String Field Theory solution for any open string background

Carlo Maccaferri
Torino University

based on ***1406.3021, JHEP 1410….***w/ ***Ted Erler***

1402.3546, JHEP 1405 (2014) 004
1207.4785, JHEP 1307 (2013) 033 (w/ **Matej Kudrna** and **Martin Schnabl**)
1201.5122, JHEP 1206 (2012) 084 (w/ **Ted Erler**)
1201.5119 , JHEP 1204 (2012) 107 (w/ **Ted Erler**)

The String Theory Universe
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EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY
Mainz Institute for Theoretical Physics

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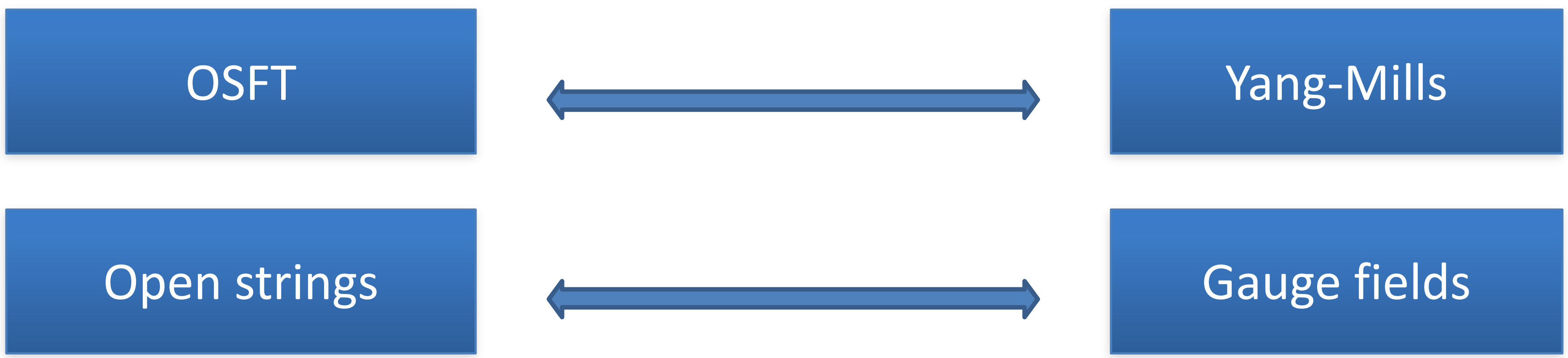

