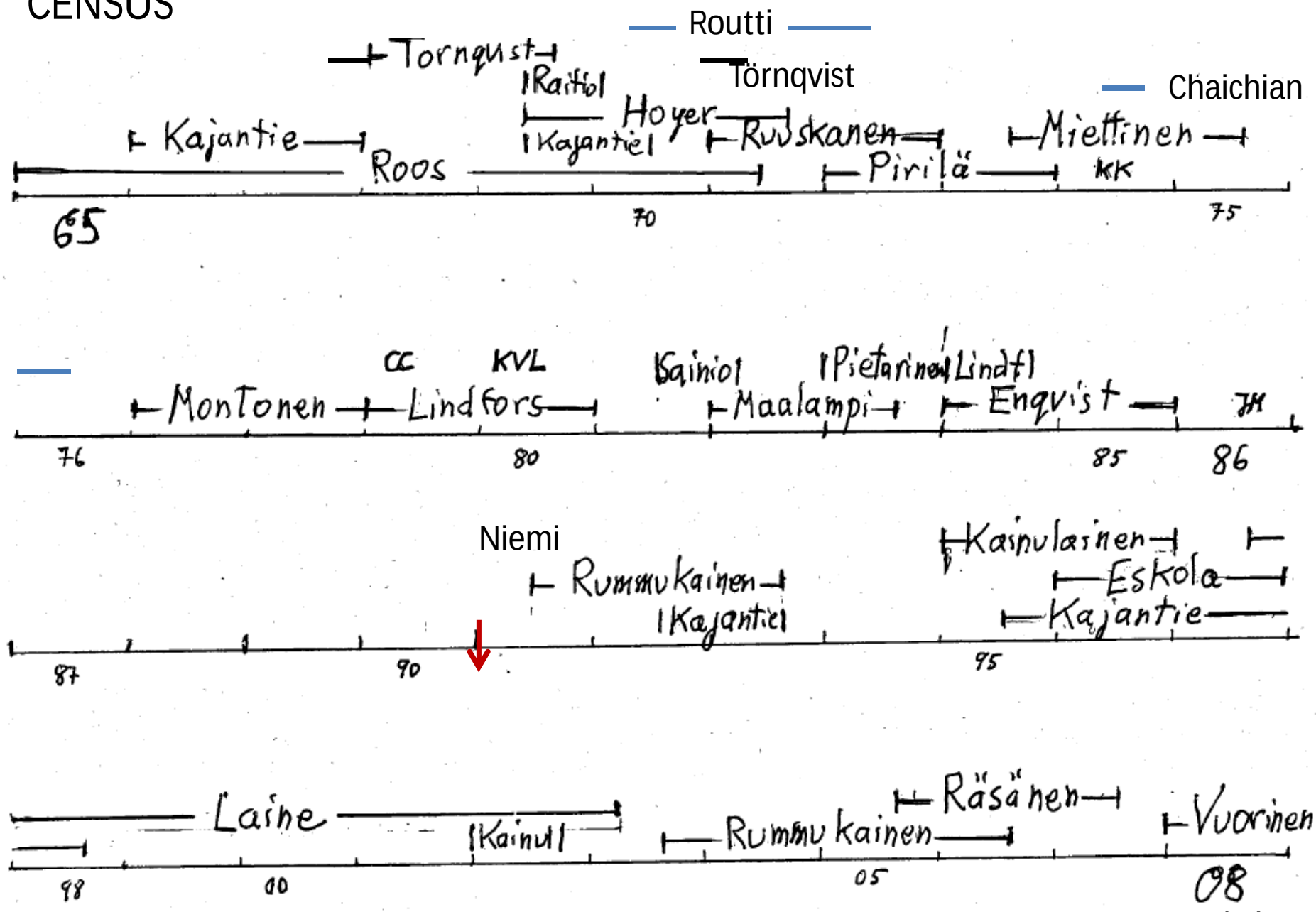
Finnish theorists and CERN

K. Kajantie, HIP

3 October 2014

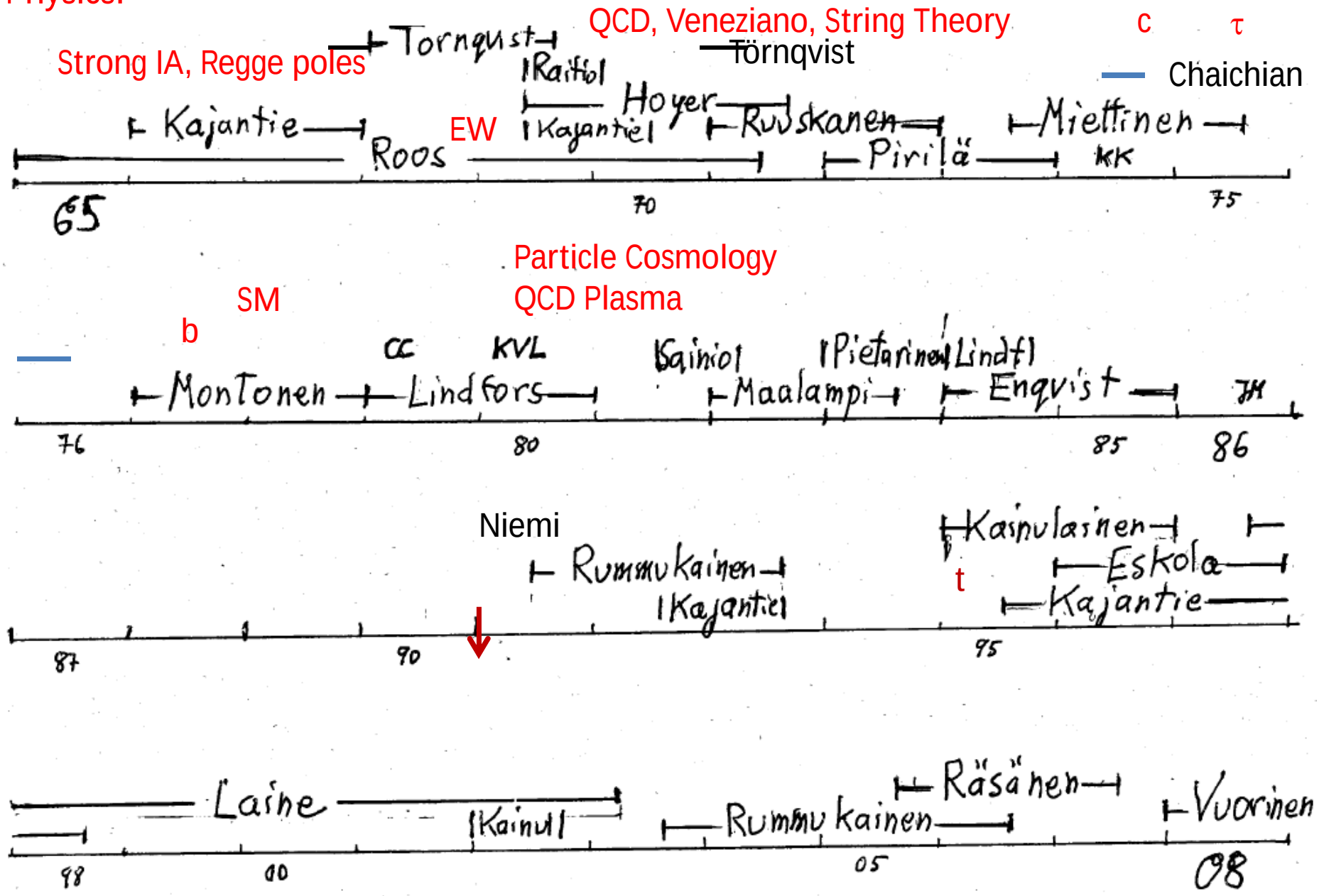
CENSUS



Absent: Huitu, Keski-Vakkuri, Tuominen, Rajantie, Vilja Riska, Niskanen

Now: Kurkela

Physics:



Absent: Huitu, Keski-Vakkuri, Tuominen, Rajantie, Vilja

Finances before 1968

- In 1966 I got per month 729mk from Helsinki U, 485mk from Comm of Nat Sc, a scholarship 4000mk from Aaltonen or in total 1380mk/month = 1840Sfr/month plus 500Sfr from TH Division = 2340 Sfr/month. Not bad, apartment 600Sfr/month

