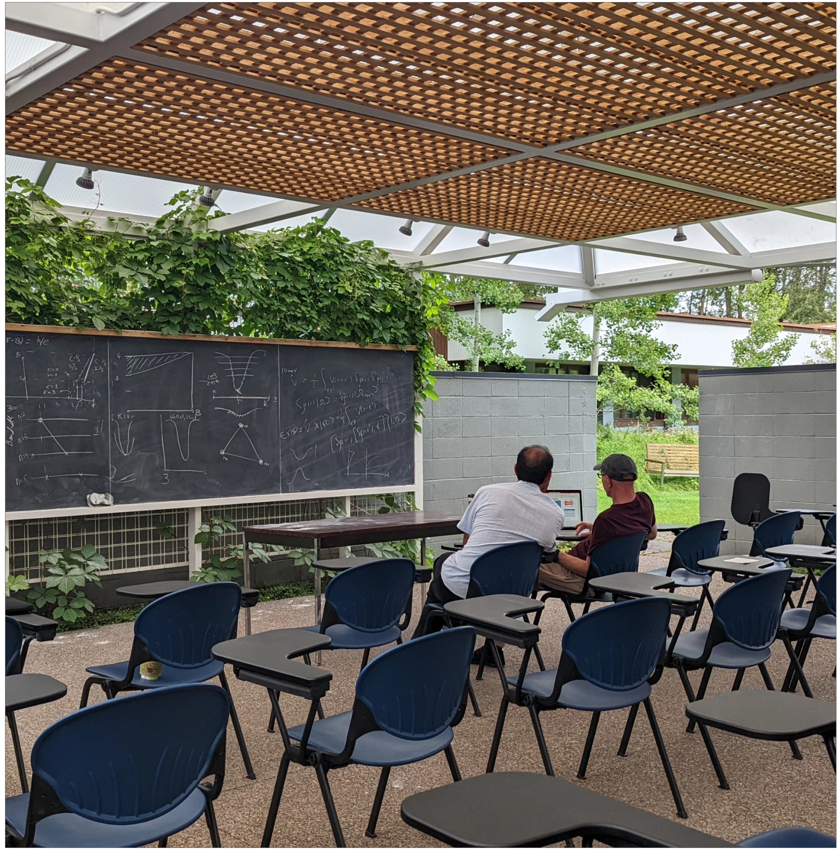
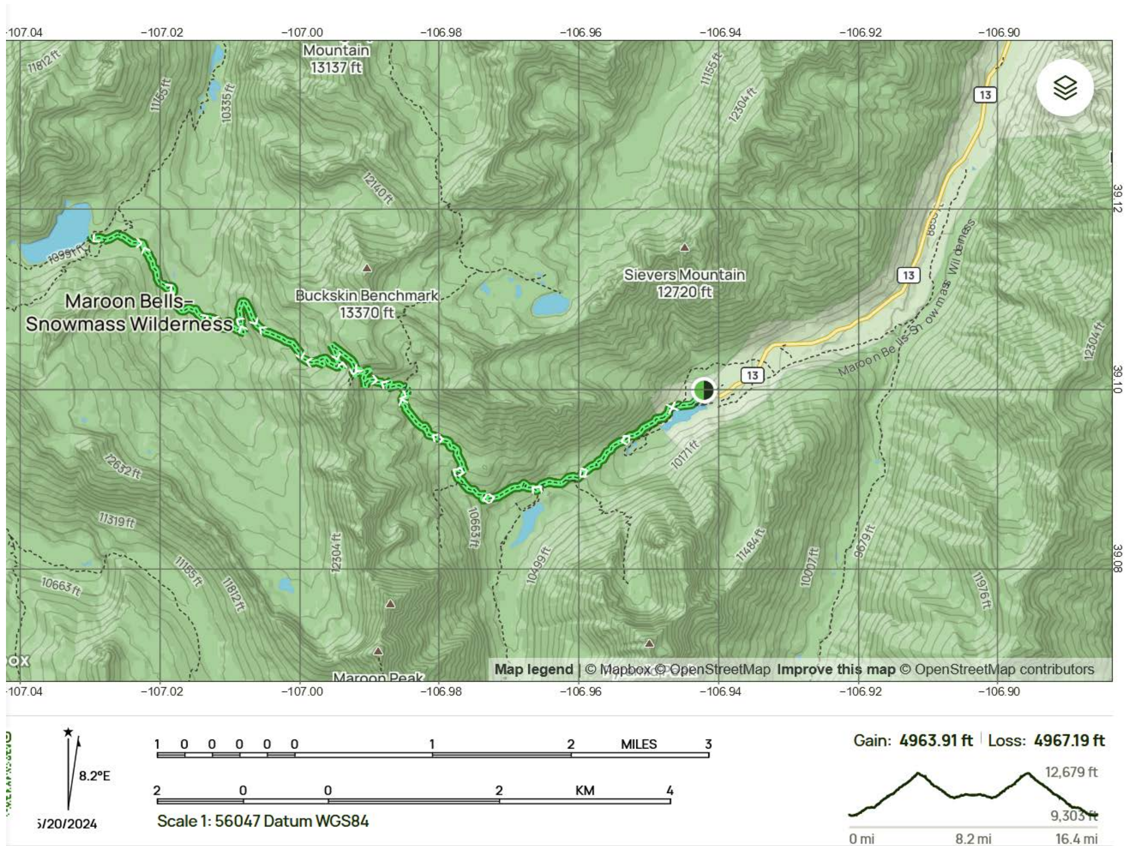
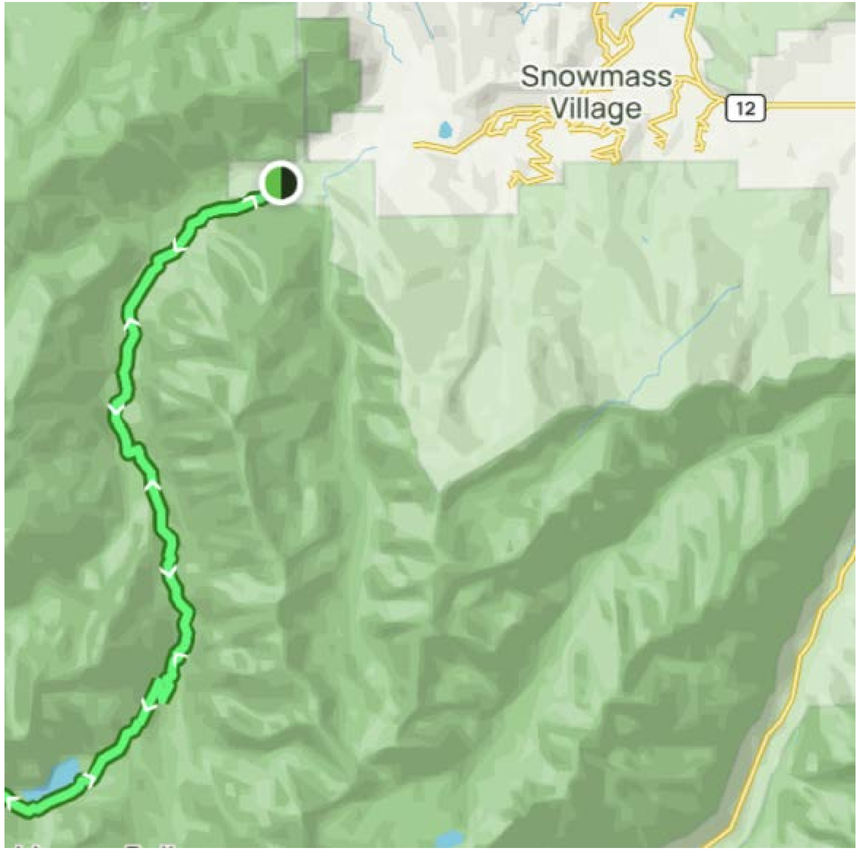
Alvaro@80

