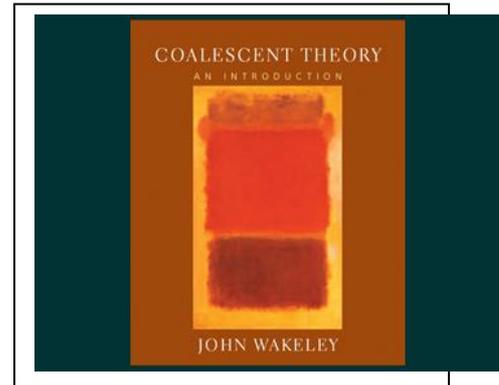# The coalescent: theory and applications

A course around "Coalescent theory – An introduction" by John Wakeley (Roberts & Co, Publishers)

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Spring 2015 (8 hp)

The coalescent is undoubtedly one of the main theoretical advances in population genetics and coalescent-based analyses have become the standard of the field. More recently, the coalescent has also started to make significant inroads in areas such as phylogenetics, phylogeography and the study of speciation. More generally, the coalescent is a wonderful conceptual tool and acquiring a good grasp of it, will help in understanding the basic properties and dynamics of populations.

John Wakeley's book is an extremely well written and rather concise introduction to the field and will serve as the backbone to the course. The course will be organized as a series of seminars (two 1-hour seminars/week) based on the chapters of the book. Each chapter discussion will begin with a short introduction by ML, SG and/or MJ on the core concepts of the chapter, which will be followed by a more detailed discussion. A student or a group of students will be assigned the leadership of the discussion, i.e. they will have to come up with their view of the chapter and a set of questions about it. When needed, the book chapters will be supplemented by articles. We have also invited guest lecturers to present aspects not covered in depth in the book, or to elaborate on important topics during three 2-days workshops. In particular, we will focus on recent important development in coalescent-based estimation methods and the application to the estimation of speciation parameters, which the book does not cover at any length. An increasing number of analysis tools for population genomics rely on coalescent theory and a solid foundation in this field will greatly aid students to understand these methods, and, potentially, allow them to develop their own analysis tools.

Venue: EBC
Form: biweekly 1.5-hour seminars, supplemented by three 2-days workshops
Evaluation: Take-home exam (likely coalescent based data analysis)
Start: February16, 2015

Schedule -- Unless indicated the lectures will be in room 1003, EBC, Norbyvägen 18D.

Schedule	Date		
Meeting 1	February 16 13:30	Chapter 1	Introduction ML
Meeting 2	February 18 13:30	Chapter 2, part 1	Probability theory SG
Meeting 3	February 23 13:30	Chapter 2, part 2	Probability theory SG
Meeting 4	February 25 13:30	Chapter 3, part 1	The Coalescent MJ
Meeting 5	March 2 14:00	Chapter 3, part 2	The Coalescent MJ
Meeting 6	March 4 13:30	Chapter 4, part 1	Neutral genetic variation ML
Meeting 7	March 9 13:30	Chapter 4, part 2	Neutral genetic variation ML
Meeting 8	March 11 13:30	Chapter 8, part 1	Simulations and inference SG
Meeting 9	March 16 13:30	Chapter 8, part 2	Simulations and inference SG
Workshop 1	March 24-25	ApproximateBayesian Computation	Daniel Wegmann, Univ Fribourg
Meeting 10	March 30 13:30	Chapter 5, part 1	Structured Coalescent PS
Meeting 11	April 1 13:30	Chapter 5, part 2	Structured Coalescent PS
	Easter break 2-7 April		
Meeting 12	April 13 13:30	Chapter 6, part 1	Separation of time scales ML
Meeting 13	April 15 13:30	Chapter 6, part 2	Separation of time scales ML
Workshop 2	April 20-21	Ancestral graphs and SMC	Asger Hobolth, Århus University
Meeting 14	April 23, 13:30	Chapter 7	Ancestral graphs, MJ
Workshop 3	May 11-12	The coalescent today	John Wakeley, Harvard University