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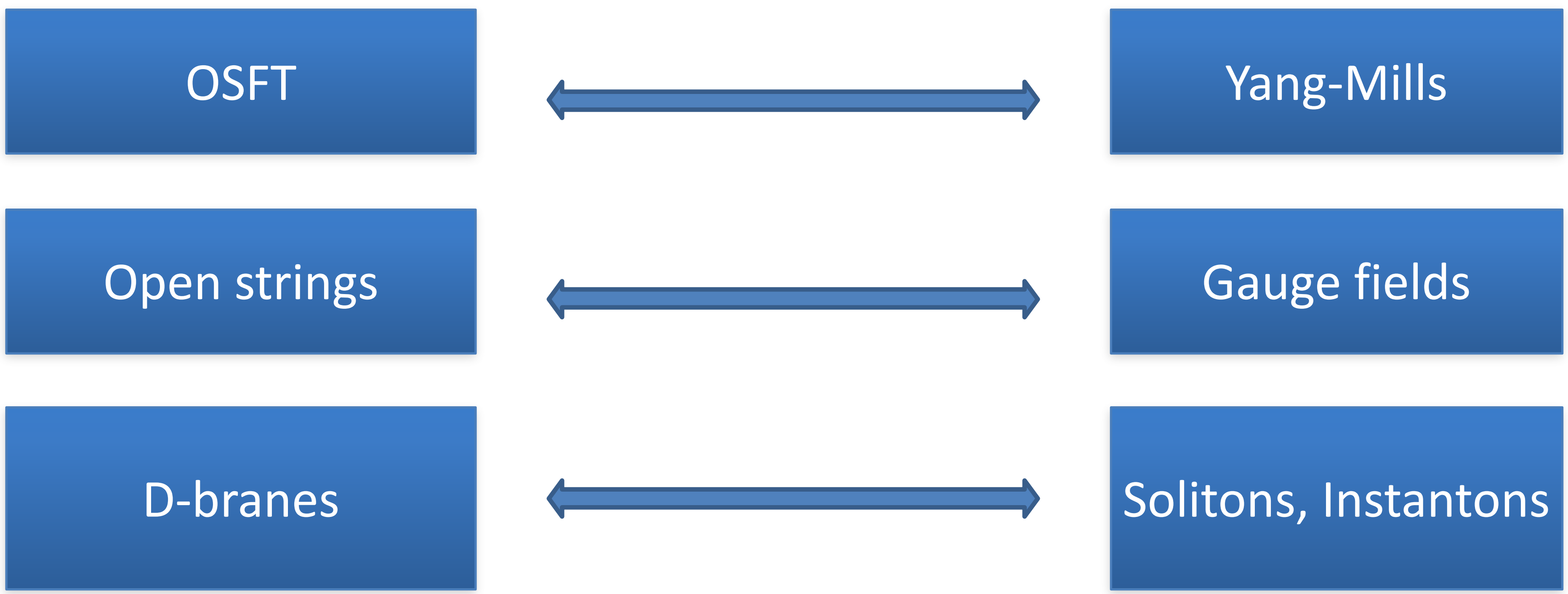

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OSFT	⟷	Yang-Mills
Open strings	⟷	Gauge fields
D-branes	⟷	Solitons, Instantons
Closed strings	⟷	Gauge invariant op.

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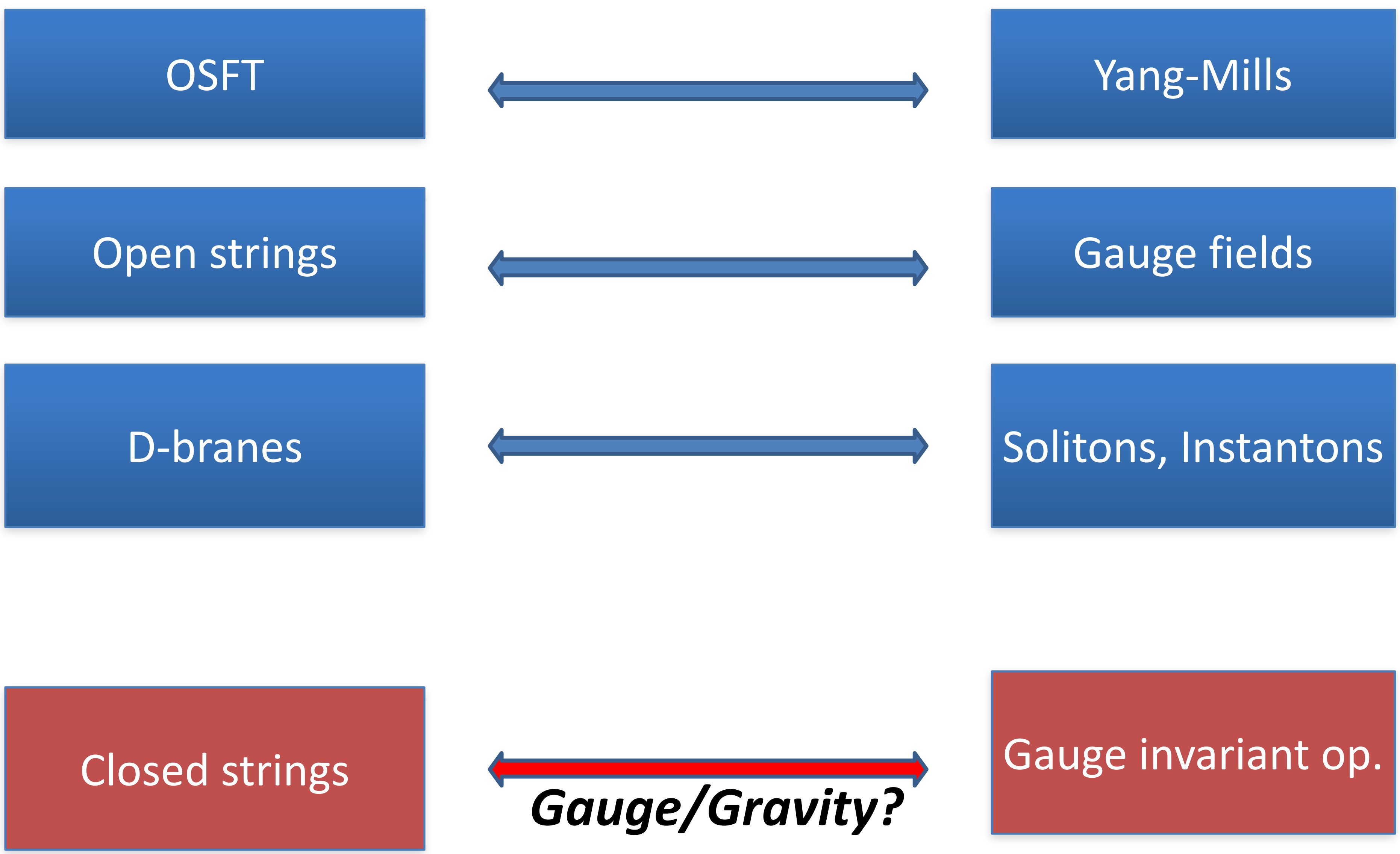