Howard Georgi



https://aspenphys.org/summer/


Mountain
13137 ft
Maroon Bells-
Snowmass Wilderness
Buckskin Benchmark
13370 ft
Sievers Mountain
12720 ft
Maroon Peak
13
Map legend | © Mapbox © OpenStreetMap Improve this map © OpenStreetMap contributors
8.2°E
5/20/2024
MILES
KM
Scale 1: 56047 Datum WGS84
Gain: 4963.91 ft | Loss: 4967.19 ft
12,679 ft
9,303 ft
0 mi
8.2 mi
16.4 mi

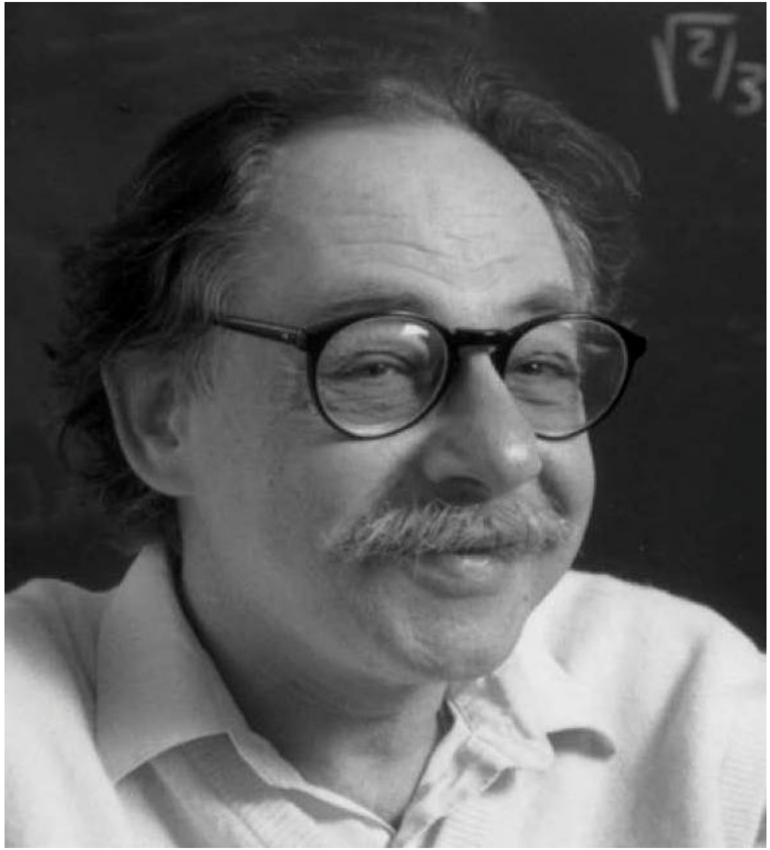


alltrails.com

Creator: Jack Brauer, Copyright: Jack Brauer

https://wildwanderertripreports.com/2021/07/19/

https://history.fnal.gov/historical/people/lee.html



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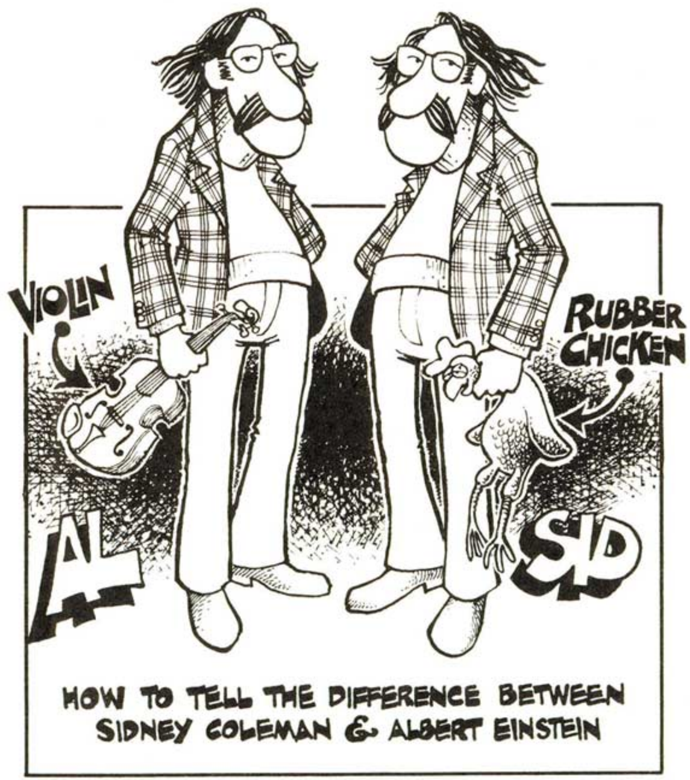
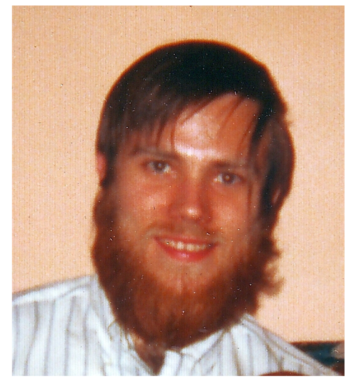


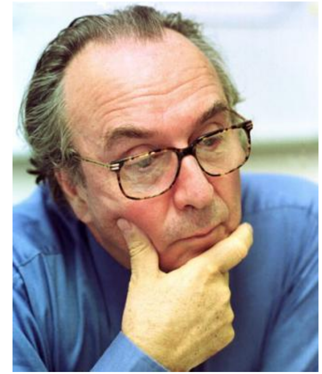
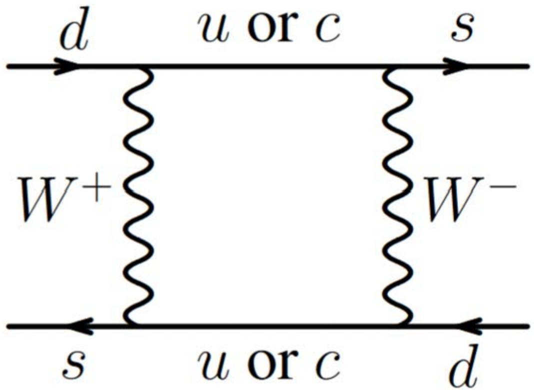
Cartoon by Grant Canfield in http://efanzines.com/EK/eI36/





