

REFERENCES

- Ache, B. W. & Young, J. M., 2005. Olfaction: diverse species, conserved principles. *Neuron* 48, 417-430.
- Ache, B. W. & Zhainazarov, A., 1995. Dual second-messenger pathways in olfactory transduction. *Current Opinion in Neurobiology* 5, 461-466.
- Alcorta, E., 1991. Characterization of the electroantennogram in *Drosophila melanogaster* and its use for identifying olfactory capture and transduction mutants. *Journal of Neurophysiology* 65, 702-714.
- Alloway, P. G. & Dolph, P. J., 1999. A role for the light-dependent phosphorylation of visual arrestin. *Proceedings of the National Academy of Sciences of the United States of America* 96, 6072-6077.
- Anton, S. & Homberg, U. (1999) Antennal Lobe Structure. IN HANSSON, B. (Ed.) *Insect Olfaction*. Berlin, Springer-Verlag.
- Attramadal, H., Arriza, J. L., Aoki, C., Dawson, T. M., Codina, J., Kwatra, M. M., Snyder, S. H., Caron, M. G. & Lefkowitz, R. J., 1992. Beta-arrestin2, a novel member of the arrestin/beta-arrestin gene family. *Journal of Biological Chemistry* 267, 17882-17890.
- Ayer, R. K., Jr. & Carlson, J., 1992. Olfactory physiology in the *Drosophila* antenna and maxillary palp: *acj6* distinguishes two classes of odorant pathways. *Journal of Neurobiology* 23, 965-982.
- Barry, P. H., 2003. The relative contributions of cAMP and InsP3 pathways to olfactory responses in vertebrate olfactory receptor neurons and the specificity of odorants for both pathways. *Journal of General Physiology* 122, 247-250.
- Baumann, A., Frings, S., Godde, M., Seifert, R. & Kaupp, U. B., 1994. Primary structure and functional expression of a *Drosophila* cyclic nucleotide-gated channel present in eyes and antennae. *European Molecular Biology Organization Journal* 13, 5040-5050.
- Belluscio, L., Gold, G. H., Nemes, A. & Axel, R., 1998. Mice deficient in *G(olf)* are anosmic. *Neuron* 20, 69-81.

- Benton, R., Sachse, S., Michnick, S. W. & Vosshall, L. B., 2006. Atypical membrane topology and heteromeric function of *Drosophila* odorant receptors in vivo. *Public Library of Science Biology* 4, e20.
- Bohbot, J. & Vogt, R. G., 2005. Antennal expressed genes of the yellow fever mosquito (*Aedes aegypti* L.); characterization of odorant-binding protein 10 and takeout. *Insect Biochemistry and Molecular Biology* 35, 961-979.
- Braks, M. A. & Takken, W., 1997. Olfactometer studies on the attraction of *Anopheles gambiae* sensu stricto (Diptera: Culicidae) to human sweat. *Proceedings of Experimental and Applied Entomology* 8, 99-104.
- Braks, M. A. H., Meijerink, J. & Takken, W., 2001. The response of the malaria mosquito, *Anopheles gambiae* to two components of human sweat, ammonia and L-lactic acid. *Physiological Entomology* 26.
- Brand, A. H. & Perrimon, N., 1993. Targeted gene expression as a means of altering cell fates and generating dominant phenotypes. *Development* 118, 401-415.
- Breer, H., 2003. Sense of smell: recognition and transduction of olfactory signals. *Biochemical Society Transactions* 31, 113-116.
- Brunet, L. J., Gold, G. H. & Ngai, J., 1996. General anosmia caused by a targeted disruption of the mouse olfactory cyclic nucleotide-gated cation channel. *Neuron* 17, 681-693.
- Buck, L. & Axel, R., 1991. A Novel Multigene Family May Encode Odorant Receptors: A Molecular Basis for Odor Recognition. *Cell* 65, 175-187.
- Bush, C. F., Jones, S. V., Lyle, A. N., Minneman, K. P., Ressler, K. J. & Hall, R. A., 2007. Specificity of olfactory receptor interactions with other G protein-coupled receptors. *Journal of Biological Chemistry* 282, 19042-19051.
- Campos, A. R., Rosen, D. R., Robinow, S. N. & White, K., 1987. Molecular analysis of the locus *elav* in *Drosophila melanogaster*: a gene whose embryonic expression is neural specific. *European Molecular Biology Organization Journal* 6, 425-431.
- Chen, Y. & Flanagan, J. G., 2006. Follow your nose: axon pathfinding in olfactory map formation. *Cell* 127, 881-884.

- Chess, A., Simon, I., Cedar, H. & Axel, R., 1994. Allelic inactivation regulates olfactory receptor gene expression. *Cell* 78, 823-834.
- Clyne, P. J., Warr, C. G., Freeman, M. R., Lessing, D., Kim, J. & Carlson, J. R., 1999. A novel family of divergent seven-transmembrane proteins: candidate odorant receptors in *Drosophila*. *Neuron* 22, 327-338.
- Coluzzi, M., Di Deco, M. & Petrarca, V., 1975. [Propensity for feeding on blood under laboratory conditions and chromosomal polymorphism in *Anopheles stephensi*]. *Parassitologia* 17, 137-143.
- Costantini, C., Gibson, G., Brady, J., Merzagora, L. & Coluzzi, M., 1993. A new odour-baited trap to collect host-seeking mosquitoes. *Parassitologia* 35, 5-9.
- Couto, A., Alenius, M. & Dickson, B. J., 2005. Molecular, anatomical, and functional organization of the *Drosophila* olfactory system. *Current Biology* 15, 1535-1547.
- Craft, C. M., Whitmore, D. H. & Wiechmann, A. F., 1994. Cone arrestin identified by targeting expression of a functional family. *Journal of Biological Chemistry* 269, 4613-4619.
- Dawson, T. M., Arriza, J. L., Jaworsky, D. E., Borisy, F. F., Attramadal, H., Lefkowitz, R. J. & Ronnett, G. V., 1993. Beta-adrenergic receptor kinase-2 and beta-arrestin-2 as mediators of odorant-induced desensitization. *Science* 259, 825-829.
- De Bruyne, M., Clyne, P. J. & Carlson, J. R., 1999. Odor coding in a model olfactory organ: the *Drosophila* maxillary palp. *Journal of Neuroscience* 19, 4520-4532.
- De Bruyne, M., Foster, K. & Carlson, J. R., 2001. Odor coding in the *Drosophila* antenna. *Neuron* 30, 537-552.
- De Jong, R. & Knols, B. G., 1995a. Olfactory responses of host-seeking *Anopheles gambiae* s.s. Giles (Diptera: Culicidae). *Acta Tropica* 59, 333-335.
- De Jong, R. & Knols, B. G., 1995b. Selection of biting sites on man by two malaria mosquito species. *Experientia* 51, 80-84.
- Defea, K. A., Vaughn, Z. D., O'bryan, E. M., Nishijima, D., Dery, O. & Bunnett, N. W., 2000. The proliferative and antiapoptotic effects of substance P are facilitated by formation of a beta -arrestin-dependent scaffolding complex. *Proceedings of the National Academy of Sciences of the United States of America* 97, 11086-11091.