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- Equation of motion

$$Q\Psi + \Psi * \Psi = 0$$

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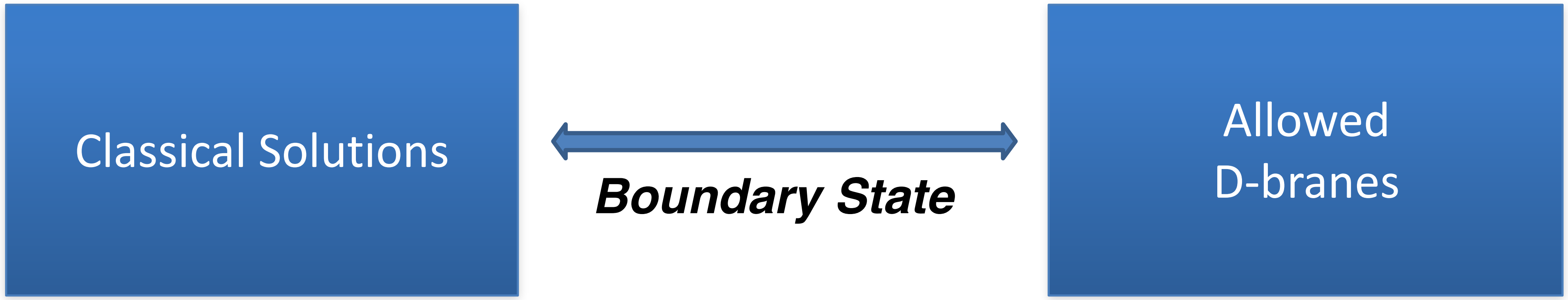

