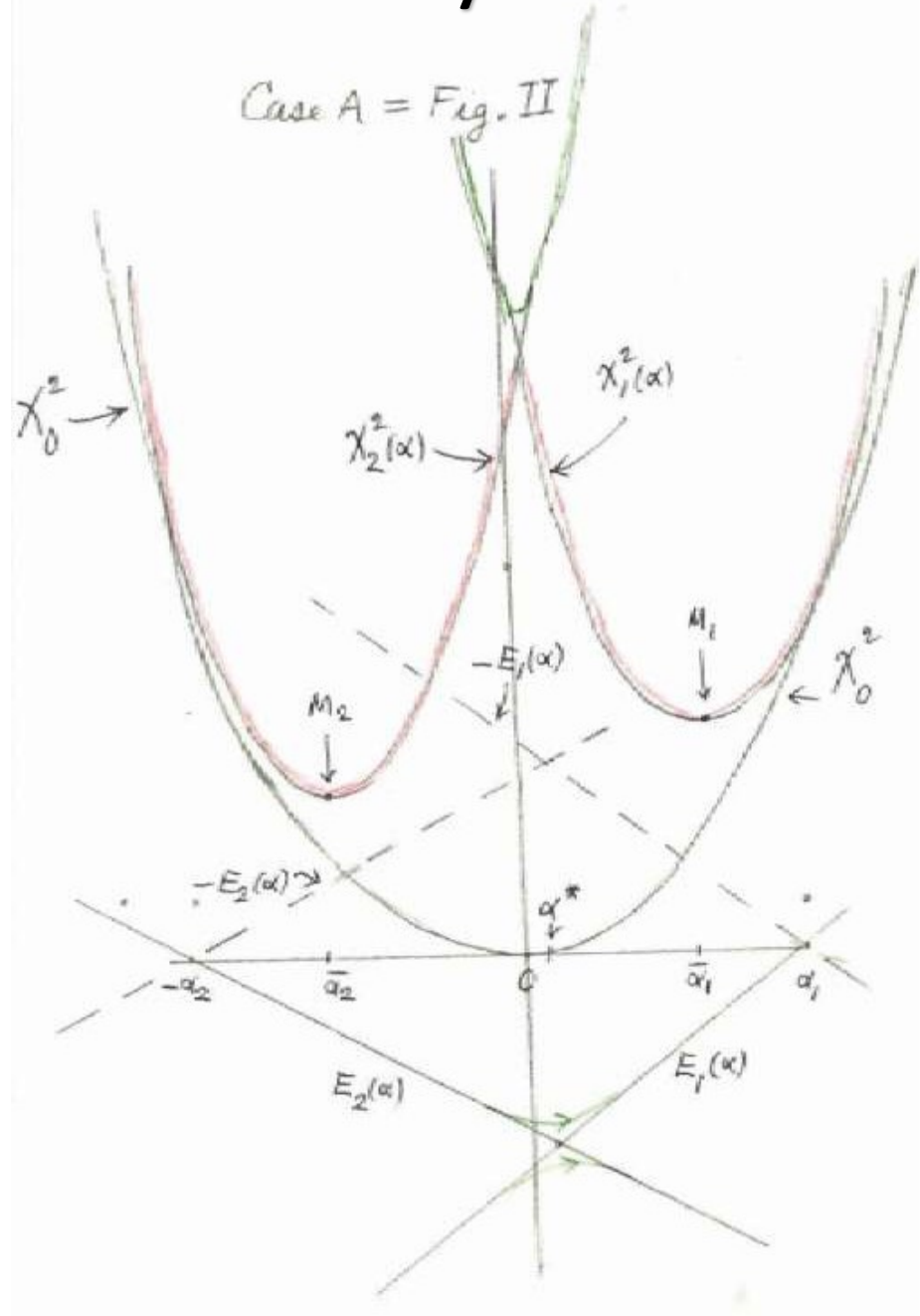




Dick Dalitz

A tribute by Frank Close



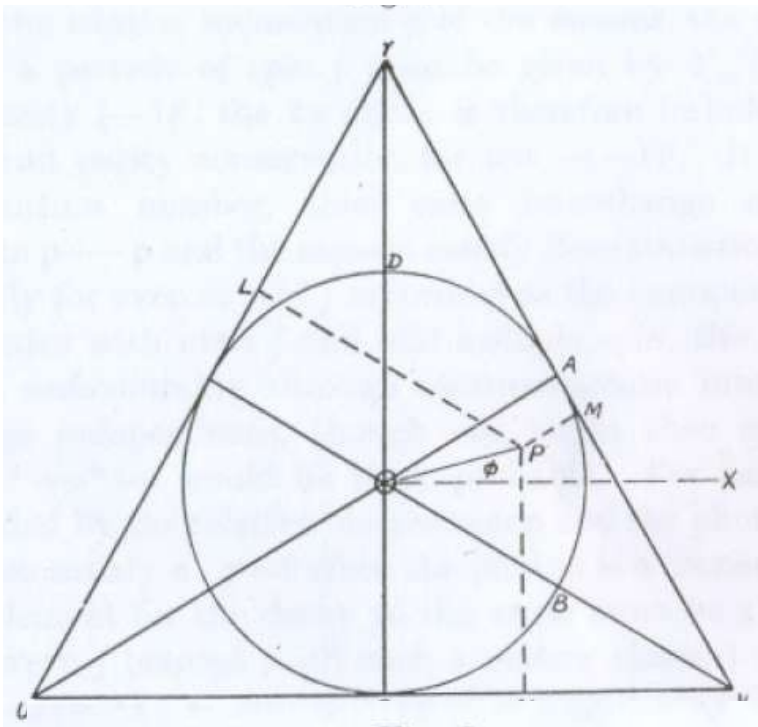


Fig. 2

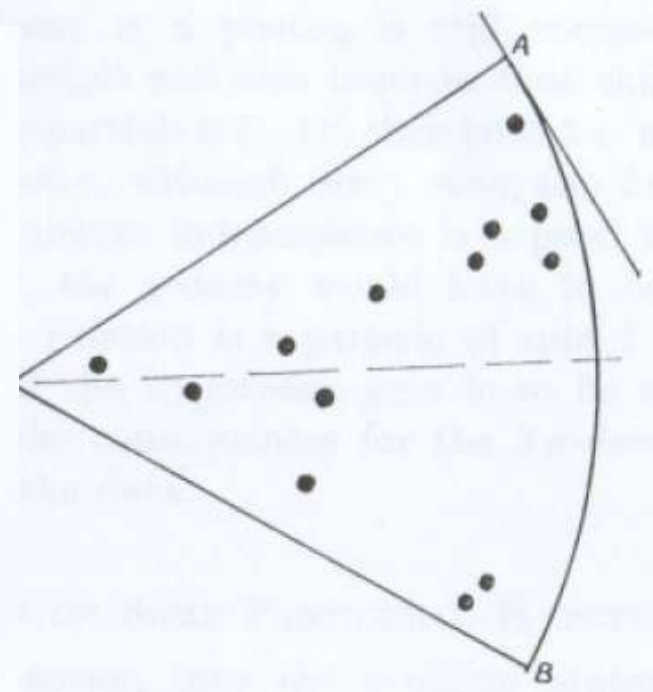
1955 PISA CONFERENCE

SUPPLEMENTO
AL VOLUME IV, SERIE X, DEL
NUOVO CIMENTO
A CURA DELLA SOCIETÀ ITALIANA DI FISICA

1956 2° Semestre N. 2

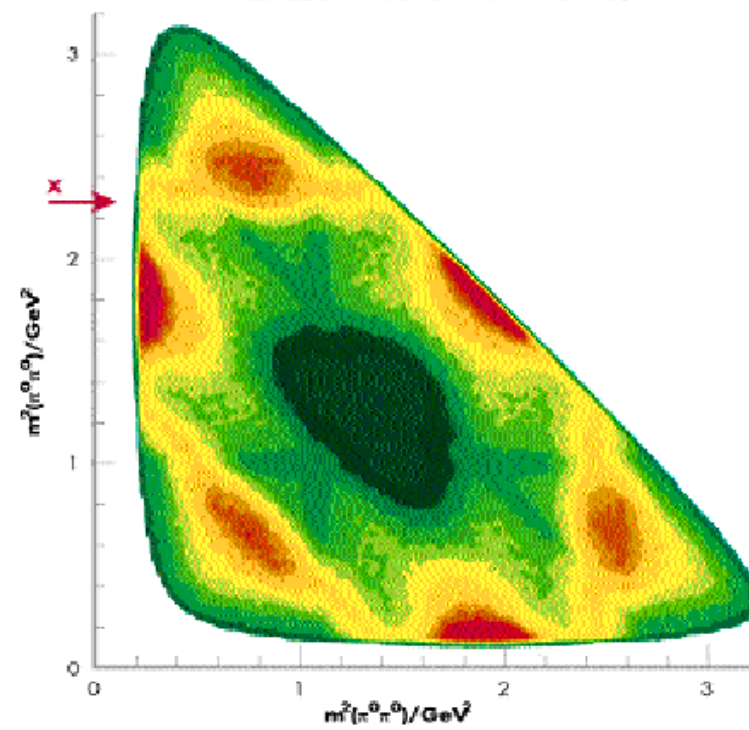
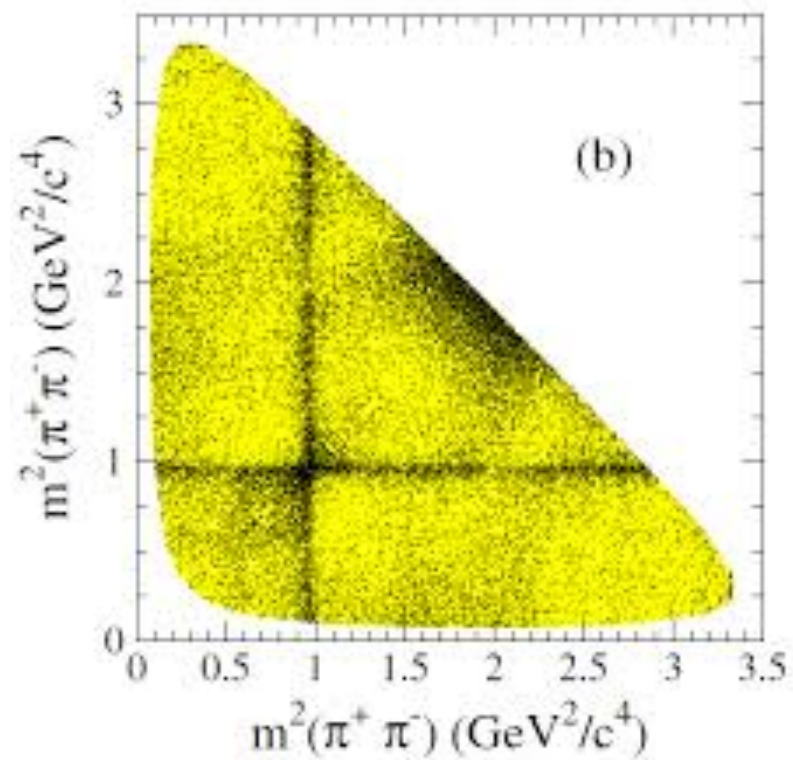
CELEBRAZIONE DEL "CENTENARIO" DEL GIORNALE
IL NUOVO CIMENTO

CONFERENZA INTERNAZIONALE
SULLE PARTICELLE ELEMENTARI



The data from 13 τ -meson decay events.

The First Dalitz Plot



1960 A "new" application of Dalitz plots

VOLUME 5, NUMBER 11

PHYSICAL REVIEW LETTERS

DECEMBER 1, 1960

RESONANCE IN THE $\Lambda\pi$ SYSTEM*

Margaret Alston, Luis W. Alvarez, Philippe Eberhard,[†] Myron L. Good,[‡]

William Graziano, Harold K. Ticho,[§] and Stanley G. Wojcicki

Lawrence Radiation Laboratory and Department of Physics, University of California, Berkeley, California

(Received October 31, 1960)

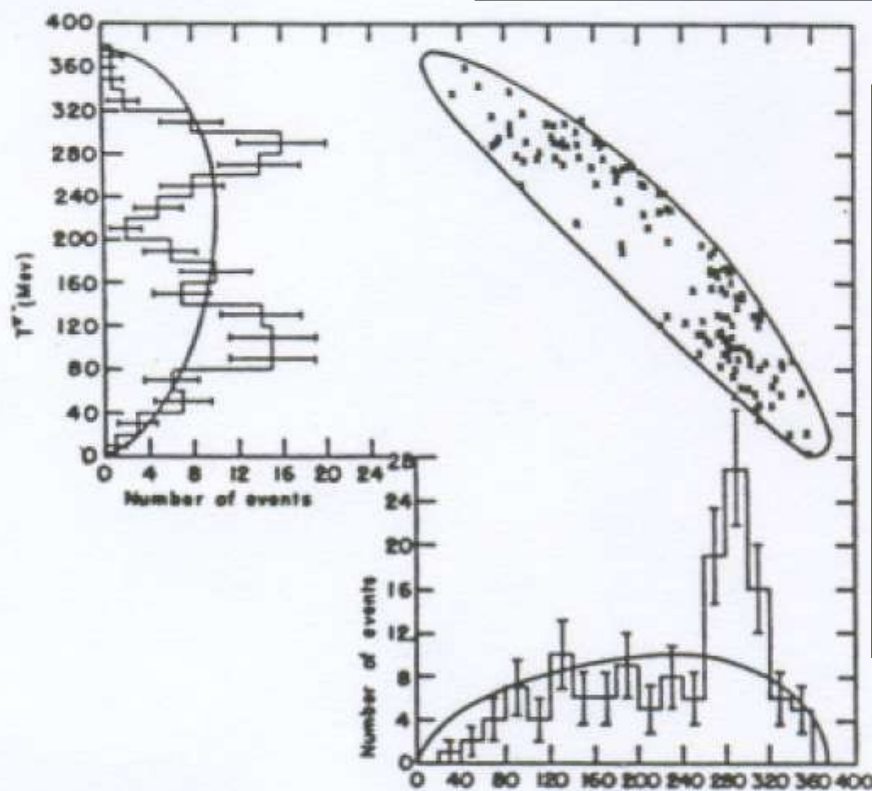
We report a study of the reaction



produced by 1.15-Bev/c K^- mesons and observed in the Lawrence Radiation Laboratory's 15-in. hydrogen bubble chamber. A preliminary report of these results was presented at the 1960 Rochester Conference.¹

Strong interaction resonances = discovery of Sigma*(1385)

FIG. 1. Energy distribution of the two pions from the reaction $K^- + p \rightarrow \Lambda^0 + \pi^+ + \pi^-$. Each event is plotted only once on the Dalitz plot, which should be uniformly populated if phase space dominated the reaction. The two energy histograms are merely one-dimensional projections of the two-dimensional plot, and each event is represented once on each histogram. The solid lines superimposed over the histograms are the phase-space curves.



Partner of Delta(1230)

Beginning of the Decuplet....

Soon followed by Csi*(1530).....

And MGM Eightfold Way

... and so Gell Mann invented the Eightfold Way

with **octets** and **decuplets**

and first spoke about it in **1961**

at TIFR summer school in Bangalore

.... with **Dick Dalitz** in the audience

During one of the lectures,

Dalitz questioned him about the **triplets**.
Why is he ignoring them?

During one of the lectures,

Dalitz questioned him about the **triplets**.
Why is he ignoring them?

