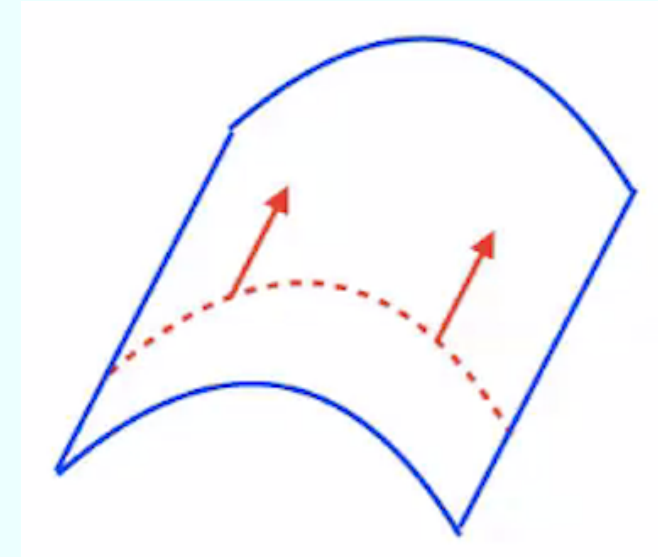


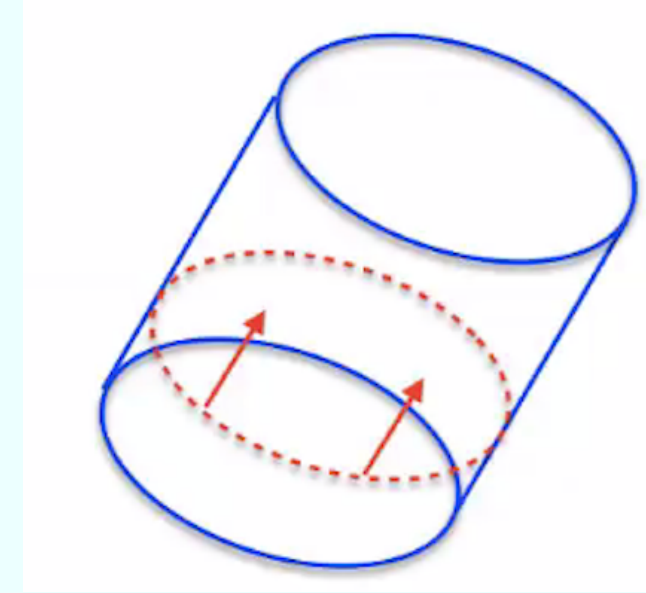
Inflationary Models in String Theory

Dibya Chakraborty

Introduction: String compactification



Open strings



Closed strings

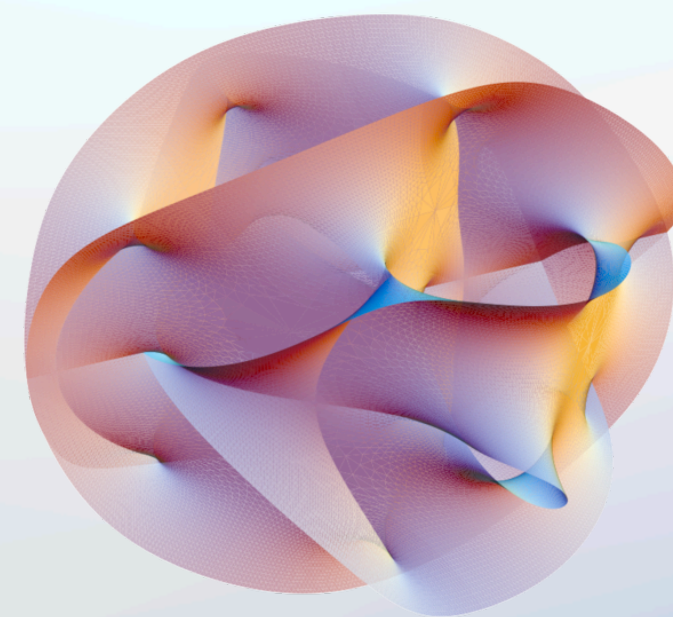
One free parameter in 10D space time: $T = \frac{1}{2\pi\alpha'}$