- Dekker, T., Steib, B., Carde, R. T. & Geier, M., 2002. L-lactic acid: a human-signifying host cue for the anthropophilic mosquito *Anopheles gambiae*. *Medical and Veterinary Entomology* 16, 91-98.
- Dekker, T. & Takken, W., 1998. Differential responses of mosquito sibling species *Anopheles arabiensis* and *An. quadriannulatus* to carbon dioxide, a man or a calf. *Medical and Veterinary Entomology* 12, 136-140.
- Deshpande, M., Venkatesh, K., Rodrigues, V. & Hasan, G., 2000. The inositol 1,4,5-trisphosphate receptor is required for maintenance of olfactory adaptation in *Drosophila antennae*. *Journal of Neurobiology* 43, 282-288.
- Dhallan, R. S., Yau, K. W., Schrader, K. A. & Reed, R. R., 1990. Primary structure and functional expression of a cyclic nucleotide-activated channel from olfactory neurons. *Nature* 347, 184-187.
- Dobritsa, A. A., Van Der Goes Van Naters, W., Warr, C. G., Steinbrecht, R. A. & Carlson, J. R., 2003. Integrating the Molecular and Cellular Basis of Odor Coding in the *Drosophila* Antenna. *Neuron* 37, 827-841.
- Dolph, P. J., Ranganathan, R., Colley, N. J., Hardy, R. W., Socolich, M. & Zuker, C. S., 1993. Arrestin function in inactivation of G protein-coupled receptor rhodopsin in vivo. *Science* 260, 1910-1916.
- Dryer, L., 2000. Evolution of odorant receptors. *Bioessays* 22, 803-810.
- Dubin, A. E., Liles, M. M., Seligman, F., Le, T., Tolli, J. & Harris, G. L., 1998. Involvement of genes encoding a K⁺ channel (ether a go-go) and a Na⁺ channel (smellblind) in *Drosophila* olfaction. *Annals of the New York Academy of Sciences* 855, 212-222.
- Duchamp-Viret, P., Chaput, M. A. & Duchamp, A., 1999. Odor response properties of rat olfactory receptor neurons. *Science* 284, 2171-2174.
- Elmore, T., Ignell, R., Carlson, J. R. & Smith, D. P., 2003. Targeted Mutation of a *Drosophila* Odor Receptor Defines Receptor Requirement in a Novel Class of Sensillum. *Journal of Neuroscience* 23, 9906-9912.
- Elmore, T. & Smith, D. P., 2001. Putative *Drosophila* odor receptor OR43b localizes to dendrites of olfactory neurons. *Insect Biochemistry and Molecular Biology* 31, 791-798.

- Ferguson, S., 2001. Evolving Concepts in G Protein-Coupled Receptor Endocytosis: The Role in Receptor Desensitization and Signaling. *Pharmacological Reviews* 53, 1-24.
- Ferguson, S. S. & Caron, M. G., 1998. G protein-coupled receptor adaptation mechanisms. *Seminars in Cell and Developmental Biology* 9, 119-127.
- Ferguson, S. S., Downey, W. E. R., Colapietro, A. M., Barak, L. S., Menard, L. & Caron, M. G., 1996. Role of beta-arrestin in mediating agonist-promoted G protein-coupled receptor internalization. *Science* 271, 363-366.
- Firestein, S., 2001. How the olfactory system makes sense of scents. *Nature* 413, 211-218.
- Fishilevich, E. & Vosshall, L. B., 2005. Genetic and functional subdivision of the *Drosophila* antennal lobe. *Current Biology* 15, 1548-1553.
- Gao, H., Sun, Y., Wu, Y., Luan, B., Wang, Y., Qu, B. & Pei, G., 2004. Identification of beta-arrestin2 as a G protein-coupled receptor-stimulated regulator of NF-kappaB pathways. *Molecular Cell* 14, 303-317.
- Gao, Q. & Chess, A., 1999. Identification of candidate *Drosophila* olfactory receptors from genomic DNA sequence. *Genomics* 60, 31-39.
- Gao, Q., Yuan, B. & Chess, A., 2000. Convergent projections of *Drosophila* olfactory neurons to specific glomeruli in the antennal lobe. *Nature Neuroscience* 3, 780-785.
- Ge, H., Krishnan, P., Liu, L., Krishnan, B., Davis, R. L., Hardin, P. E. & Roman, G., 2006. A *Drosophila* nonvisual arrestin is required for the maintenance of olfactory sensitivity. *Chemical Senses* 31, 49-62.
- Ghaninia, M., Hansson, B. S. & Ignell, R., 2007. The antennal lobe of the African malaria mosquito, *Anopheles gambiae* - innervation and three-dimensional reconstruction. *Arthropod Structure & Development* 36, 23-39.
- Girnita, L., Shenoy, S. K., Sehat, B., Vasilcanu, R., Girnita, A., Lefkowitz, R. J. & Larsson, O., 2005. {beta}-Arrestin is crucial for ubiquitination and down-regulation of the insulin-like growth factor-1 receptor by acting as adaptor for the MDM2 E3 ligase. *Journal of Biological Chemistry* 280, 24412-24419.

