Souvenir E: An Array of Questions, Problems, Models

> It is a fundamental contribution of modern mathematical statistics to have recognized the explicit need of a model in analyzing the significance of experimental data. (Suppes 1969, p. 33)

Our framework cannot abide by oversimplifications of accounts that blur statistical hypotheses and research claims, that ignore assumptions of data or limit the entry of background information to any one portal or any one form. So what do we do if we're trying to set out the problems of statistical inference? I appeal to a general account (Mayo 1996) that builds on Patrick Suppes' (1969) idea of a hierarchy of models between models of data, experiment, and theory. Trying to cash out a full-blown picture of inquiry that purports to represent all
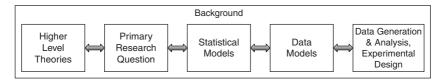
Figure 2.1 Array of questions, problems, models.

contexts of inquiry is a fool's errand. Or so I discovered after many years of trying. If one is not to land in a Rube Goldberg mess of arrows and boxes, only to discover it's not pertinent to every inquiry, it's best to settle for pigeonholes roomy enough to organize the interconnected pieces of a given inquiry as in Figure 2.1.

Loosely, there's an inferential move from the data model to the primary claim or question via the statistical test or inference model. Secondary questions include a variety of inferences involved in generating and probing conjectured answers to the primary question. A sample: How might we break down a problem into one or more local questions that can be probed with reasonable severity? How should we generate and model raw data, put them in canonical form, and check their assumptions? Remember, we are using "tests" to encompass probing any claim, including estimates. It's standard to distinguish "confirmatory" and "exploratory" contexts, but each is still an inferential or learning problem, although criteria for judging the solutions differ. In explorations, we may simply wish to infer that a model is worth developing further, that another is wildly off target.