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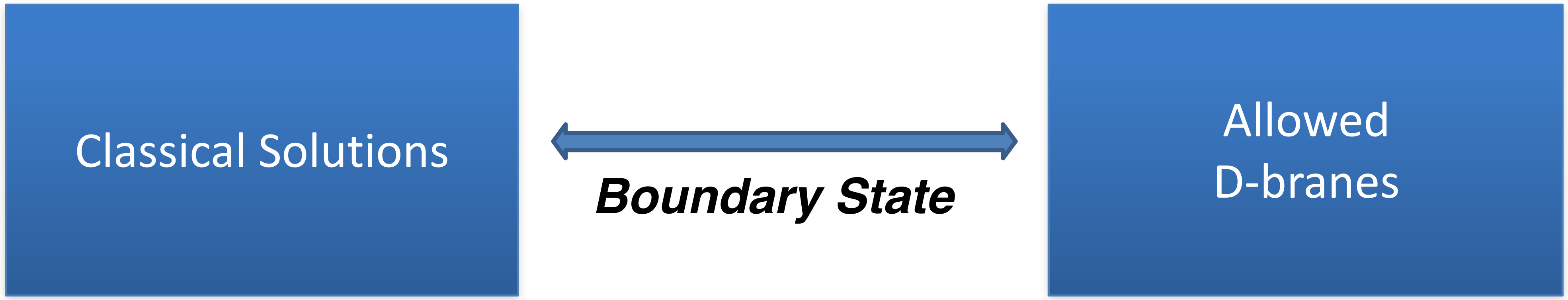

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- The (KMS) boundary state is constructed from **gauge invariant** quantities starting from a given solution

$$Q\Psi_* + \Psi_*^2 = 0 \quad \Longrightarrow \quad |B_*\rangle = \sum_\alpha n_*^\alpha \, |V_\alpha\rangle\rangle$$

$$n_*^\alpha = \langle V^\alpha | B_* \rangle = \langle V^\alpha(0) \rangle_{\rm disk}^{\rm BCFT_*} \;=\; W_{V^\alpha}[\Psi_* - \Psi_{\rm tv}]$$

- *Intriguing possibility of relating BCFT consistency conditions (Cardy-Lewellen, Pradisi-Sagnotti-Stanev) with OSFT equation of motion*

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- Today, we understand this complicated state "simply" as (**Schnabl, Okawa, Erler**)

$$\Psi_{\text{tv}} = F(K)\, c\, \frac{KB}{1 - F^2(K)}\, c\, F(K)$$

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$$Q_{\mathrm{tv}}\psi \equiv Q\psi + [\Psi_{\mathrm{tv}}, \psi]$$

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- For the TV in the KBc algebra it is readily found

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- Subtle: ***1/K* does not exist**, but ***A*** is well defined (this defines the TV)

$$\boxed{F(K) = 1 + F'(0)K + O(K^2)}$$

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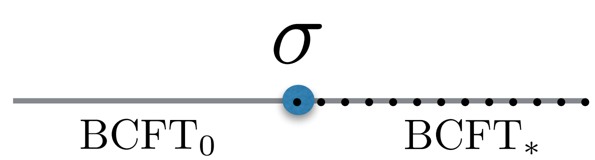

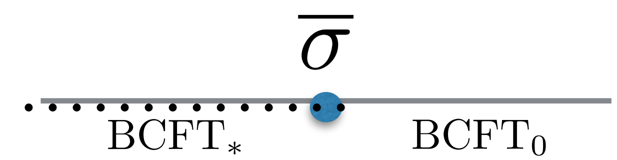

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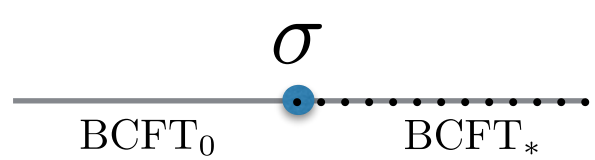

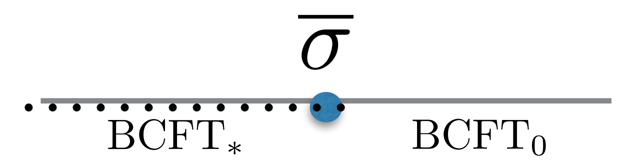

- OSFT: describe the dof of a target **BCFT*** using the dof of a reference **BCFT$_0$**