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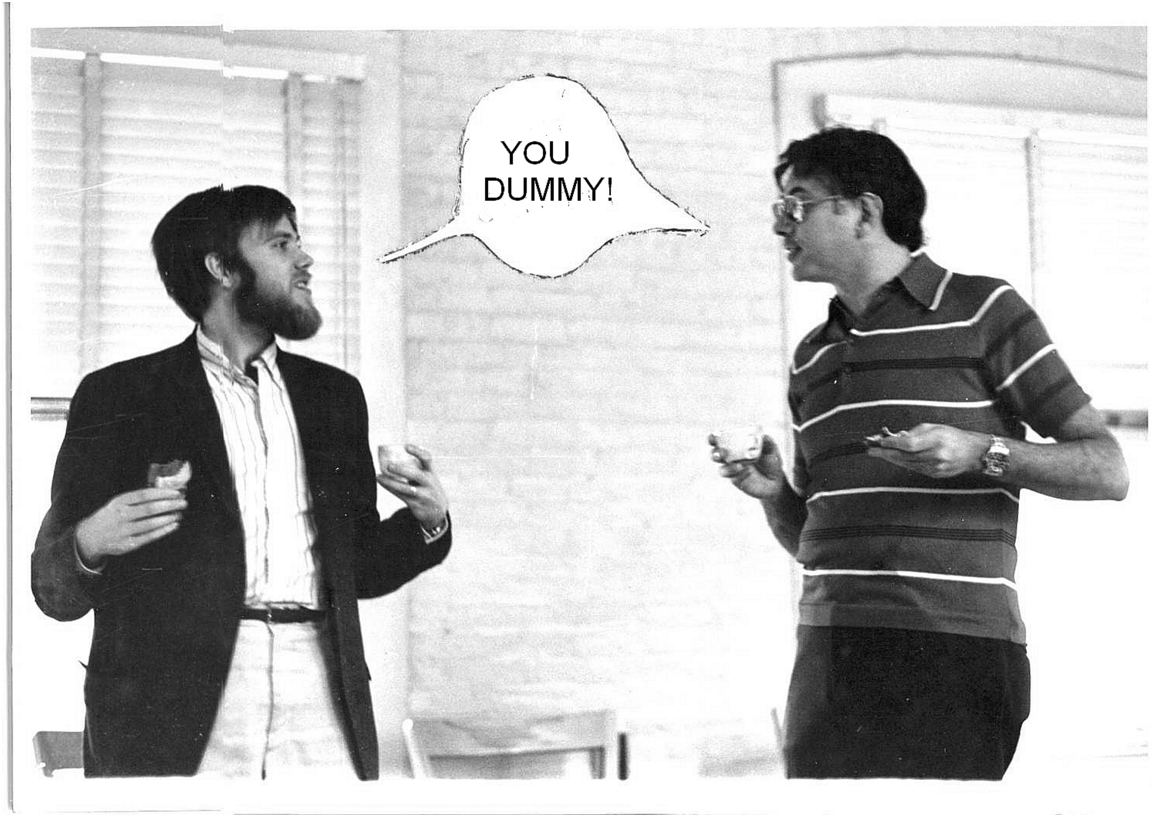
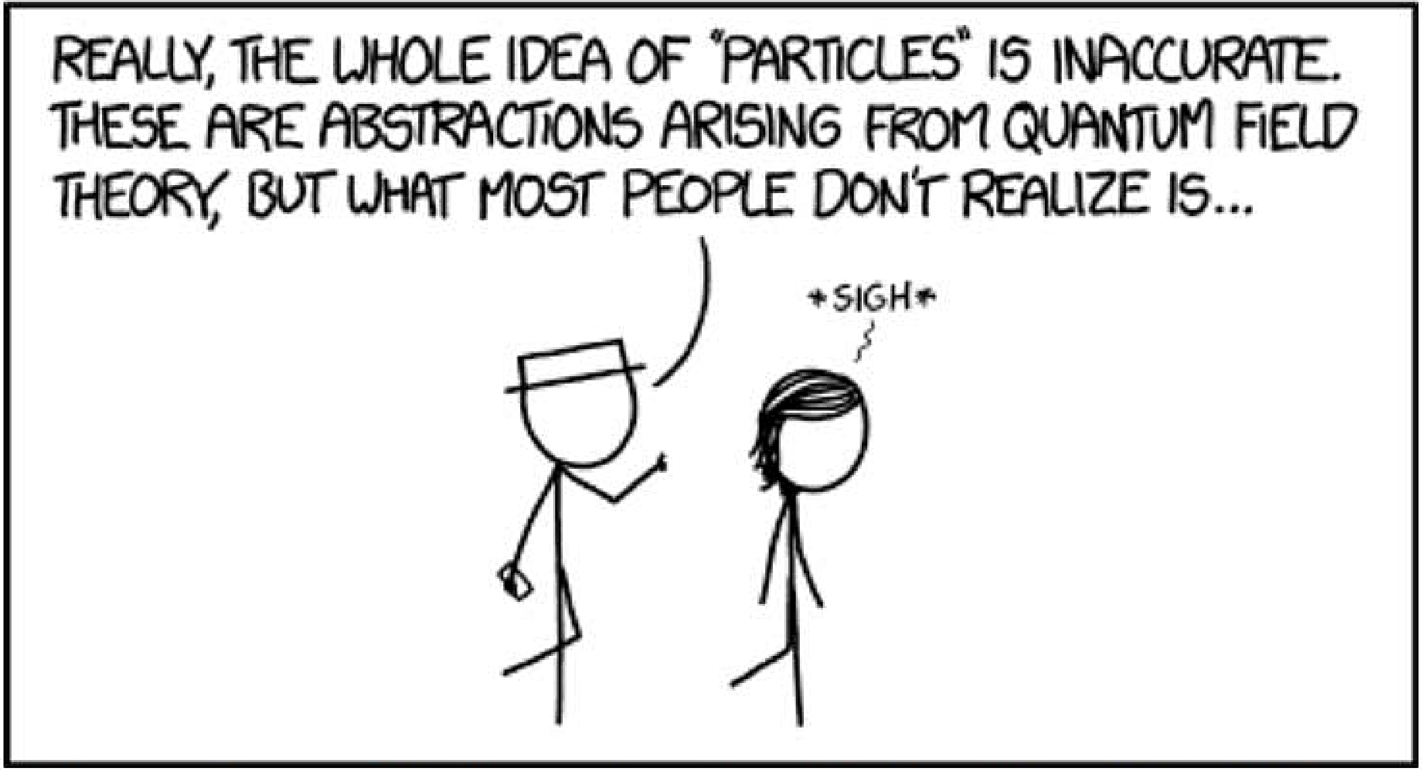
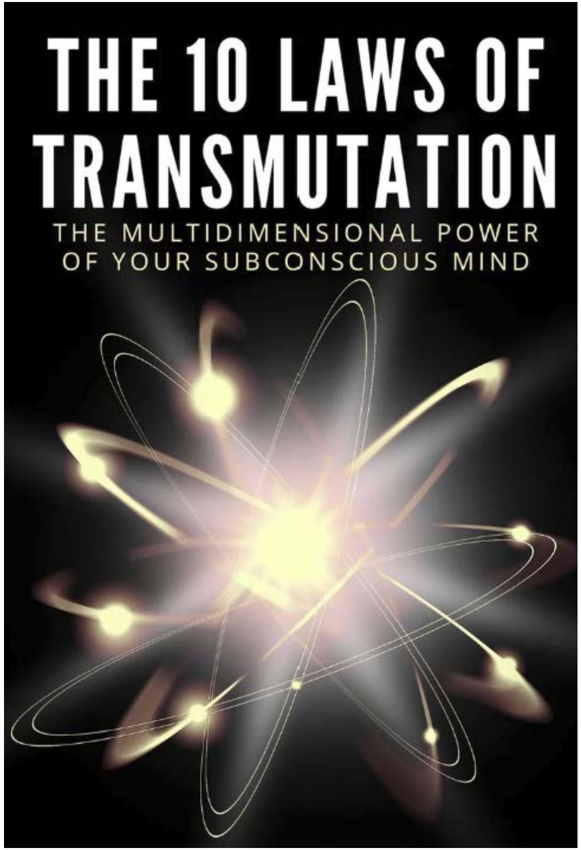

