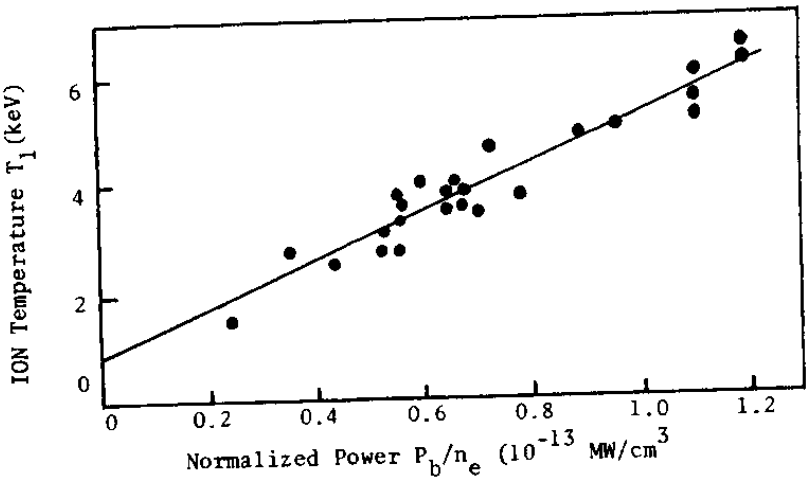
1. THE BASIC PROBLEM

1.1 Introduction

Have you ever read an article in Scientific American, Physics Today, Science or other periodical, and come across a picture like this one:



(Source: Murakami, M., and Eubank, H.P., "Recent progress in tokamak experiments," Physics Today 32 (1979), #5, p.30.)

Some experiment has been performed to determine how one quantity, ion temperature, depends on another quantity, normalized power. The results of the experiment are indicated by the dots in the picture. Then someone has drawn in the curve which "best fits" these data points. Perhaps the equation for the curve has been determined.

Did you wonder how they knew where to draw the curve? How can the equation for the curve be determined? Sometimes it is not obvious what type of curve to draw. Should it be a straight line, a parabola, a log curve, or some other type? Among all curves of the same type, which one gives the best fit? What is meant by "best fit" anyway?

In this unit and its sequel, Unit 434, we shall consider the problem of fitting a curve to data. We shall take for our measure of goodness of fit the most common one--the least-squares criterion. In this unit, you will learn how to fit a line to data and how to tell if the fit is a good one. In the sequel, you will learn how to fit other common curves, using the computer.

The four examples that follow illustrate the purposes and process of curve fitting. You need not understand all the technical language.