Abstract
Stably differentiated cells can sometimes display a remarkable degree of plasticity and switch fates to another differentiated cell type, in a process termed transdifferentiation. In the vertebrate nervous system, radial glia act as neural progenitors during embryogenesis. Surprisingly, stably differentiated glia can also act as neural progenitors during adult neurogenesis. We have discovered two cases in which differentiated glial cells undergo a glia-to-neuron cell-fate switch during sexual maturation in the nervous system of *C. elegans*. In the first case, a class of glial cells re-enter the cell cycle and divide asymmetrically to produce a pair of interneurons, the mystery cells of the male (MCMs), which are required for male-specific associative learning (Sammut et al 2015). More recently we have found that a different class of glial cells, during sexual maturation, undergo dramatic morphological and molecular changes to become cholinergic sensory neurons through a direct transdifferentiation. These neurons are incorporated into a sensory-motor mating circuit in the male and are required to correctly perform specific steps of mating. To identify the genetic factors that regulate these glia-to-neuron cell fate switches, we have generated a collection of *no mystery cell* (nom) mutants and assessed their role in both glia-to-neuron cell fate switches. All together our findings reveal an important role for glia developmental plasticity in the remodeling of neural circuits during sexual maturation and provide us with a paradigm to study glia-to-neuron cell fate switches at the single-cell level in a genetically tractable system.


Biosketch
Richard is interested in the mechanisms by which diverse types of neurons develop from a fertilised egg. He studied Biology with European Studies (French) at the University of Sussex and did his PhD in Developmental Biology at University College London with Prof. Nigel Holder and Prof. Steve Wilson, where he worked on the interface between patterning and morphogenesis during somite formation. He then moved to Columbia University to study the early embryonic mechanisms of left-right asymmetric neuron specification with Prof. Oliver Hobert. Following a successful postdoc, he established his own research group at UCL in 2012 as a Wellcome Trust
Research Career Development Fellow. His team uses the power of *C. elegans* as an *in vivo* genetic model system with single-cell resolution to reveal fundamental principles of neural development, which should subsequently provide the basis for novel therapies and brain repair strategies. He is focused on uncovering the cellular and molecular mechanisms that regulate left-right asymmetric neurogenesis and more recently is expanding his research in a new direction, to address the mechanisms of plasticity and transdifferentiation during glial-derived neurogenesis.