YOU DUMMY!



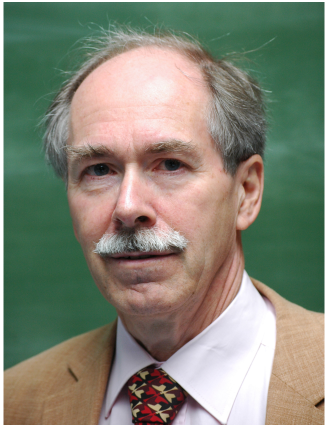
Randall Munroe - XKCD

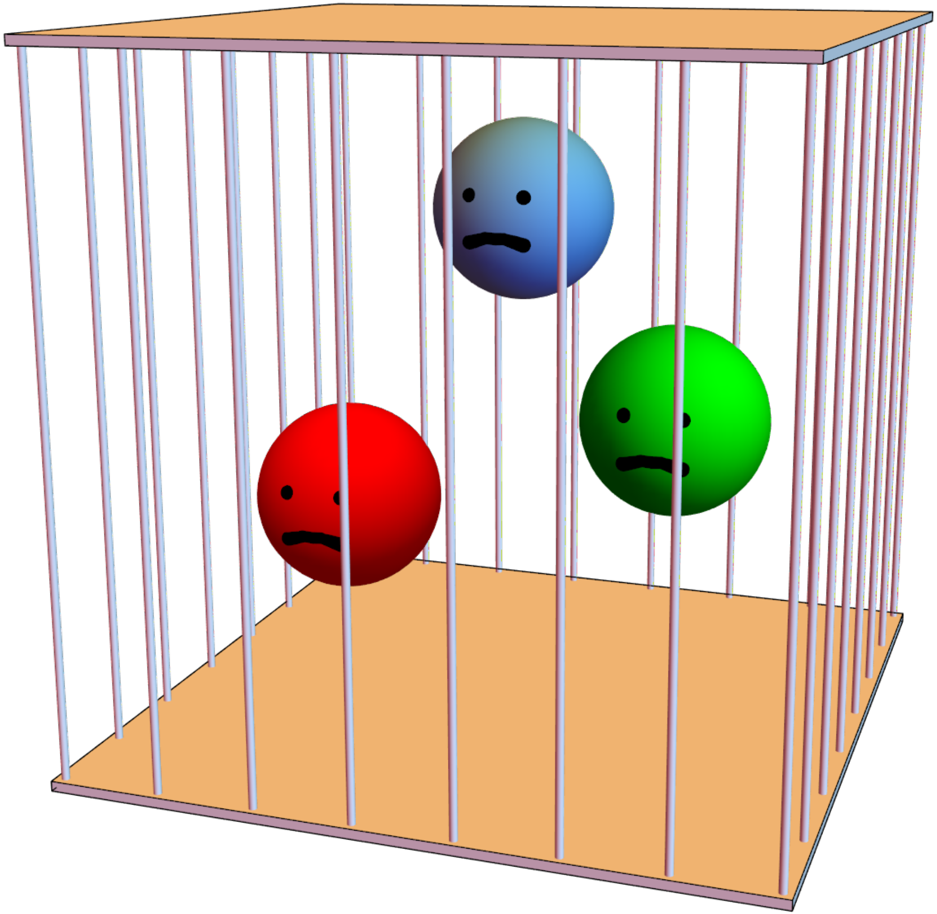


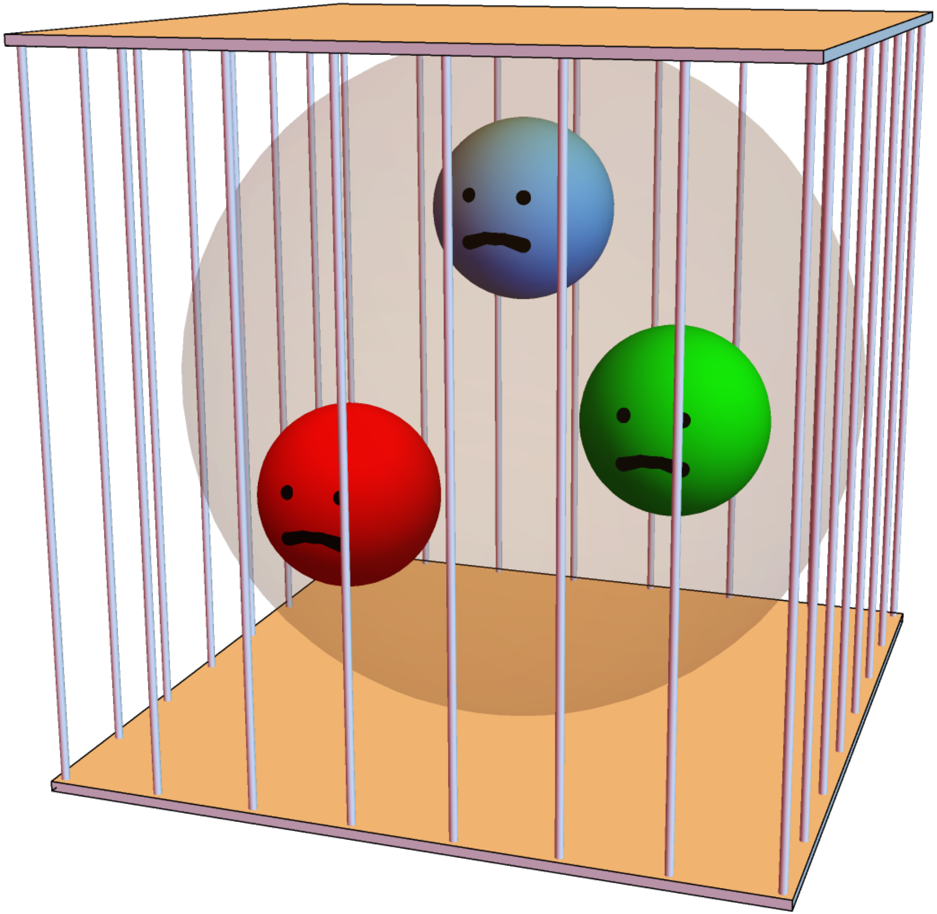
Radiative Corrections as the Origin of Spontaneous Symmetry Breaking