- Goldman, A. L., Van Der Goes Van Naters, W., Lessing, D., Warr, C. G. & Carlson, J. R., 2005. Coexpression of two functional odor receptors in one neuron. *Neuron* 45, 661-666.
- Gomez-Diaz, C., Martin, F. & Alcorta, E., 2004. The cAMP transduction cascade mediates olfactory reception in *Drosophila melanogaster*. *Behavior Genetics* 34, 395-406.
- Goodman, O. B., Jr., Krupnick, J. G., Santini, F., Gurevich, V. V., Penn, R. B., Gagnon, A. W., Keen, J. H. & Benovic, J. L., 1996. Beta-arrestin acts as a clathrin adaptor in endocytosis of the beta2-adrenergic receptor. *Nature* 383, 447-450.
- Grant, A. J., Wigton, B. E., Aghajanian, J. G. & O'connell, R. J., 1995. Electrophysiological responses of receptor neurons in mosquito maxillary palp sensilla to carbon dioxide. *Journal of Comparative Physiology A* 177, 389-396.
- Gross, S. P., Guo, Y., Martinez, J. E. & Welte, M. A., 2003. A determinant for directionality of organelle transport in *Drosophila* embryos. *Current Biology* 13, 1660-1668.
- Gurevich, E. V. & Gurevich, V. V., 2006a. Arrestins: ubiquitous regulators of cellular signaling pathways. *Genome Biology* 7, 236.
- Gurevich, V. V. & Benovic, J. L., 1993. Visual arrestin interaction with rhodopsin. Sequential multisite binding ensures strict selectivity toward light-activated phosphorylated rhodopsin. *Journal of Biological Chemistry* 268, 11628-11638.
- Gurevich, V. V. & Benovic, J. L., 1995. Visual arrestin binding to rhodopsin. Diverse functional roles of positively charged residues within the phosphorylation-recognition region of arrestin. *Journal of Biological Chemistry* 270, 6010-6016.
- Gurevich, V. V., Dion, S. B., Onorato, J. J., Ptasienski, J., Kim, C. M., Sterne-Marr, R., Hosey, M. M. & Benovic, J. L., 1995. Arrestin interactions with G protein-coupled receptors. Direct binding studies of wild type and mutant arrestins with rhodopsin, beta 2- adrenergic, and m2 muscarinic cholinergic receptors. *Journal of Biological Chemistry* 270, 720-731.
- Gurevich, V. V. & Gurevich, E. V., 2004. The molecular acrobatics of arrestin activation. *Trends in Pharmacological Sciences* 25, 105-111.

- Gurevich, V. V. & Gurevich, E. V., 2006b. The structural basis of arrestin-mediated regulation of G-protein-coupled receptors. *Pharmacology & Therapeutics* 110, 465-502.
- Gurevich, V. V. & Gurevich, E. V., 2008. GPCR monomers and oligomers: it takes all kinds. *Trends in Neurosciences* 31, 74-81.
- Hague, C., Uberti, M. A., Chen, Z., Bush, C. F., Jones, S. V., Ressler, K. J., Hall, R. A. & Minneman, K. P., 2004. Olfactory receptor surface expression is driven by association with the beta2-adrenergic receptor. *Proceedings of the National Academy of Sciences of the United States of America* 101, 13672-13676.
- Halfon, M. S., Gisselbrecht, S., Lu, J., Estrada, B., Keshishian, H. & Michelson, A. M., 2002. New fluorescent protein reporters for use with the Drosophila Gal4 expression system and for vital detection of balancer chromosomes. *Genesis* 34, 135-138.
- Hallem, E., Fox, A. N., Zwiebel, L. J. & Carlson, J. R., 2004a. A mosquito odorant receptor tuned to a component of human sweat. *Nature* 427, 212-213.
- Hallem, E., Ho, M. G. & Carlson, J. R., 2004b. The Molecular Basis of Odor Coding in the Drosophila Antenna. *Cell* 117, 965-979.
- Hallem, E. A. & Carlson, J. R., 2004. The odor coding system of Drosophila. *Trends in Genetics* 20, 453-459.
- Hallem, E. A. & Carlson, J. R., 2006. Coding of odors by a receptor repertoire. *Cell* 125, 143-160.
- Hallem, E. A., Dahanukar, A. & Carlson, J. R., 2006. Insect odor and taste receptors. *Annual Review of Entomology* 51, 113-135.
- Han, M., Gurevich, V. V., Vishnivetskiy, S. A., Sigler, P. B. & Schubert, C., 2001. Crystal structure of beta-arrestin at 1.9 Å: possible mechanism of receptor binding and membrane translocation. *Structure (Cambridge)* 9, 869-880.
- Hatt, H. & Ache, B. W., 1994. Cyclic nucleotide- and inositol phosphate-gated ion channels in lobster olfactory receptor neurons. *Proceedings of the National Academy of Sciences of the United States of America* 91, 6264-6268.

- Hildebrand, J. G. & Shepherd, G. M., 1997. Mechanisms of olfactory discrimination: converging evidence for common principles across phyla. *Annual Review of Neuroscience* 20, 595-631.
- Hill, C. A., Fox, A. N., Pitts, R. J., Kent, L. B., Tan, P. L., Chrystal, M. A., Cravchik, A., Collins, F. H., Robertson, H. M. & Zwiebel, L. J., 2002. G protein-coupled receptors in *Anopheles gambiae*. *Science* 298, 176-178.
- Hirsch, J. A., Schubert, C., Gurevich, V. V. & Sigler, P. B., 1999. The 2.8 Å crystal structure of visual arrestin: a model for arrestin's regulation. *Cell* 97, 257-269.
- Holt, R. A., Subramanian, G. M., Halpern, A., Sutton, G. G., Charlab, R., Nusskern, D. R., Wincker, P., Clark, A. G., Ribeiro, J. M., Wides, R., Salzberg, S. L., Loftus, B., Yandell, M., Majoros, W. H., Rusch, D. B., Lai, Z., Kraft, C. L., Abril, J. F., Anthouard, V., Arensburger, P., Atkinson, P. W., Baden, H., De Berardinis, V., Baldwin, D., Benes, V., Biedler, J., Blass, C., Bolanos, R., Boscus, D., Barnstead, M., Cai, S., Center, A., Chatuverdi, K., Christophides, G. K., Chrystal, M. A., Clamp, M., Cravchik, A., Curwen, V., Dana, A., Delcher, A., Dew, I., Evans, C. A., Flanigan, M., Grundschober-Freimoser, A., Friedli, L., Gu, Z., Guan, P., Guigo, R., Hillenmeyer, M. E., Hladun, S. L., Hogan, J. R., Hong, Y. S., Hoover, J., Jaillon, O., Ke, Z., Kodira, C., Kokoza, E., Koutsos, A., Letunic, I., Levitsky, A., Liang, Y., Lin, J. J., Lobo, N. F., Lopez, J. R., Malek, J. A., McIntosh, T. C., Meister, S., Miller, J., Mobarry, C., Mongin, E., Murphy, S. D., O'brochta, D. A., Pfannkoch, C., Qi, R., Regier, M. A., Remington, K., Shao, H., Sharakhova, M. V., Sitter, C. D., Shetty, J., Smith, T. J., Strong, R., Sun, J., Thomasova, D., Ton, L. Q., Topalis, P., Tu, Z., Unger, M. F., Walenz, B., Wang, A., Wang, J., Wang, M., Wang, X., Woodford, K. J., Wortman, J. R., Wu, M., Yao, A., Zdobnov, E. M., Zhang, H., Zhao, Q., et al., 2002. The genome sequence of the malaria mosquito *Anopheles gambiae*. *Science* 298, 129-149.
- Hyde, D. R., Mecklenburg, K. L., Pollock, J. A., Vihtelic, T. S. & Benzer, S., 1990. Twenty *Drosophila* visual system cDNA clones: one is a homolog of human arrestin. *Proceedings of the National Academy of Sciences of the United States of America* 87, 1008-1012.
- Ignell, R., Dekker, T., Ghaninia, M. & Hansson, B. S., 2005. Neuronal architecture of the mosquito deutocerebrum. *Journal of Comparative Neurology* 493, 207-240.
- Jones, D. T. & Reed, R. R., 1989. Golf: An Olfactory Neuron Specific-G Protein Involved in Odorant Signal Transduction. *Science* 244, 790-795.
- Jones, W. D., Nguyen, T. A., Kloss, B., Lee, K. J. & Vosshall, L. B., 2005. Functional conservation of an insect odorant receptor gene across 250 million years of evolution. *Current Biology* 15, R119-121.