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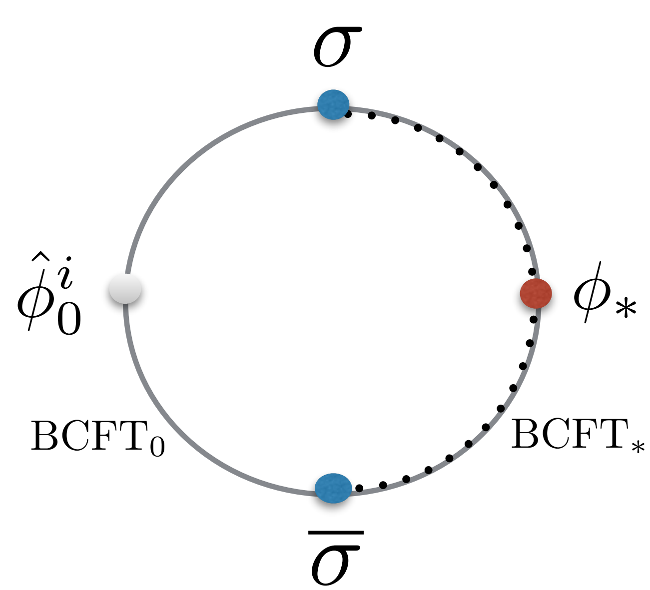

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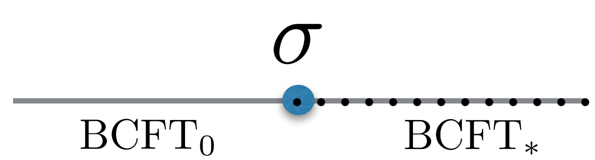

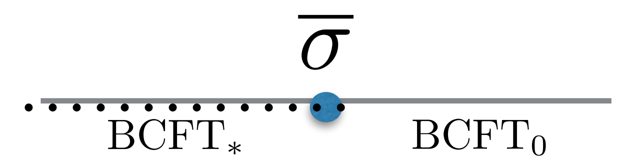

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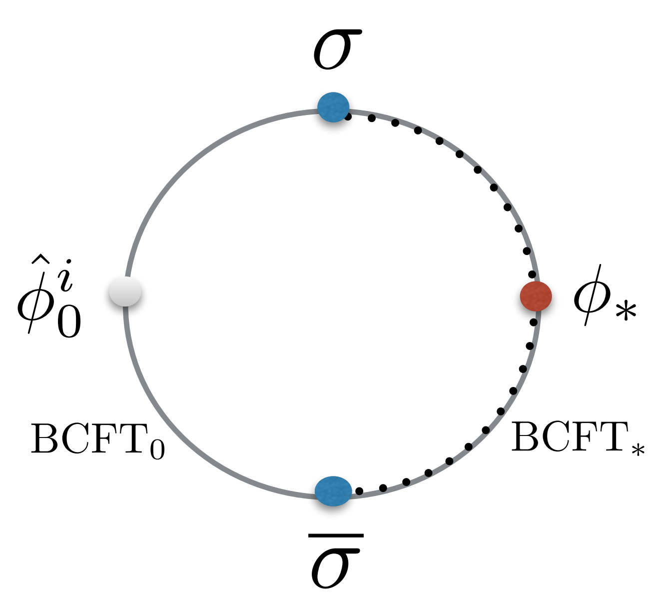
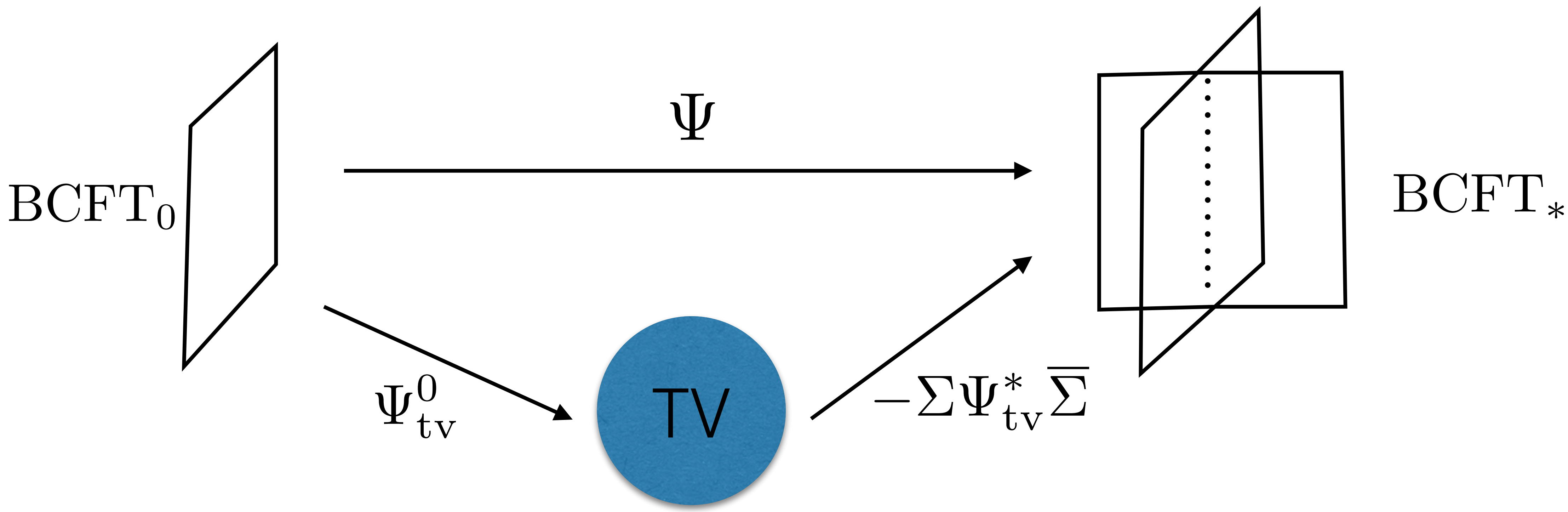


