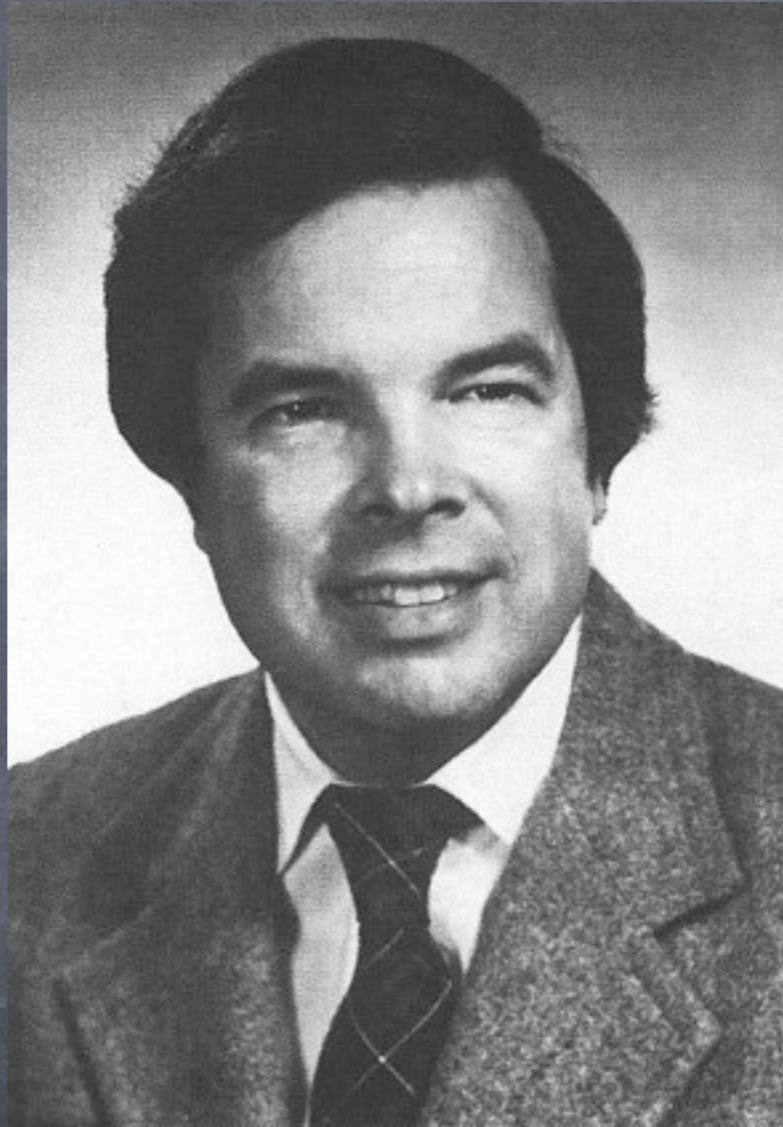


Chapter 11: Grand Unification

Ken Wilson



Nobel Prize 1982
renormalization group

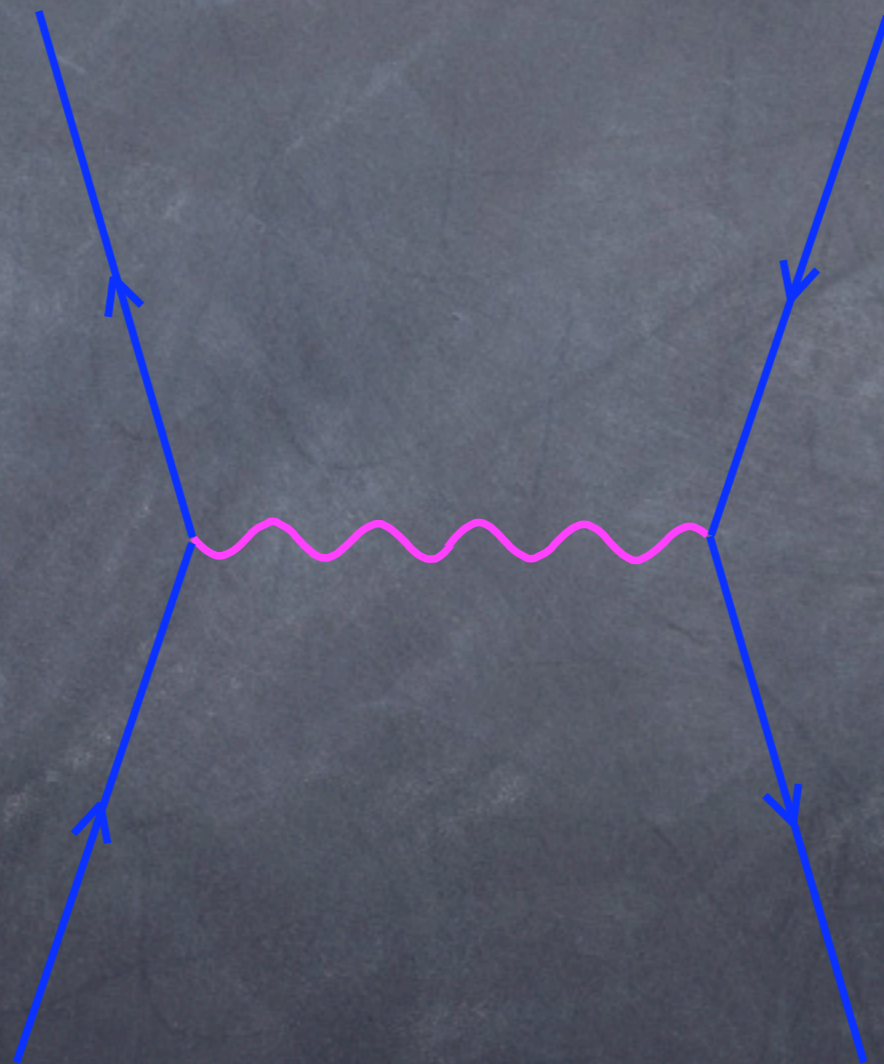


300 pi → 72 dpi

