$-Q/D$ where Q is the source strength at $x = d$ and D is the diffusion coefficient $\lambda_t v/3$. Thus, the conditions on n and dn/dx at d are:

$$\text{(Continuity of n)} \quad Ae^{-d/L} - Ae^{+d/L} = Be^{-d/L}$$

$$\text{(Discontinuity of } -Q/D \text{ in dn/dx)} \quad -(A/L)e^{-d/L} - (A/L)e^{+d/L} = -(B/L)e^{-d/L} + (Q/D)$$

Hence $A = -LQe^{-d/L}/2D$ and $B = LQ(1 - e^{-2d/L})$.

The flux at $x = 0$ is then $D\,(dn/dx)_{x=0} = Qe^{-d/L}$, and for unit source strength it is simply $e^{-d/L}$. This gives the probability, p (d), that a slow neutron at a distance d from bounding surface will eventually escape from the medium.

Before we use this result to find the albedo of such a one-dimensional medium for neutrons incident on the boundary from the outside, let us do the problem in another way. In addition to the methods of diffusion, there is a more exact and rigorous way to attack problems of the type being discussed. To find the neutron density in a particular volume V at a time t, one could investigate the density of neutrons that are moving toward V and are in the other volumes at various earlier times t' so that (considering their velocities and distances from V) they would be in V at the time t. The neutron density at V at the time t could be expressed as some sort of sum or integral of these other neutron densities. We would be led to an integral equation in the neutron density n.

Thus in addition to the differential equation method of solving diffusion problems, there is an integral equation method, too. It would be well to stop a moment and compare the relative merits of the two approaches. In setting up the diffusion differential equation, it had to be assumed the quantities such as n, dn/dx, etc. vary slowly with respect to the mean free path of the diffusing particles. Further, it was assumed that densities of particles were large enough so that speaking of quantities such as dn/dx made sense. In particular, one would not expect that the solution of a problem like the following by diffusion methods would give physically true results: "Find $n(r, \theta, \phi)$, the density of slow neutrons in a sphere of radius $\lambda/2$, if there is a point slow neutron source at the center of the sphere and λ is the mean free path of slow neutrons in the medium of the sphere." There are, however, no such restrictions on the use of integral equation methods. No assumptions about the variation of dn/dx with distance, etc., need be made. Integral equation methods are more general and usually more difficult. It often becomes expedient to do diffusion problems by means of differential equations and proper boundary conditions first in order to get a rough idea about the function in question. Then the more exact solution can be obtained by means of an integral equation. This is the procedure we shall follow here. We have obtained $p(d)$, the probability that a neutron d units from the boundary of a one-dimensional medium will escape it, by means of the diffusion differential equation. Let us now apply integral methods.

Consider a neutron at d. As it leaves d, one of two things may occur. It may go to the left (toward the boundary), or it may go to the right, each with a 50% chance. If it goes to the left, it may escape before it suffers a collision, or it may experience a collision. The probability that a neutron at d will escape without a collision is, therefore, the product $(1/2) \times e^{-d/\lambda}$, where λ is the mean free path between collisions (mfp for scattering when $\sigma_s >> \sigma_a$). However, a neutron may escape even if it suffers a collision. Suppose the neutron suffers its first collision

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