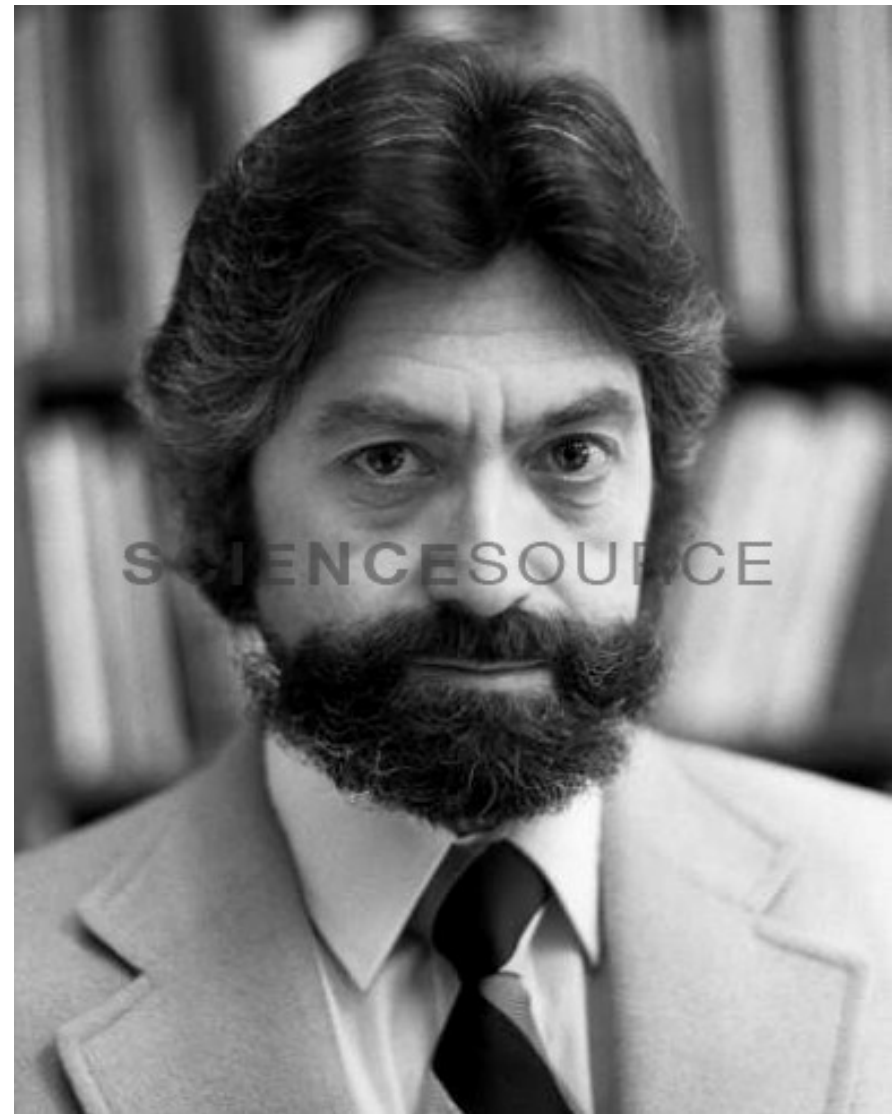
**Gell-Mann managed to evade it,
inspite of Dalitz's repeated questioning.**

"If Gell-Mann had answered the question directly,
quarks would have been born in Bangalore in 1961
instead of having to wait for another three years...."



Murray GellMann

1964



George Zweig

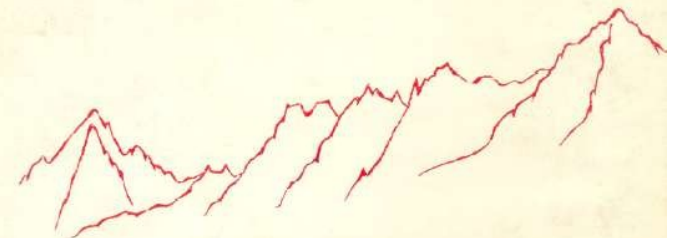
Also Peterman: CHLS narrate

Quark Models for the "Elementary Particles"

R. H. Dalitz

Clarendon Laboratory, Oxford

HIGH ENERGY PHYSICS



LES HOUCHES 1965

Lectures delivered at the Summer School
of Theoretical Physics
of the University of
Grenoble with a Grant from NATO

WICK

GÜRSEY

FROISSART

OMNÈS

CHEW

DALITZ

JACKSON

BELL

R. H. DALITZ

Clarendon Laboratory, Oxford.

1. HISTORICAL INTRODUCTION

The type of model for the strongly-interacting "elementary particles", or hadrons, which I wish to discuss in these lectures has a very long history, beginning with the model discussed by Fermi and Yang [1] for the pion, as a bound state of the nucleon-antinucleon system. These bound-state models have never been considered fully respectable, perhaps not even today. Indeed, it is not really possible to meet all the objections to such models which can be made from the field-theoretic standpoint. Yet the models are instructive and suggestive, and have at present rather more contact with the experimental data than do the more formal considerations based on group theory. They are explicit representations of the group-theoretical approach, of course, and so they are able to reproduce the group-theoretical results, but in a more pedestrian and comprehensible manner; however, they involve dynamical assumptions going beyond the group-theoretical structure and lead to further predictions which can be tested experimentally.

What Dalitz had proposed

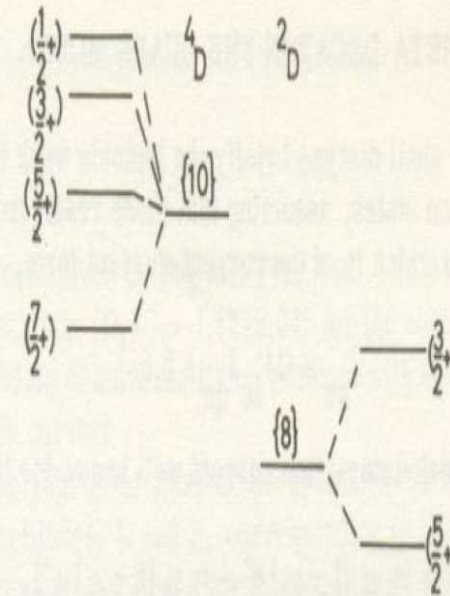
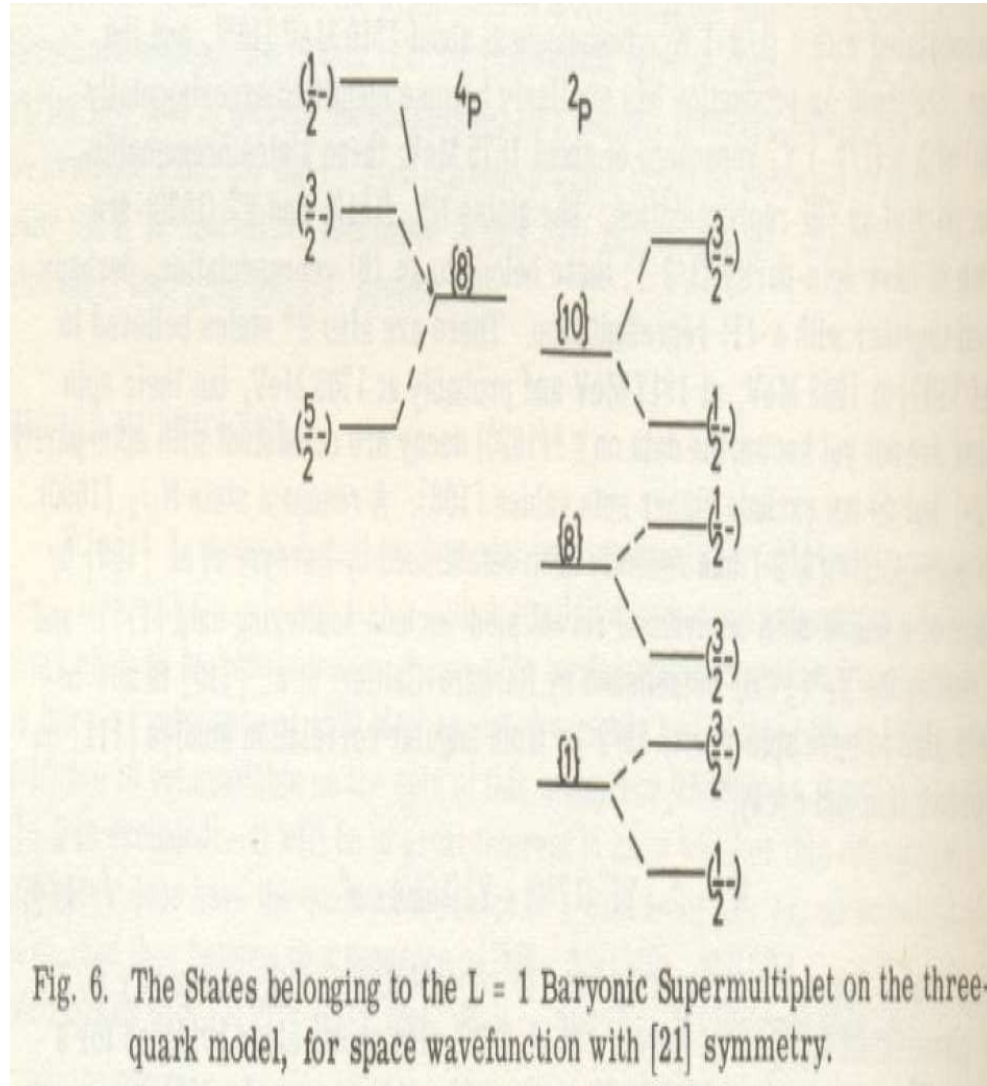
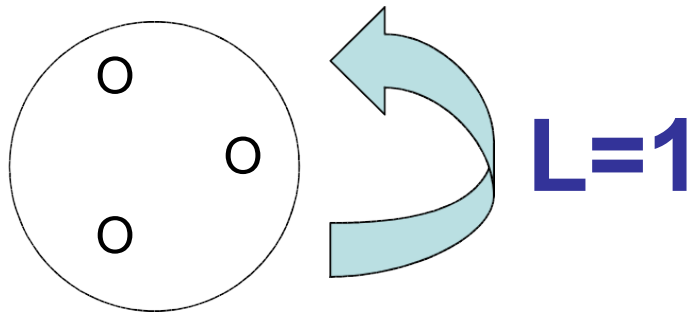
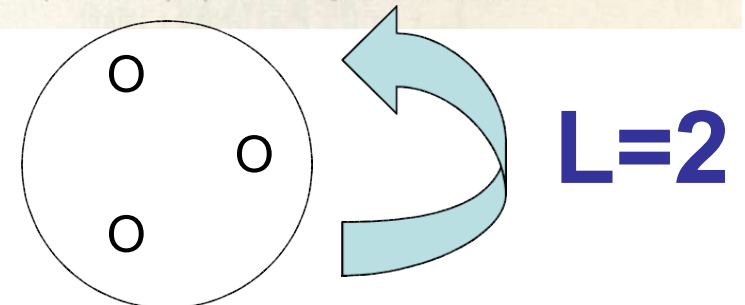


