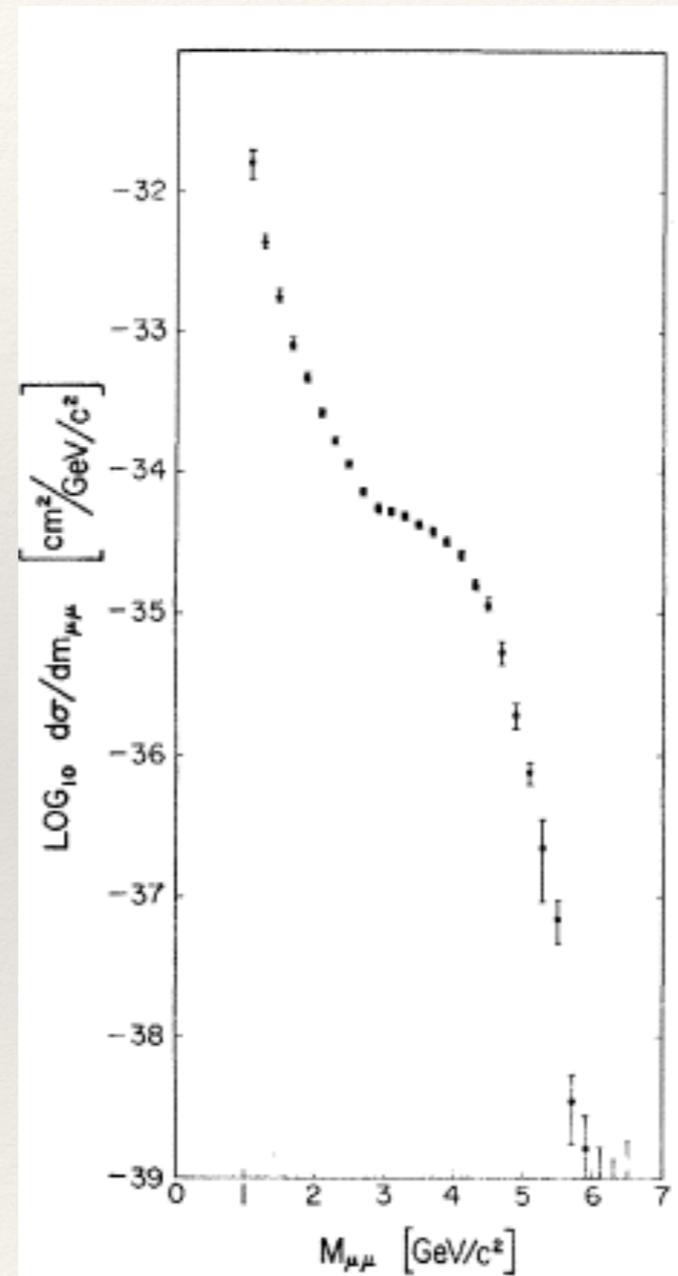

The b-quark at 40

Keith Ellis
IPPPP

Prehistory

- ❖ Lederman et al, PRL 25 1523 were the first to measure massive muon pairs coming from the collision of hadrons, following a suggestion of Lederman and Yamaguchi.
- ❖ They were interested in measuring this to normalise the cross section for W production.
- ❖ This discovery came to be known as “Drell-Yan” process, (quite unfairly)
- ❖ The experiment had low mass resolution on the mass of the muon pairs, ($\sim 15\%$ in the appropriate mass range).
- ❖ In 1974 it was discovered (at SLAC and at Brookhaven) that the reason for the shoulder, was the J/psi observed at low mass resolution.
- ❖ Leon had missed a major discovery.



Oops-Leon

- ❖ Anxious not to miss another discovery the Lederman group mounted another experiment, this time at Fermilab observing electron-positron pairs, with better mass resolution ($\sigma=70\text{MeV}$)

