

In the case of lamp black, however, the cross section for the unfiltered neutrons is found to be considerably not only higher than that of graphite, but also its value rose from 11 to 14.8 when filtered neutrons were used. This increase may be explained by supposing that the lamp black atoms are arranged in clusters whose dimensions are small compared to the wave length of the neutrons. Since the atoms are not arranged in a regular way, destructive interference will not take place. Instead, the neutron waves of the scattered radiation will be in phase and the intensity of the scattering will then become proportional to the square of the number of atoms in a cluster rather than to the first power of this number as would be the case for smaller neutron wave lengths. The increase in the scattering cross section observed for paraffin and for D₂O is believed due to the effects of chemical binding. For uranium the increase is due to the increase in the absorption for lower energy neutrons. This increase is smaller than for boron because of the more important role played in uranium by the scattering.

The measurement of the boron cross section was also made using a paraffin filter of 3.8 cm thickness. The result was 368 cm²/mole, indicating that neutrons which penetrate through paraffin emerge with a higher average energy. From paraffin filtered neutrons to graphite filtered neutrons the energy is decreased by a factor of 25. This should be useful in studying the variation in nuclear cross sections for slow neutrons of different energies. These effects reopen the question of what is the value of the boron cross section for the neutrons of a given energy. It is planned to resolve this difference by measuring boron cross section for indium resonance neutrons, the energy of which has been measured to be 1.44 ev. In addition an attempt will be made to use the monochromatic radiation which may be obtained by Bragg reflection from a crystal.

Table III

Substance	gm/cm ²	No Filter		23 cm Graphite Filter	
		Log T	σ	Log T	σ
Paraffin	.1244	.626	58.4	1.117	104
Paraffin	.2992	1.425	55.3	2.590	92.7
Be	4.52	.977	3.25	.219	.73
Be	9.04	1.693	2.82	.424	.71
Graphite	12.96	2.637	4.05	.453	.70
Lampblack	1.69	.936	11.0	1.260	14.8
Pyrex	.241	.437		1.537	
U	17.5	.697	15.7	1.390	31.4
D ₂ O	4.352	2.008	7.65	2.475	9.44