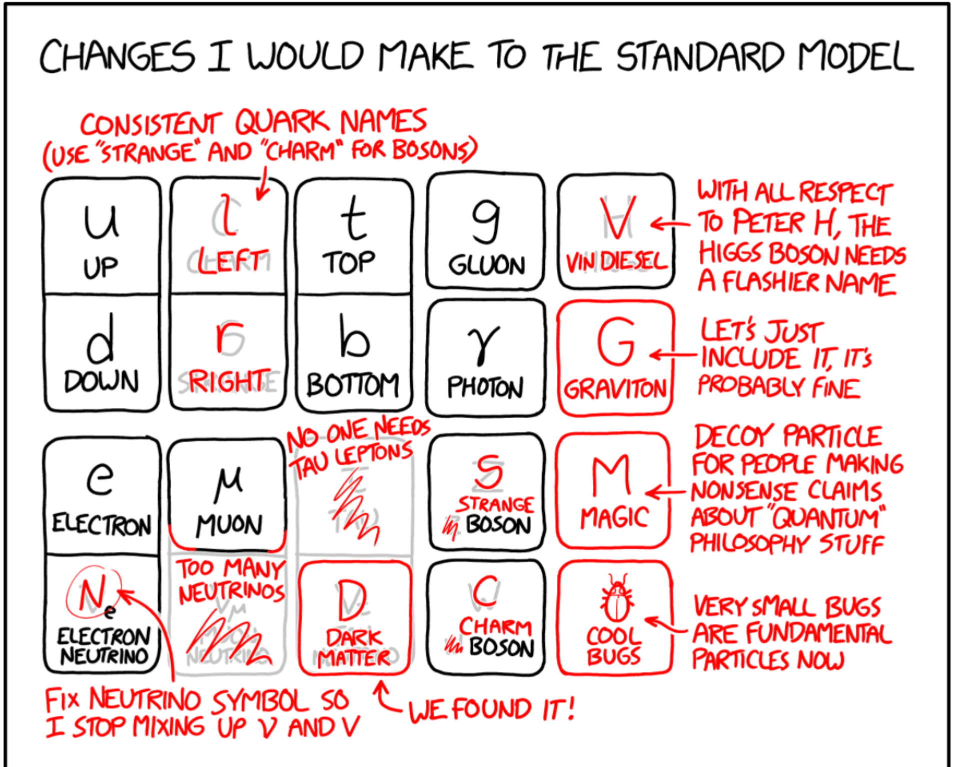
S. Coleman & E. Weinberg

November 1972 — soon after Alvaro arrived at harvard





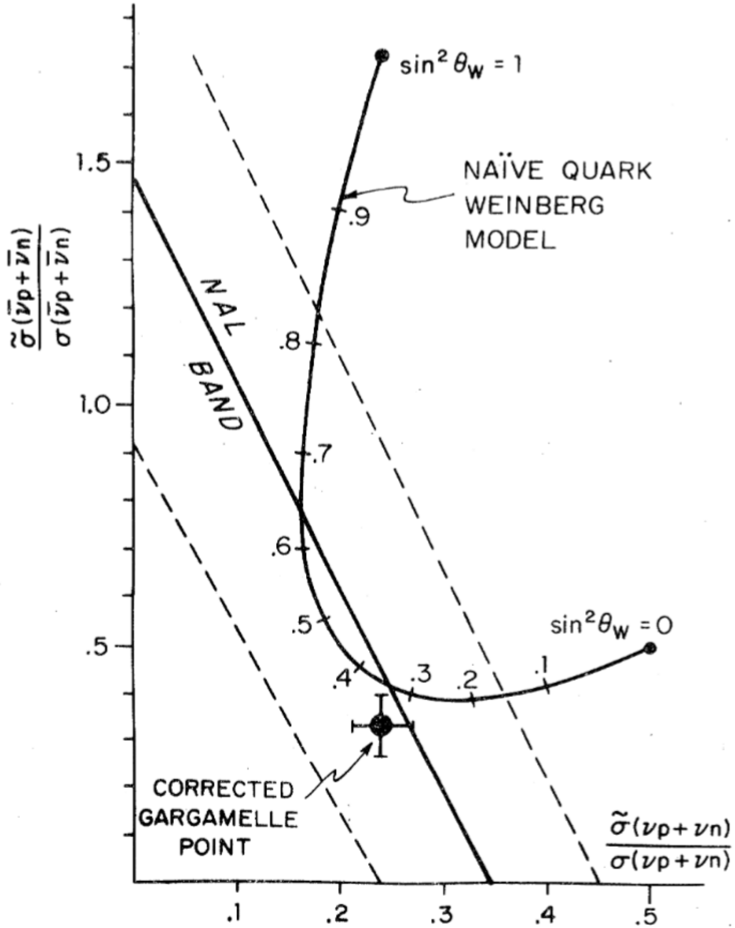


Randall Mundoe - XKCD

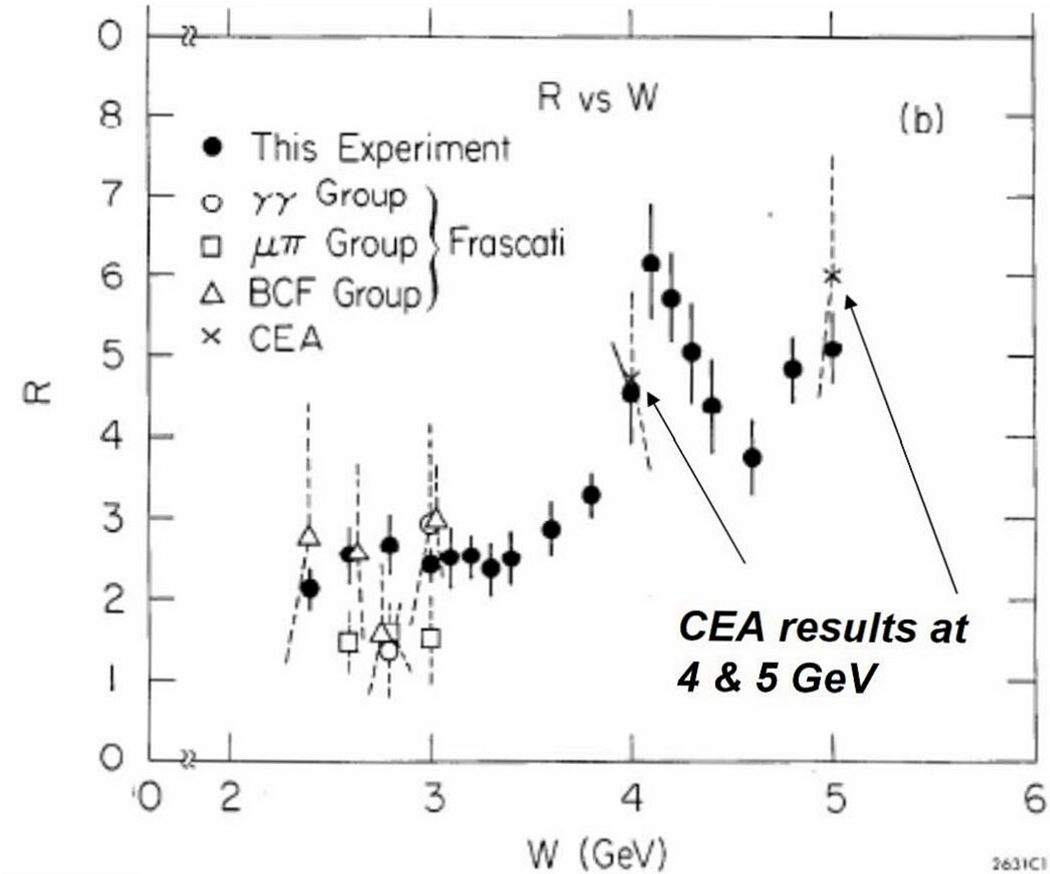
Fact and Fancy in Neutrino Physics

Dramatis Personae

Moderator (an experimentalist)	Alvaro De Rújula
Speaker (a conservative theorist)	Helen Quinn
Model Builder (a not-so-conservative theorist)	Sheldon Glashow
Computer (a talking computer)	Howard Georgi

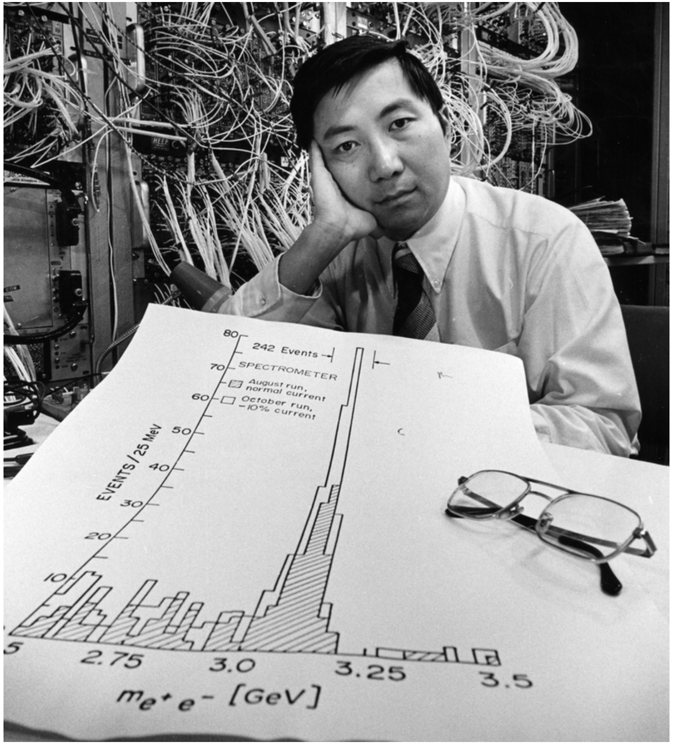


