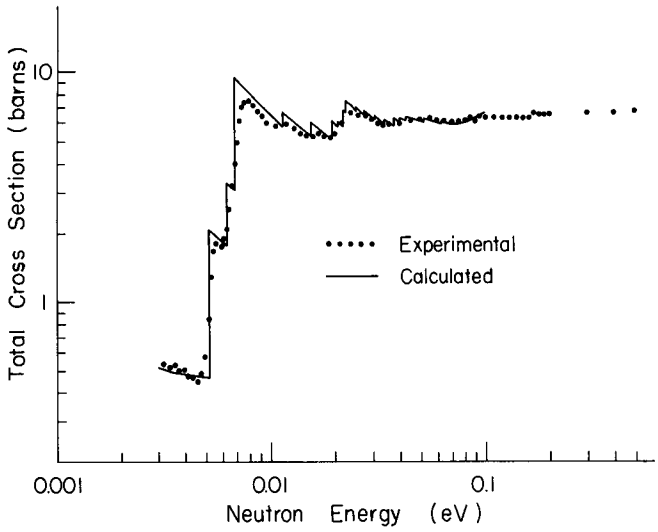

Fig. 1. Total neutron cross section for beryllium metal measured at room temperature.

small that the block may be in a perfect polycrystalline state. Therefore, the experimental value of λ_{II} will be nearly equal to the calculated one, and the present slope of the λ_K curve seems to be correct.

The second comment concerns the conception of the pseudomode. We recognize the existence of the pseudomode in which the pulsed neutron flux apparently decays exponentially. For instance, there is some region where the instantaneous decay constant becomes constant, as shown in Fig. 7 of Ref. 1, except for the case of the 15- × 15- × 15-cm assembly. In such a small assembly, however, the region where the instantaneous decay constant becomes constant vanishes. In this case, the conception of a pseudomode becomes uncertain. Therefore, we feel the concept of a pseudomode is a convenience for explaining some experimental results. It has physical meaning only when certain experimental conditions are satisfied.

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Comments on the Electron-Photon Transport by the Discrete Ordinates Method

In a recent article by Bartine et al.,[1] the promising idea of treating electron transport by the discrete ordinates method was developed. As we have been using a similar approach in attacking the problem, perhaps the following suggestions concerning several items in their procedure, based on our direct experience, can help improve the agreement between S_N calculation and experiment:

1. In many practical problems of electron transport, especially dosimetric ones, overall energy conservation (and energy deposition) would be of primary concern. In the standard treatment of energy group structure and cross-section averaging followed by Bartine et al. (Ref. 2, pp. 15-16), conservation of particle number and "activation rates" is emphasized, with damage for energy conservation. We see this to be a real handicap in the present electron transport method.

2. The cutoff concept at the low-frequency limit of bremsstrahlung is best understood by including both elastic and radiative electron-nucleus processes in the so-called "electron scattering without atomic or nuclear excitation," reviewed by Motz et al.[3] According to this interpretation, the lower the cutoff value chosen, the larger the reduction ("soft-photon correction factor") needed in the "quasi-elastic" scattering cross section (Mott-Moliere or Rutherford formulas). Specifically, the cutoff value of 10^{-4} MeV used in the work of Bartine et al. (Ref. 1, Sec. III.C.) would need the approximate reductions in the "elastic" scattering formula, shown in Table I. This effect is especially important with increasing Z and energy; perhaps it could be responsible, in part, for the tendency to lateral shifting noticed when comparing calculation with experiment in the (aluminum, 2.5 MeV) and (gold, 1 MeV) cases of Bartine et al.

TABLE I

Approximate Reduction in the "Elastic" Scattering Formula

Initial Electron Energy (MeV)	Scattering Angle (deg)		
	45	90	135
2.5	8.5%	13%	15%
10	18%	23%	25%

TABLE II

Sequence of Legendre Coefficients for a Typical Case

L	A_L (Legendre Coefficients)		
	Normal	P-7 Correction	P-10 Correction
0	1	1.54 E-4	2.84 E-4
1	0.999 993	1.47 E-4	2.77 E-4
4	0.999 940	0.94 E-4	2.24 E-4
7	0.999 846	0	1.30 E-4
10	0.999 716	0	0
20	0.999 055	0	0

[1] D. E. BARTINE et al., *Nucl. Sci. Eng.*, **48**, 159 (1972).

[2] D. E. BARTINE et al., "Low-Energy Electron Transport by the Method of Discrete Ordinates," ORNL-TM-3438, Oak Ridge National Laboratory (1971).

[3] J. W. MOTZ et al., *Rev. Mod. Phys.*, **36**, 881 (1964).

3. In Sec. II of Ref. 1, Bartine et al. state that, although small-angle soft collisions are so numerous in electron scattering (while not in neutron scattering), a program like ANISN is quite adequate for electron transport if the multigroup "multitable" cross sections are determined with more or less the following procedure: energy degradation is "normalized" to stopping power and the angular distribution is reduced to Legendre coefficients using the δ-function correction technique. Certainly we agree with the first point but not with the second, indicating that the numerous slight deflections in electron single-scattering by both nuclei and electrons need a different (more sophisticated) treatment. In fact, as shown in Table II for a typical case ("elastic" scattering for $Z = 10$, $A = 20$, $T = 10$ MeV), the sequence of Legendre coefficients, A_L, decreases very slowly with L but nonetheless does decrease. However, the technique of N-level δ-function correction is based on the assumption that A_L remains constant for $L \geq N$, hardly valid here for reasonable values of N; then it happens that the $P-7$ correction, used in the subject work, gives cross sections quite different from those obtained by, for example, a $P-10$ correction (a shift in the forward direction).

Therefore, it seems that, at least in cases of high heterogeneity in materials or in the electron source, angular and spatial fluxes obtained with the present method could be rather inexact.

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