similarity between (a) and (b) : large probability of small spacings and occurrence of some large spacings. On the contrary, (c) (d) and (e) show small probability of small and large spacings, the small probability of small spacings being usually referred to in the literature as the phenomenon of level repulsion. The spectrum (c), (d) and (e) deviate from (f) less strongly than (a) and (b). The picket fence (f) is a spectrum that we may qualify as absolutely rigid, in the sense that there is no departure at all from uniformity. Once the position of one level $X_i$ is known, the position of any other level is determined, no matter how far it is from $X_i$. For this system the correlations between spacings are maximum and it shows perfect short and long range order. At the opposite extreme, the Poisson spectrum contains no correlations between spacings : the knowledge of a stretch of the spectrum puts no restriction on the behaviour of the spectrum beyond the interval considered (this is of course true irrespective of the form of the function $P(\lambda)$ chosen in Eq.(1-30)). In intermediate situations between Poisson and the picket fence the degree of the spectral rigidity will depend on the nature and strength of the correlations between spacings.

Although this topic will be treated in greater detail in the next Section, let us already give some examples of characterization of fluctuation properties. We have mentioned before the spacing distribution $P(\lambda)$ between adjacent levels. Let us reproduce a simple heuristic argument due to Wigner [Wi-56] that illustrates the presence or absence of level repulsion. Consider the probability $p(x)dx$ that, given a level at $x_o$, the next level is in the small interval $dl = [x_o+x, x_o+x+dx]$ (see Fig. 1.9). It can be represented as the product of two factors

$$p(x)dx = Pr \text{ (one level in } dl/ \text{ no level in } I) \times Pr \text{ (no level in } I)$$

(1-31)

where $Pr$ means probability and $Pr(a/b)$ is the conditional probability of having a if b