means perfect (black body) absorption.*

Let us solve a typical problem. We shall calculate the albedo of an infinite plane surface for slow neutrons. But first it will be necessary to solve the following problem: "Given a medium bounded at $x = 0$ and occupying all of space to the right of this plane, what is the probability that a slow neutron starting at a point d units distant from $x = 0$ will escape from the medium, i.e., will reach $x = 0$?"

We shall do this problem twice, using two very different approaches. First, we shall use the slow neutron diffusion equation and assume that the problem is one dimensional, i.e., that the neutrons move only in the x direction. The second method will involve the solution of an integral equation.

Assume a point source of neutrons at $x = d$ on the x axis. We must calculate the flux at the origin for unit source strength. This is precisely the escape probability, since the boundary of the medium is at the origin. The slow neutron diffusion equation is in this case:

$$\nabla^2 n - \frac{n}{L^2} = 0$$

(everywhere but at $x = d$), and since this is a one-dimensional problem, the solution is:

$$n = Ae^{-x/L} - Ae^{+x/L}$$

for $0 \leq x < d$, assuming the boundary condition $n(x = 0) = 0$. For $x > d$, $n = Be^{-x/L}$. These two solutions must join at $x = d$ (see Figure 45) so that n is continuous and the gradient dn/dx

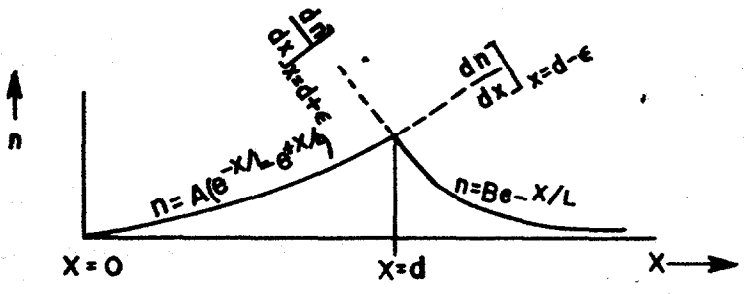

Figure 45. Joining solutions at discontinuity.

has a finite discontinuity. To find the amount of this discontinuity, integrate the complete diffusion equation (7-3) throughout a small "volume" surrounding the source:

$$\int_{d-\epsilon}^{d+\epsilon} \left[\frac{d^2n}{dx^2} - \frac{n}{L^2}\right] dx = -\int_{d-\epsilon}^{d+\epsilon} \frac{q}{D}\, dx$$

The first term is $[dn/dx]_{d-\epsilon}^{d+\epsilon}$, the discontinuity in dn/dx. The second term vanishes as $\epsilon \to 0$, for n must, for physical reasons, be a continuous function of x. The last term is simply

*See Fermi's paper on the motion of neutrons in hydrogenous substances in Ricerca Sci. 7:13 (1936).

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