Fig. 7. The States belonging to the $L = 2$ Baryonic Supermultiplet on the three-quark model, for totally-symmetric space wavefunction.



PDG 2014 !!!

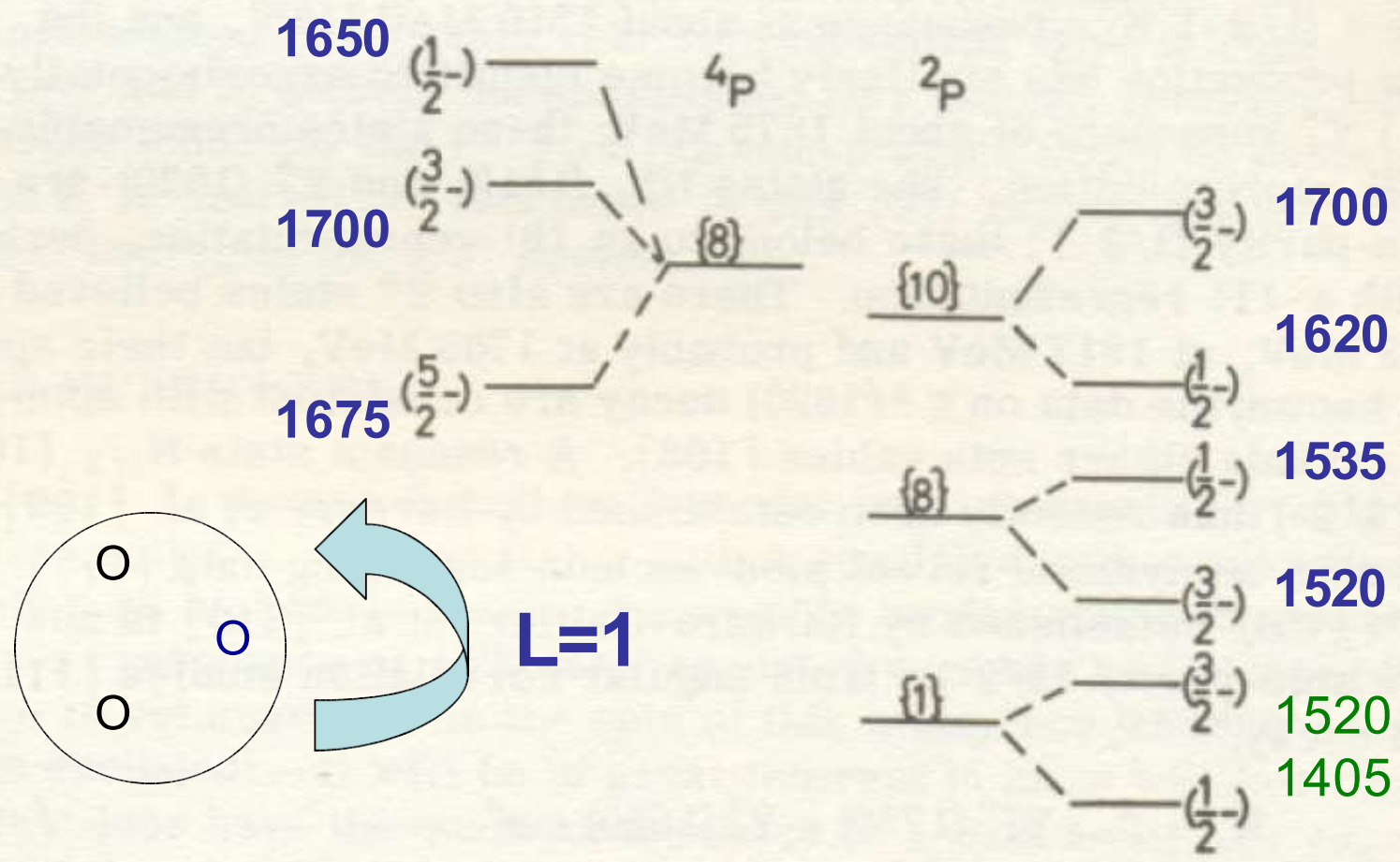


Fig. 6. The States belonging to the L = 1 Baryonic Supermultiplet on the three-quark model, for space wavefunction with [21] symmetry.