We need to **curl-up** six of the dimensions to make contact with 4d \Rightarrow **Compactification**

D=10 String Theory

On 6D space - Calabi Yau

D=4 Theory

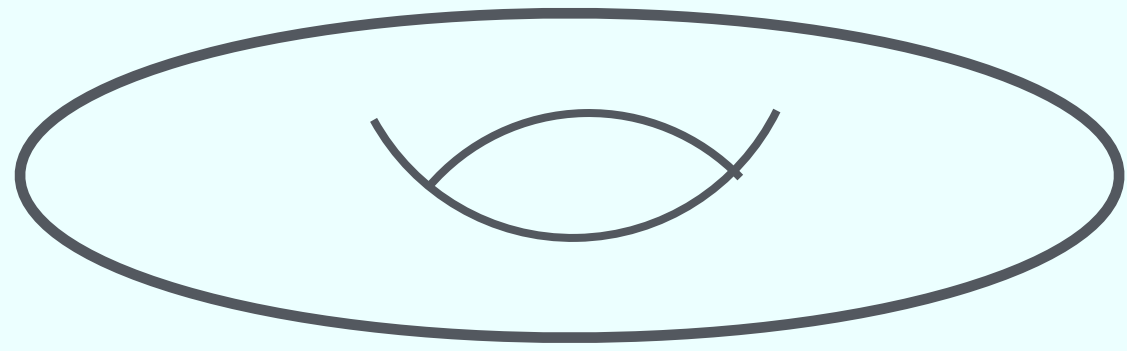


CY contains: branes, fluxes, warped throats, perturbative and non-perturbative corrections, and anti-branes

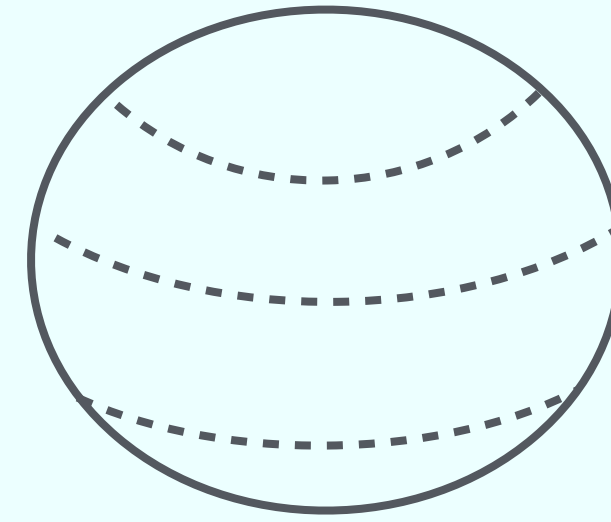
Introduction: String compactification

How does 4d theory depend on the “curling-up”?