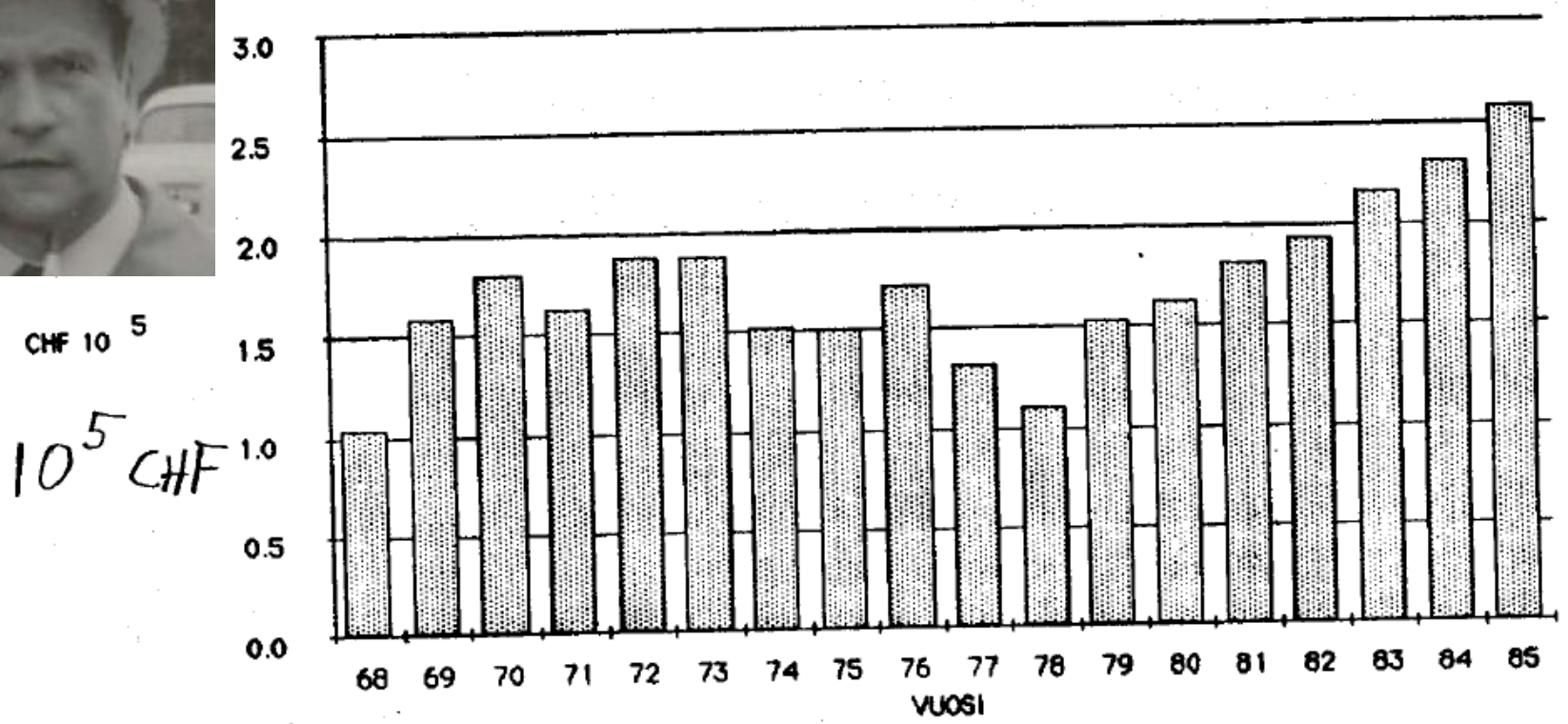
Then 1 Sfr = 0.75 mk

Now 1 CHF = 0.83 EUR = 4.1 FIM

All Finnish TH visitors had to patch up their support from various sources. Speciality: ”0sapalkka”, you could get up to 70% of your salary ”for training abroad” – if you had a job!.

Committee for Particle Physics 1968-89, Hitukomitea

Picking the raisins from the pudding



Kuva 3. Hiukkasfysiikan komitean vuosittainen määräraha CERNin matkoihin ja siellä työskentelyyn (mom. AI) Sveitsin frangeinax. Sveitsin inflaatiota ei ole otettu huomioon.

What was gained by connections to CERN/TH?

Theoretical particle physics in Finland is unthinkable without CERN

About 24 TH-physicists have spent extended periods at CERN

All write they profited tremendously of their stay

13 have had/have stable academic position in particle physics

Helsinki, Jyväskylä, Bern

These have so far been advisors of 70 Finnish + 15 non-Finnish PhDs

How did TH Finns contribute to CERN? Papers with affiliation:CERN AND cit>250:

- ParticleDataGroup with Roos (total 36k citations) and Törnqvist (48k) is a special case

Has crucially affected the position of Helsinki U in university listings

Note: exp part physicists normally have ~ 40k total citations

- Roos – James (75, Minuit) 1393
- Montonen – Olive (77, duality) 728
- Roos – Leutwyler (84, KM matrix) 560
- Enqvist – Ellis, Nanopoulos, Zwirner (85, Super stuff) 296, 323
- Kajantie, Laine, Rummukainen – Shaposhnikov (96, hot EW) 274, 323, 350
- Eskola, Kolhinen, Ruuskanen (98, heavy ions) 262, 311
- Kajantie, Laine, Rummukainen, Schröder (02, hot QCD) 297

Moral: find good collaborators!

