Division of Natural System	Research field	Insect Molecular Biology	Lab. ID NS07
Laboratory web site	http://kiya.w3.kanazawa-u.ac.jp/		

Research subjects

Insects exhibit a variety of interesting biological phenomenon, such as metamorphosis and innate behaviors. Using the silkmoth (Bombyx mori), vinegar fly (Drosophila melanogaster), and honeybee (Apis mellifera), we are investigating molecular and genetic mechanisms of sexual behaviors of insects and interplay between hormone and behavior. The main research topics are as follows.

1. Visualization and manipulation of neural circuits that regulate sexual behavior in insect brains.
Insects communicate sexual information using species-specific sex pheromones. The actions of sex pheromones are well-investigated, but the neural mechanisms that regulate sexual behavior in response to sex pheromones are still elusive. Recently, we identified a novel immediate early gene (whose expression is upregulated by neural activity), Hr38, which is conserved in all insect species (Current Biology, 2013). By utilizing the neural activity-dependent transcriptional activity of Hr38, we are establishing a novel activity-mapping systems with gene-modifies insects, such as flies and silkmoths. Our final goal of this study is to understand how sensory information is calculated and integrated and how decision is made in the insect brains.

2. Novel actions of metamorphic hormones on brain functions.
Recent progress on insect molecular biology revealed that metamorphic hormones, such as ecdysone and juvenile hormone, have important actions on insect brain functions. Since Hr38, a novel immediate early gene identified by our group, is a type of ecdysteroid receptor, we are focusing on the functional importance of Hr38 and ecdysteroids on behavioral plasticity. Using the courtship learning of Drosophila and appetitive learning of honeybees, we are revealing how humoral factors and their receptors regulate behavioral and neural plasticities.

3. Sexual difference of insect brain function.
Insects exhibit a large difference in appearance between males and females. Not only the appearance but also the behavior is drastically distinct between the sexes. The sexual differences in behavior are most evident in the sexual behavior, where sexually dimorphic neural circuits play essential roles. By employing the silkmoth as a model organism, we are addressing the questions how sexually dimorphic brain function is produced and what neural circuits governs these behavioral differences. So far, we conducted a comprehensive screenings using subtraction, differential display, and microarray methods, and identified several genes that show sexually differential expression. Utilizing the latest technology, such as genome editing by TALEN and CRISPR/Cas9 systems, we are addressing the above questions.

Master/Doctor course: Education policy, curriculum, typical activity in the laboratory

Both Master and Doctor course students give presentations in the lab meeting. Twice per half year of progress reports and once per half year of journal club is regular schedule. Depending on the progress of research, conference presentation is possible. We request foreign students to have enough English skills (At least TOEFL＞85 /TOEIC＞800 /IELTS＞6.0). To obtain Ph.D., Doctor course students need to publish at least one paper in the international journals with citation index.

Daily life in the laboratory, etc.

Students need to be in the lab until 10AM on week days. Lab members are friendly and polite.
To obtain MEXT scholarship for PhD program, which is very competitive, candidates need to have at least two papers (including 1st author publications in Master deg. with impact factor) and high GPA score at least ＞3.0/4.0.

Message or comments by the laboratory faculty staffs

We welcome highly motivated students who are willing to work hard for interesting research and good publication. We like students who have playful mind to enjoy good science. Many alumni are working as academic professors at universites or researchl staffs in national and private instututes. Some alumni contribute to the society as public employees.

Recent Master theses in these 3 years (+ more if appropriate)

year.month	Thesis title (including English translation of Japanese thesis title)
2016.3	A novel immediate early gene, *Hr38*, facilitates formation of the long-term courtship memory in the vinegar fly, Drosophila melanogaster

2016.3	Visualization and manipulation of the neural circuit that respond to sex pheromones of silkmoth, Bombyx mori, using activity-dependent expression of a novel immediate early gene, Hr38
2015.3	Elucidation of neural circuits in Drosophila meranogaster by neural activity visualization and quantification
2015.3	Visualization and manipulation of neural circuits responsive to sex pheromone in the silkmoth, Bombyx mori
2014.3	Functional importance of Dhr38 on the long-term courtship memory in the vinegar fly, Drosophila melanogaster
2014.3	Establishment of transgenic silkmoths to visualize neural circuit of sexual behavior
2014.3	Ecdysteroid signaling facilitates the long-term memory formation in the brain of honeybee, Apis mellifera
Recent Doctoral theses in these 3 years (+ more if appropriate)	
year.month	Thesis title (including English translation of Japanese thesis title)
2012.3	Studies on the genes induced by ecdysteroid in the larval brain of the silkworm, *Bombyx mor*i.
2011.3	Studies on the regulation mechanism of sugar metabolism during the larval-pupal transition of the silkworm, *Bombyx mori*.
2010.9	Studies on the molecular structure, organization, and expression of novel bombyxin genes of the silkmoth *Bombyx mori*.
2010.9	Determinations of the active sites of yeast killer toxin HM-1 and the *Saccharomyces cerevisiae* genes involved in the killing action of HM-1.
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