Topology

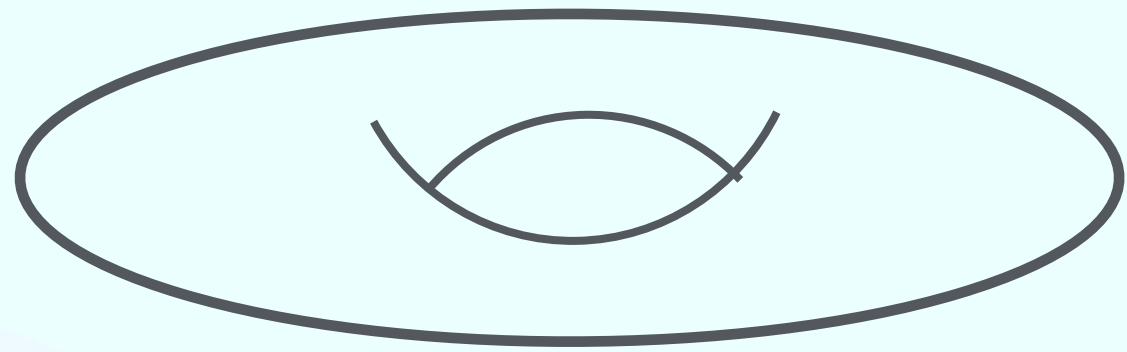


Or

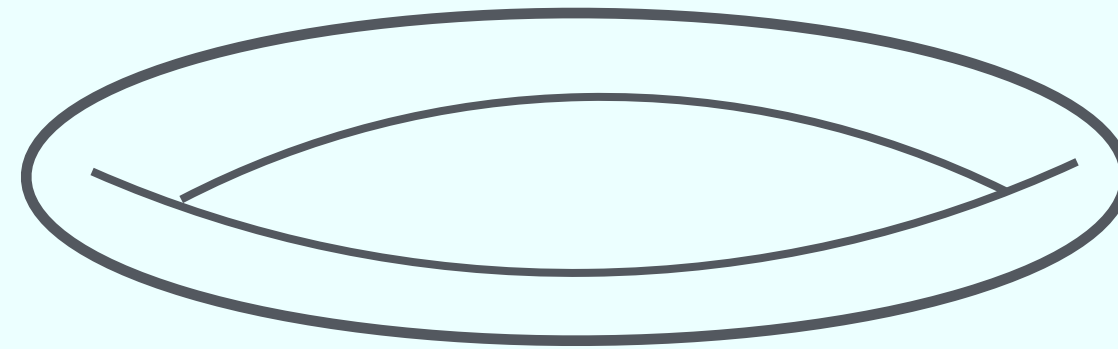


Determines structure of 4d theory: forces, matter content

Shape

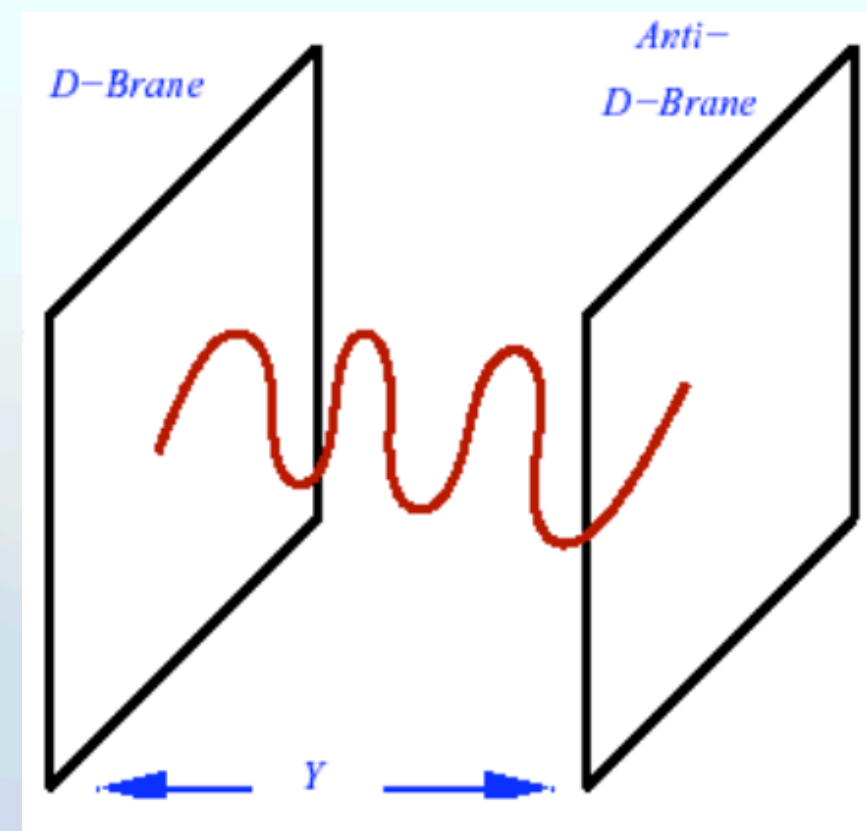


Or