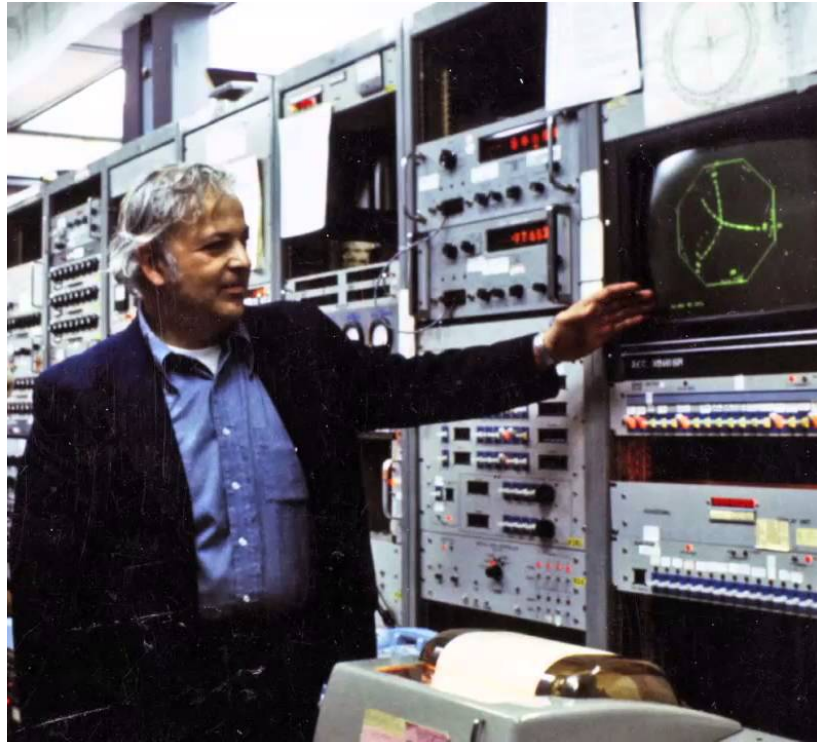
$\frac{\tilde{\sigma}(\bar{\nu}p+\bar{\nu}n)}{\sigma(\bar{\nu}p+\bar{\nu}n)}$
1.5
1.0
.5
$\sin^2\theta_W = 1$
NAÏVE QUARK
WEINBERG
MODEL
.9
.8
.7
.6
.5
.4
.3
.2
.1
$\sin^2\theta_W = 0$
NAL
BAND
CORRECTED
GARGAMELLE
POINT
$\frac{\tilde{\sigma}(\nu p+\nu n)}{\sigma(\nu p+\nu n)}$
.1
.2
.3
.4
.5



SLAC-PUB-1520, LBL-3621; January 1975







Physical Review Letters 6 January 1975 — 8 theory articles

Are the New Particles Baryon-Antibaryon Nuclei?