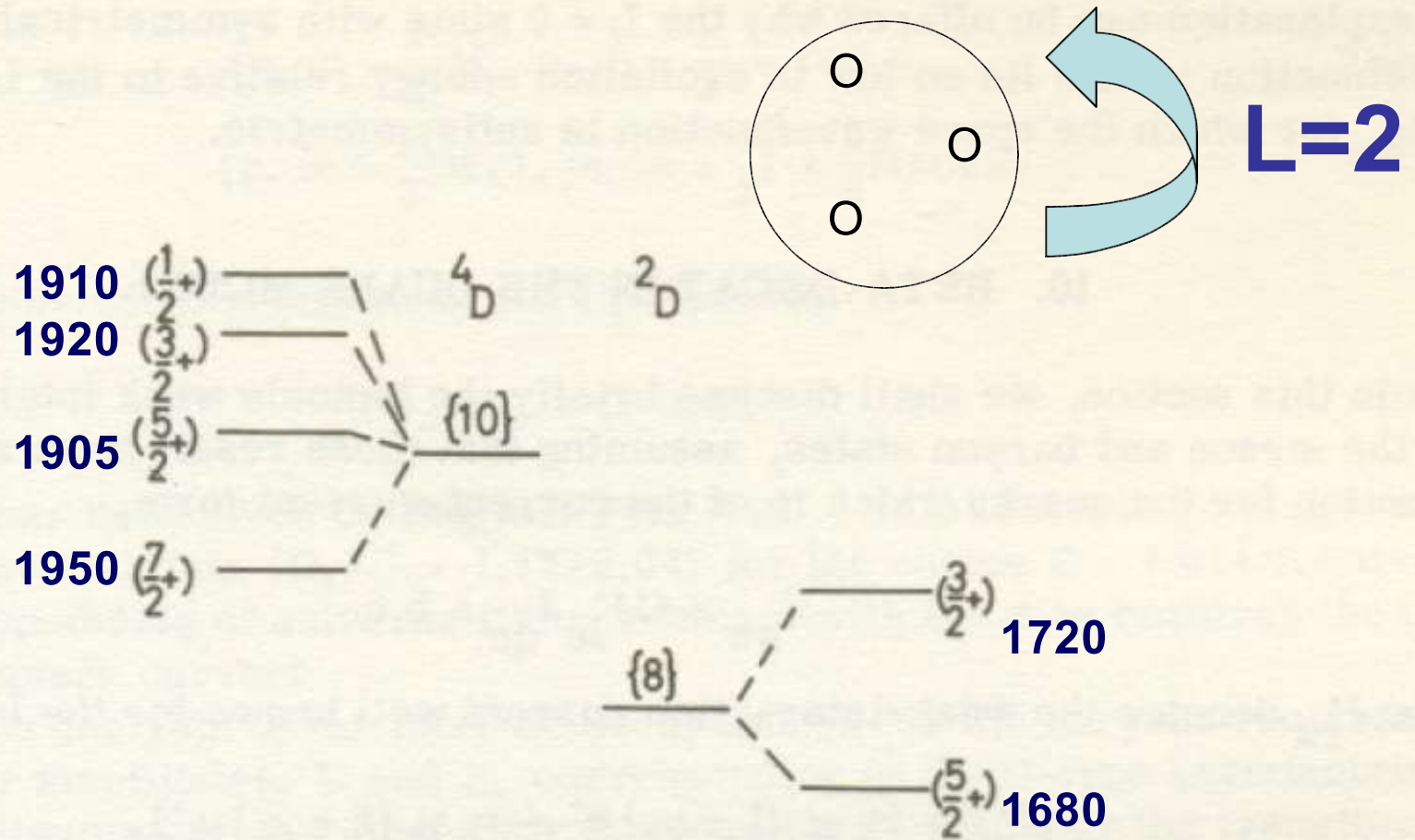


Fig. 7. The States belonging to the $L = 2$ Baryonic Supermultiplet on the three-quark model, for totally-symmetric space wavefunction.

A student's dilemma in 1968

were fractionally charged particles that noone had ever seen
REAL?

Or just figments of the imagination of people in Oxford?

A student's dilemma in 1968

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MGM 2 FEC @ R(HE)L 1968/9



A student's dilemma in 1968

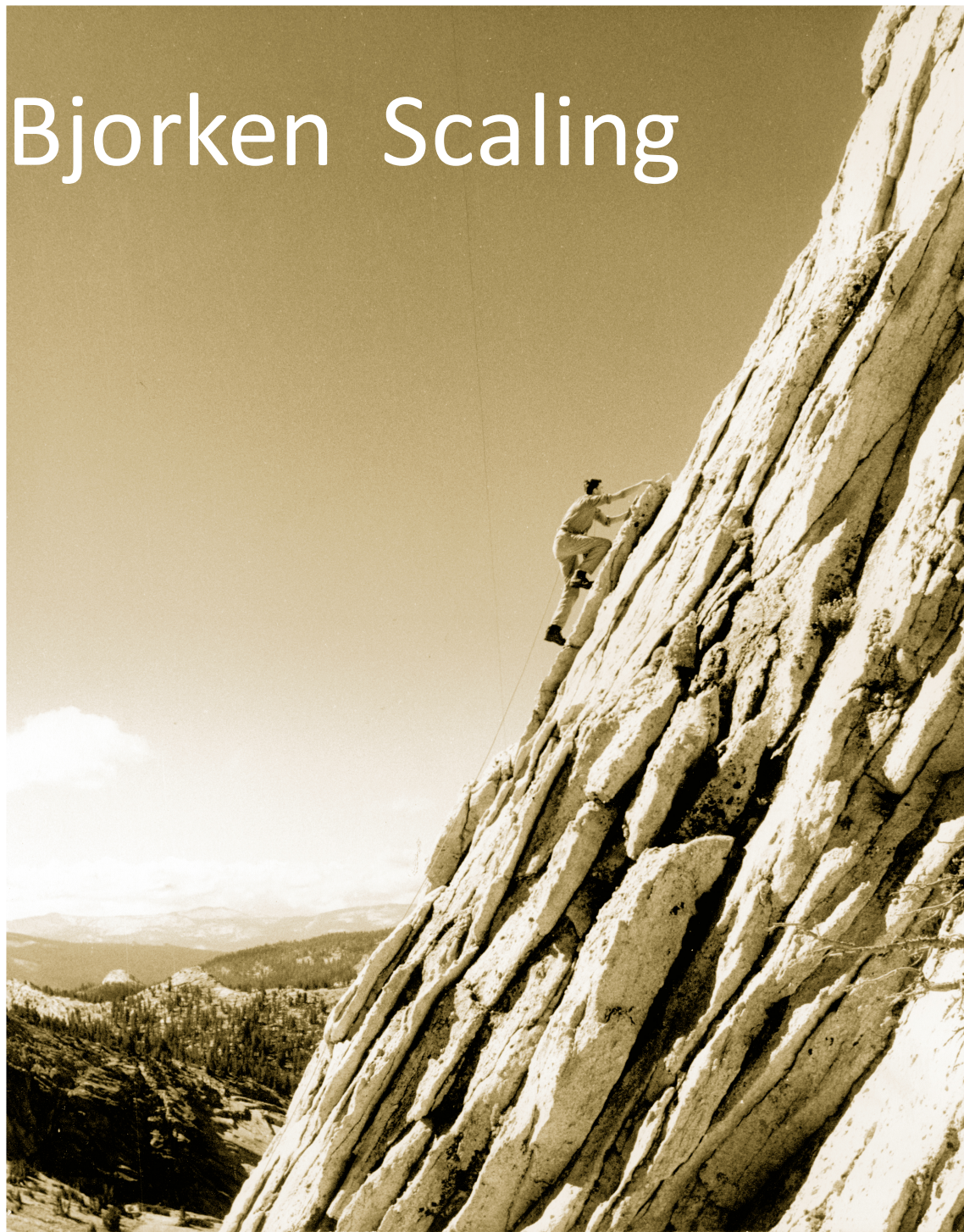
were fractionally charged particles that noone had ever seen
REAL?

Or just figments of the imagination of people in Oxford?

MGM 2 FEC @ R(HE)L 1968/9

**“The quark model is a convenient way
for keeping track of the group theory labels”**

Bjorken Scaling



bj on SE Anneté - Cathedral Peak

Henry Kendall 1960

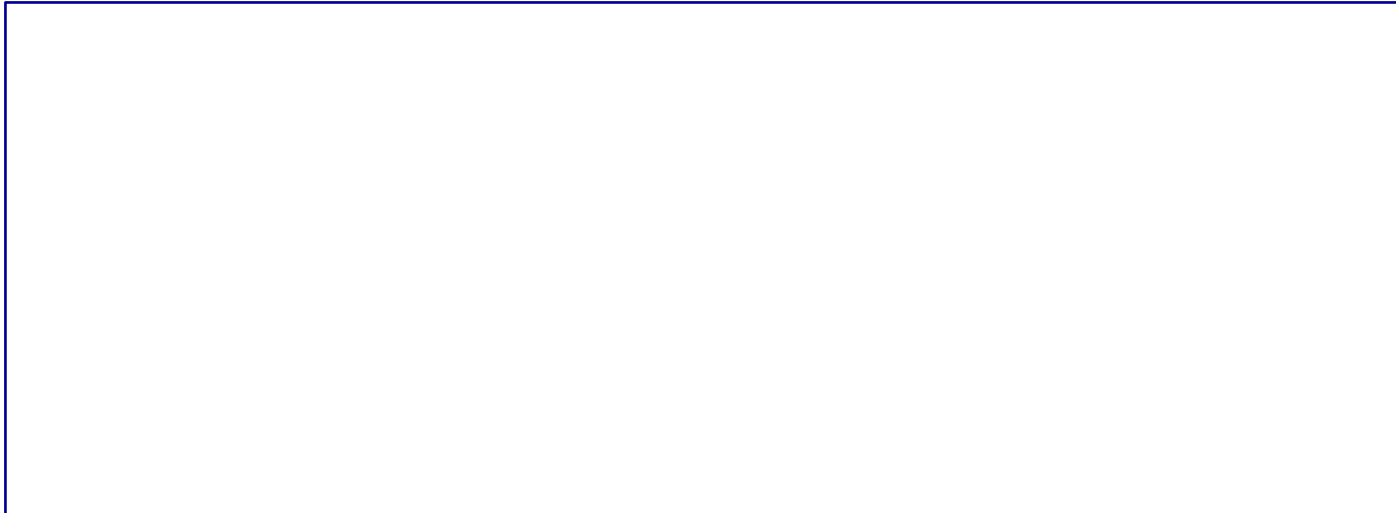
Bjorken DIS Quarks 1967

make any kind of careful statement. But the indication is that there does not yet seem to be any large cross sections which this model of point-like constituents suggests. Additional data is necessary and very welcome in order to completely destroy the picture of elementary constituents.

