

# Three examples of the EM algorithm

Week 12, Lecture 1

Statistics 246, Spring 2002

# The estimation of linkage from the offspring of selfed heterozygotes

R A Fisher and Bhai Balmukand,  
*Journal of Genetics* **20** 79-92 (1928)

See also:

*Collected Papers of R A Fisher*,  
Volume II, Paper 71, pp 285-298.

# The problem

In modern terminology, we have two linked bi-allelic loci, A and B say, with alleles A and a, and B and b, respectively, where A is dominant over a and B is dominant over b.

A double heterozygote  $AaBb$  will produce gametes of four types: AB, Ab, aB and ab.

Since the loci are linked, the types AB and ab will appear with a frequency different from that of Ab and aB, say  $1-r$  and  $r$ , respectively, in males, and  $1-r'$  and  $r'$  respectively in females.

Here we suppose that the parental origin of these heterozygotes is from the mating  $AABB \times aabb$ , so that  $r$  and  $r'$  are the male and female recombination rates between the two loci.

The problem is to estimate  $r$  and  $r'$ , if possible, from the offspring of selfed double heterozygotes.