Determines couplings/ particle masses in 4d theory

Other objects



Open string moduli: feasible inflaton and dark matter, dark energy candidates

Perturbative Large Volume Scenario

Main ingredients: perturbative corrections in string theory

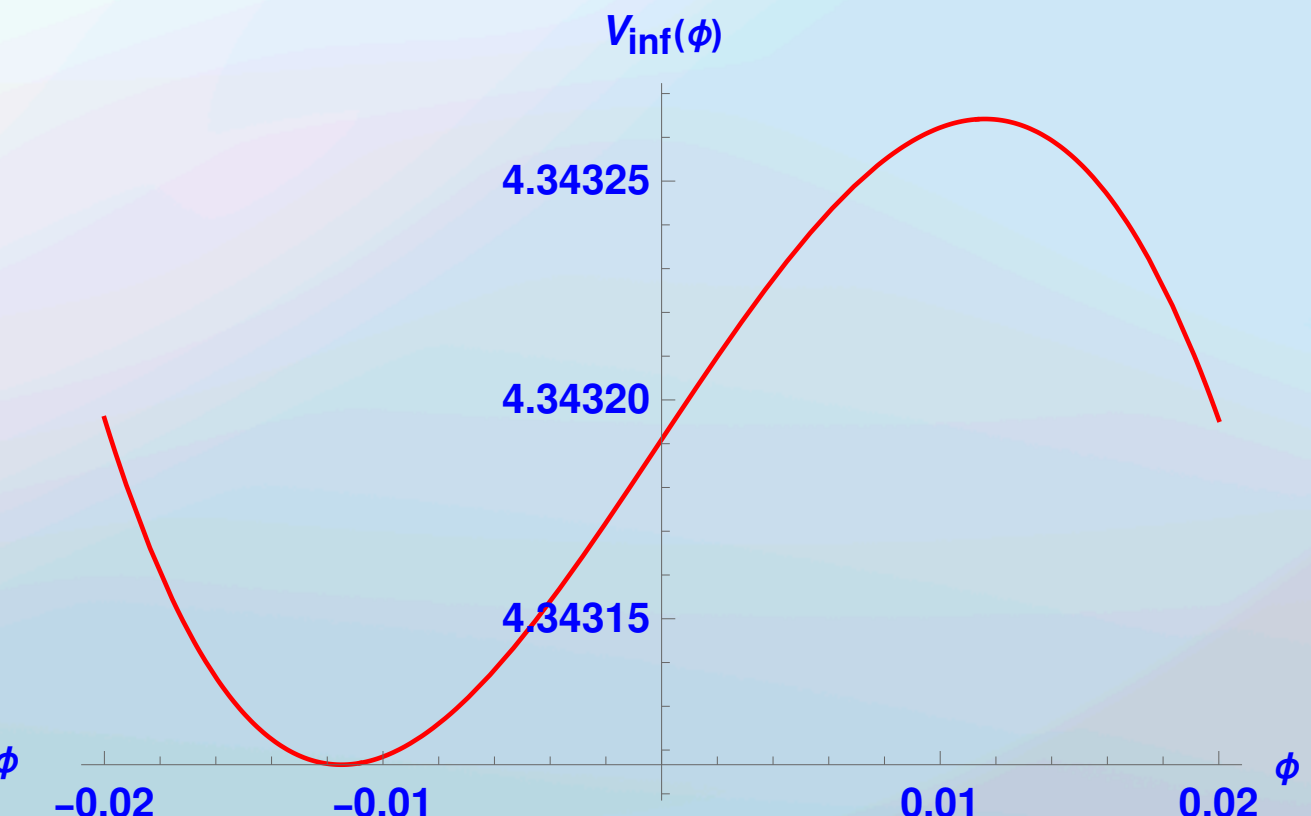
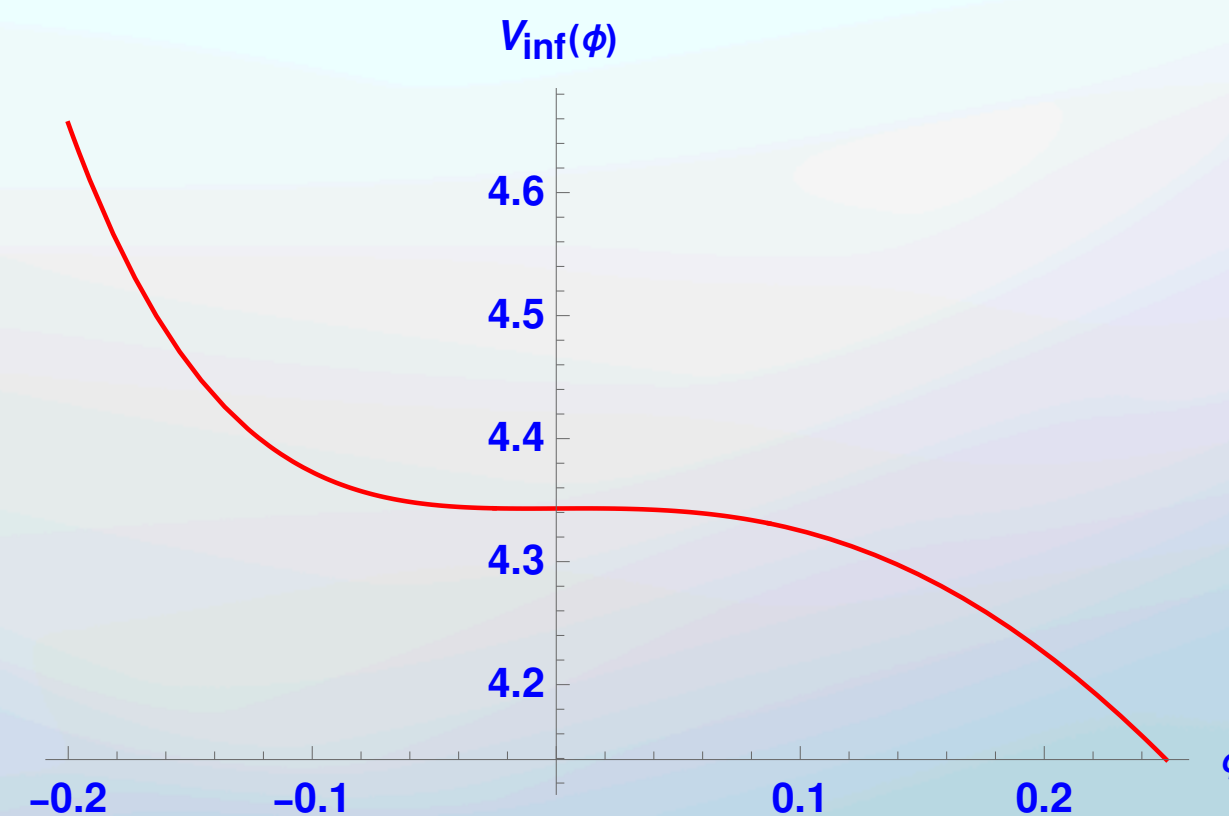
Upshot: generates small-field inflation, makes fibre inflation without a bound on field excursion