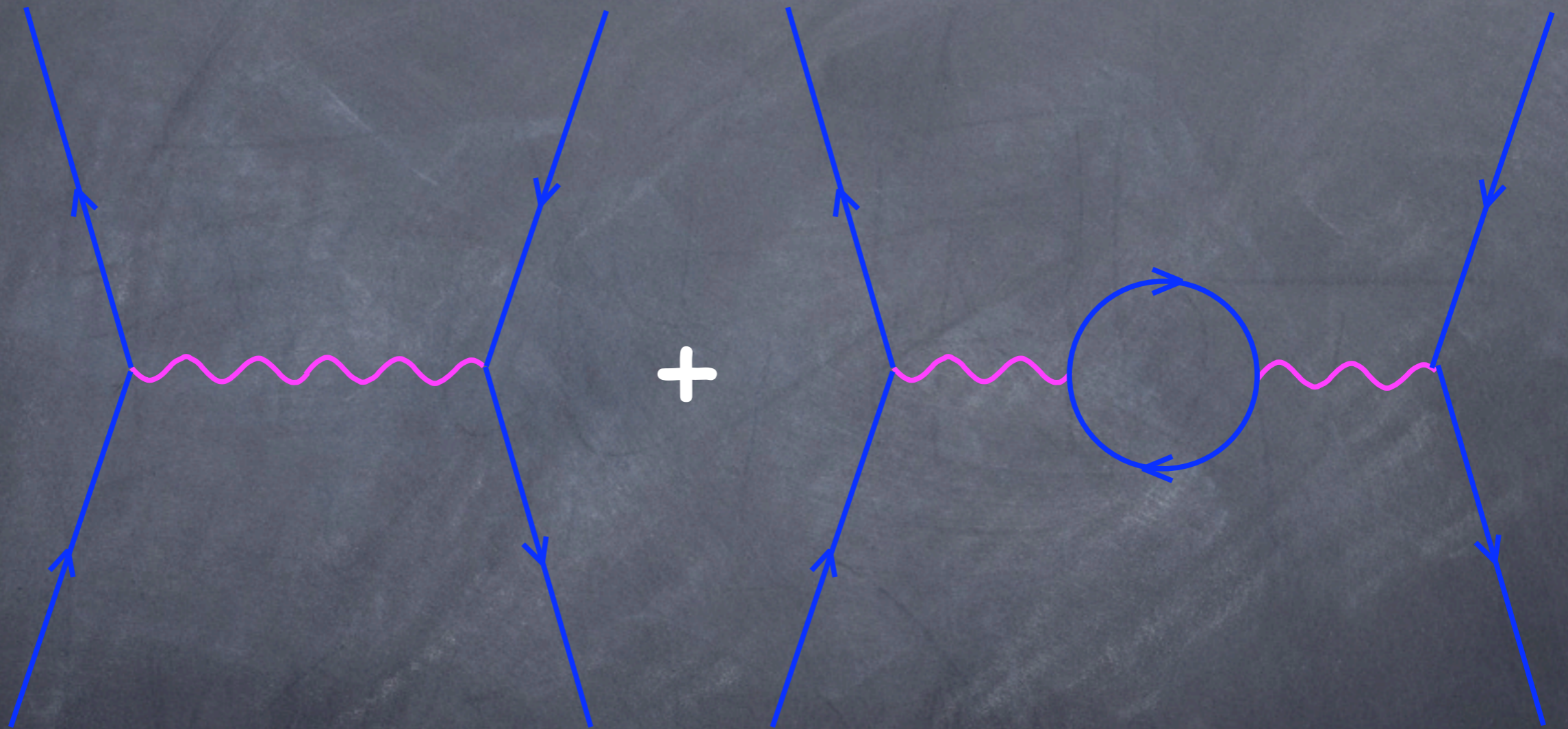


5.8 MB → 188 kB

Virtual Exchange



Virtual Exchange



Effective charge smaller at
larger distances

Anarchic Principle

"Anything that is not forbidden will occur."



