Chapter 11: Grand Unification
Ken Wilson

Nobel Prize 1982
renormalization group
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Nobel Prize 1982
renormalization group
300 pi $\rightarrow$ 72 dpi

5.8 MB $\rightarrow$ 188 kB
Virtual Exchange
Virtual Exchange

Effective charge smaller at larger distances
Anarchic Principle

“ Anything that is not forbidden will occur. ”

Jonathan Flynn
Gross, Politzer, Wilcek

Nobel Prize 2004
color charge bigger at larger distances
Gluon Virtual Exchange

Effective charge larger at larger distances
Georgi, Glashow
GUT Force

\[ u \quad e^- \quad u \]

\[ e^- \quad \text{to} \quad e^- \]
Georgi, Weinberg, Quinn
Unified Forces?
Proton Decay

Super-Kamiokande
Proton Decay