EEB 600A FINAL

- This is an open-book exam

- Please note the time limits for each question (honor system)
  These limits are to make sure you don't overly stress on the questions

- You can do the questions in any order and at any time

- PLEASE ANSWER EACH QUESTION ON A **SEPARATE SHEET** !

• **Exams due at noon on Wes 21 May**. You can return them to my mailbox in the main EEB office (3rd floor of BSW). If you are not an EEB student, please put your campus mailing address on the exam and we will return them to you.

(1) Bruce Walsh (time limit 1 hour)

You are measuring fitness components in a frog species that lives in the desert. You follow ten males and observe three fitness components: W_1 whether they survive the winter, W_2 = the number of success matings in the spring, and W_3 = average number of eggs resulting from each mating. You are also measuring snout-vent (SV) length. The data are as follows

Male	Survive?	# mates	total # eggs	SV length
1	No			25
2	No			30
3	No			33
4	No			30
5	No			40
6	No			50
7	Yes	0		45
8	Yes	1	200	40
9	Yes	2	300	50
10	Yes	2	500	55

For this data compute:

(i) I, the opportunity for selection following these three episodes of selection (i.e., using the total number of eggs produced by each male)

(ii) The mean fitness for each of the three episodes of selection

(iii) The fitness-weighted mean SV length after each episode of selection

(iv) The selection differentials associated with each episode of selection.

Hint: Using something like an Excel spread sheet program makes this very quick.

(2) Nancy Moran (time limit 1 hour)

What has been the primary impact of studies of molecular divergences of modern taxa for dating major events in the ancestry of life? Please include mention of at least 3 specific studies in your answer. Also, what are possible explanations for the discrepancies between molecular studies and paleontological studies? (limit 2 pages or less)

(3) Bruce Walsh (time limit 1 hour)

You are measuring two traits. z_1 and z_2. The phenotypic variances and covariances are observed to be $Var(z_1) = 10$, $Var(z_2) = 20$, $Cov(z_1,z_2) = -8$
Likewise, the midparent-offspring regression for trait 1 has a slope of 0.5, and 0.7 for trait 2. The regression of trait 1 in the offspring on trait 2 in the midparents has a slope of 0.3.

(i) What are the additive genetic variances for both traits?

(ii) What is the additive genetic covariance between traits?

(iii) Suppose after selection we observe an increase of 2 in trait 1 ($S_1 = 2$) and a decrease of -6 in trait 2 ($S_2 = -6$). Computer β. What is the true nature of selection on both traits?

(iv) What is the expected response to selection (i.e., by how much do the two means change after one generation of selection?)

(v) What is the predicted change in mean for each character if we treated them as independent univariate traits (i.e., $R_i = h^2_i \ S_i$)?