(Gottfried)

I also wanted to ask a question. I think Professor Bjorken and I constructed the sum rules in the hope of destroying the quark model. The electroproduction sum rule depends only on the assumption that the proton's charge is concentrated on three particles, and that these charges are given by the usual SU(3) quark model. Nothing need be assumed about forces, wave functions, etc. I wonder whether one of the experts, perhaps Professor Dalitz, would care to say how he would view a gross violation of the electroproduction sum rule at small q^2 ?

Dick's response:

A large, empty rectangular box with a thin blue border, positioned below the text. It is intended for a response or answer.



RHD

CLARENDON LABORATORY
UNIVERSITY OF OXFORD

SINGLE PION PHOTOPRODUCTION IN THE QUARK MODEL
by
L. A. Copley, G. Karl and E. Obryk*
Department of Theoretical Physics,
12, Parks Road,
Oxford, England.

1969

PHYSICAL REVIEW D VOLUME 3, NUMBER 11 1 JUNE 1971

Current Matrix Elements from a Relativistic Quark Model*

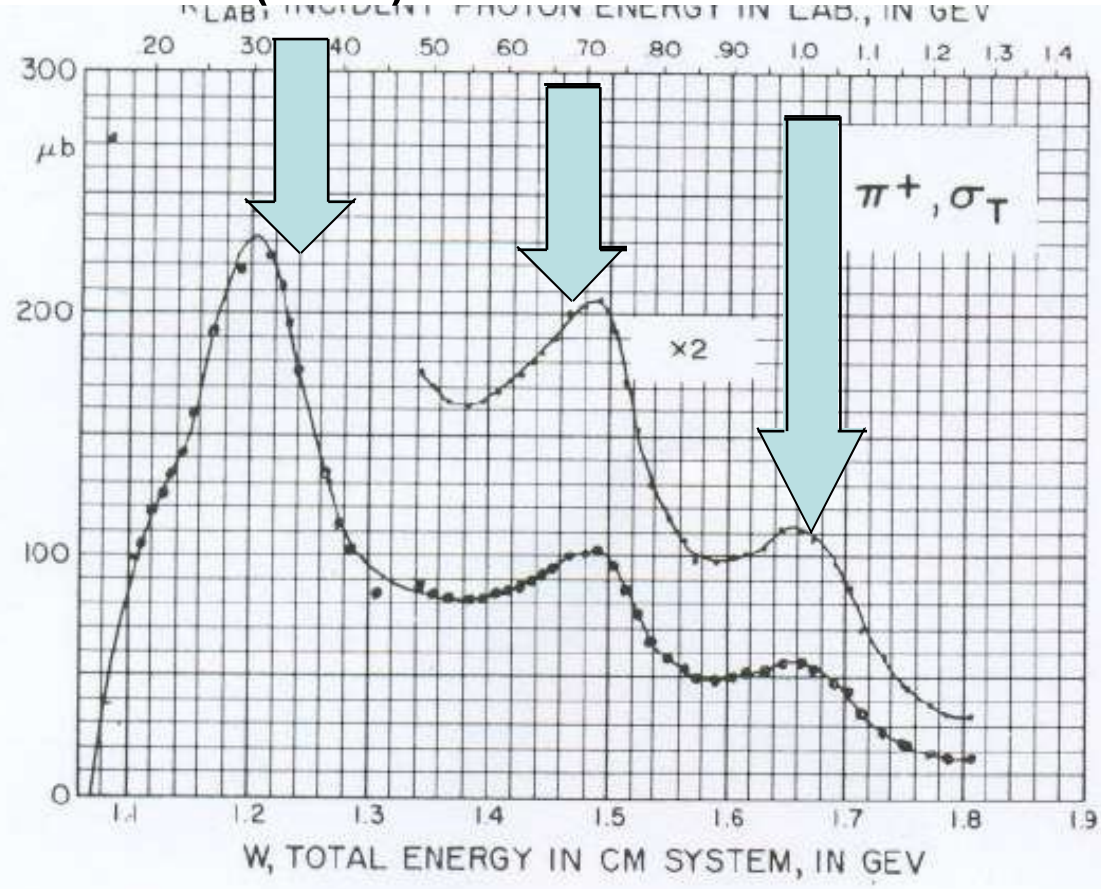
R. P. Feynman, M. Kislinger, and F. Ravndal
Lauritsen Laboratory of Physics, California Institute of Technology, Pasadena, California 91109
(Received 17 December 1970)

A relativistic equation to represent the symmetric quark model of hadrons with harmonic interaction is used to define and calculate matrix elements of vector and axial-vector currents. Elements between states with large mass differences are too big compared to experi-

What had they done?

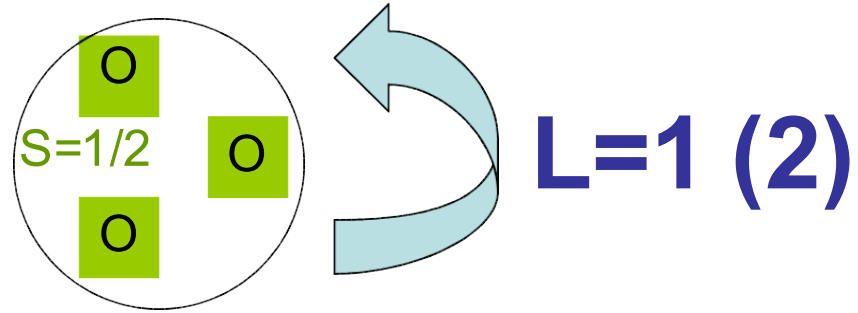
Empirically three prominent resonances

Dalitz model: L=0 (Delta) L=1 L=2



Photoproduction: E and B conspiracy explained by CKO and FKR

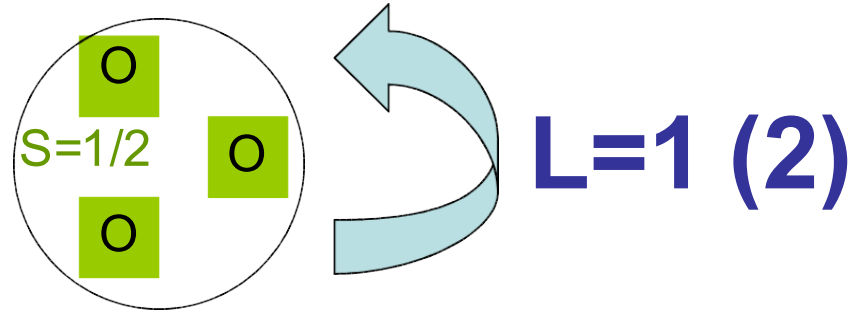
Quark Model: $N^* J=3/2 (5/2) =$



Photoexcitation

Magnetic - Electric vanishes = data

Quark Model: $N^* J=3/2 (5/2) =$



Photoexcitation

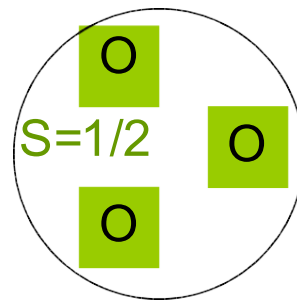
Magnetic - Electric vanishes = data

Catch 22:

