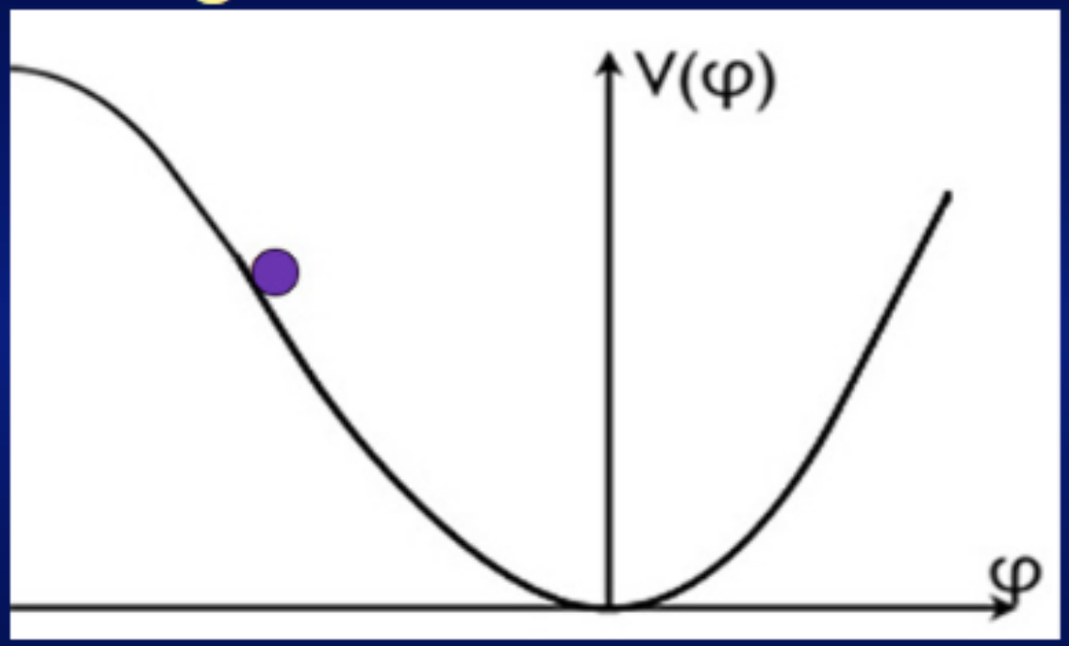
Lightning Review of Inflation and Preheating

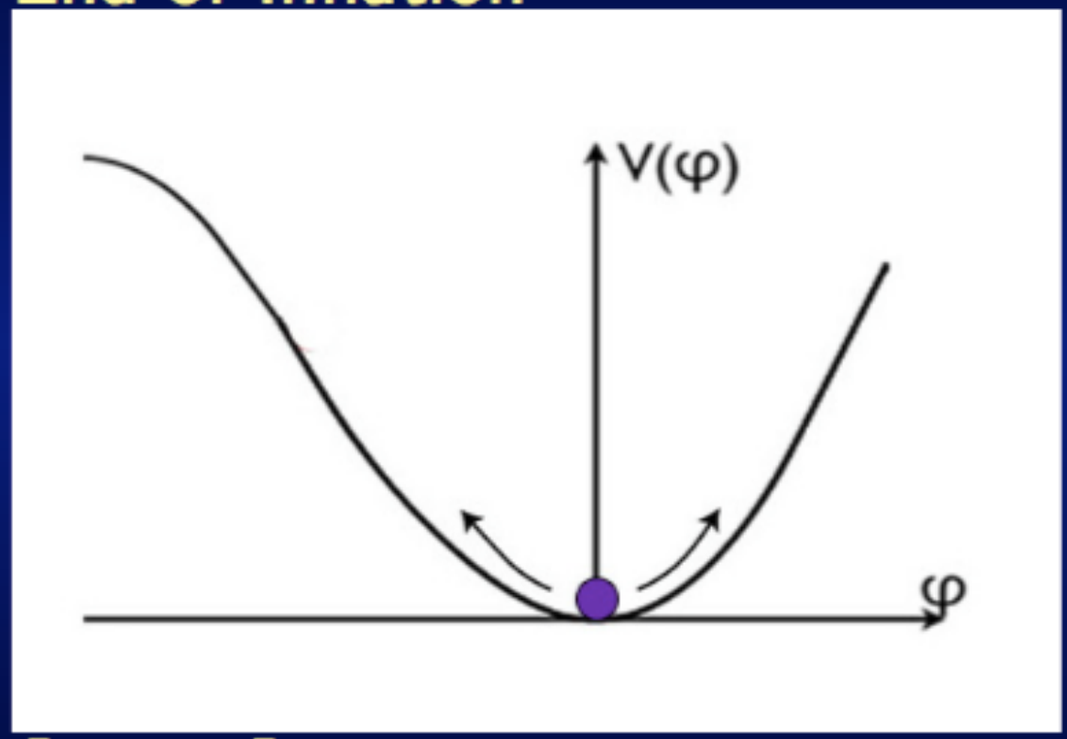
$$\mathcal{L} = -\frac{G_{IJ}(\vec{\phi})}{2}\partial_\mu \phi^I \partial^\mu \phi^J - V(\vec{\phi})$$

