

**Genetics 320 Problem Set Eight**  
**Due Friday, 16 November**

(1) [ 4 points] You are using marker loci to look for a linked QTL and have a single large full-sib family. Three marker loci are considered, A, B, and C. The father has genotype  $A_1A_2B_1B_2C_2C_2$ , while the mother is  $A_3A_2B_1B_2C_1C_1$ .

(a) Can all of these markers can be used to detect potential linkage? If some loci cannot be used, why is this so? **Marker locis C in father, Marker locus C in mother ---- both maker homozygote, hence no linkage information**

(b) Suppose the mean value of the trait of interest in the offspring genotyped for marker A are as follows:

$A_1A_3$  15,  $A_1A_2$  25,  $A_2A_2$  45,  $A_2A_3$  55.

Is there evidence that the marker is linked to a QTL? If a QTL found, is it segregating (i.e., a heterozygote) in the father? The Mother? Both?

$A_1$  (father) =  $(15+25)/2 = 20$

$A_2$  (father) =  $(45+55)/2 = 40$

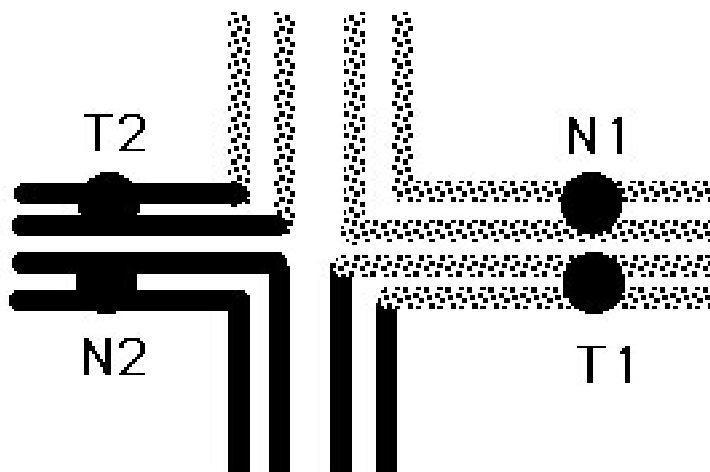
**QTL linked to marker A segregating in Dad**

$A_3$  (mom) =  $(15+55)/2 = 35$

$A_2$  (mon) =  $(25+45)/2 = 35$

**The QTL linked to Makrer A (we know this from dad) is not segregating in mom**

(2) [ 3 points ] Looking under a microscope, you observe the following structure at meiosis. Chromosome two stains black, while chromosome one stains stippled.



(a) What structural change in the chromosomes causes this feature?

**translocation**

(b) Is this individual a heterozygote or a homozygote (for this chromosomal feature)?

**heterozygote**

(c) If centromeres T2 and N1 go to one cell, is the gamete normal or aneuploid? Why?

**Aneuplid -- missing part of 2, duplication of parts of 1**

(d) If centromere T2 and T1 go to one cell, is the gamete normal or aneuploid? Why?

**Normal -- contains all of chromosome 1 and 2 information in both gametes**

**(3) [ 3 points ]** Sun devils, although diploid, have a different chromosome set from humans (which may account for their long list of undesirable phenotypes). The basic sun devil set is 20 pairs of autosomes and one pair of sex chromosomes.

(a) What is  $2n$ ? **42**

(b) How many chromosomes are in a trisomic sun devil? **43**

(c) How many chromosomes in a monosomic sun devil? **41**

(d) How many chromosomes in a tetraploid sun devil? **84**