MGM symmetry:

can impose it by symmetry/clebsches

Quark Model: $N^* J=3/2 (5/2) =$



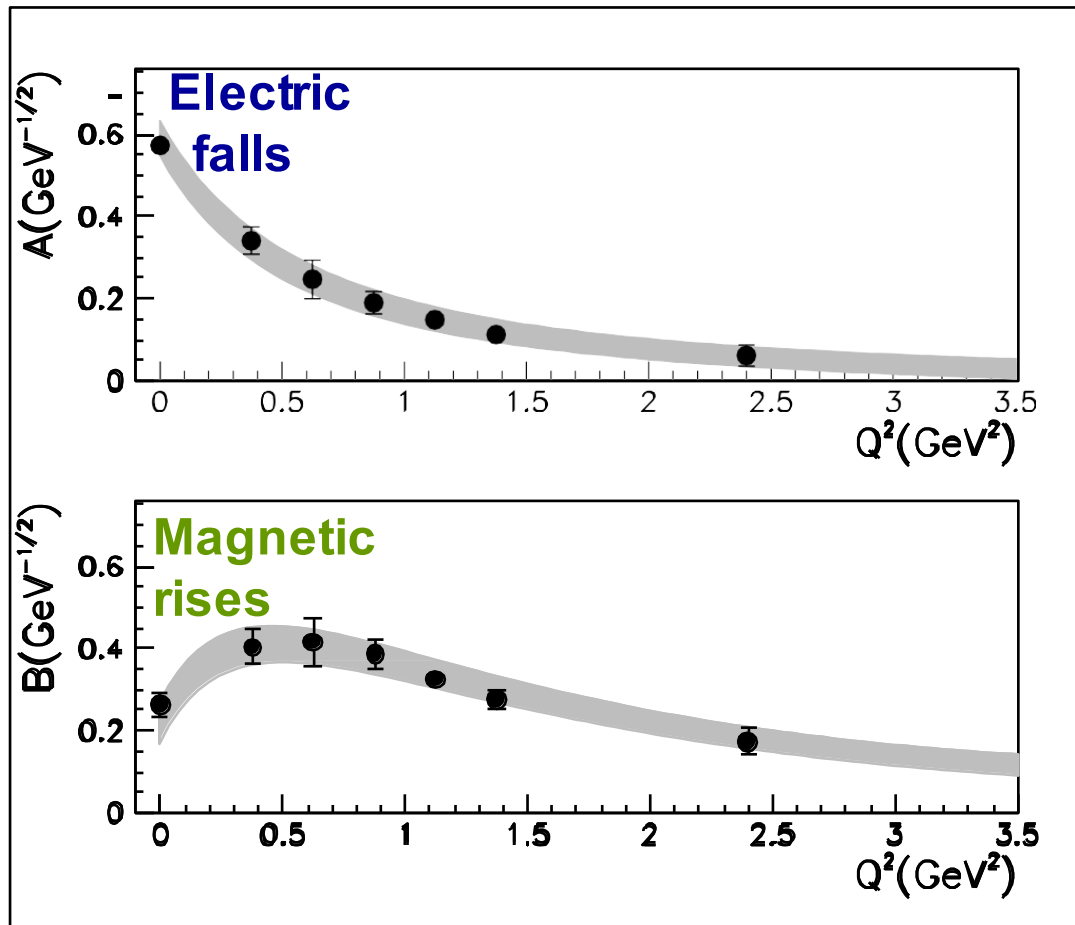
$L=1 (2)$

**Electroexcitation
at small q^2**

**Magnetic
rises**

**- Electric
falls**

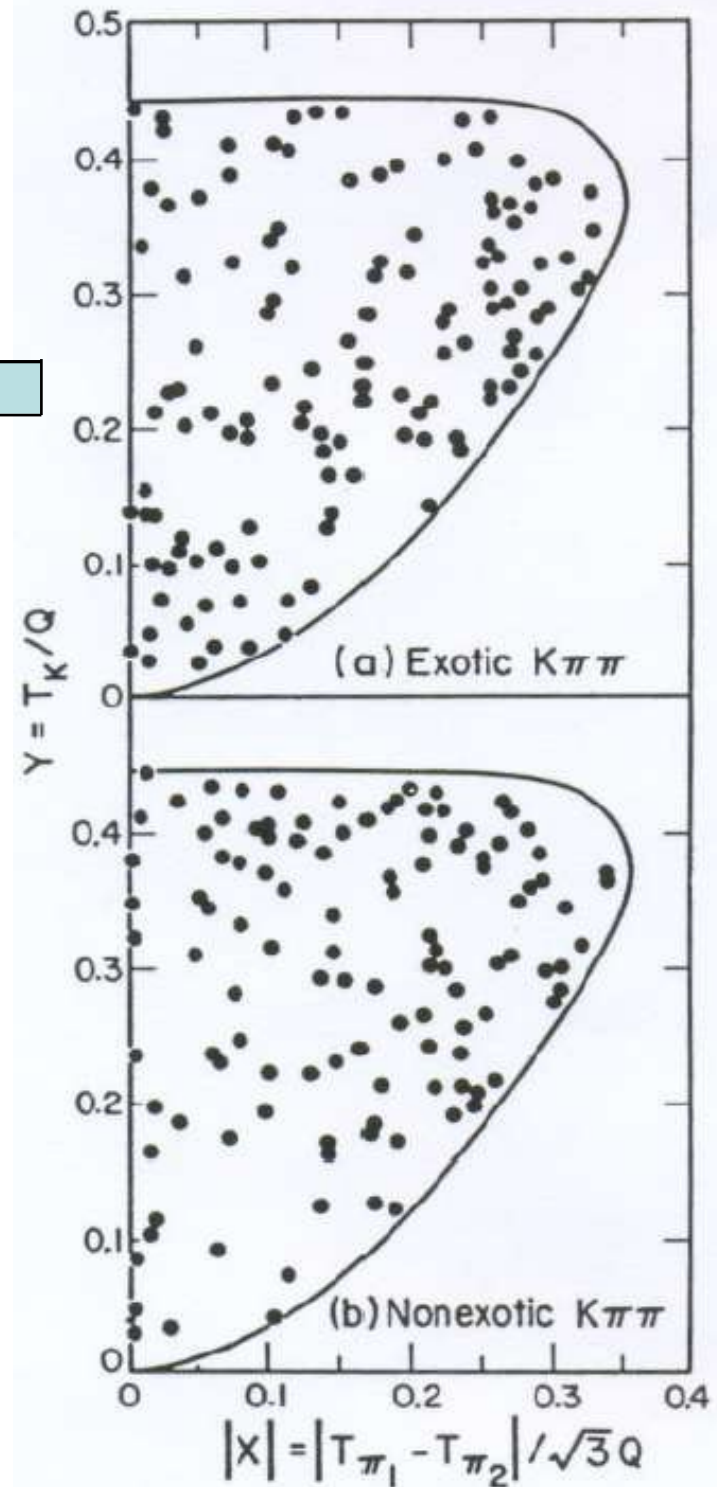
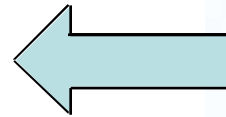
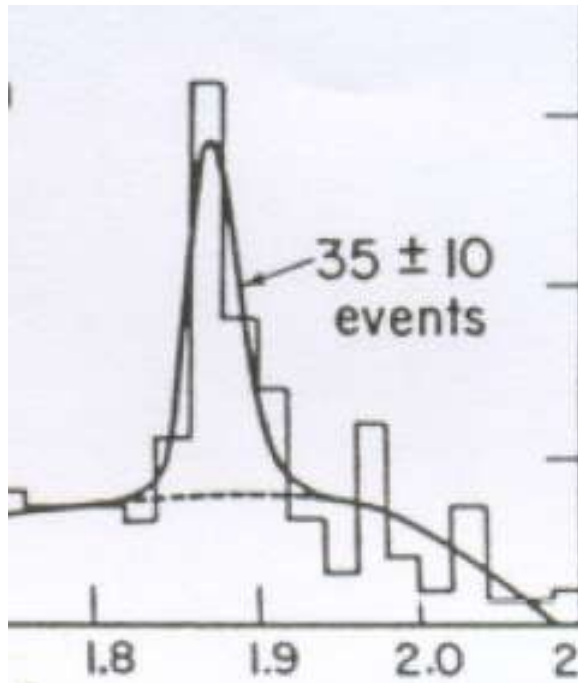
= data



Response of "real" quarks

Dramatic change in spin data

Close+Gilman 1972



1974 psi and charmonium confirmed quarks

RHD didn't work on this

But Dalitz plots were again central in establishing charmed D mesons in 1976

1977: Dick extends 1965 idea to L=3

J. Phys. G: Nucl. Phys., Vol. 3, No. 9, 1977. Printed in Great Britain. © 1977

LETTER TO THE EDITOR

The new resonance $\Delta D_{35}(1925)$ and the $(56, 1_3^-)$ baryonic supermultiplet

