Question 9 answers (2000)
HARDY-WEINBERG CALCULATIONS:

Kingston Peak		aa	Aa	AA	Total
O		52	39	12	103.0000
p(A)=	0.3058				
p(a)=	0.6942				
Sum(check)	1				
Genotypic frequencies		0.4819	0.4246	0.0935	
E		49.6335	43.7330	9.6335	103.0000
X^2		0.1128	0.5122	0.5813	1.2064
O/E		1.0477	0.8918	1.2457	total chi^2 (P>0.05, not Significant)
Relative fitnesses, standardized		1.1748	1	1.3968	
Selection coefficients		-0.1748		-0.3968	
Het Adv equilibrium p		0.3058			

Charleston Peak		aa	Aa	AA	Total
O		102	21	5	128.0000
p(A)=	0.1211				
p(a)=	0.8789				
Sum(check)	1				
Genotypic frequencies		0.7725	0.2129	0.0147	
E		98.8770	27.2461	1.8770	128.0000
X^2		0.0986	1.4319	5.1964	6.7270
O/E		1.0316	0.7708	2.6639	total chi^2 (P<0.01
Relative fitnesses, standardized		1.3384	1	3.4562	
Selection coefficients		-0.3384		-2.4562	
Het Adv equilibrium p		0.1211			

d) Deviation at Charleston Peak, but not at Kingston Peak. At Charleston, heterozygote deficit, and also at Kingston, but not significant there. Suggests maybe inbreeding locally, or selection against heterozygotes. This is significant only at Charleston, where s = - 0.17, and t = - 0.40.

e) There is evidence for extensive gene flow (iii) between the sites, and the available population size data (i), which suggests large effective population size, means that the local inbreeding and a Wahlund effect is extremely unlikely. The available evidence that strong selection may cause the strong inversion frequency differences between sites, i.e. arrowhead 0.31 vs. 0.12 (ii), with possibly gene flow leading to an excess of homozygotes in the population (see d, above). The experiments by Dobzhansky (iv) suggest that there ought to be heterozygous advantage, but this does not seem to occur in the wild, of if it does, it is outweighed by gene flow between the sites.

Experiment: Find out what the local temperature on the two mountain peaks is, and see if the conditions can be recreated in the laboratory. Then subject replicate populations from each site, and also hybrids between them, to the same environmental conditions, and see whether the frequencies from all populations stabilize near the frequency expected for the temperature. If so, this supports the temperature explanation; if not, then genetic differences, perhaps wrapped up in the inversion itself (which acts as a crossover suppressor) explains the differences between the populations.