$$\langle \hat{\phi}_0^i | \phi_0^j \rangle = \delta^{ij}$$

OSFT solution for any background

- Connect two generic backgrounds by passing through the tachyon vacuum



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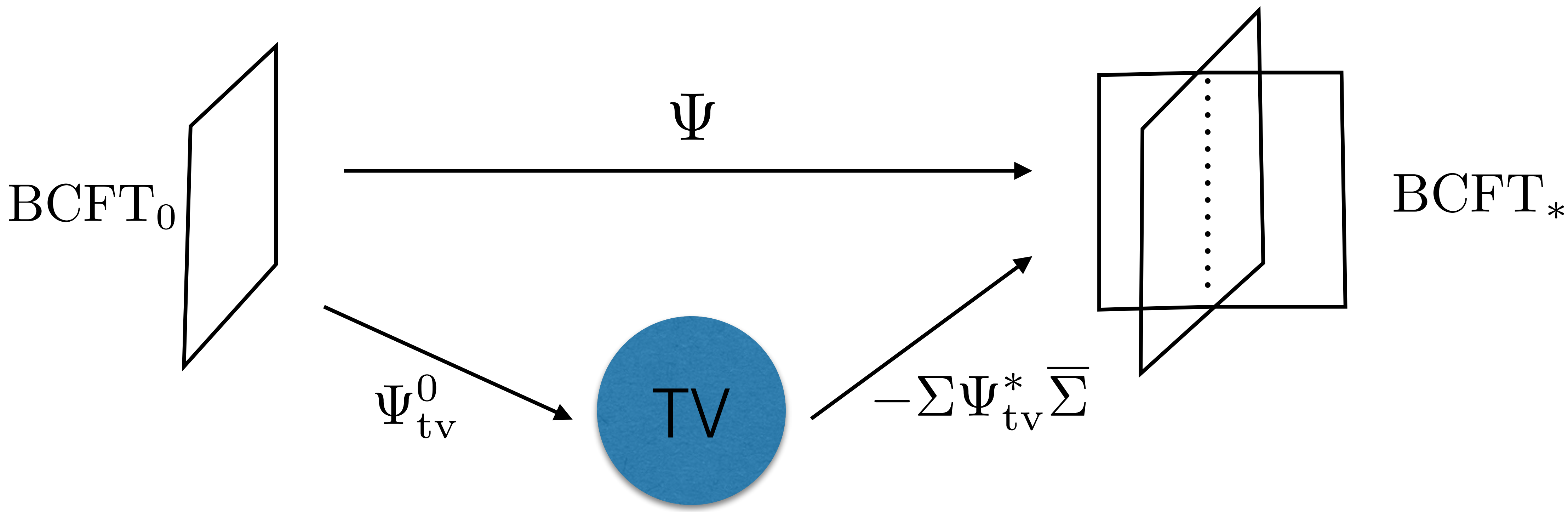

