

# Production of energetic electrons during magnetic reconnection

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Energetic electrons are often observed in regions associated with magnetic reconnection. For example, in solar flares upward of 50% of the released magnetic energy can appear in electrons and in the magnetotail 300 keV electrons (several times the polar cap potential) have been observed near a reconnection site. However, since the outflows in the standard reconnection picture are (at best) Alfvénic, one might expect the ions to gain most of the energy. Here we show that electrons can gain significant amounts of energy via interactions with contracting magnetic islands that form as reconnection proceeds. As the islands shrink the electrons reflect from the converging ends, gaining energy in what is essentially first-order Fermi acceleration. The resultant electron energy spectrum can take the form of a power-law with a total energy content that approaches the released magnetic energy.