In the large volume limit, set of perturbative corrections can give a dS vacuum after uplift:

$$K = -2 \ln (\mathcal{V} + \mathcal{O}(\alpha'^3) + \mathcal{O}(g_s^2 \alpha^3)) \quad V_{\text{inf}} = -\tilde{\mathcal{B}} e^{-3\sqrt{\frac{3}{2}}\phi} \left(\sqrt{\frac{3}{2}}\phi - \frac{3}{2}e^{-x+\sqrt{\frac{3}{2}}\phi} + \frac{4}{3} \right), \quad \tilde{\mathcal{B}} = \tilde{\mathcal{B}}(|W_0|, g_s) > 0$$

Base

K3 fibration



Perturbative Large Volume Scenario

Main ingredients: perturbative corrections in string theory

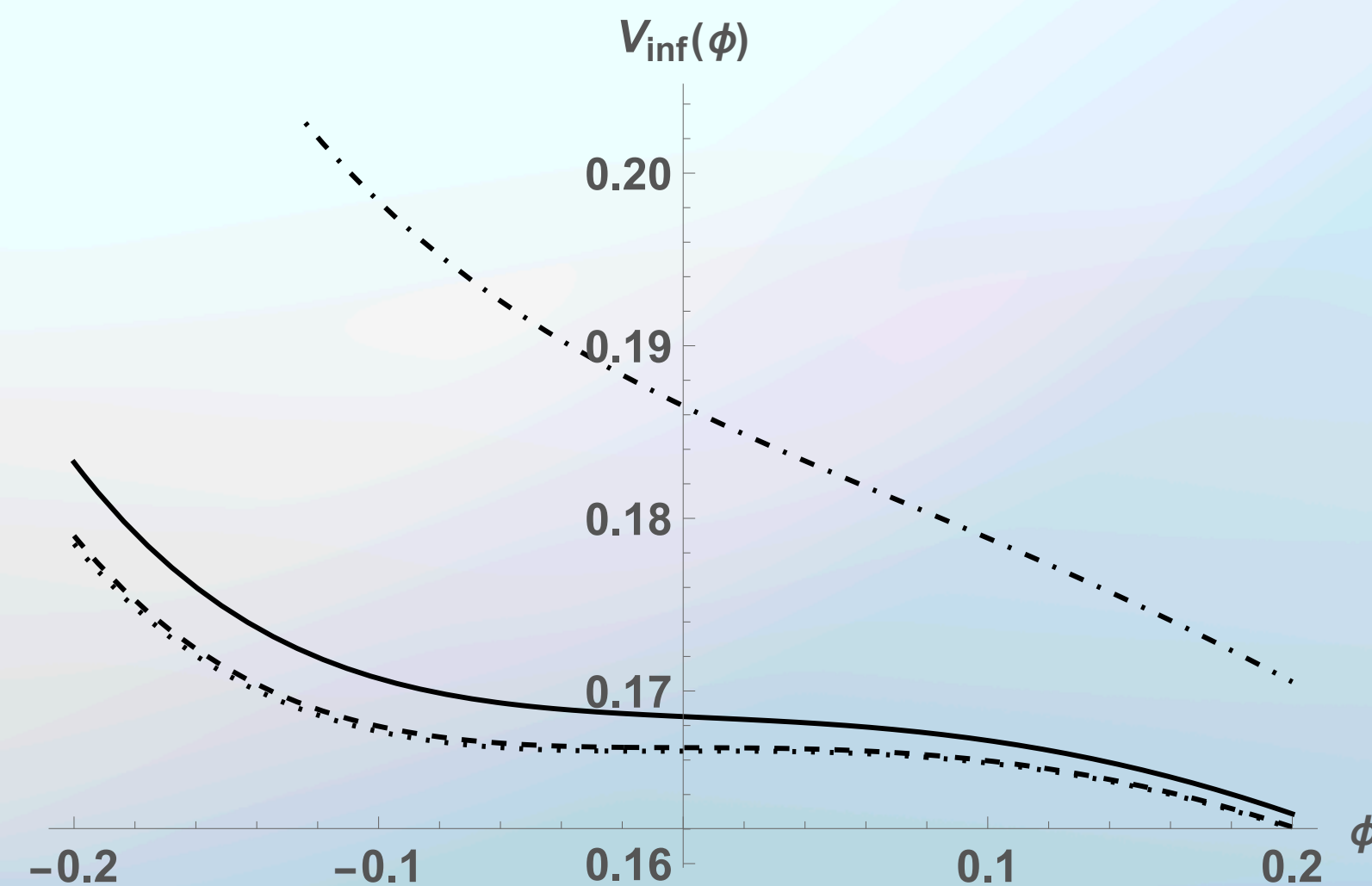
Upshot: generates small-field inflation, makes fibre inflation free of Kahler cone bound

In the large volume limit, set of perturbative corrections can give a dS vacuum with D-terms: add dots

$$K = -2 \ln (\mathcal{V} + \mathcal{O}(\alpha'^3) + \mathcal{O}(g_s^2 \alpha^3)) \quad V_{\text{inf}} = -\tilde{\mathcal{B}} e^{-3\sqrt{\frac{3}{2}}\phi} \left(\sqrt{\frac{3}{2}}\phi - \frac{3}{2}e^{-x+\sqrt{\frac{3}{2}}\phi} + \frac{4}{3} \right), \quad \tilde{\mathcal{B}} = \tilde{\mathcal{B}}(|W_0|, g_s) > 0$$