R H Dalitz, R R Horgan† and L J Reinders

Department of Theoretical Physics, University of Oxford, 1 Keble Road, Oxford
OX1 3NP, UK

Received 13 July 1977

1973-7

Nuclear Physics B66 (1973) 135–172. North-Holland Publishing Company

Classified baryon spectrum with Horgan and Jones

BARYON SPECTROSCOPY AND THE QUARK SHELL MODEL (I). THE FRAMEWORK, BASIC FORMULAE, AND MATRIX-ELEMENTS

R. HORGAN⁺ and R.H. DALITZ
Department of Theoretical Physics, Oxford University

Received 29 June 1973

....his only formally journal-published work on the baryon quark model ideas

Nuclear Physics B129 (1977) 45–65
© North-Holland Publishing Company

RE-ANALYSIS OF THE BARYON MASS SPECTRUM USING THE QUARK SHELL MODEL

Michael JONES * †
Serim Physics Laboratory, Rutgers University, Piscataway, NJ 08854, USA

R.H. DALITZ and R.R. HORGAN **
Department of Theoretical Physics, Oxford University

Received 27 May 1977
(Revised 22 July 1977)

I didn't realise Dick had read my thesis until in 1981 he produced a paper himself out of the blue using it and insisted he include my name on it

His final paper on light quark hadrons in 1981

THE ANTISYMMETRIC SPIN-ORBIT INTERACTION BETWEEN QUARKS

F.E. Close
Theoretical Physics Division, Rutherford and Appleton
Laboratories - Chilton, Didcot

R.H. Dalitz
Theoretical Physics Department - Oxford University

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*E. Ferrari and G. Violini (eds.), Low and Intermediate Energy Kaon-Nucleon Physics, 411-418.
Copyright © 1981 by D. Reidel Publishing Company.*

and then turned to
Spin+TOP quark
with Gary Goldstein

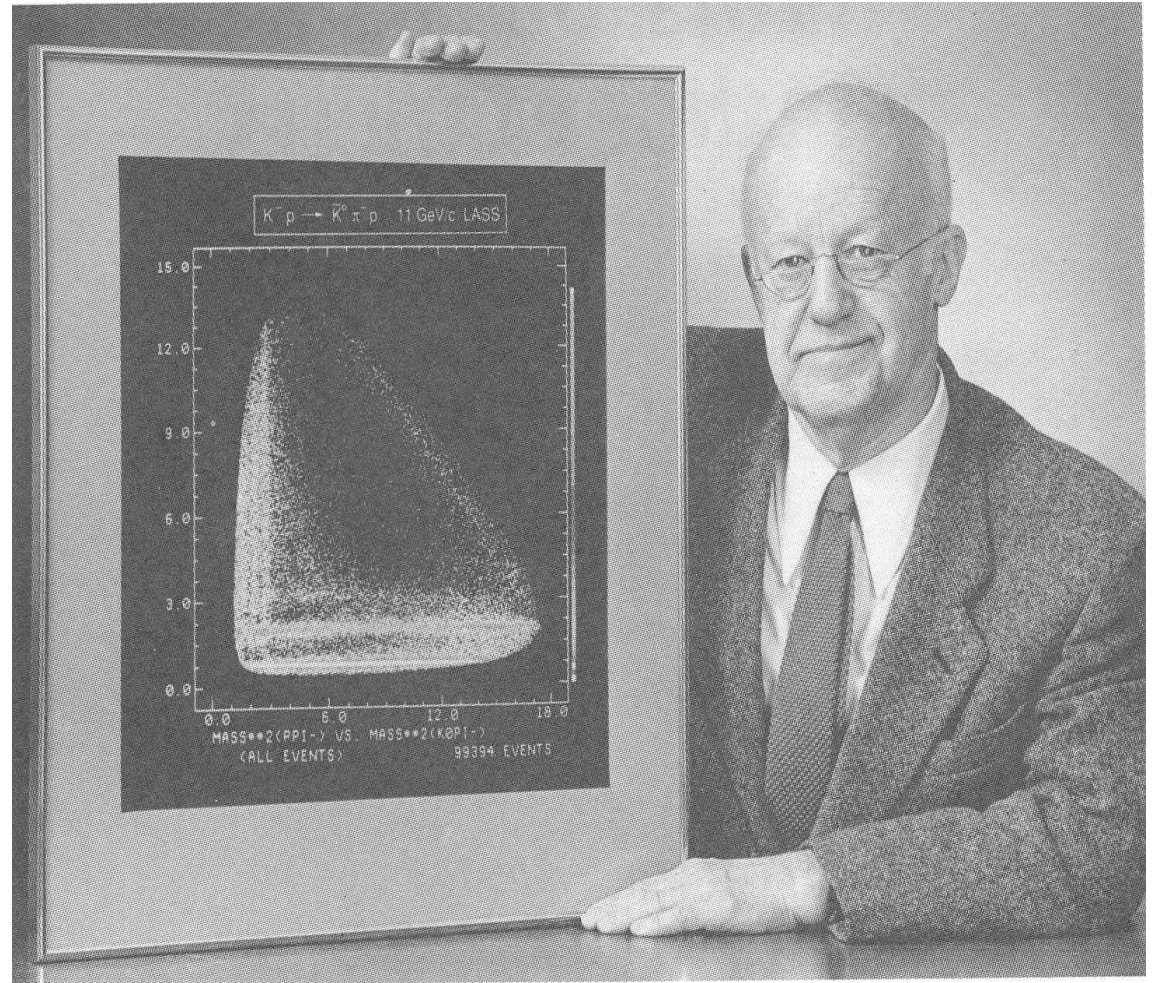
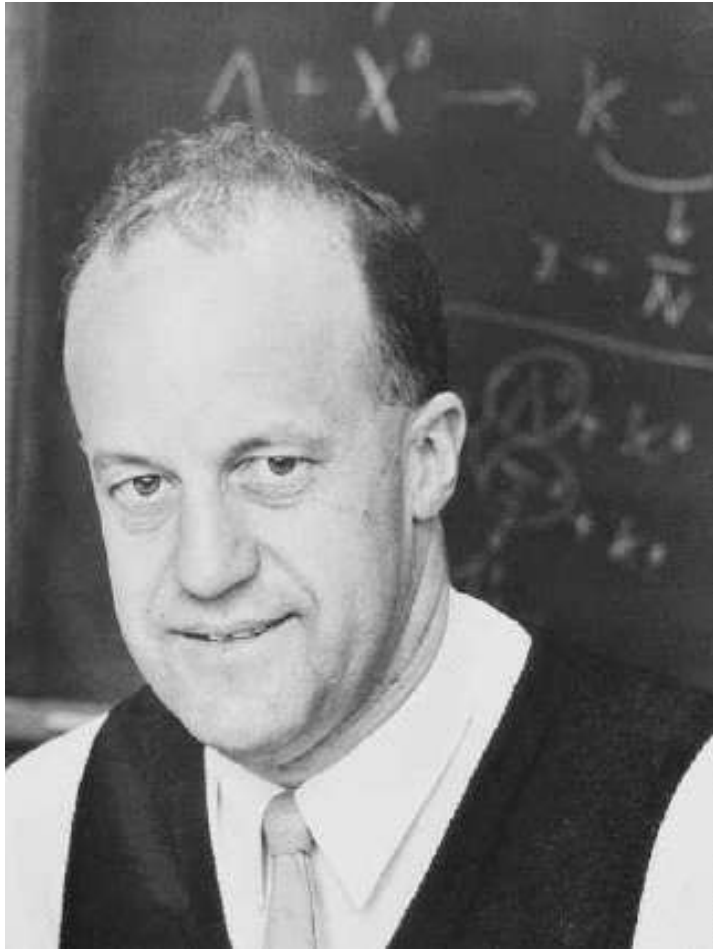


CONSTITUENT QUARKS ARE REAL;
Its just that we don't know what they are

Last word from Feynman (allegedly in response to MGM)

THE NON RELATIVISTIC QUARK MODEL IS RIGHT
(it describes so many data).

IT IS FOR THEORISTS TO EXPLAIN WHY



Dick Dalitz