- Juilfs, D. M., Fulle, H. J., Zhao, A. Z., Houslay, M. D., Garbers, D. L. & Beavo, J. A., 1997. A subset of olfactory neurons that selectively express cGMP-stimulated phosphodiesterase (PDE2) and guanylyl cyclase-D define a unique olfactory signal transduction pathway. *Proceedings of the National Academy of Sciences of the United States of America* 94, 3388-3395.
- Kajiya, K., Inaki, K., Tanaka, M., Haga, T., Kataoka, H. & Touhara, K., 2001. Molecular bases of odor discrimination: Reconstitution of olfactory receptors that recognize overlapping sets of odorants. *J. Neurosci.* 21, 6018-6025.
- Kalidas, S. & Smith, D. P., 2002. Novel genomic cDNA hybrids produce effective RNA interference in adult *Drosophila*. *Neuron* 33, 177-184.
- Kang, J., Shi, Y., Xiang, B., Qu, B., Su, W., Zhu, M., Zhang, M., Bao, G., Wang, F., Zhang, X., Yang, R., Fan, F., Chen, X., Pei, G. & Ma, L., 2005. A nuclear function of beta-arrestin1 in GPCR signaling: regulation of histone acetylation and gene transcription. *Cell* 123, 833-847.
- Kim, J., Ahn, S., Ren, X. R., Whalen, E. J., Reiter, E., Wei, H. & Lefkowitz, R. J., 2005. Functional antagonism of different G protein-coupled receptor kinases for beta-arrestin-mediated angiotensin II receptor signaling. *Proceedings of the National Academy of Sciences of the United States of America* 102, 1442-1447.
- Knols, B. G., De Jong, R. & Takken, W., 1994. Trapping system for testing olfactory responses of the malaria mosquito *Anopheles gambiae* in a wind tunnel. *Medical and Veterinary Entomology* 8, 386-388.
- Knols, B. G. J., Van Loon, J. J. A., Cork, A., Robinson, R. D., Adam, W., Meijerink, J., De Jong, R. & Takken, W., 1997. Behavioural and electrophysiological responses of the female malaria mosquito *Anopheles gambiae* (Diptera: Culicidae) to Limburger cheese volatiles. *Bulletin of Entomological Research* 87, 151-159.
- Kohout, T. A., Lin, F. S., Perry, S. J., Conner, D. A. & Lefkowitz, R. J., 2001. beta-Arrestin 1 and 2 differentially regulate heptahelical receptor signaling and trafficking. *Proceedings of the National Academy of Sciences of the United States of America* 98, 1601-1606.
- Krautwurst, D., Yau, K. W. & Reed, R. R., 1998. Identification of ligands for olfactory receptors by functional expression of a receptor library. *Cell* 95, 917-926.

- Krieger, J., Klink, O., Mohl, C., Raming, K. & Breer, H., 2003. A candidate olfactory receptor subtype highly conserved across different insect orders. *Journal of Comparative Physiology A* 189, 519-526.
- Krupnick, J. G. & Benovic, J. L., 1998. The role of receptor kinases and arrestins in G protein-coupled receptor regulation. *Annual Review of Pharmacology and Toxicology* 38, 289-319.
- Krupnick, J. G., Gurevich, V. V. & Benovic, J. L., 1997. Mechanism of quenching of phototransduction. Binding competition between arrestin and transducin for phosphorhodopsin. *Journal of Biological Chemistry* 272, 18125-18131.
- Kuhn, H., Hall, S. W. & Wilden, U., 1984. Light-induced binding of 48-kDa protein to photoreceptor membranes is highly enhanced by phosphorylation of rhodopsin. *Federation of European Biochemical Societies Letters* 176, 473-478.
- Kuhn, H. & Wilden, U., 1987. Deactivation of photoactivated rhodopsin by rhodopsin-kinase and arrestin. *Journal of Receptor Research* 7, 283-298.
- Kwon, H. W., Lu, T., Rutzler, M. & Zwiebel, L. J., 2006. Olfactory responses in a gustatory organ of the malaria vector mosquito *Anopheles gambiae*. *Proceedings of the National Academy of Sciences of the United States of America* 103, 13526-13531.
- Laissue, P. P., Reiter, C., Hiesinger, P. R., Halter, S., Fischbach, K. F. & Stocker, R. F., 1999. Three-dimensional reconstruction of the antennal lobe in *Drosophila melanogaster*. *Journal of Comparative Neurology* 405, 543-552.
- Laporte, S. A., Oakley, R. H., Holt, J. A., Barak, L. S. & Caron, M. G., 2000. The interaction of beta-arrestin with the AP-2 adaptor is required for the clustering of beta 2-adrenergic receptor into clathrin-coated pits. *Journal of Biological Chemistry* 275, 23120-23126.
- Laporte, S. A., Oakley, R. H., Zhang, J., Holt, J. A., Ferguson, S. S., Caron, M. G. & Barak, L. S., 1999. The beta2-adrenergic receptor/betaarrestin complex recruits the clathrin adaptor AP-2 during endocytosis. *Proceedings of the National Academy of Sciences of the United States of America* 96, 3712-3717.
- Larsson, M. C., Domingos, A. I., Jones, W. D., Chiappe, M. E., Amrein, H. & Vosshall, L. B., 2004. Or83b encodes a broadly expressed odorant receptor essential for *Drosophila* olfaction. *Neuron* 43, 703-714.