Base

K3 fibration



Perturbative Large Volume Scenario

Main ingredients: perturbative corrections in string theory

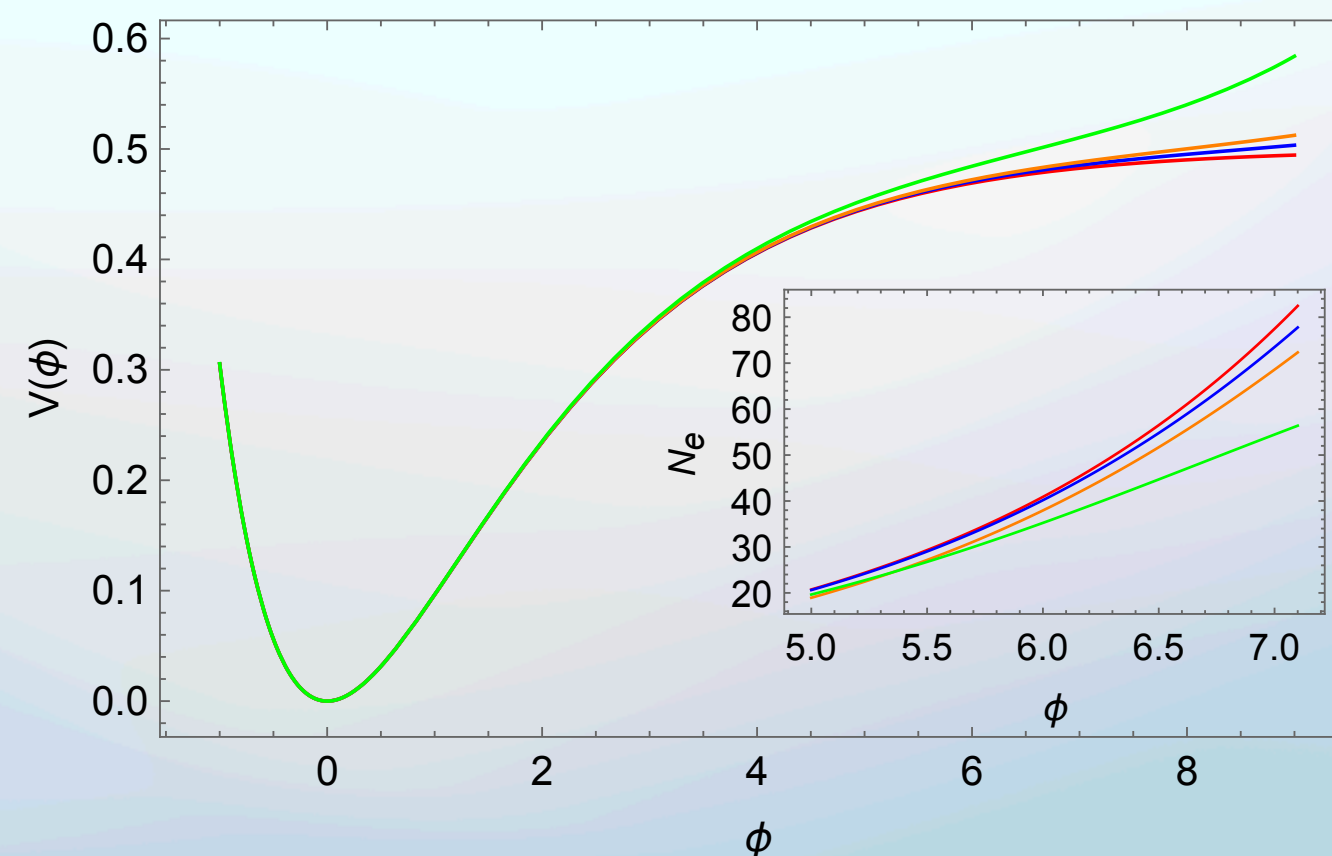
Upshot: generates small-field inflation, makes fibre inflation free of Kahler cone bound

In the large volume limit, set of perturbative corrections can give a dS vacuum with D-terms:

$$K = -2 \ln (\mathcal{V} + \mathcal{O}(\alpha'^3) + \mathcal{O}(g_s^2 \alpha^3)) \quad V = \mathcal{C}_0 \left(\mathcal{C}_{\text{up}} + \mathcal{R}_0 e^{-\gamma \phi} - e^{-\frac{\gamma}{2} \phi} + \mathcal{R}_1 e^{\frac{\gamma}{2} \phi} + \mathcal{R}_2 e^{\gamma \phi} \right),$$

