a sigmoidal curve, which goes to zero as the explanatory variable x goes to $-\infty$ and increases to one as $x \to \infty$. The fitted curve in Figure 8.9 is based on the following statistical model: for the i-th value of light intensity we let Y_i be the number of light flashes on which the subject perceives light and then take

$$Y_i \sim B(n_i, p_i) \tag{8.42}$$

$$p_i = \frac{\exp(\beta_0 + \beta_1 x_i)}{1 + \exp(\beta_0 + \beta_1 x_i)}. \tag{8.43}$$

This is known as the *logistic regression model*. There are many possible approaches to estimating the parameter vector $\theta = (\beta_0, \beta_1)$ but the usual solution is to apply maximum likelihood. The observed information matrix is then used to get standard errors of the coefficients. These calculations are performed by most statistical software packages. For the data in Figure 8.9 we obtained $\hat{\beta}_0 = -20.5 \pm 2.4$ and $\hat{\beta}_1 = 10.7 \pm 1.2$. Further discussion of logistic regression, and interpretation of this result, are given in Section 14.1. □