- Lattemann, M., Zierau, A., Schulte, C., Seidl, S., Kuhlmann, B. & Hummel, T., 2007. Semaphorin-1a controls receptor neuron-specific axonal convergence in the primary olfactory center of *Drosophila*. *Neuron* 53, 169-184.
- Lefkowitz, R. J., Rajagopal, K. & Whalen, E. J., 2006. New roles for beta-arrestins in cell signaling: not just for seven-transmembrane receptors. *Molecular Cell* 24, 643-652.
- Lefkowitz, R. J. & Shenoy, S. K., 2005. Transduction of receptor signals by beta-arrestins. *Science* 308, 512-517.
- Leinders-Zufall, T., Ma, M. & Zufall, F., 1999. Impaired odor adaptation in olfactory receptor neurons after inhibition of Ca²⁺/calmodulin kinase II. *Journal of Neuroscience* 19, RC19.
- Levine, H. D., Smith, D. P., Whitney, M., Malicki, D. M., Dolph, P. J., Smith, G. F., Burkhart, W. & Zuker, C. S., 1990. Isolation of a novel visual-system-specific arrestin: an in vivo substrate for light-dependent phosphorylation. *Mechanisms of Development* 33, 19-25.
- Lin, D. M. & Goodman, C. S., 1994. Ectopic and increased expression of Fasciclin II alters motoneuron growth cone guidance. *Neuron* 13, 507-523.
- Lin, F. T., Krueger, K. M., Kendall, H. E., Daaka, Y., Fredericks, Z. L., Pitcher, J. A. & Lefkowitz, R. J., 1997. Clathrin-mediated endocytosis of the beta-adrenergic receptor is regulated by phosphorylation/dephosphorylation of beta-arrestin1. *Journal of Biological Chemistry* 272, 31051-31057.
- Liu, L., Davis, R. L. & Roman, G., 2007. Exploratory activity in *Drosophila* requires the kurtz nonvisual arrestin. *Genetics* 175, 1197-1212.
- Lohse, M. J., Benovic, J. L., Codina, J., Caron, M. G. & Lefkowitz, R. J., 1990. beta-Arrestin: a protein that regulates beta-adrenergic receptor function. *Science* 248, 1547-1550.
- Lomvardas, S., Barnea, G., Pisapia, D. J., Mendelsohn, M., Kirkland, J. & Axel, R., 2006. Interchromosomal interactions and olfactory receptor choice. *Cell* 126, 403-413.
- Lu, T., Qiu, Y. T., Wang, G., Kwon, J. Y., Rutzler, M., Kwon, H. W., Pitts, R. J., Van Loon, J. J., Takken, W., Carlson, J. R. & Zwiebel, L. J., 2007. Odor Coding in the Maxillary Palp of the Malaria Vector Mosquito *Anopheles gambiae*. *Current Biology* 17, 1533-1544.

- Lundin, C., Kall, L., Kreher, S. A., Kapp, K., Sonnhammer, E. L., Carlson, J. R., Heijne, G. & Nilsson, I., 2007. Membrane topology of the *Drosophila* OR83b odorant receptor. *Federation of European Biochemical Societies Letters* 581, 5601-5604.
- Luttrell, L. M., Ferguson, S. S., Daaka, Y., Miller, W. E., Maudsley, S., Della Rocca, G. J., Lin, F., Kawakatsu, H., Owada, K., Luttrell, D. K., Caron, M. G. & Lefkowitz, R. J., 1999. Beta-arrestin-dependent formation of beta2 adrenergic receptor-Src protein kinase complexes. *Science* 283, 655-661.
- Luttrell, L. M. & Lefkowitz, R. J., 2002. The role of beta-arrestins in the termination and transduction of G-protein-coupled receptor signals. *Journal of Cell Science* 115, 455-465.
- Luttrell, L. M., Roudabush, F. L., Choy, E. W., Miller, W. E., Field, M. E., Pierce, K. L. & Lefkowitz, R. J., 2001. Activation and targeting of extracellular signal-regulated kinases by beta-arrestin scaffolds. *Proceedings of the National Academy of Sciences of the United States of America* 98, 2449-2454.
- Malnic, B., Hirono, J., Sato, T. & Buck, L. B., 1999. Combinatorial receptor codes for odors. *Cell* 96, 713-723.
- Mao, Z., Roman, G., Zong, L. & Davis, R. L., 2004. Pharmacogenetic rescue in time and space of the rutabaga memory impairment by using Gene-Switch. *Proceedings of the National Academy of Sciences of the United States of America* 101, 198-203.
- Marchese, A., Chen, C., Kim, Y. M. & Benovic, J. L., 2003. The ins and outs of G protein-coupled receptor trafficking. *Trends in Biochemical Sciences* 28, 369-376.
- Marshall, E., 2000. Malaria. A renewed assault on an old and deadly foe. *Science* 290, 428-430.
- Martin, N. P., Lefkowitz, R. J. & Shenoy, S. K., 2003. Regulation of V2 vasopressin receptor degradation by agonist-promoted ubiquitination. *Journal of Biological Chemistry* 278, 45954-45959.
- Mashukova, A., Spehr, M., Hatt, H. & Neuhaus, E. M., 2006. Beta-arrestin2-mediated internalization of mammalian odorant receptors. *Journal of Neuroscience* 26, 9902-9912.