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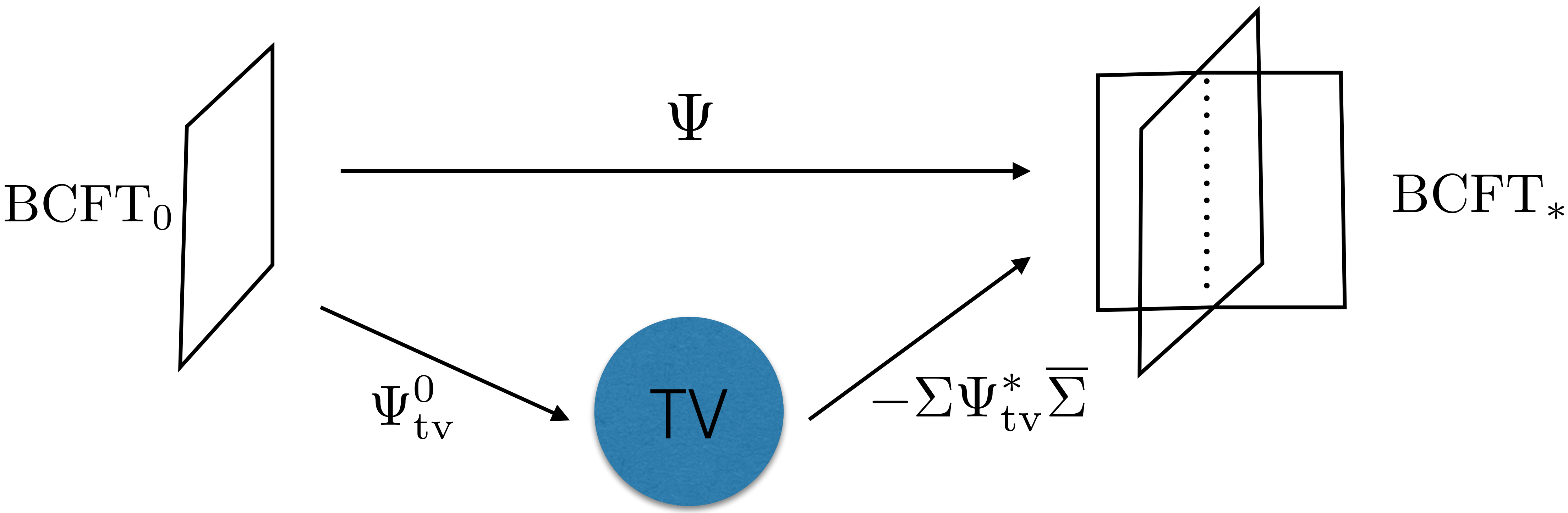

