Strings 2018
OIST
Okinawa Institute of Science and Technology Graduate University

Golden Jubilee

Of Crises & Revolutions

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"Physics thrives on crises" (S. Weinberg)

CERN 1968

- ~end June: checked in for month-long visit
- ~July 10: trip toTurin to get S.Fubini's blessing, left there copy of a handwritten draft…

$$A(s,t,u) = \frac{\beta}{\pi}\left[B(1-\alpha(t), 1-\alpha(s)) + B(1-\alpha(t), 1-\alpha(u)) + B(1-\alpha(s), 1-\alpha(u))\right] \qquad (3)$$

where we have introduced the Euler B-function $B(x,y) = \frac{\Gamma(x)\Gamma(y)}{\Gamma(x+y)}$.

- ~end July: submission to Nuovo Cimento

The hadronic crisis & two revolutions

QFT looked completely inadequate for strong interactions

String Theory: a revolution w/out QFT

QCD: a revolution w/in QFT

Both short & long-distance reasons for choosing the latter

The hadronic string revolution

- The result of a bottom-up approach based on phenomenological as well as theoretical inputs:
  - Linear Regge trajectories
  - DHS duality & duality diagrams (1967)
  - Nuclear democracy: all hadrons are equal
  - Crossing symmetry & dispersion relations
  - Zero-width approximation
- The outcome: **all hadrons are strings**!
- Still true but with an effective string replacing a fundamental/elementary one.

The quantum gravity crisis and the superstring revolution:

Existence of massless $J=1, 2$ strings implies (quantum versions of) gauge & gravitational interactions

The appearance of a fundamental length makes both UV finite

Challenges (again!) @ short & long distances:

- Understanding the fate of singularities (black holes, big bang,…)

- Reproducing a viable "low-energy" model of elementary particles & their interactions (e.g. no unwanted 5^{th} force)

To conclude

Let's wish to ST 50 more years of prosperity & to produce, by 2068, a

STSM

(string theoretic standard model)