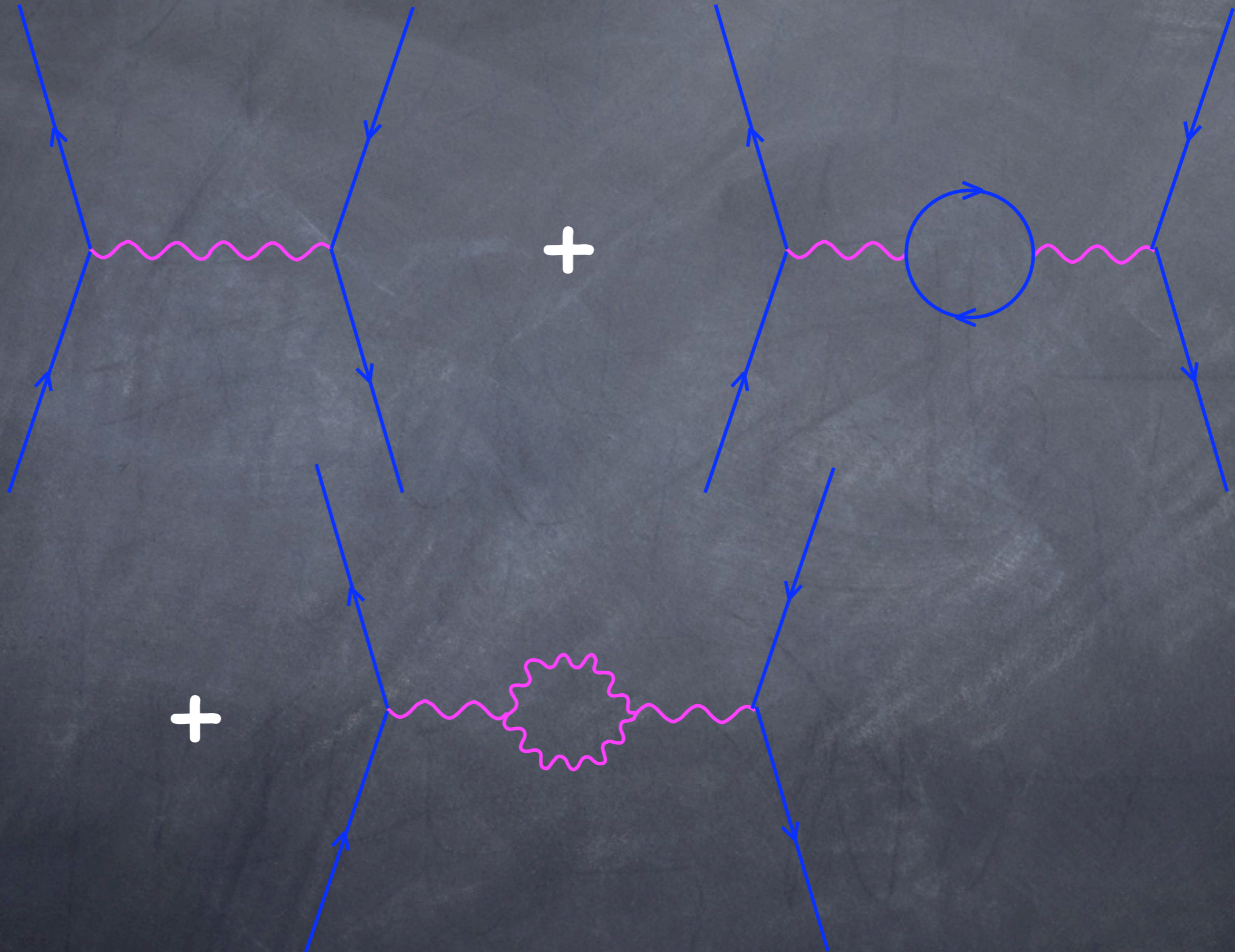
Jonathan Flynn

Gross, Politzer, Wilce



