### Today

- Questions from homework?
- Coding an MCMC algorithm
- An example to work on

# Rosenbluth algorithm aka Metropolis-Hastings

```
Algorithm (original)
for many iterations

propose new value for parameter:

draw Unif(-max_d, max_d)

proposal = current parameter + draw

calculate the probability of accepting the proposal:

P_accept = min(Pr(proposal) / Pr(current), 1)

accept proposal randomly with Bern(P_accept)

plot posterior distribution (histogram) of parameter values
```

where Pr() = prior x likelihood

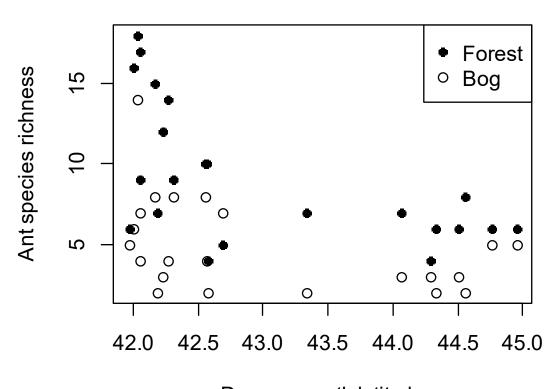
#### Where are we at?

- Frequentist
  - sampling distribution, SSQ, Im, optim
- Likelihood
  - the likelihood, MLE via optim, likelihood ratios
- Bayesian
  - posterior distribution, prior, MCMC, sampost, ulam, rstanarm
- Simple linear model

## Where are we going?

- GLM
  - glm, stan\_glm
- GLMM
  - multilevel models, glmer, stan\_glmer
- Prediction
  - cross-validation, AIC
  - segue to machine learning

### Dataset to analyze



Degrees north latitude

#### Scientific questions:

How different is species richness between habitats?

How does species richness vary with latitude?

Is this relationship different between habitats?