

# Molecular Phylogeny and Next-Generation Sequencing

## Overview

Phylogenetic studies are critically important for understanding the rich and diversified flora and fauna of India, as a good understanding of the past helps effective planning for the future and conservation of biodiversity. Molecular phylogenetics is the branch of phylogeny that analyses hereditary molecular differences, mainly in DNA sequences, to gain information on an organism's evolutionary relationships. The result of a molecular phylogenetic analysis is expressed in a phylogenetic tree. Molecular phylogenetics is one aspect of molecular systematics, a broader term that also includes the use of molecular data in taxonomy and biogeography. With the advancement of sequencing technology, a large amounts of biological information in the form of DNA sequences (both Sanger as well as NGS) is available in public databases which contributes towards phylogenetic studies. Now a day's various labs are involved in generation of massive DNA sequence data, in various genetic diversity and phylogenetic studies but due to the lack of proper knowledge/training in molecular phylogenetics these data are often not analyzed appropriately.

The course would consist of lecture and practical sessions to familiarize students with the theory and practice of phylogenetic studies. Furthermore it will also provide a clear understanding about Next Generation Sequencing concepts and data analysis.

<b>Modules</b>	<b>Module: Theory and practice of molecular phylogenetics : 24 April to 04 May 2017</b> Number of participants for the course will be limited to fifteen.
<b>You Should Attend If...</b>	Students and Researchers from Universities, Research Institutions and government organizations including R&D laboratories.
<b>Fees</b>	The participation fees for taking the course is as follows: <b>Industry/ Research Organizations: ` 1000</b> <b>Academic Institutions: ` 500</b> The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, free internet facility. The participants will be provided with accommodation on payment basis.

## Course details

<b><u>Lecture 1:</u> Introduction to phylogenetics and tree building</b>	<b><u>Lecture 6:</u> Genetic variation in populations, gene trees</b>
<b><u>Lecture 2:</u> Molecular markers and homology</b>	<b><u>Tutorial 2:</u> DNA Sequencing and Analysis <i>Discussion of student research projects</i></b>
<b><u>Lecture 3:</u> Model-based phylogenetics</b>	<b><u>Lecture 7:</u> Next-generation sequencing for ecological and evolutionary research</b>
<b><u>Tutorial 1:</u> Working with phylogenetics programs: tree building</b>	<b><u>Lecture 8:</u> Biodiversity: macroecology and macroevolution</b>
<b><u>Lecture 4:</u> Species and speciation</b>	<b><u>Tutorial 3:</u> Genome assembly</b>
<b><u>Lecture 5:</u> DNA taxonomy and barcoding</b>	<b><i>Examination for students</i></b>

## Teaching Faculty



**Alfried Vogler** is Professor of Molecular Systematics at Imperial College and holds a joint appointment with the Natural History Museum. He leads a research group that links museum-type taxonomic research with novel molecular approaches, and was an early proponent of DNA taxonomy (barcoding) and more recently developed genomic methods for the study of biodiversity. He currently leads the NHM's Biodiversity Initiative, which conducts molecular biodiversity surveys in endangered ecosystems around the world. Prof. Vogler is the director of a long-standing Masters course in Taxonomy and Biodiversity, jointly taught at Imperial College and the NHM. He enjoys working closely with students in the laboratory, and he has been advisor to numerous PhD students and postdocs, who now lead academic labs of their own.



Wenqing Zhang is a Deputy Dean of School of Life Sciences at SunYat-sen University and holds a joint appointment as a Professor with the State Key Laboratory of Biocontrol. He leads a research group that links Biocontrol of agricultural insect pests, RNA interference (RNAi) in insects, Insect chitin metabolism and Insect reproduction and gustatory receptors research with novel molecular approaches, and was an early proponent of RNAi research and more recently developed transcriptomic and proteomic analyses for brown plant hopper in relation to insecticide resistance. He provided the first report of an miRNA-gene network that regulates chitin biosynthesis at the genome scale. Prof. Wenqing Zhang is the director of a long-standing Masters course in Principles and methods of biocontrol (for undergraduates) and Biostatistics (for graduates) taught at SunYat-sen University.



**N. Senthil Kumar**, Ph.D, is Professor in the Department of Biotechnology, Mizoram University with 14 years of teaching and research experience. His field of interest includes chemical ecology, molecular phylogeny, bioinformatics, and genetic control of insect pests. He is presently working on molecular variations using DNA markers and mutation analysis. During his post doctoral stint at Sun Yat-sen University, China he was involved in RNAi studies with chitin synthase gene. He has authored more than 50 research papers and he is investigator of various national research projects. He is a Fellow of the Royal Entomological Society, UK.



**G. Gurusubramanian** is Professor of Zoology, Mizoram University with over 21 years of experience in research and teaching of insect-plant-microbe interactions, chemical ecology, organic farming, IPM, molecular entomology, insect bioinformatics and DNA bar coding. He is the author of more than 110 research papers and coordinator of many national and international research projects. He worked for the Biologische Bundesanstalt für land & Forstwirtschaft, Institut für biologischen pflanzenschutz, Germany as a Humboldt fellow, evaluating the potentiality of biocontrol agents and biopesticides against insect pests and involved in international tea protection programmes, pesticide certification and molecular basis of Darjeeling tea flavour.

## Course Coordinator

Prof. N. Senthil Kumar

Department of Biotechnology,  
Mizoram University,  
Aizawl, Mizoram-796004, India.

Email: [nskmzu@gmail.com](mailto:nskmzu@gmail.com)  
Mobile: +91-9436352574

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<http://www.mzu.edu.in>