Neutron Scattering Dictionary

"Normal Physicist"	Neutron Scatterer
Elastic Scattering – Total kinetic energy of the system is conserved	Elastic Scattering – Kinetic energy of the neutron is conserved
Incoherence – Phases are randomized	Incoherence – Different Nuclei have different scattering amplitudes (phases are usually equal)
Scattering amplitude: f	negative (–) scattering length: a
Density	Flux (is NOT current!) $\phi = \rho v$, reaction rate = $N\sigma(\rho v)$
Cross section	Scattering law
Multiphonon process $\rightarrow$ expansiion in powers of the interaction $\propto e\vec{p}\cdot\vec{A}$, $A \propto (a + a^\dagger)e^{i\vec{q}\cdot\vec{r}}$, photon operators $e^{i\vec{q}\cdot\vec{r}} \rightarrow 1 + i\vec{q}\cdot\vec{r} + \ldots$, Multipole expansinon: electric dipole, magnetic dipole, electric quadrupole, etc. transitions	Born Approximation – Always 1^{st} order in interaction, multiphonon processes, $e^{i\vec{q}\cdot\vec{r}} \rightarrow 1 + i\vec{q}\cdot\vec{r}_i$, $\vec{r}_i = \vec{r}_0 + U(t)$, $U \propto (a + a^\dagger)$, phonon operators