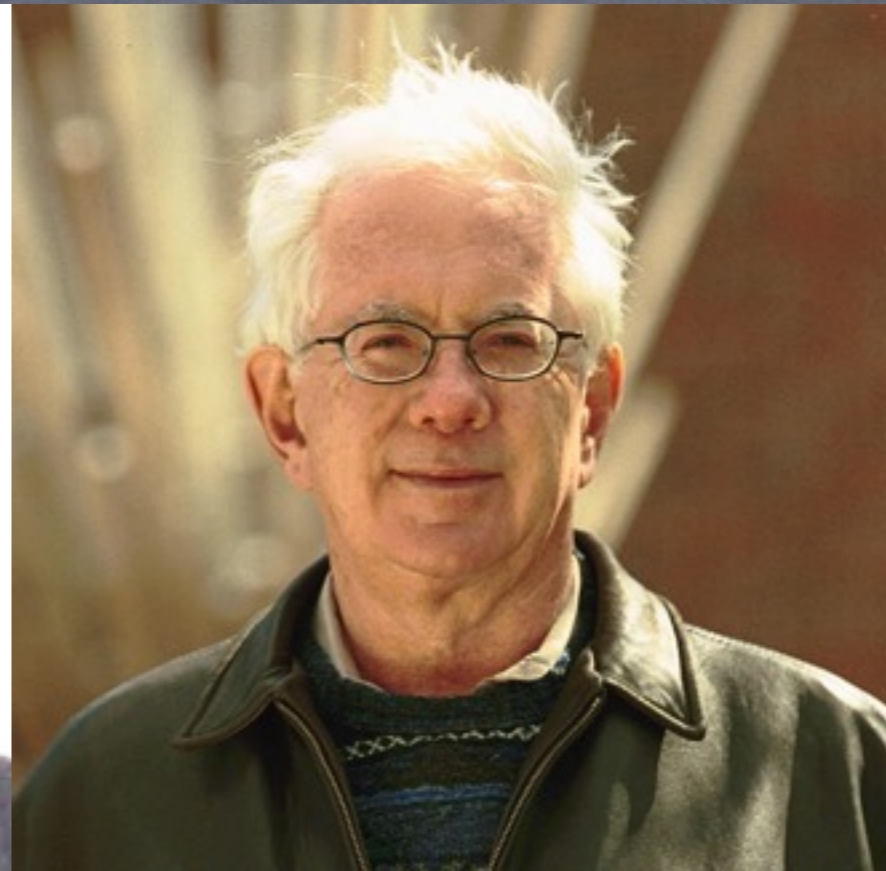
Nobel Prize 2004
color charge bigger at
larger distances

