The production of squeezed states of light essentially requires the generation of a mixing of a particular mode of the field with its conjugate mode. This ican not be achieved by transformations offered by linear optical devices (mirror, beam splitter, phase shifter). Th only way to achieve this is through the use of nonlinear optical devices.

In general, what we desire is a canonical Bogoliubov transformation of the form:

$$\hat{b} = \mu\hat{a} + \nu\hat{a}^\dagger$$

Where controlling μ and ν allows us to control the extent of squeezing.

Phrased in other terms, what we require is a Hamiltonian that contains quadratic terms in the creation and annihilation operators of that mode. This is given in the general form:

$$H = i\frac{h}{2\pi}\kappa\left(\left(\hat{a}^\dagger\right)^2 - \hat{a}^2\right)$$

This can be achieved through two main methods:

1. Degenerate Parametric Down-Conversion ($\mathrm{X}^{(2)}$): Here, a strong classical photon pump is used to drive a $\mathrm{X}^{(2)}$ crystal at ssome frequency 2ω. this results in the creation of two photons of almost perfectly correlated phases of ω, and the process gives us an interaction Hamiltonian of the form mentioned above. The extent of squeezing is controlled by the non-linear susceptibility of the crystal used.
2. Degenerate 4-wave mixing ($\mathrm{X}^{(3)}$): Same as the previous method, but in this case we use two photon pumps to drive the crystal with two photons of some frequency ω. This generates two photons that are again nearly perfectly correlated in phase. This gives us a nearly identical interaction Hamiltonian and the same Bogoliubov transformation as before.