Topography of the antenno-cerebral pathway in the silkmoth

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In the silkmoth, as in many other animals, there are two largely separate olfactory subsystems: a labeled-line system responsible for pheromone information processing and a system for processing general odor information. In the antennal lobe (AL) of the silkmoth, these two are represented by the macroglomerular complex (MGC) and the ordinary glomeruli (OGs). We analyzed the next relay into higher brain areas, the antenno-cerebral tract system composed by the antennal lobe projection neurons (PNs) with particular emphasis on the morphology of AL dendritic and mushroom body calyx (MBCa) axon terminal distributions. Only in the MGC toroid, responding to the major pheromone component, a subclass of PNs with clearly locally confined dendritic trees could be identified. MGC PNs project to specific areas in the MBCa and have fewer synapses overall than OG PNs, whose outputs cover the entire MBCa. Our results show that labeled-line pheromone-sensitive circuits have specific properties even in higher brain areas that set them apart from general odor processing circuitry. We are now aiming at identifying in detail what kind of behaviorally relevant information is being encoded in these labeled-line circuits, as compared to the general odor pathway.