Alfred S. Goldhaber and Maurice Goldhaber

Baryon-antibaryon bound states and resonances could account for the new particles, as well as narrow states near nucleon-antinucleon threshold, which were reported earlier. [**no comment**]

Interpretation of a Narrow Resonance in e+e- Annihilation

Julian Schwinger

A previously published unified theory of electromagnetic and weak interactions proposed a mixing between two types of unit-spin mesons, one of which would have precisely the characteristics of the newly discovered neutral resonance at 3.1 GeV. With this interpretation, a substantial fraction of the small hadronic decay rate can be accounted for. It is also remarked that other long-lived particles should exist in order to complete the analogy with ρ^0, ω, and ϕ. [**no comment**]

Possible Explanation of the New Resonance in e+e- Annihilation

S. Borchardt, V. S. Mathur, and S. Okubo

We propose that the recently discovered resonance in e+e- annihilation is a member of the $15 \oplus 1$ dimensional representation of the SU(4) group. This hypothesis is consistent with the various experimental features reported for the resonance. In addition, we make a prediction for the masses of the charmed vector mesons belonging to the same representation. [**mentions charm but completely misses the point**]

Model with Three Charmed Quarks

R. Michael Barnett

The spectroscopy and weak couplings of a quark model with three charmed quarks are discussed in the context of recent results from Brookhaven National Laboratory, Stanford Linear Accelerator Center, and Fermi National Accelerator Laboratory. **[no comment]**

Possible Interactions of the J Particle

H. T. Nieh, Tai Tsun Wu, and Chen Ning Yang

We discuss some possible interaction schemes for the newly discovered particle J and their experimental implications, as well as the possible existence of two J^0's like the K_S-K_L case. Of particular interest is the case where the J particle has strong interactions with the hadrons. In this case J can be produced by associated production in hadron-hadron collisions and also singly in relative abundance in ep and μp collisions. [**no comment**]

Is Bound Charm Found?

A. De Rújula and S. L. Glashow

We argue that the newly discovered narrow resonance at 3.1 GeV is a $^3S_1$ bound state of charmed quarks and we show the consistency of this interpretation with known meson systematics. The crucial test of this notion is the existence of charmed hadrons near 2 GeV. [**correct interpretation**]

Remarks on the New Resonances at 3.1 and 3.7 GeV

C. G. Callan, R. L. Kingsley, S. B. Treiman, F. Wilczek, and A. Zee

This is a collection of comments which may be useful in the search for an understanding of the recently discovered narrow resonances at 3.1 and 3.7 GeV.
[**not stupid - but doesn't commit to charm**]

Heavy Quarks and e+e- Annihilation

Thomas Appelquist and H. David Politzer

The effects of new, heavy quarks are examined in a colored quark-gluon model. The e+e- total cross section scales for energies far above any quark mass. However, it is much greater than the scaling prediction in a domain about the nominal two-heavy-quark threshold, despite e+e- being a weak-coupling problem above 2 GeV. We expect spikes at the low end of this domain and a broad enhancement at the upper end. [**brilliant prediction - sadly submitted too late**]

STUDIES IN THE NATURAL SCIENCES • VOLUME 9

ORBIS SCIENTIAE

THEORIES AND EXPERIMENTS IN HIGH-ENERGY PHYSICS

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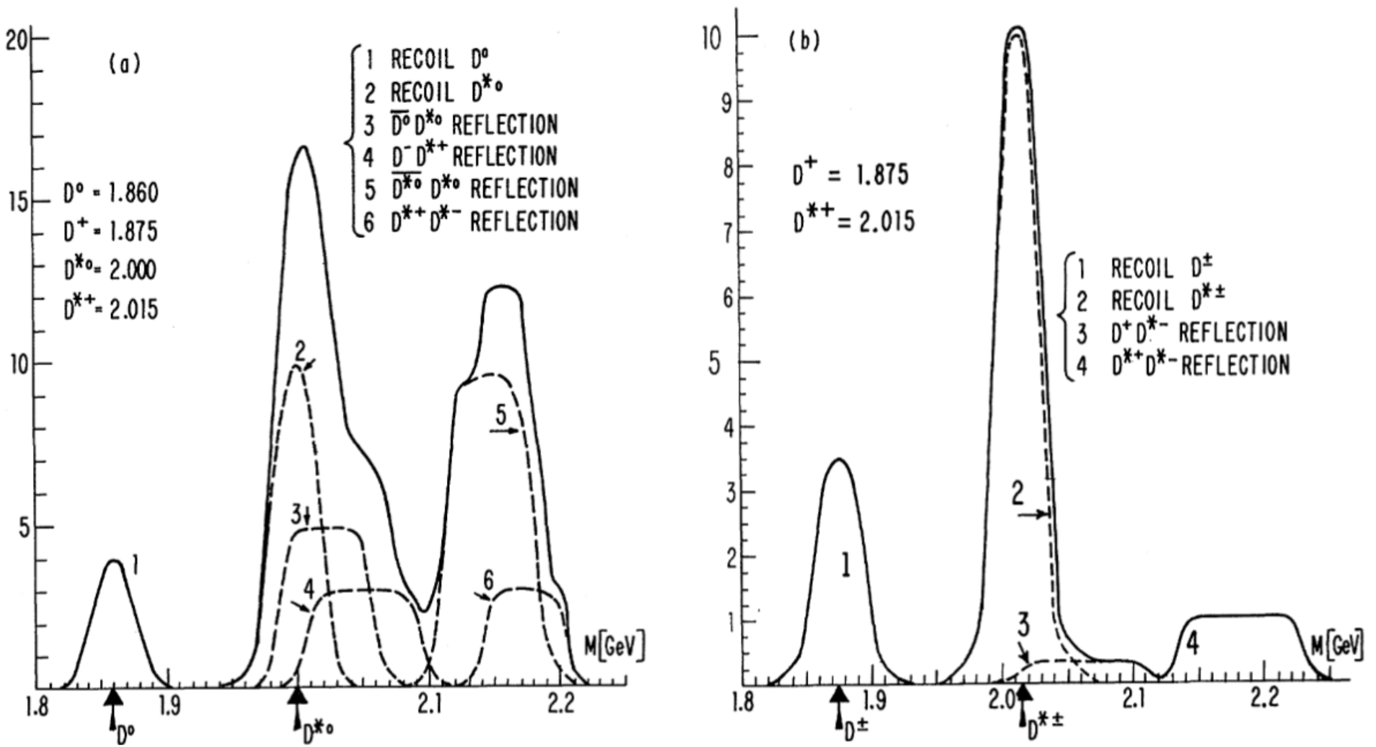
Stable Particle Table *(cont'd)*

