titative relationships which can then be applied to the system. Therefore, the model must be constructed so that there is a known correspondence between model values and system values. Generally, one is the same or proportional to the other. For example, if a map is a visual model of a certain piece of terrain, distances on the map are proportional to distances on the terrain. The corresponding angles have the same value.

Models are ordinarily classified as "visual," "analog," or "symbolic." Of course, these classifications are not rigid, and several may apply to a given model at the same time. Navigation charts and house floor plans are examples of visual models. You will note that both are much simpler than the things they represent, containing only significant alements of the original, and none of the unessential details. At the same time, they are useful; the charts help the mariner steer from one buoy to the next, even though he's often unable to see more than one buoy at a time. The floor plan helps the architect detect and correct faults in the house layout before starting construction.

A common analog model is the electrical network, which is used to represent mechanical and waterflow systems. The kind of model that has been especially valuable in the study of complex systems is the symbolic model which is composed of mathematical and logical relationships. An example of such a model is one that is used in the engineering design of bridges. I believe Dr. Davidson mentioned this the other day. It is made up of a number of theoretical and empirical relationships involving the mechanics of materials stress analysis and vibration analysis.

With the aid of these mathematical representations bridge structures can be designed quickly and cheaply. Another example of a symbolic model is the computer simulation which has made possible the analysis of complex systems that could not ordinarily be analyzed prior to the development of high-speed digital computers.