**2.4 – Introducing generalized linear mixed models**

Exercise for afternoon session:

*Goal*: Students should be able to demonstrate the importance of accounting for unmeasured covariates in a regression analysis.

*Task:* Please develop code using R and JAGS that conducts a simulation experiment. This experiments involves a single scenario, and fitting with a model that either includes or excludes additional “random” variation:

1. Modify code from Example #2 of the 2.4 afternoon session, to estimate a covariate that affects the logarithm of expected density for each sample, while also including additional “random” variation among sites. I will call this the “Overdispersion model”.
2. Modify code from from Step 2 to remove the “random” variation (i.e., using a GLM), but still including the covariate. I will call this the “null model”.
3. Use the function “Sim\_Fn” to simulate a data set with 100 samples.
4. Fit the “Overdispersion model” and “null model” to this simulated data set. For each model, record the estimated coefficient for the covariate, and the 80% credible interval. Also record the true value of the covariate.
5. Repeat steps 3-4 one-hundred times.

Please evaluate model performance using the following techniques:

* Plot the range of estimates of the mean parameter, and compare this with the true mean.
* Calculate the proportion of replicates for which the true mean was within the 80% credible interval.

*Interpretation*: Students should think about the following questions:

* How else might you model additional variance, besides the overdispersion in the “Overdispersion model”?
* What processes might cause sampling data to have greater variance than assumed by the Poisson distribution