Curriculum Vitae

Personal Information

Name	Lena van Giesen
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Date of birth	January 15th 1987
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Education

January 2012 – June 2016	PhD in Neurobiology and Neurogenetics; University of Fribourg (Switzerland); Supervisor: Prof. Simon G. Sprecher, Date of defense: July 7th 2016 PhD Thesis: "Genetic and functional studies on the gustatory system of *Drosophila* larvae"
Oct 2006 – July 2011	Diploma in Biology; Christian-Albrechts-University Kiel (Germany); Supervisor: Prof. Margaret Sauter Diploma-thesis: "Regulation of adventitious root growth in rice and *Arabidopsis"*

Employment history

Aug 2016 – June 2018	Postdoctoral Fellow, Brandeis University (Waltham, MA, USA), Prof. Paul Garrity, Molecular basis of temperature sensing in *Drosophila melanogaster* and *Anopheles Gambiae*
July 2018 – current	Postdoctoral Fellow, Harvard University (Cambridge, MA, USA), Prof. Nicholas Bellono, Evolution of sensory systems in cephalopods

Supervision of junior researchers

- Yvonne Buntschu, Master thesis, Gustatory response in the dorsal organ of Drosophila larvae (2013-2014)
- Maëlle Bochud, Bachelor thesis, Physiology and behavior of CO_2 sensing in the Drosophila larvae (Spring 2014)
- Tatevik Sarkissian, Rotation student, The role of IR21a and IR60a in gravitaxis and Proprioception (Spring 2017)
- Alena Lokhmanenko; Summer student REU program, Courtship-behavior in IR-mutant flies (Summer 2017)
- Tyler Hill, Rotation student, Gravitaxis-behavior in IR-mutant flies (Fall 2017)
- Jenna Harris, Rotation student, Electrophysiology- screen for IR21a-Cofactors in Drosophila Cold Cells (Winter 2017)
- Mason Towne, Rotation student (Spring 2018)
- Anastasia Repouliou, Rotation student, Ligand gating on octopus chemo tactile receptors (Spring 2019)
- Wenyi Zhang, Rotation student, Analysis of binding side in octopus CR518 (Spring 2020)
- Peter Kilian, research assistant, octopus behavioural analyses (second author publication, ongoing)

Teaching activities

- Teaching assistant in plant physiology course (2010-2011), Prof. Margaret Sauter (University of Kiel)
- Teaching assistant for microscopy course (December 2014, December 2015), Dr. Boris Egger (University of Fribourg)
- Teaching assistant for seminar (introductory class for 1st year grad school students), (Fall 2017), Prof. Paul Garrity (Brandeis University)

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Fellowships

June 2016	Scholarship Neuroscience summer school, Marine Biological Laborato (Woods Hole, MA, USA)
Jan 2017 – June 2018	Early Postdoc.mobility Grant SNF (Swiss National Science Foundation
July 2018	FENS (Federal European Neuroscience Society) Travel Grant
Aug 2018 - Feb 2020	Postdoc.mobility Grant SNF (Swiss National Science Foundation)

Major scientific achievements

Understanding how information is encoded in a meaningful way is a fundamental problem of all living organisms and the analysis of sensory systems provides insight into the basic principles by which cells detect and integrate diverse signals. Throughout my training, I have studied sensory coding in multiple systems and organisms to make important contributions to our understanding of how the properties of proteins and cells shape adaptation and behavior.

Chemical information coding in Drosophila larvae:

During my PhD with Simon Sprecher at the University of Fribourg (Switzerland), I characterized characterize the gustatory system of the Drosophila larvae. In order to understand how gustatory sensory input is encoded, I designed and developed a custom microfluidics chip, that enabled us to measure neuronal activity in primary sensory neurons in a semi-intact preparation. This investigation revealed, that the larvae are able to navigate in complex chemical environments and encode salient information with a very small number of primary sensory neurons through combinatorial coding. Through this strategy, the valence of a mixture is signaled rather than in the widely assumed labeled line model in which individual modalities are encoded by specific cell types. These studies resulted in two first author publications:

- **van Giesen, L**; Hernandez-Nunez, L; Delasoie-Baranek, S; Colombo, M; Renaud, F; Bruggmann, R; Benton, R; Samuel, AV and Sprecher, SG. Multimodal stimulus coding by a gustatory sensory neuron in *Drosophila* larvae. ***Nature Communications*** 2016 Feb 7:10687. doi: 10.1038/ncomms10687
- **van Giesen, L**; Neagu-Maier, GL; Kwon, JY; Sprecher SG. A microfluidics-based method for measuring neuronal activity in *Drosophila* chemosensory neurons. ***Nature Protocols*** 2016 Dec;11(12):2389-2400. doi: 10.1038/nprot.2016.144

Genetics of insect thermosensation:

For my postdoctoral research, I worked for two years (2016-2018) with Paul Garrity at Brandeis University on the genetic basis of thermosensation in Drosophila and Anopheles mosquitoes. During this time, I contributed to studies elucidating how evolutionarily-conserved ionotropic receptors serve structural roles in temperature-sensitive neurons of insects. This work is published in two co-authored studies:

- Greppi, C; Laursen, WJ; Budelli, G; Chang, E; Daniels, AM; **van Giesen, L**; Smidler, AL; Catteruccia, F; Garrity, PA. Mosquito heat seeking is driven by an ancestral cooling receptor. **Science**. 2020 Feb; 367 (6478), 681-684. doi: 10.1126/science.aay9847
- Budelli, G; Ni, L; Berciu, C; **van Giesen, L**; Knecht, Z; Chang, E; Kaminski, B; Silbering, AF; Benton, R; Samuel, A; Klein, M; Nicastro, D and Garrity, PA. Ionotropic Receptors specify the morphogenesis of phasic sensors controlling rapid thermal preference in *Drosophila*. ***Neuron***. 2019 Feb; 101(4), 738-747.e3. doi: 10.1016/j.neuron.2018.12.022

Molecular basis of Octopus chemotactile sensation:

Since 2018, I have been working with Nicholas Bellono at Harvard University on chemotactile sensation in octopus. Our investigation in this virtually unexplored 'touch-taste' sense led to the discovery of a novel family of chemotactile receptors (CRs) that mediate the octopus' contact-dependent, aquatic chemosensation. CRs are found specifically in cephalopods, expressed in suction cups (suckers) along the arms, and mediate the detection of poorly-soluble terpenoid molecules from natural products which act as 'touch-taste' stimuli in aquatic environments. CRs are co-expressed in diverse patterns and form heteromeric ion channel complexes to specify signal detection and transduction, a filtering system suited to the octopus' uniquely-distributed nervous system. Furthermore, separate chemo- and mechanosensory cells express specific receptors and exhibit discrete electrical activities to encode chemical and touch information, respectively. Indeed, we found octopuses exploration behavior involves stereotypical touch motions that are modified by CR terpenoid agonists. Thus, our results demonstrated that the peripherally-distributed octopus nervous system exhibits exceptional signal filtering properties that are mediated by highly specialized, sensory receptors. This work resulted in a first-author publication:

- **van Giesen, L**; Killian, P; Allard, CAH, Bellono, NW. Molecular Basis of Chemotactile Sensation in Octopus. **Cell**. October 29, 2020, (183) 594-604, doi.org/10.1016/j.cell.2020.09.008