- Mboera, L., Knols, B., Takken, W. & Della Torre, A., 1997. The response of *Anopheles gambiae* s.l. and *A. funestus* (Diptera: Culicidae) to tents baited with human odour or carbon dioxide in Tanzania. *Bulletin of Entomological Research* 87, 173-178.
- McClintock, T. S., Landers, T. S., Gimelbrandt, A. A., Fuller, L. Z., Jackson, B. A., Jayawickreme, C. K. & Lerner, M. R., 1997. Functional expression of olfactory-adrenergic receptor chimeras and intracellular retention of heterologously expressed olfactory receptors. *Molecular Brain Research* 48, 270-278.
- McDonald, P. H., Chow, C. W., Miller, W. E., Laporte, S. A., Field, M. E., Lin, F. T., Davis, R. J. & Lefkowitz, R. J., 2000. beta-arrestin 2: A receptor-regulated MAPK scaffold for the activation of JNK3. *Science* 290, 1574-1577.
- McGuire, S. E., Le, P. T., Osborn, A. J., Matsumoto, K. & Davis, R. L., 2003. Spatiotemporal rescue of memory dysfunction in *Drosophila*. *Science* 302, 1765-1768.
- Meredith, M., 2001. Human vomeronasal organ function: a critical review of best and worst cases. *Chemical Senses* 26, 433-445.
- Merrill, C. E., Pitts, R. J. & Zwiebel, L. J., 2003. Molecular characterization of arrestin family members in the malaria vector mosquito, *Anopheles gambiae*. *Insect Molecular Biology* 12, 641-650.
- Merrill, C. E., Riesgo-Escovar, J., Pitts, R. J., Kafatos, F. C., Carlson, J. R. & Zwiebel, L. J., 2002. Visual arrestins in olfactory pathways of *Drosophila* and the malaria vector mosquito *Anopheles gambiae*. *Proceedings of the National Academy of Sciences of the United States of America* 99, 1633-1638.
- Merrill, C. E., Sherertz, T. M., Walker, W. B. & Zwiebel, L. J., 2005. Odorant-specific requirements for arrestin function in *Drosophila* olfaction. *Journal of Neurobiology* 63, 15-28.
- Mombaerts, P., 1999. Molecular biology of odorant receptors in vertebrates. *Annual Review of Neuroscience* 22, 487-509.
- Mombaerts, P., Wang, F., Dulac, C., Chao, S. K., Nemes, A., Mendelsohn, M., Edmondson, J. & Axel, R., 1996. Visualizing an olfactory sensory map. *Cell* 87, 675-686.

- Mukherjee, A., Veraksa, A., Bauer, A., Rosse, C., Camonis, J. & Artavanis-Tsakonas, S., 2005. Regulation of Notch signalling by non-visual beta-arrestin. *Nature Cell Biology* 7, 1191-1201.
- Nakamura, T. & Gold, G. H., 1987. A cyclic nucleotide-gated conductance in olfactory receptor cilia. *Nature* 325, 442-444.
- Neuhaus, E. M., Gisselmann, G., Zhang, W., Dooley, R., Stortkuhl, K. & Hatt, H., 2005. Odorant receptor heterodimerization in the olfactory system of *Drosophila melanogaster*. *Nature Neuroscience* 8, 15-17.
- Nicolaides, N., 1974. Skin lipids: their biochemical uniqueness. *Science* 186, 19-26.
- Niimura, Y. & Nei, M., 2003. Evolution of olfactory receptor genes in the human genome. *Proceedings of the National Academy of Sciences of the United States of America* 100, 12235-12240.
- Oakley, R. H., Laporte, S. A., Holt, J. A., Caron, M. G. & Barak, L. S., 2000. Differential affinities of visual arrestin, beta arrestin1, and beta arrestin2 for G protein-coupled receptors delineate two major classes of receptors. *Journal of Biological Chemistry* 275, 17201-17210.
- Orem, N. R., Xia, L. & Dolph, P. J., 2006. An essential role for endocytosis of rhodopsin through interaction of visual arrestin with the AP-2 adaptor. *Journal of Cell Science* 119, 3141-3148.
- Osterwalder, T., Yoon, K. S., White, B. H. & Keshishian, H., 2001. A conditional tissue-specific transgene expression system using inducible GAL4. *Proceedings of the National Academy of Sciences of the United States of America* 98, 12596-12601.
- Pace, U., Hanski, E., Salomon, Y. & Lancet, D., 1985. Odorant-sensitive adenylate cyclase may mediate olfactory reception. *Nature* 316, 255-258.
- Pates, H. V., Takken, W., Stuke, K. & Curtis, C. F., 2001. Differential behaviour of *Anopheles gambiae sensu stricto* (Diptera: Culicidae) to human and cow odours in the laboratory. *Bulletin of Entomological Research* 91, 289-296.
- Paysan, J. & Breer, H., 2001. Molecular physiology of odor detection: current views. *Pflugers Archive* 441, 579-586.

- Pelosi, P., 2001. The role of perireceptor events in vertebrate olfaction. *Cellular and Molecular Life Sciences* 58, 503-509.
- Peppel, K., Boekhoff, I., McDonald, P., Breer, H., Caron, M. G. & Lefkowitz, R. J., 1997. G protein-coupled receptor kinase 3 (GRK3) gene disruption leads to loss of odorant receptor desensitization. *Journal of Biological Chemistry* 272, 25425-25428.
- Pfaffl, M. W., 2001. A new mathematical model for relative quantification in real-time RT-PCR. *Nucleic Acids Research* 29, e45.
- Pitts, R. J., Fox, A. N. & Zwiebel, L. J., 2004. A highly conserved candidate chemoreceptor expressed in both olfactory and gustatory tissues in the malaria vector, *Anopheles gambiae*. *Proceedings of the National Academy of Sciences of the United States of America* 101, 5058-5063.
- Premont, R. T. & Gainetdinov, R. R., 2007. Physiological roles of G protein-coupled receptor kinases and arrestins. *Annual Review of Physiology* 69, 511-534.
- Prossnitz, E. R., 2004. Novel roles for arrestins in the post-endocytic trafficking of G protein-coupled receptors. *Life Sciences* 75, 893-899.
- Qiu, Y. T., Van Loon, J. J., Takken, W., Meijerink, J. & Smid, H. M., 2006. Olfactory Coding in Antennal Neurons of the Malaria Mosquito, *Anopheles gambiae*. *Chemical Senses* 31, 845-863.
- Raming, K., Freitag, J., Krieger, J. & Breer, H., 1993a. Arrestin-subtypes in insect antennae. *Cell Signal* 5, 69-80.
- Raming, K., Krieger, J., Strotmann, J., Boekhoff, I., S.Kubick, Baumstark, C. & Breer, H., 1993b. Cloning and expression of odorant receptors. *Nature* 361, 353-356.
- Rawson, N. E., Eberwine, J., Dotson, R., Jackson, J., Ulrich, P. & Restrepo, D., 2000. Expression of mRNAs encoding for two different olfactory receptors in a subset of olfactory receptor neurons. *Journal of Neurochemistry* 75, 185-195.
- Ray, A., Van Naters, W. G., Shiraiwa, T. & Carlson, J. R., 2007. Mechanisms of odor receptor gene choice in *Drosophila*. *Neuron* 53, 353-369.
- Ren, X. R., Reiter, E., Ahn, S., Kim, J., Chen, W. & Lefkowitz, R. J., 2005. Different G protein-coupled receptor kinases govern G protein and beta-arrestin-mediated

signaling of V2 vasopressin receptor. *Proceedings of the National Academy of Sciences of the United States of America* 102, 1448-1453.

