Soliton Lasers

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A comprehensive treatment is given for the formation of mode-locked soliton pulses in optical fiber and solid state lasers. The pulse dynamics is dominated by the interaction of the cubic Kerr nonlinearity and chromatic dispersion with an intensity dependent perturbation provided by the mode-locking element in the laser cavity. The intensity dependent perturbation preferentially attenuates low intensity electromagnetic radiation which makes the mode-locked pulses attractors of the laser cavity. A review of the broad spectrum of mode-locked laser models, both qualitative and quantitative, are considered with the basic pulse formation phenomena highlighted. Although the numerous mode-locking models are considerably different, they are unified by the fact that stable solitons are exhibited in each case due to the intensity discrimination perturbation in the laser cavity.