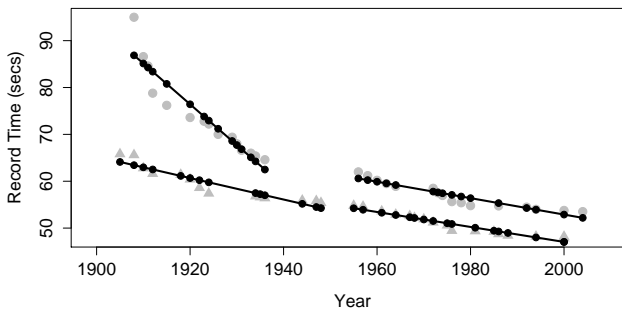


## Elab 4.10

[f2007/f2007-152]

It's possible to have interaction terms that involve more than two variables. To illustrate look at the swimming record data. The model that included an interaction term between year and sex (see page ??) produced lines with two different slopes. Now consider a third term, the transform term that is "yes" when the year is larger than 1948 and "no" when the year is 1948 or earlier. Call this variable "post-war," since World War II ended in 1945 and the Olympic games resumed in 1948. This can be interpreted to represent the systematic changes that occurred after the war.

Here is the model of the swimming record data that includes an intercept term, main terms for year, sex, and post-war, and interaction terms among all of those: a three-way interaction.



The two-way interaction term between sex and year allowed there to be differently sloping lines for men and women. The three-way interaction term among sex, year, and post-war allows even more flexibility; the difference between slopes for men and women can be different before and after the war. You can see this from the graph. Before 1948, men's and women's slopes are very different. After the war the slopes are almost the same.

Explain how this graph gives support for the following interpretation: Before the war, women's participation in competitive sports was rapidly increasing. As more women became involved in swimming, records were rapidly beaten. After the war, both women and men had high levels of participation and so new records were the result of better methods of training. Those methods apply equally to men and women and so records are improving at about the same rate for both sexes. [Enter Text](#) [Elab 4.10-1](#)