Ressler, K. J., Sullivan, S. L. & Buck, L. B., 1993. A zonal organization of odorant receptor gene expression in the olfactory epithelium. *Cell* 73, 597-609.

Ressler, K. J., Sullivan, S. L. & 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.

Restrepo, D., 2005. The ins and outs of intracellular chloride in olfactory receptor neurons. *Neuron* 45, 481-482.

Riesgo-Escovar, J., Raha, D. & Carlson, J. R., 1995. Requirement for a phospholipase C in odor response: overlap between olfaction and vision in *Drosophila*. *Proceedings of the National Academy of Sciences of the United States of America* 92, 2864-2868.

Riesgo-Escovar, J. R., Woodard, C. & Carlson, J. R., 1994. Olfactory physiology in the *Drosophila* maxillary palp requires the visual system gene *rdgB*. *Journal of Comparative Physiology A* 175, 687-693.

Robertson, H. M., 1998. Two large families of chemoreceptor genes in the nematodes *Caenorhabditis elegans* and *Caenorhabditis briggsae* reveal extensive gene duplication, diversification, movement, and intron loss. *Genome Research* 8, 449-463.

Robertson, H. M. & Wanner, K. W., 2006. The chemoreceptor superfamily in the honey bee, *Apis mellifera*: expansion of the odorant, but not gustatory, receptor family. *Genome Research* 16, 1395-1403.

Robertson, H. M., Warr, C. G. & Carlson, J. R., 2003. Molecular evolution of the insect chemoreceptor gene superfamily in *Drosophila melanogaster*. *Proceedings of the National Academy of Sciences of the United States of America* 100 Suppl 2, 14537-14542.

Robinow, S. & White, K., 1988. The locus *elav* of *Drosophila melanogaster* is expressed in neurons at all developmental stages. *Developmental Biology* 126, 294-303.

Roman, G., Endo, K., Zong, L. & Davis, R. L., 2001. P[Switch], a system for spatial and temporal control of gene expression in *Drosophila melanogaster*. *Proceedings of*

the National Academy of Sciences of the United States of America 98, 12602-12607.

- Roman, G., He, J. & Davis, R. L., 2000. kurtz, a Novel Nonvisual Arrestin, Is an Essential Neural Gene in *Drosophila*. *Genetics* 155, 1281-1295.
- Rutzler, M. & Zwiebel, L. J., 2005. Molecular biology of insect olfaction: recent progress and conceptual models. *Journal of Comparative Physiology A* 191, 777-790.
- Saito, H., Kubota, M., Roberts, R. W., Chi, Q. & Matsunami, H., 2004. RTP family members induce functional expression of mammalian odorant receptors. *Cell* 119, 679-691.
- Satoh, A. K. & Ready, D. F., 2005. Arrestin1 mediates light-dependent rhodopsin endocytosis and cell survival. *Current Biology* 15, 1722-1733.
- Scott, M. G., Le Rouzic, E., Perianin, A., Pierotti, V., Enslin, H., Benichou, S., Marullo, S. & Benmerah, A., 2002. Differential nucleocytoplasmic shuttling of beta-arrestins. Characterization of a leucine-rich nuclear export signal in beta-arrestin2. *Journal of Biological Chemistry* 277, 37693-37701.
- Serizawa, S., Miyamichi, K., Nakatani, H., Suzuki, M., Saito, M., Yoshihara, Y. & Sakano, H., 2003. Negative feedback regulation ensures the one receptor-one olfactory neuron rule in mouse. *Science* 302, 2088-2094.
- Shenoy, S. K. & Lefkowitz, R. J., 2005. Receptor-specific ubiquitination of beta-arrestin directs assembly and targeting of seven-transmembrane receptor signalosomes. *Journal of Biological Chemistry* 280, 15315-15324.
- Shenoy, S. K., McDonald, P. H., Kohout, T. A. & Lefkowitz, R. J., 2001. Regulation of receptor fate by ubiquitination of activated beta 2-adrenergic receptor and beta-arrestin. *Science* 294, 1307-1313.
- Shykind, B. M., Rohani, S. C., O'donnell, S., Nemes, A., Mendelsohn, M., Sun, Y., Axel, R. & Barnea, G., 2004. Gene switching and the stability of odorant receptor gene choice. *Cell* 117, 801-815.
- Sklar, P. B., Anholt, R. R. & Snyder, S. H., 1986. The odorant-sensitive adenylate cyclase of olfactory receptor cells. Differential stimulation by distinct classes of odorants. *Journal of Biological Chemistry* 261, 15538-15543.

- Smallegange, R. C., Qiu, Y. T., Van Loon, J. J. & Takken, W., 2005. Synergism between ammonia, lactic acid and carboxylic acids as kairomones in the host-seeking behaviour of the malaria mosquito *Anopheles gambiae sensu stricto* (Diptera: Culicidae). *Chemical Senses* 30, 145-152.
- Smith, D. P., 2007. Odor and pheromone detection in *Drosophila melanogaster*. *Pflugers Archive* 454, 749-758.
- Smith, D. P., Shieh, B. H. & Zuker, C. S., 1990. Isolation and structure of an arrestin gene from *Drosophila*. *Proceedings of the National Academy of Sciences of the United States of America* 87, 1003-1007.
- Snow, R. W., Guerra, C. A., Noor, A. M., Myint, H. Y. & Hay, S. I., 2005. The global distribution of clinical episodes of *Plasmodium falciparum* malaria. *Nature* 434, 214-217.
- Steinbrecht, R. A., 1996. Structure and function of insect olfactory sensilla. *Ciba Foundation Symposia* 200, 158-174.
- Stensmyr, M. C., Giordano, E., Balloi, A., Angioy, A. M. & Hansson, B. S., 2003. Novel natural ligands for *Drosophila* olfactory receptor neurones. *Journal of Experimental Biology* 206, 715-724.
- Stocker, R. F., 1994. The organization of the chemosensory system in *Drosophila melanogaster* : a review. *Cell & Tissue Research* 275, 3-26.
- Stortkuhl, K. F., Hovemann, B. T. & Carlson, J. R., 1999. Olfactory adaptation depends on the Trp Ca²⁺ channel in *Drosophila*. *Journal of Neuroscience* 19, 4839-4846.
- Sutton, R. B., Vishnivetskiy, S. A., Robert, J., Hanson, S. M., Raman, D., Knox, B. E., Kono, M., Navarro, J. & Gurevich, V. V., 2005. Crystal structure of cone arrestin at 2.3Å: evolution of receptor specificity. *Journal of Molecular Biology* 354, 1069-1080.
- Takken, W., 1991. The Role of Olfaction in Host-Seeking of Mosquitoes: A Review. *Insect Science Applications* 12, 287-295.
- Takken, W. & Knols, B., 1990. Flight behaviour of *Anopheles gambiae* Giles (Diptera: Culicidae) in response to host stimuli: A wind tunnel study. . *Proceedings of Experimental and Applied Entomology, N.E.V. Amsterdam* 1, 121-128.

