



## Title of Project : Genetic Bases for the Evolution of Complex Adaptive Traits

Term of Project : FY2010-2014

Mitsuyasu Hasebe  
(National Institute of Natural Sciences,  
National Institute for Basic Biology, Professor )

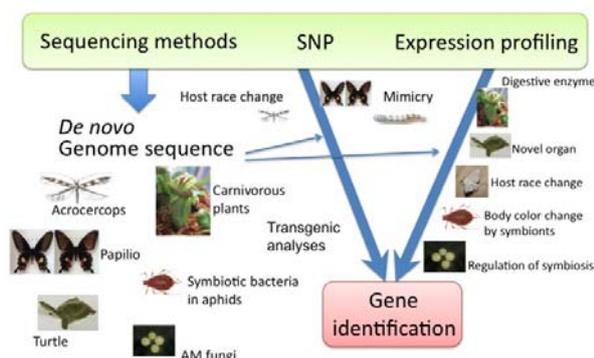
### 【Purpose of the Research Project】

The theory of natural selection and the neutral theory of molecular evolution are powerful concepts in evolutionary biology. However, even with such theories, there still remain unexplained phenomena, one of which is the evolution of complexity. It is difficult to explain the mechanisms needed to evolve complex adaptive traits, such as host race change, novel organ development, mimicry, symbiosis, among many more. Such traits comprise many components and become adaptive only when all components are gathered together. However, based on evolutionary theory, each component should evolve one by one according to the accumulation of mutations. Understanding the evolution of complex adaptive traits will be advanced by analyzing the genes regulating such traits comprehensively. Recent advancement of sequencing technologies enables to analyze genomes of non-model organisms, which add power to the evolutionary study. This project enhances the collaboration between evolutionary biologists and genome biologists and aims to reveal the genetic networks regulating the complex traits and to infer the mechanisms needed to evolve complex characters. Synthesis of results from different traits and organisms will give us insights on the new and general evolutionary theory.

### 【Content of the Research Project】

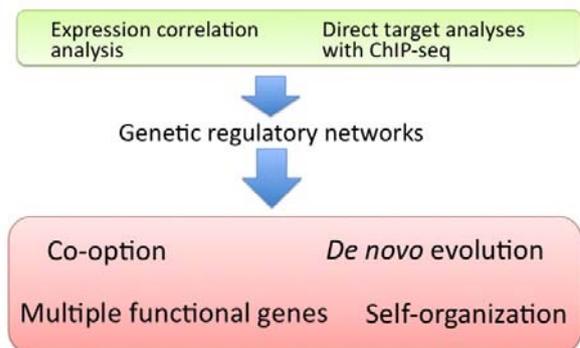
1. Identification of genes regulating complex characters based on genome analyses, SNP analyses, and expression profiling.

#### 1 : Identification of Responsible Genes

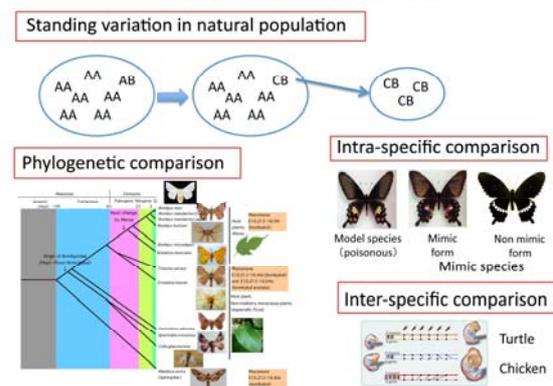


2. Analysis of genetic networks around the identified genes to infer evolutionary mechanisms.
3. Analysis of polymorphisms of the identified genes in wild populations and related species to infer evolutionary process.

#### 2 : Mechanisms of Evolution



#### 3 : Process of Evolution



### 【Expected Research Achievements】

We hope to explain the evolutionary mechanisms and processes of complex characters. Furthermore, this project will introduce a new genomic approach to the field of evolutionary biology.

### 【Key Words】

**Host race change:** Larvae able to eat a new host and female adults able to lay eggs on the same new host both have to evolve. Such simultaneous evolution should be difficult but is often observed in insect evolution.

### 【Homepage Address】

<http://staff.aist.go.jp/t-fukatsu/SGJHome.html>