Special assignment of more recent TH fellows:

lecturing to visiting school groups

Even better: have a Nobel laureate as your advisor:

Fermi ⇒ Chew ⇒ David Gross ⇒ Wilzcek, Witten

Fermi ⇒ Treiman ⇒ Weinberg (Fermillä yhteensä 13 nobelistijälkeläistä[1])

Segré, Rainwater, Fitch, Yang, Lee, Gross, Wilczek, Chamberlain, Steinberger, Schwarz, Weinberg, Rubbia, Freedman

Born, Wigner ⇒ Weisskopf ⇒ Gell-Mann ⇒ Coleman ⇒ Politzer

Gell-Mann ⇒ Ken Wilson ⇒ Peskin

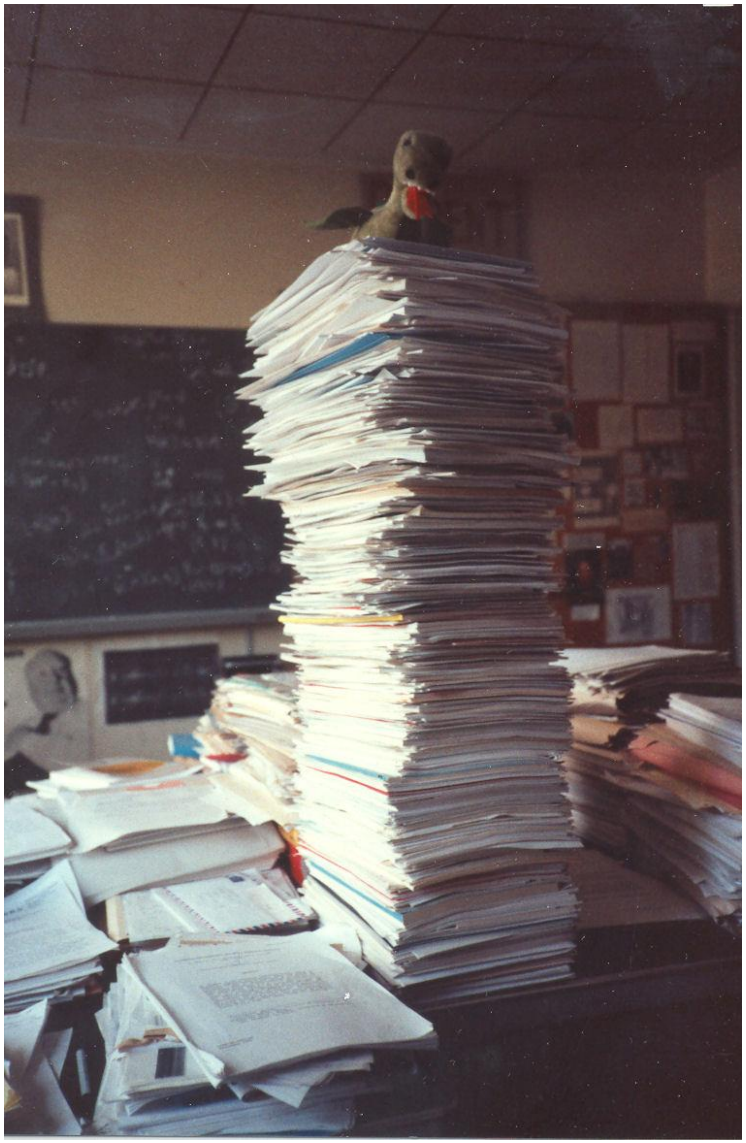
Rabi ⇒ Schwinger ⇒ Glashow, Glauber, Kohn, Mottelson

Van Hove ⇒ Veltman ⇒ 't Hooft

John Bell/CERN is an exception – but he died too early!

