2009 Winner

Richard Benton, Ph.D.

Assistant Professor
Center for Integrative Genomics
University of Lausanne
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eppendorf & Science PRIZE FOR NEUROBIOLOGY

Richard Benton received his BA in Natural Sciences in 1998 from the University of Cambridge, England. He obtained his PhD in 2003 for research on the molecular basis of cell polarisation, performed in the group of Daniel St Johnston at The Wellcome Trust/Cancer Research UK Gurdon Institute in Cambridge. For his post-doctoral training, he joined Leslie Vosshall's laboratory at the Rockefeller University, New York, where he became interested in olfactory signalling mechanisms. During his post-doc he was supported by fellowships from the European Molecular Biology Organisation and the Helen Hay Whitney Foundation. He established his group as Assistant Professor at the Center for Integrative Genomics at the University of Lausanne, Switzerland in September 2007. His laboratory studies the molecular, neuronal and evolutionary biology of chemosensation using the fruit fly, *Drosophila*, as a model system. In 2008, he was awarded a European Research Council Starting Independent Grant.

Evolution and revolution in odour detection

Understanding how diverse odour signals are detected and represented in the brain has long fascinated sensory neuroscientists. Vertebrate and insect olfactory systems display striking similarities in their neuroanatomical and physiological properties, suggesting an evolutionarily conserved mechanism for odour perception. Richard Benton's essay describes his studies on the molecular biology of odour detection in *Drosophila*, which have revealed several surprises in how insects sense volatile chemicals. First, he showed that insect Odorant Receptors (ORs), unlike those in vertebrates (and contrary to dogma), are not G protein-coupled receptors, defining instead a novel, insect-specific family of transmembrane proteins. Second, he found pheromone-sensing ORs require a co-factor normally associated with immune recognition to be activated by their ligands. Finally, he discovered a second family of insect olfactory receptors that are homologous to ionotropic glutamate receptors, a class of ligand-gated ion channel best-known for their role in synaptic communication. His discoveries raise questions about the evolutionary origin of insect olfactory signalling and whether established parallels between insect and vertebrate olfactory systems represent conserved or convergent features. Furthermore, these unusual molecular solutions for odour detection represent excellent targets for specific chemical inhibitors that could be used to control odour-evoked behaviours of insect vectors of human diseases.