Critical Mass Encyclopedia Article

Critical Mass

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A **chain reaction** is a self-propagating reaction that continues without additional outside assistance once it is started. Like a series of dominoes falling in regular succession after the first is toppled, chain reactions proceed by themselves once started. Nuclear chain reactions advance in a somewhat similar way, where the effects of one reaction induce the start of the next. With regard to nuclear chain reactions, however, critical **mass** must first be achieved.

Critical mass is the amount of material necessary to sustain a nuclear chain reaction at a constant rate. The amount is critical because if the threshold mass is not met, the chain reaction will not occur. Controlled nuclear chain reactions are important in nuclear **power** plants. Nuclear **energy** is harnessed in these plants to produce **electricity**. The nuclear chain reaction requires a critical mass of nuclear material. Similarly, atomic explosions require a critical mass of fissionable or fusionable material in order for the nuclear chain reaction to occur. In **nuclear fission** explosions, where atoms are split apart to release immense quantities of energy, critical mass is needed to slow the emitted neutrons of the nuclear reaction. When atoms are split, they eject neutrons at very high speeds. The critical mass provides the minimum material to ensure that an emitted **neutron** will adequately collide with another **atom** causing it in turn to split, initiating the chain reaction. In fusion reactions, samples of less than critical mass are forced together to create one portion with supercritical mass that then proceeds as a nuclear chain reaction.