Facilities in 66: Desk, chair, paper, pencil, phone

John Ellis's desk was famous:



Tower collapsed once on its own with Enqvist and Nanopoulos watching with dismay.

but Morpurgo's desk
was more chaotic:

Results were published in the form of preprints:

Equations were written by hand on sheets of wax fed into a duplicating machine, text was typed in a typing pool

CONSTRUCTION OF A CROSSING SYMMETRIC, REGGE BEHAVED AMPLITUDE FOR LINEARLY RISING TRAJECTORIES

G. Veneziano*+
CERN - Geneva

A B S T R A C T

A representation of the scattering amplitude, containing an average Regge behaviour and crossing symmetry for linearly rising trajectories, is proposed. It obeys superconvergence sum rules at all t, exhibits in a clear way the Regge poles vs. resonances duality and demands families of parallel daughters.

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* On leave of absence from the Weizmann Institute of Science, Rehovoth, Israel

+ Address after 1 September 1968: Department of Physics, M.I.T., Cambridge, Mass. USA

68/881/5 - TH. 924
19 July 1968

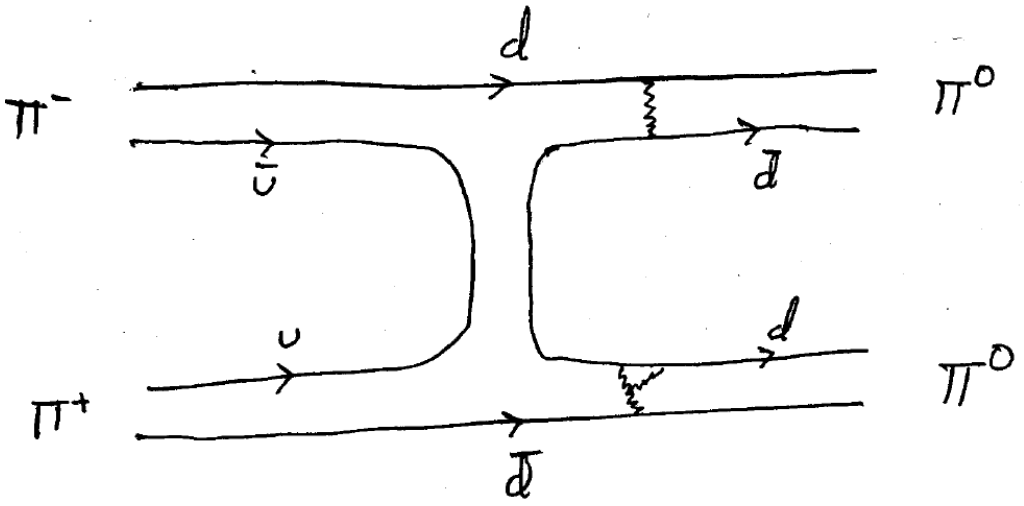
Roos had number 1000

Consequently, we take out the factor $(-\alpha(s))^{\alpha(t)-1}$ and we symmetrize Eq. (2) multiplying by a factor $\Gamma(1-\alpha(s))$ and dividing by $\Gamma(2-\alpha(s)-\alpha(t))$ in order to have the correct asymptotic behaviour. After symmetrization in s,t,u we have

Ultrafamous Veneziano model:

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

One studied reactions of strongly interacting particles, symbolically:



Nobody can compute the amplitude even today and even numerically!

However, then
QCD was discovered:

686

CALT 68-409
AEC RESEARCH AND
DEVELOPMENT REPORT

Advantages of the Color Octet Gluon Picture*

HARALD FRITZSCH†, MURRAY GELL-MANN and HEINRICH LEUTWYLER††

California Institute of Technology, Pasadena, California 91109

Phys. Letters 47B, 365 (73

ABSTRACT

It is pointed out that there are several advantages in abstracting properties of hadrons and their currents from a Yang-Mills gauge model based on colored quarks and color octet gluons.

Regge poles, reaction
amplitudes were forgotten

18. XII. 1973

Field theory, string theory,
Standard Model

A godfather of many of the Finns:
Chan Hong-Mo

Joint papers with
Kajantie
Hoyer
Raitio
Törnqvist
Miettinen
Ruuskanen

Prof at Rutherford Lab
Wife Tsou Sheung
Tsun, prof. of Math

Bet on quark molecules:
none found

Has written a big book on
Chinese poetry!