During Inflation



- Subhorizon Homogeneity
- (Small) Superhorizon Inhomogeneity

End of Inflation



$$\left[\delta\phi, \delta\dot{\phi}\right] \neq 0$$

$$\Longrightarrow \langle|\delta\tilde{\phi}_k|^2\rangle, \langle|\delta\tilde{\dot{\phi}}_k|^2\rangle > 0$$

- Variety of instabilities

Preheating (linear theory)

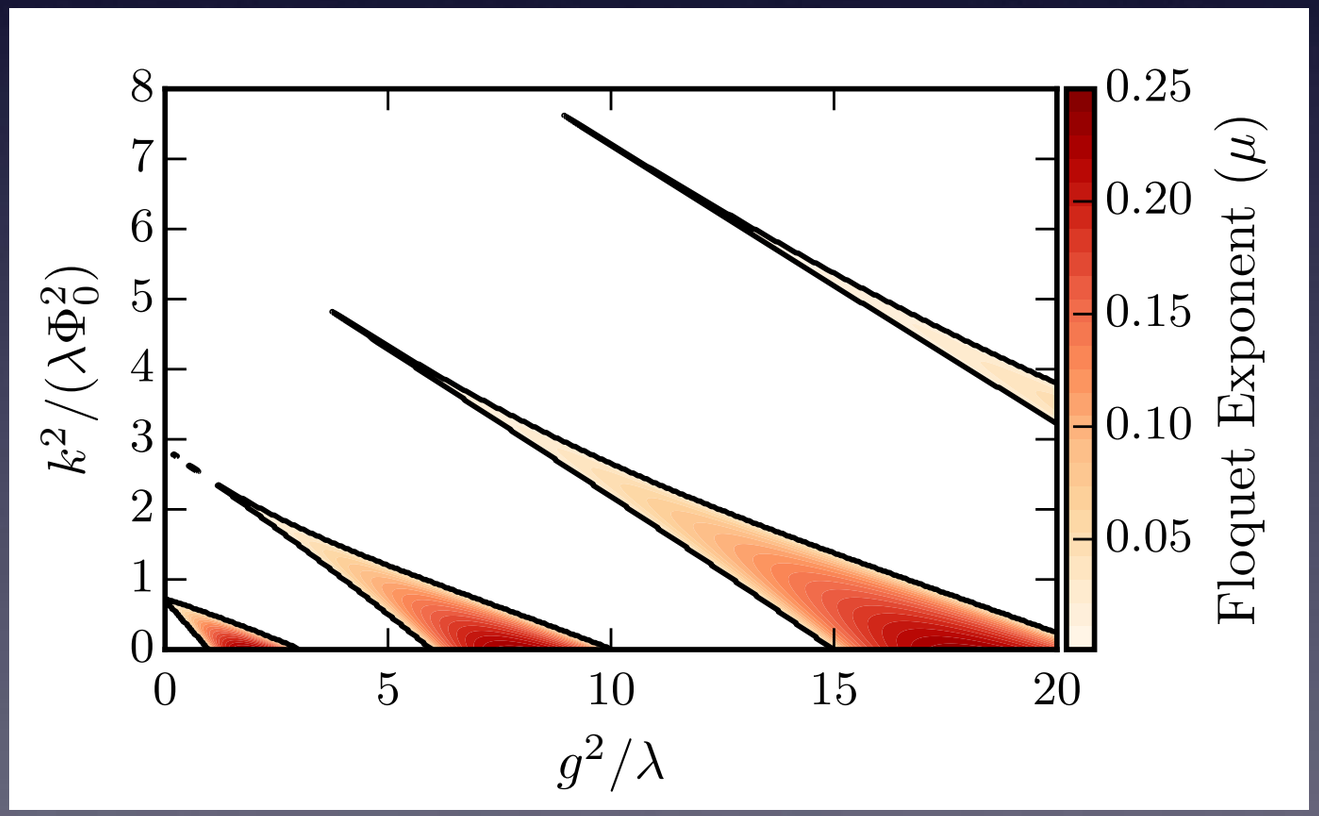
[e.g. Traschen, Bradendberger / Kofman, Linde, Starobinski]

$$V(\phi) = \frac{\lambda}{4}\phi^4$$

$$\phi = \bar{\phi}(t) + \delta\phi$$

$$\delta\ddot{\phi} + \left(k^2 + V''(\bar{\phi})\right)\delta\phi = 0$$

In linear theory, $\bar{\phi}$ acts as an external driver for the fluctuations



Full treatment includes backreaction and rescattering