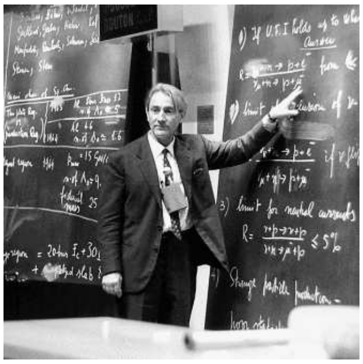
What are those "Loop Calculations" all about?



Theorists like

$\mathcal{L}$

Why: The Lagrangian defines the Theory.

Experimentalists like

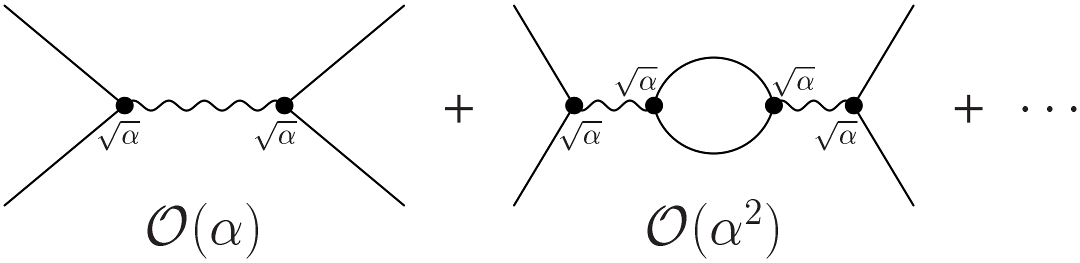
S

Why: Experimental quantities (cross sections, decay rates, etc.) follow directly from the S-Matrix.

How to connect $\mathcal{L}$ and S?

$$S = \sum \text{(Feynman Diagrams)}$$

$$= \text{perturbation series in the coupling constant } \sqrt{\alpha}\,.$$



$\mathcal{L}$ determines the Feynman Rules which tell us how to translate the diagrams into formulas.

Accuracy of results $\longleftrightarrow$ Order in α $\longleftrightarrow$ # of Loops