Base

K3 fibration



Perturbative Large Volume Scenario

Main ingredients: perturbative corrections in string theory

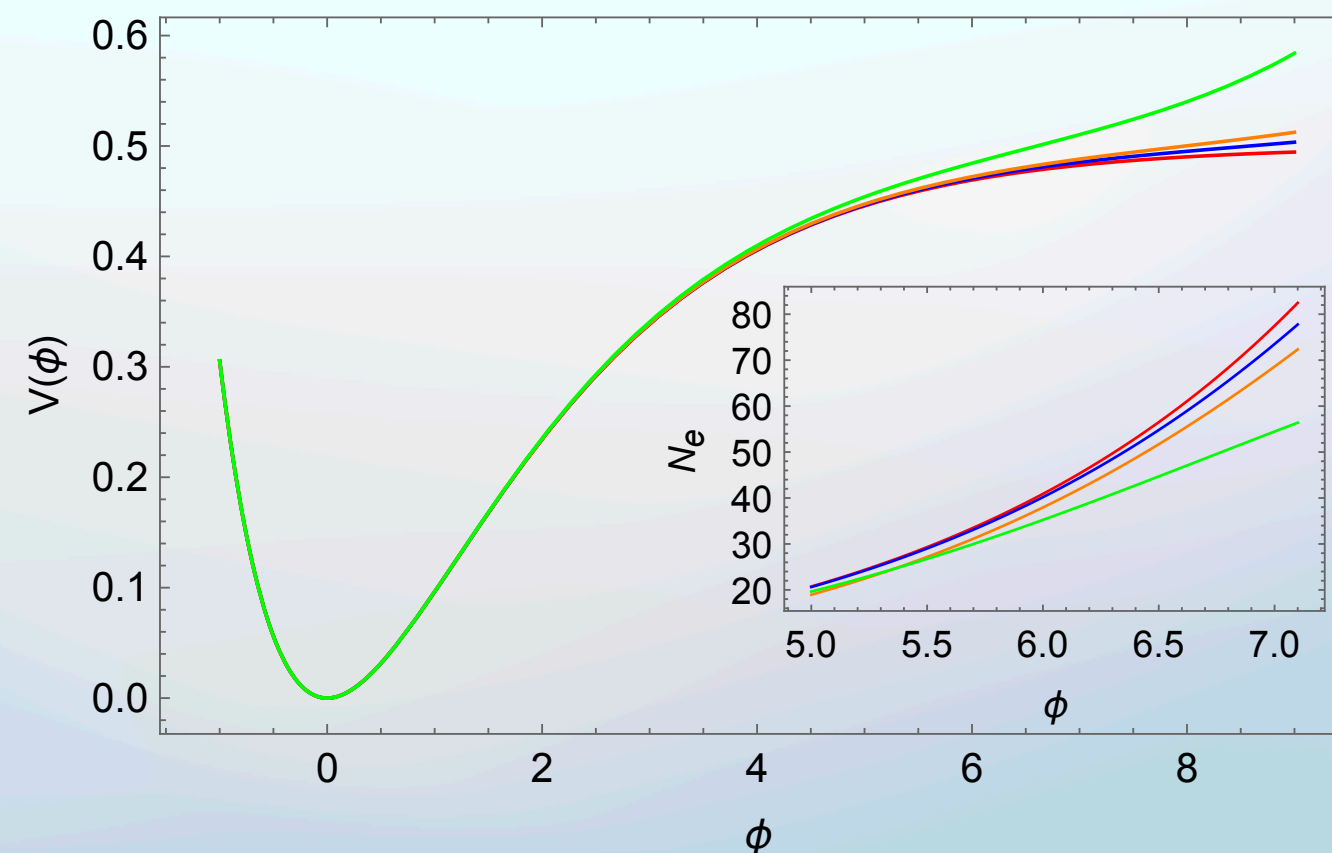
Upshot: generates small-field inflation, makes fibre inflation free of Kahler cone bound

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Base

K3 fibration



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