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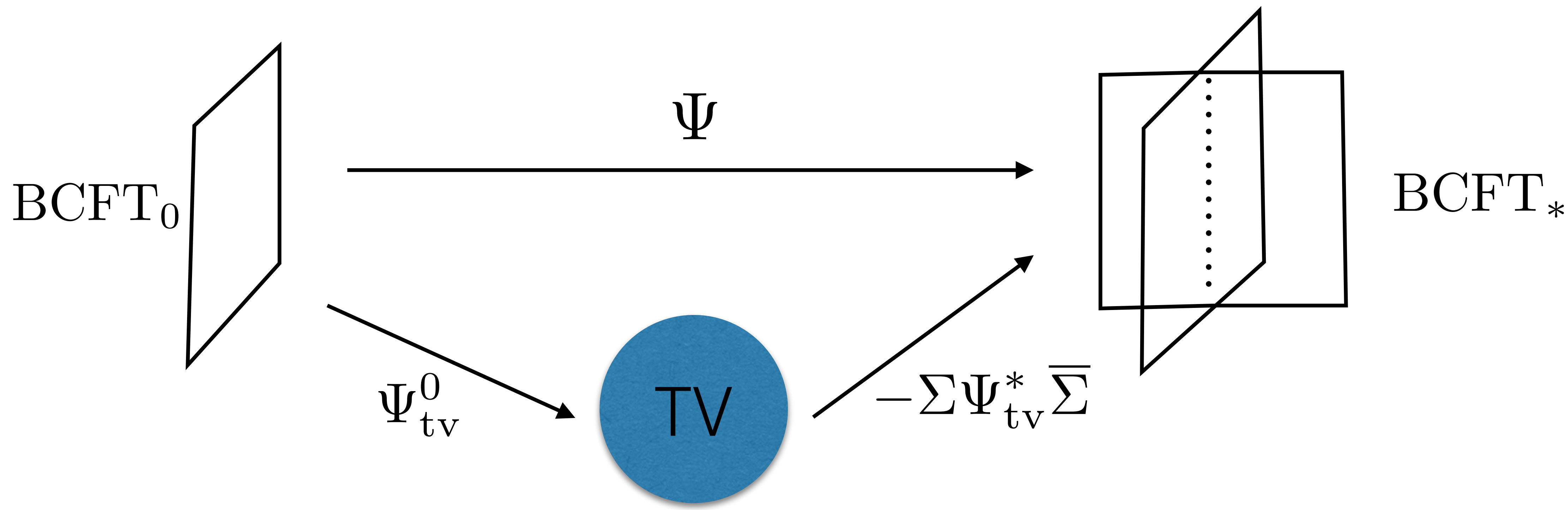

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$$\overline{\Sigma}\Sigma = 1$$

$$Q\Psi + \Psi^2 = 0$$

$$Q_{\mathrm{tv}}\overline{\Sigma} = Q_{\mathrm{tv}}\Sigma = 0$$

- **The Sigma's can be constructed due to the trivial cohomology at the TV, using the WS bcc's**

$$Q_{\rm tv}\overline{\Sigma} = Q_{\rm tv}\Sigma = 0 \xrightarrow[\Psi_{\rm tv} = \frac{1}{1+K}c(1+K)Bc]{} \begin{array}{l} \Sigma = Q_{\rm tv}\left(\frac{B}{1+K}\sigma\right) \\ \overline{\Sigma} = Q_{\rm tv}\left(\frac{B}{1+K}\overline{\sigma}\right) \end{array}$$

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- **It remains to search for world-sheet local fields obeying**

$$\boxed{\overline{\sigma}\sigma = 1}$$

- Suppose we have c=25 bcc operators of weight ***h*** switching from **$\mathbf{BCFT_0}$** to **BCFT*** with leading OPE

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- Tensor them with timelike momentum operators (*constant Wilson line*)

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- Factorization of the bcc's, and time non-compactness implies (*a time-like Wilson line is pure gauge*)

$$\mathrm{BCFT}_*^{c=26} = \mathrm{BCFT}_0^{X^0} \otimes \mathrm{BCFT}_*^{c=25}$$

Background independence

- Action for fluctuations

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- We remarkably get the theory DIRECTLY formulated in **BCFT*!**

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- To solve the equation of motion I need the **non trivial** orthogonality relation

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Thank You!