John "Bell's theorem" Bell

1928 -1990

Nuclear, accelerator, particle physicist

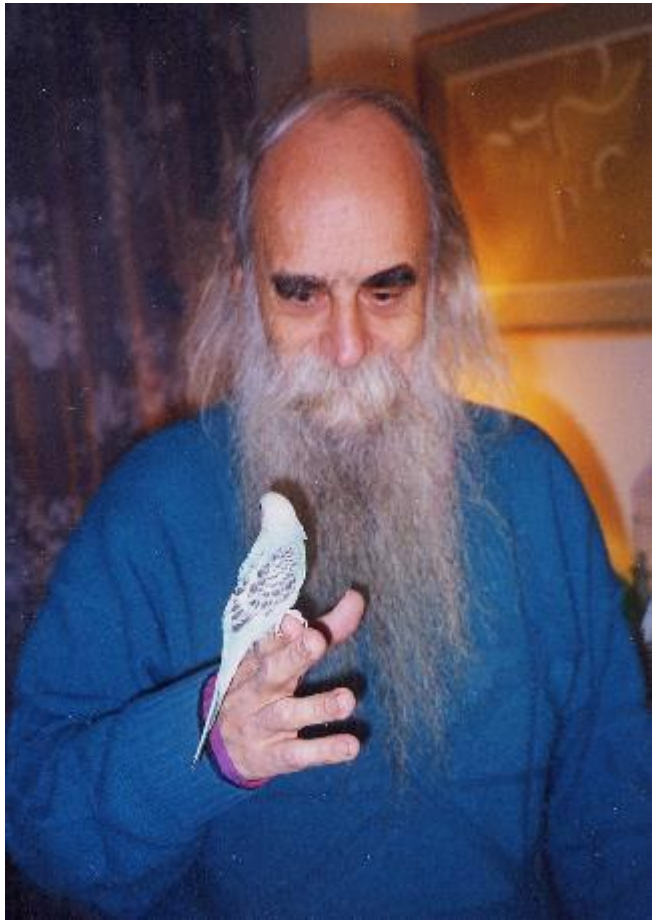
Hobby: foundations of quantum mechanics. Bell's theorem 1964, non-locality, no hidden variables

I had often lunch with him at the unusual time of 11.45; he was vegetarian

Died unexpectedly in 1990: it is 100% certain he was a few years from a Nobel prize in physics

Claud ”d=26” Lovelace

1934-2012



Came to a party with a stack of 10 PhysRevs and started reading them in a corner

Came to seminars with huge piles of computer output

Protest movement: when he gave a seminar everybody came with books and papers and Veltman with a sleeping bag

Discovered in 1971 that bosonic string theory is consistent in d=26

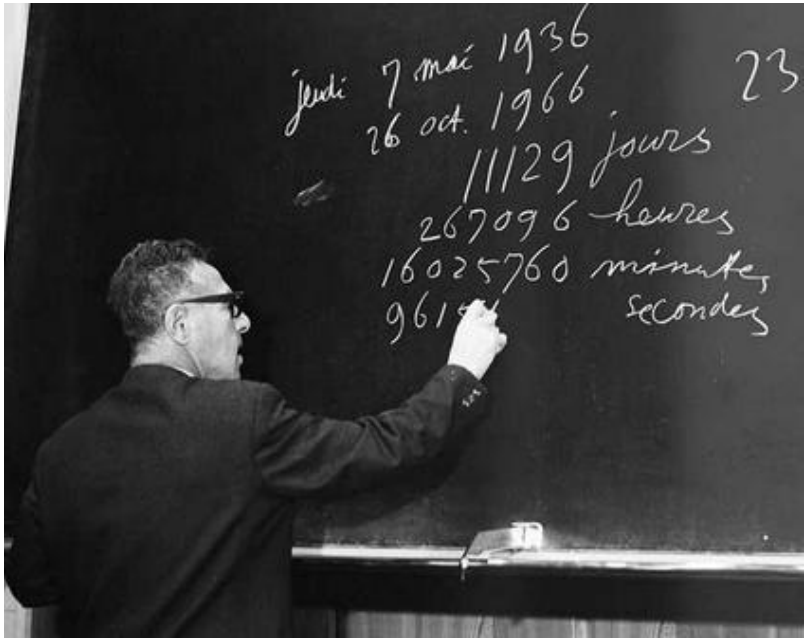
In Rutgers 1971-2012
Willed his fortune of 1.5M$ to the physics dept for chair in exp cond matt phys

Wim "the human computer" Klein

1912-1986

At CERN/TH 1958-1976 as a computer

Unbelievable mental computational abilities



73rd root of a 500 digit number in 2min43s

Was murdered by an unknown