- Takken, W. & Knols, B. G., 1999. Odor-mediated behavior of Afrotropical malaria mosquitoes. *Annual Review of Entomology* 44, 131-157.
- Troemel, E. R., Chou, J. H., Dwyer, N. D., Colbert, H. A. & Bargmann, C. I., 1995. Divergent seven transmembrane receptors are candidate chemosensory receptors in *C. elegans*. *Cell* 83, 207-218.
- Vassar, R., Chao, S. K., Sitcheran, R., Nunez, J. M., Vosshall, L. B. & Axel, R., 1994. Topographic organization of sensory projections to the olfactory bulb. *Cell* 79, 981-991.
- Vassar, R., Ngai, J. & Axel, R., 1993. Spatial segregation of odorant receptor expression in the mammalian olfactory epithelium. *Cell* 74, 309-318.
- Vishnivetskiy, S. A., Hirsch, J. A., Velez, M. G., Gurevich, Y. V. & Gurevich, V. V., 2002. Transition of arrestin into the active receptor-binding state requires an extended interdomain hinge. *Journal of Biological Chemistry* 277, 43961-43967.
- Vishnivetskiy, S. A., Hosey, M. M., Benovic, J. L. & Gurevich, V. V., 2004. Mapping the arrestin-receptor interface. Structural elements responsible for receptor specificity of arrestin proteins. *Journal of Biological Chemistry* 279, 1262-1268.
- Vishnivetskiy, S. A., Paz, C. L., Schubert, C., Hirsch, J. A., Sigler, P. B. & Gurevich, V. V., 1999. How does arrestin respond to the phosphorylated state of rhodopsin? *Journal of Biological Chemistry* 274, 11451-11454.
- Vishnivetskiy, S. A., Schubert, C., Climaco, G. C., Gurevich, Y. V., Velez, M. G. & Gurevich, V. V., 2000. An additional phosphate-binding element in arrestin molecule: implications for the mechanism of arrestin activation. *Journal of Biological Chemistry*.
- Vosshall, L. B., Amrein, H., Morozov, P. S., Rzhetsky, A. & Axel, R., 1999. A spatial map of olfactory receptor expression in the *Drosophila* antenna. *Cell* 96, 725-736.
- Vosshall, L. B., Wong, A. M. & Axel, R., 2000. An olfactory sensory map in the fly brain. *Cell* 102, 147-159.
- Walker, W. B., Smith, E. M., Jan, T. & Zwiebel, L. J., 2008. A functional role for *Anopheles gambiae* Arrestin1 in olfactory signal transduction. *Journal of Insect Physiology*.

- Wang, F., Nemes, A., Mendelsohn, M. & Axel, R., 1998. Odorant receptors govern the formation of a precise topographic map. *Cell* 93, 47-60.
- Wang, Z., Nudelman, A. & Storm, D. R., 2007. Are pheromones detected through the main olfactory epithelium? *Molecular Neurobiology* 35, 317-323.
- White, G. B., 1974. *Anopheles gambiae* complex and disease transmission in Africa. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 68, 278-301.
- WHO (2007) Malaria Fact Sheet Geneva, Switzerland, World Health Organization.
- Wilbanks, A. M., Fralish, G. B., Kirby, M. L., Barak, L. S., Li, Y. X. & Caron, M. G., 2004. Beta-arrestin 2 regulates zebrafish development through the hedgehog signaling pathway. *Science* 306, 2264-2267.
- Wilden, U., Hall, S. W. & Kuhn, H., 1986. Phosphodiesterase activation by photoexcited rhodopsin is quenched when rhodopsin is phosphorylated and binds the intrinsic 48-kDa protein of rod outer segments. *Proceedings of the National Academy of Sciences of the United States of America* 83, 1174-1178.
- Wilden, U. & Kuhn, H., 1982. Light-dependent phosphorylation of rhodopsin: number of phosphorylation sites. *Biochemistry* 21, 3014-3022.
- Witherow, D. S., Garrison, T. R., Miller, W. E. & Lefkowitz, R. J., 2004. beta-Arrestin inhibits NF-kappaB activity by means of its interaction with the NF-kappaB inhibitor I kappa B alpha. *Proceedings of the National Academy of Sciences of the United States of America* 101, 8603-8607.
- Wong, S. T., Trinh, K., Hacker, B., Chan, G. C., Lowe, G., Gaggar, A., Xia, Z., Gold, G. H. & Storm, D. R., 2000. Disruption of the type III adenylyl cyclase gene leads to peripheral and behavioral anosmia in transgenic mice. *Neuron* 27, 487-497.
- Yao, C. A., Ignell, R. & Carlson, J. R., 2005. Chemosensory coding by neurons in the coeloconic sensilla of the *Drosophila* antenna. *Journal of Neuroscience* 25, 8359-8367.
- Zhang, J., Ferguson, S. S. G., Barak, L. S., Menard, L. & Caron, M. G., 1996. Dynamin and beta-arrestin reveal distinct mechanisms for G protein-coupled receptor internalization. *Journal of Biological Chemistry* 271, 18302-18305.

- Zhang, Y., Chou, J. H., Bradley, J., Bargmann, C. I. & Zinn, K., 1997. The *Caenorhabditis elegans* seven-transmembrane protein ODR-10 functions as an odorant receptor in mammalian cells. *Proceedings of the National Academy of Sciences of the United States of America* 94, 12162-12167.
- Zhao, H., Ivic, L., Otaki, J. M., Hashimoto, M., Mikoshiba, K. & Firestein, S., 1998. Functional expression of a mammalian odorant receptor. *Science* 279, 237-242.
- Zhuang, H. & Matsunami, H., 2007. Synergism of accessory factors in functional expression of mammalian odorant receptors. *Journal of Biological Chemistry* 282, 15284-15293.
- Zufall, F. & Leinders-Zufall, T., 2000. The cellular and molecular basis of odor adaptation. *Chemical Senses* 25, 473-481.
- Zwiebel, L. J. & Takken, W., 2004. Olfactory Regulation of Mosquito-Host Interactions. *Insect Biochemistry and Molecular Biology* 34, 645-652.