Gluon Virtual Exchange

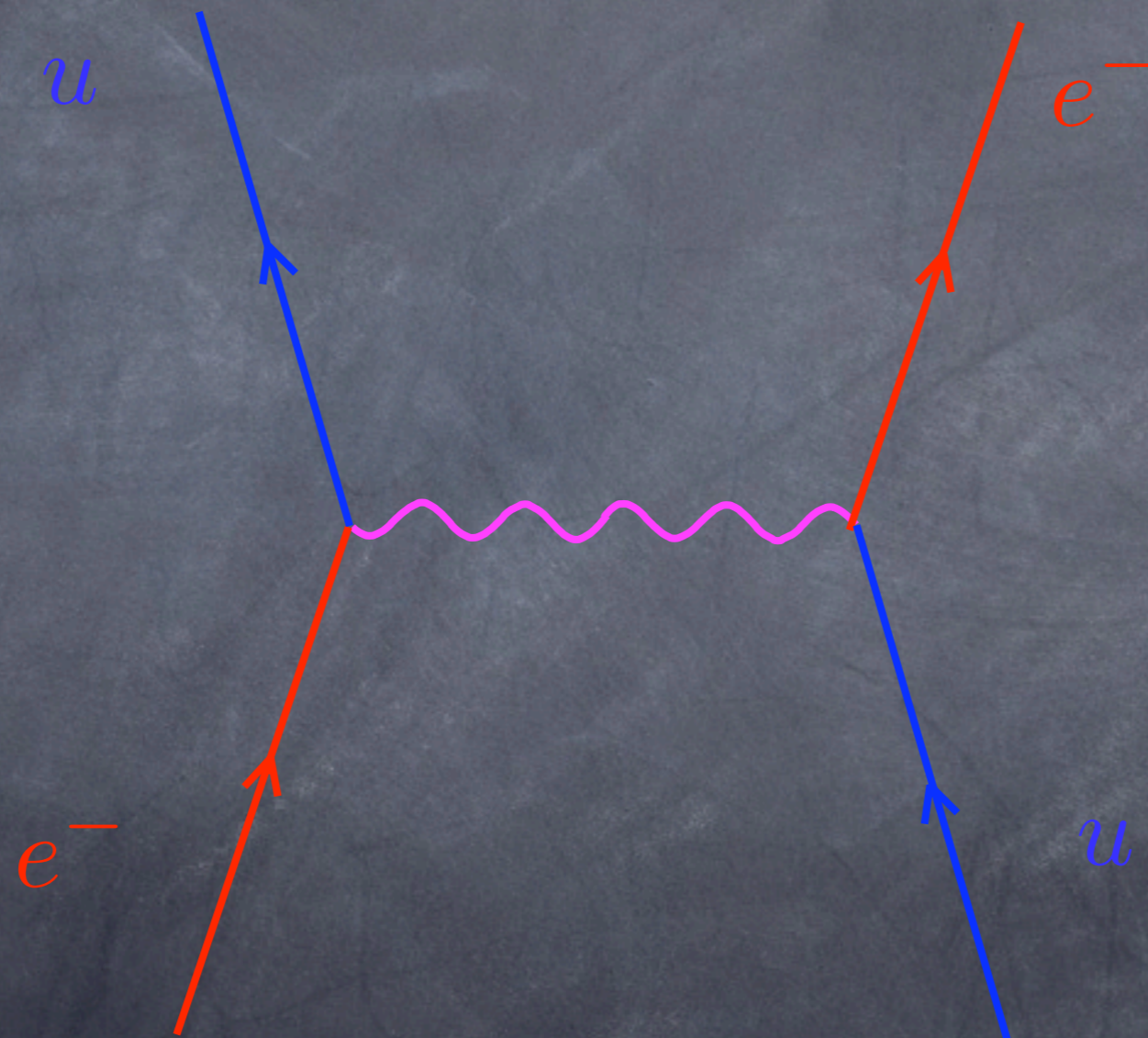


Effective charge larger