. Neurosci.*, 20, 1858-1864.
- Venables, W.N. and Ripley, B.D.** (2005) *Multivariate Analysis and Pattern Recognition*. *Modern Applied Statistics with S-Plus*. Springer, New York, pp. 329-365.
- von Frisch, K.** (1963) *Bienen und Blumen*. Kosmos, 59, 279-283.
- Vosshall, L.B., Amrein, H., Morozov, P.S., Rzhetsky, A. and Axel, R.** (1999) *A spatial map of olfactory receptor expression in the Drosophila antenna*. *CELL*, 96, 725-736.
- Vosshall, L.B., Wong, A.M. and Axel, R.** (2000) *An olfactory sensory map in the fly brain*. *CELL*, 102, 147-159.
- Wachowiak, M., Denk, W. and Friedrich, R.W.** (2004) *Functional organization of sensory input to the olfactory bulb glomerulus analyzed by two-photon calcium imaging*. *Proc. Natl. Acad. Sci. U. S. A.*, 101, 9097-9102.
- Wang, J.W., Wong, A.M., Flores, J., Vosshall, L.B. and Axel, R.** (2003) *Two-photon calcium imaging reveals an odor-evoked map of activity in the fly brain*. *CELL*, 112, 271-282.
- Wang, Y., Guo, H.F., Pologruto, T.A., Hannan, F., Hakker, I., Svoboda, K. and Zhong, Y.** (2004a) *Stereotyped odor-evoked activity in the mushroom body of Drosophila revealed by green fluorescent protein-based Ca²⁺ imaging*. *J. Neurosci.*, 24, 6507-6514.
- Wang, Y., Guo, H.F., Pologruto, T.A., Hannan, F., Hakker, I., Svoboda, K. and Zhong, Y.** (2004b) *Stereotyped odor-evoked activity in the mushroom body of Drosophila revealed by green fluorescent protein-based Ca²⁺ imaging*. *J. Neurosci.*, 24, 6507-6514.

- Wehr, M. and Laurent, G.** (1999) *Relationship between afferent and central temporal patterns in the locust olfactory system.* J. Neurosci., 19, 381-390.
- Wilson, R.I., Turner, G.C. and Laurent, G.** (2004) *Transformation of olfactory representations in the Drosophila antennal lobe.* Science, 303, 366-370.
- Witthöft, W.** (1967) *Absolute Anzahl und Verteilung der Zellen im Hirn der Honigbiene.* Z. Morph. Tiere, 61, 160-184.
- Wong, A.M., Wang, J.W. and Axel, R.** (2002) *Spatial representation of the glomerular map in the Drosophila protocerebrum.* CELL, 109, 229-241.
- Wright, G.A., Lutmerding, A., Dudareva, N. and Smith, B.H.** (2005) *Intensity and the ratios of compounds in the scent of snapdragon flowers affect scent discrimination by honeybees (Apis mellifera).* J. Comp Physiol A Neuroethol. Sens. Neural Behav. Physiol, 191, 105-114.
- Yasuyama, K., Meinertzhagen, I.A. and Schurmann, F.W.** (2002) *Synaptic organization of the mushroom body calyx in Drosophila melanogaster.* J. Comp Neurol., 445, 211-226.
- Yokoi, M., Mori, K. and Nakanishi, S.** (1995) *Refinement of odor molecule tuning by dendrodendritic synaptic inhibition in the olfactory bulb.* Proc. Natl. Acad. Sci. USA, 92, 3371-3375.
- Yu, D., Ponomarev, A. and Davis, R.L.** (2004) *Altered representation of the spatial code for odors after olfactory classical conditioning; memory trace formation by synaptic recruitment.* Neuron, 42, 437-449.
- Zars, T., Wolf, R., Davis, R. and Heisenberg, M.** (2000) *Tissue-specific expression of a type I adenylyl cyclase rescues the rutabaga mutant memory defect: in search of the engram.* Learn. Mem., 7, 18-31.