Letters to the Editor

Comments on "Measurements of Anisotropic Neutron Diffusion Coefficients in Square Lattices of Aluminum in Light Water by the Pulsed Neutron Method"

In a recent Note, Kaneko et al.[1] attribute to me[2] the prediction that the discrete-time eigenvalue cannot exceed the limit of $(\nu\Sigma)_{min}$ of the materials constituting the heterogeneous system.

I must make it clear that in my *Nukleonik* paper no such statement is made. In fact, the paper deals with the diffusion length experiment and predicts that the spatial decay constant in a heterogeneous system is bounded by Σ_{min}. The origin of the time-dependent analog of my result is difficult to trace, but certainly it is evident in the work of Grosshög,[3] Dance and Connolly,[4] and Sjöstrand and Grosshög[5] and, therefore, it is to the work of these authors that reference should have been made by Kaneko et al.

Let me emphasize that this Letter is in no way intended as a criticism of the scientific merit of the paper under discussion, but is simply an effort to set the record straight regarding the role of $(\nu\Sigma)_{min}$ in heterogeneous systems.

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October 17, 1974

[1]YOSHIHIKO KANEKO, FUJIYOSHI AKINO, YOSHIRO SUZUOKI, KENJI KITADATE, RYOSUKE KUROKAWA, and KINJI KOYAMA, *Nucl. Sci. Eng.*, **55**, 105 (1974).

[2]M. M. R. WILLIAMS, *Nukleonik*, **12**, 129 (1969).

[3]G. GROSSHÖG, *J. Nucl. Energy*, **24**, 101 (1970).

[4]K. D. DANCE and T. J. CONNOLLY, *J. Nucl. Energy*, **25**, 155 (1971).

[5]N. G. SJÖSTRAND and G. GROSSHÖG, *Proc. Fourth Conf. Peaceful Uses At. Energy*, **7**, 53 (1971).

Comments on "On the Randomness of a Neutron's Kinetic Energy as It Slows Down by Elastic Collisions in an Infinite Medium"

In a recent Note, Barnett[1] considered some problems concerning the slowing down of neutrons in an infinite nonabsorbing medium; he employed the language and the methods of probability theory as an alternative to the procedures typical of transport theory. The purpose of this Letter is to show that Barnett's results can be obtained directly from the appropriate form of the transport equation.

It is my belief that all contributions to a cross-fertilization among the fields of nonequilibrium statistical mechanics, probability theory, and neutron transport theory are very useful. However, in the specific case of Ref. 1, it appears that the interesting features inherent in establishing a connection between transport theory and probability theory can be somewhat hindered by the computational intricacies in which the probability theoretical approach seems to be entangled. Finally, it may be worth mentioning that a debate concerning issues related to those considered here has appeared recently, following a previous Note by Barnett.[2-6]

THE NOTATION

Retaining Barnett's notation we let

$A \triangleq$ scattering mass of nucleus in neutron mass units $(A \geq 1)$

$\alpha \triangleq \left(\frac{A-1}{A+2}\right)^2$, so that $0 \leq \alpha < 1$

$\beta \triangleq -\log(\alpha)$

$H(x) \triangleq \begin{cases} 1 & \text{for } x \geq 0 \\ 0 & \text{for } x < 0 \end{cases}$

$I_{(b,c)}(x) \triangleq H(x-b) - H(x-c)$, for $b < c$

$Q_n \triangleq$ kinetic energy of neutron during n'th flight

$Q_{max} \triangleq$ maximum kinetic energy of injected neutrons

$u_n \triangleq \log(Q_{max}/Q_n)$ = lethargy during n'th flight

$E[\ldots] \triangleq$ expectation value of the random variable $[\ldots]$

$P[\ldots] \triangleq$ probability that $[\ldots]$ is true

$M(u) \triangleq$ number of collisions at which the neutron's lethargy crosses the value u.

Furthermore, we employ the following notation, which differs from Barnett's:

$p_n(u) \triangleq$ probability density function for the lethargy of neutrons in their n'th flight

$p_n^*(Q) \triangleq$ probability density function for the energy of neutrons in their n'th flight

$q(u) \triangleq$ probability density function for the lethargy of injected neutrons.

[1]C. S. BARNETT, *Nucl. Sci. Eng.*, **55**, 234 (1974).

[2]C. S. BARNETT, *Nucl. Sci. Eng.*, **50**, 398 and **52**, 381 (1973).

[3]G. C. POMRANING, *Nucl. Sci. Eng.*, **52**, 144 (1973).

[4]E. R. COHEN, *Nucl. Sci. Eng.*, **52**, 280 (1973).

[5]E. H. CANFIELD, *Nucl. Sci. Eng.*, **53**, 137 (1974).

[6]B. D. GANAPOL, *Nucl. Sci. Eng.*, **53**, 350 (1974).