at larger distances

Georgi, Glashow



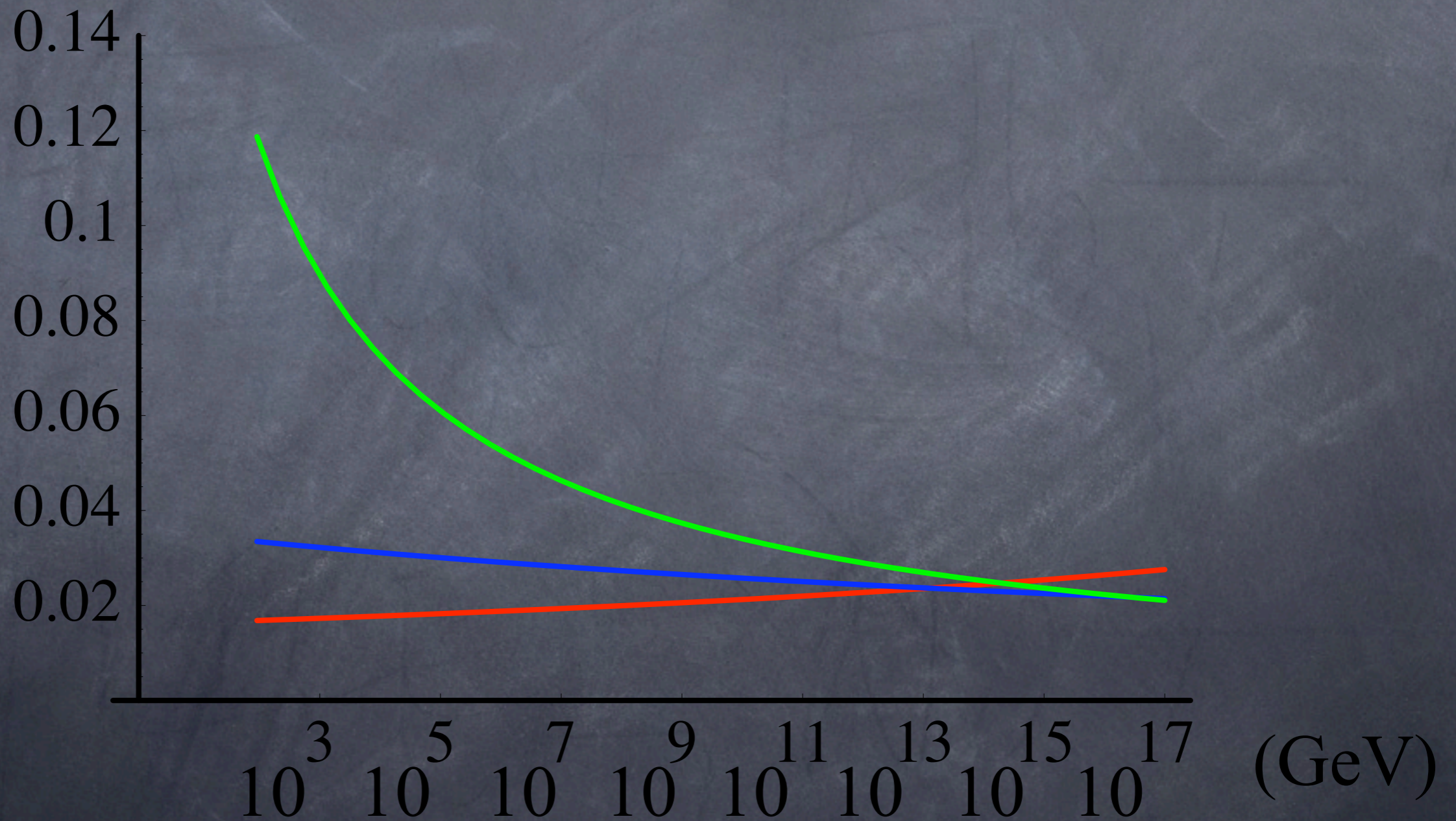
GUT Force



