



**Figure 32.15:** Photon total cross sections as a function of energy in carbon and lead, showing the contributions of different processes [51]:

$\sigma_{\text{p.e.}}$  = Atomic photoelectric effect (electron ejection, photon absorption)

$\sigma_{\text{Rayleigh}}$  = Rayleigh (coherent) scattering—atom neither ionized nor excited

$\sigma_{\text{Compton}}$  = Incoherent scattering (Compton scattering off an electron)

$\kappa_{\text{nuc}}$  = Pair production, nuclear field

$\kappa_e$  = Pair production, electron field

$\sigma_{\text{g.d.r.}}$  = Photonuclear interactions, most notably the Giant Dipole Resonance [52].

In these interactions, the target nucleus is broken up.

Original figures through the courtesy of John H. Hubbell (NIST).