Particle	$I^G(J^P)C_n$	Mass (MeV) Mass^2 (GeV)^2	Mean life (sec) $c\tau$ (cm)	Mode	Fraction[a]	p or p_{max}[b] (MeV/c)
K^0	$\frac{1}{2}(0^-)$	497.70 ±0.13 S=1.1*	50% K_{Short}, 50% K_{Long}			
K^0_S	$\frac{1}{2}(0^-)$	m^2=0.248	0.886×10^{-10} ±.007 S=2.4* $c\tau$=2.66	$\pi^+\pi^-$	(68.77±0.26)% S=1.1*	206
				$\pi^0\pi^0$	(31.23±0.26)%	209
				$\mu^+\mu^-$	(< 0.3) 10^{-6}	225
				e^+e^-	(<35) 10^{-5}	249
				$\pi^+\pi^-\gamma$	c(2.0 ±0.4) 10^{-3}	206
				$\gamma\gamma$	(< 0.4) 10^{-3}	249
K^0_L	$\frac{1}{2}(0^-)$		5.179×10^{-8} ±0.040 $c\tau$=1553	$\pi^0\pi^0\pi^0$	(21.3 ±0.6)% S=1.1*	139
				$\pi^+\pi^-\pi^0$	(11.9 ±0.4)% S=2.2*	133
				$\pi\mu\nu$	(27.5 ±0.5)% S=1.1*	216
				$\pi e\nu$	(39.0 ±0.6)% S=1.1*	229
				$\pi e\nu\gamma$	c(1.3 ±0.8)%	229
	$m_{K_L}-m_{K_S}$ = $0.5403\times10^{10}\hbar$ sec^{-1} ±0.0035			$\pi^+\pi^-$	(0.177±0.018)% S=4.9*	206
				$\pi^0\pi^0$	(0.093±0.019)% S=1.5*	209
				$\pi^+\pi^-\gamma$	c(< 0.4) 10^{-3}	206
				$\pi^0\gamma\gamma$	(< 2.4) 10^{-4}	231
				$\gamma\gamma$	(4.9± 0.4) 10^{-4}	249
				$e\mu$	(< 1.6) 10^{-9}	238
				$\mu^+\mu^-$	i(< 1.6) 10^{-8}	225
				e^+e^-	(< 1.6) 10^{-9}	249
				$e^+e^-\gamma$	(< 2.8) 10^{-5}	249

Once upon a time, there was a controversy in particle physics. There were some physicists[1] who denied the existence of structures more elementary than hadrons, and searched for a self-consistent interpretation wherein all hadron states, stable or resonant, were equally elementary. Others,[2] appalled by the teeming democracy of hadrons, insisted on the existence of a small number of fundamental constituents and a simple underlying force law. In terms of these more fundamental things, hadron spectroscopy should be qualitatively described and essentially understood just as are atomic and nuclear physics.



Is Charm Found?

A. De Rújula, Howard Georgi,† and S. L. Glashow

Demythification of Electroproduction Local Duality and Precocious Scaling*

A. DE RÚJULA, HOWARD GEORGI,† AND H. DAVID POLITZER†

Lyman Laboratory of Physics, Harvard University, Cambridge, Massachusetts 02138

Received August 20, 1976

In an effort to develop a quantitative check of asymptotically free color-gauge theories, we analyze the logarithmic corrections to ξ-scaling coming from anomalous dimensions and coefficient functions of twist-two operators and compare with electroproduction data for $1 \leqslant Q^2 \leqslant 16\ \mathrm{GeV}^2$. Excellent agreement is obtained using $g^2(2\ \mathrm{GeV})/4\pi^2 = 0.17$ for the effective quark–gluon coupling in the color-gauge theory. Effects of higher-twist operators are suppressed by powers of $M_0{}^2/Q^2$. We use data from the resonance region to show $M_0 \simeq 400$ MeV, in agreement with theoretical expectations. Our fit to νW_2 in the scaling region also describes the resonance region in the sense of Bloom–Gilman local duality. We show that local duality is a consequence of the moment predictions obtained from the operator–product expansion in quantum chromodynamics. We resolve a paradox associated with local duality and spin-zero targets. Present measurements of $R = \sigma_L/\sigma_T$ at large x and Q^2 are systematically higher than our predictions.

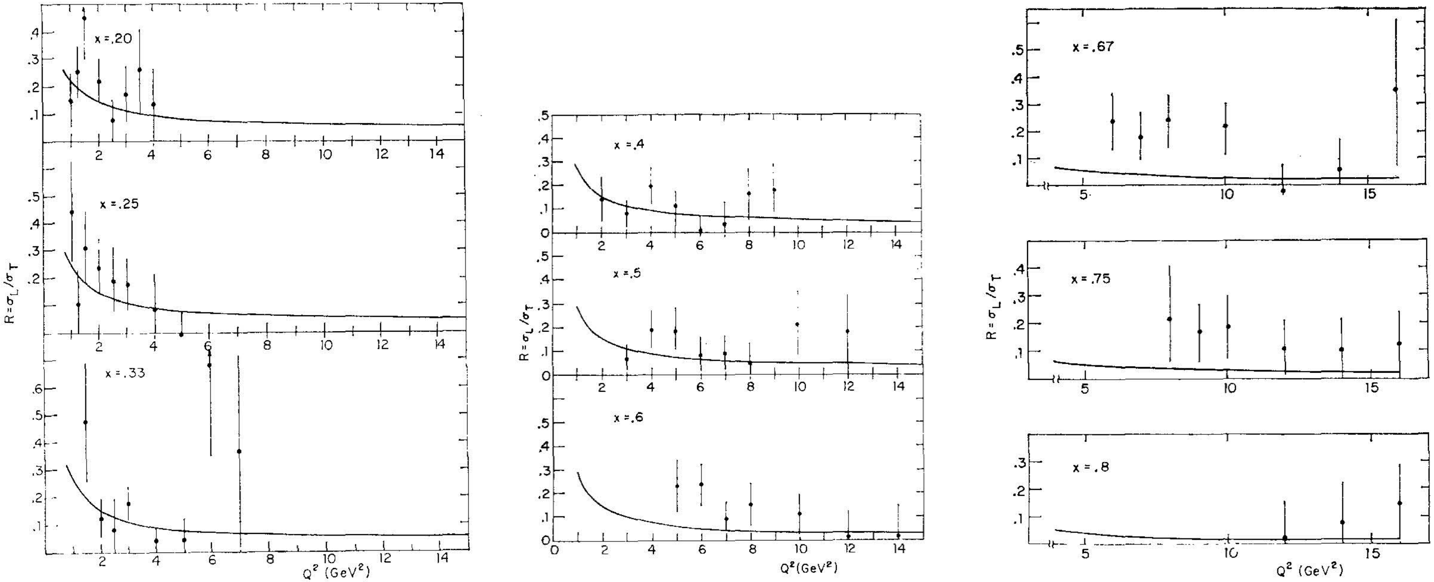


FIG. 3.2. $R = \sigma_L/\sigma_T$ versus Q^2 for various x values. The data are from [6]; the curves are our prediction based on the $\Lambda = 0.5$ GeV fit to νW_2.

As we showed in Section III.2, improved measurements of $R = \sigma_L/\sigma_T$ are crucial. The theoretical predictions are specific, dramatic and unequivocal. They are significantly below the reported values of R for $Q^2 > 5\ \mathrm{GeV}^2$ but are much larger than the old parton model prediction which gives $R \propto 1/Q^2$ [18]. Until the existing measurements can be improved, it is unreasonable to continue using $R = 0.2$ as an approximation for extracting νW_2 from the unseparated cross section. Rather, we recommend using Eq. (3.1). Another (equivalent) approach is to use Eq. (2.13) (Eqs. (A.1–A.8) in Appendix A) to directly fit the total cross section with $F(\xi)$ and Λ.


WILDERNESS RIVER ADVENTURES


ARGO 100X
pelican

Happy Birthday Al!