STATISTICAL RETHINKING 2022
WEEK 4

You can use MCMC to solve these problems, if you like. But it's not required.

1. Revisit the marriage, age, and happiness collider bias example from Chapter 6. Run models `m6.9` and `m6.10` again (pages 178–179). Compare these two models using both PSIS and WAIC. Which model is expected to make better predictions, according to these criteria? On the basis of the causal model, how should you interpret the parameter estimates from the model preferred by PSIS and WAIC?

2. Reconsider the urban fox analysis from last week's homework. On the basis of PSIS and WAIC scores, which combination of variables best predicts body weight (W, `weight`)? How would you interpret the estimates from the best scoring model?

3. Build a predictive model of the relationship show on the cover of the book, the relationship between the timing of cherry blossoms and March temperature in the same year. The data are found in `data(cherry_blossoms)`. Consider at least two functions to predict `doy` with `temp`. Compare them with PSIS or WAIC.

Suppose March temperatures reach 9 degrees by the year 2050. What does your best model predict for the predictive distribution of the day-in-year that the cherry trees will blossom?

4-OPTIONAL CHALLENGE. The data in `data(Dinosaurs)` are body mass estimates at different estimated ages for six different dinosaur species. See `?Dinosaurs` for more details. Choose one or more of these species (at least one, but as many as you like) and model its growth. To be precise: Make a predictive model of body mass using age as a predictor. Consider two or more model types for the function relating age to body mass and score each using PSIS and WAIC.

Which model do you think is best, on predictive grounds? On scientific grounds? If your answers to these questions differ, why?

This is a challenging exercise, because the data are so scarce. But it is also a realistic example, because people publish *Nature* papers with even less data. So do your best, and I look forward to seeing your growth curves.