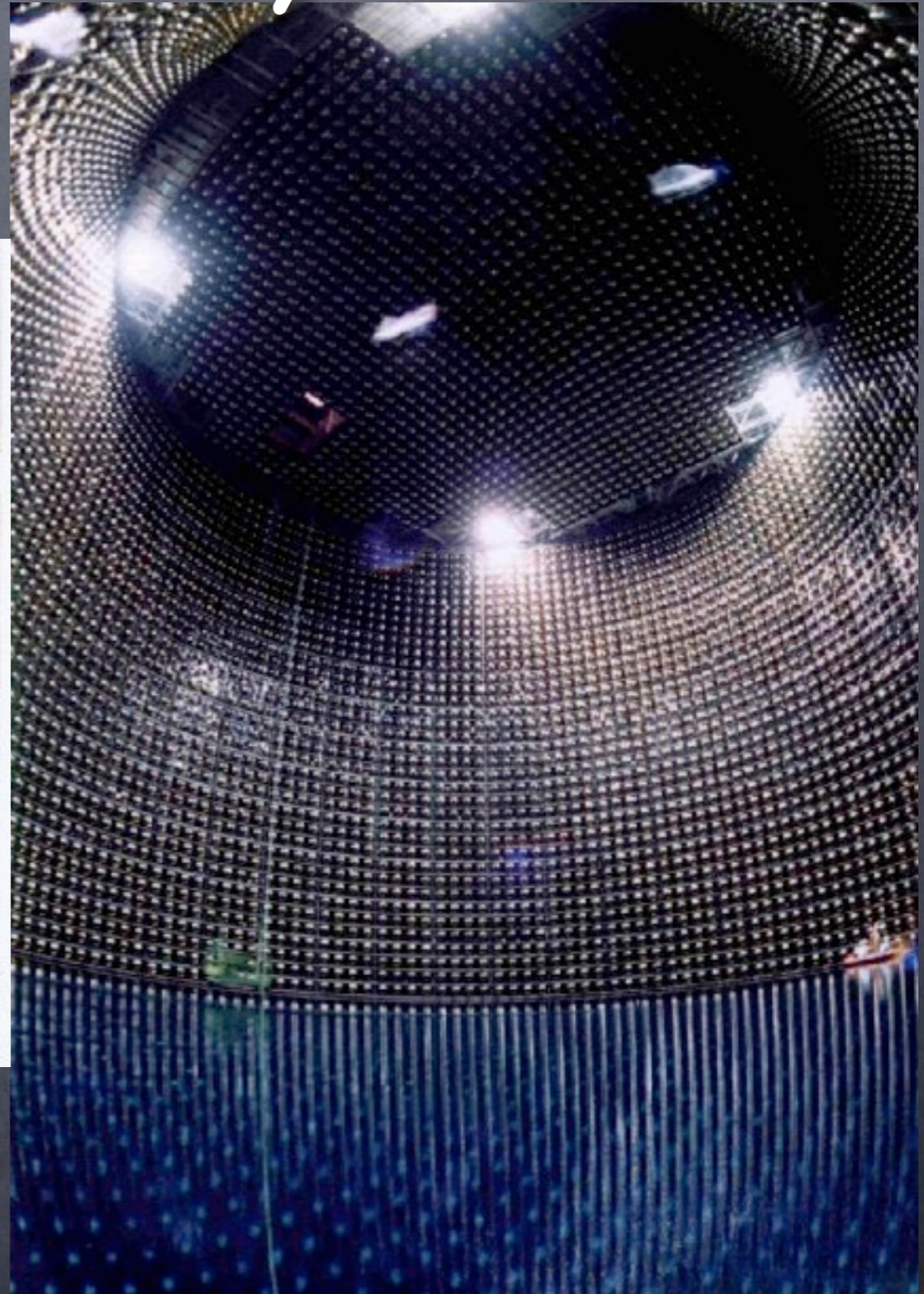
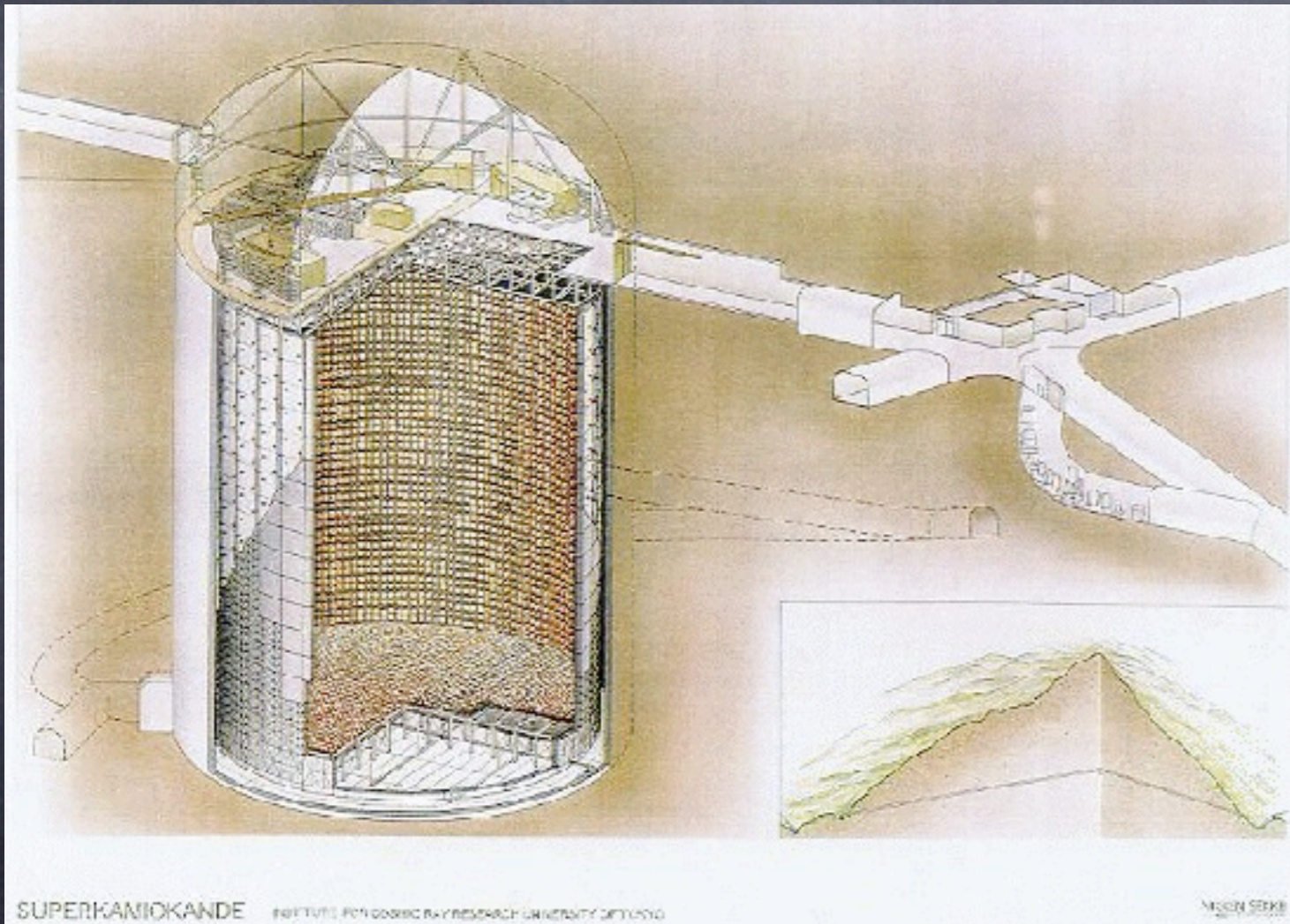
Georgi, Weinberg, Quinn



Unified Forces?



Proton Decay



Super-Kamiokande

Proton Decay