OBSERVATION OF HIGH MASS DILEPTON PAIRS
IN HADRON COLLISIONS AT 400 GeV

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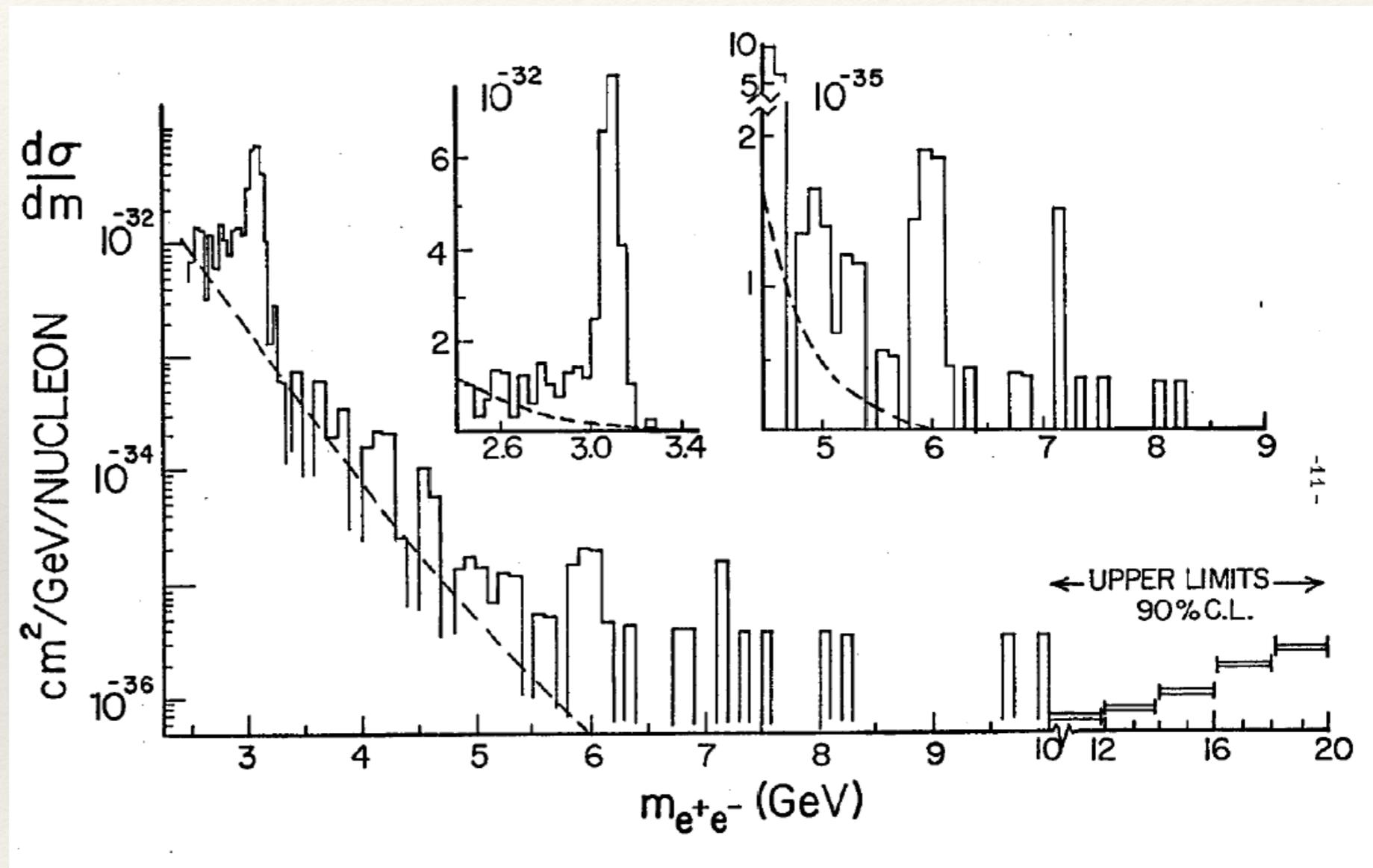
ABSTRACT

We report preliminary results on the production of electron-positron pairs in the mass range 2.5 to 20 GeV in 400 GeV p-Be interactions.

Twenty-seven high mass events are observed in the mass range 5.5-10.0 GeV corresponding to $\sigma = (1.2 \pm .5) \times 10^{-35} \text{ cm}^2$ per nucleon. Clustering of 11 of these events between 5.8 and 6.1 GeV suggests that the data contains at least one new resonance at 5.97 GeV.

Oops-Leon

- ❖ After the bump went away with higher statistics, this state known as the Upsilon, became the Oops-Leon.



The discovery of the Upsilon

Observation of a Dimuon Resonance at 9.5 GeV in 400-GeV Proton-Nucleus Collisions

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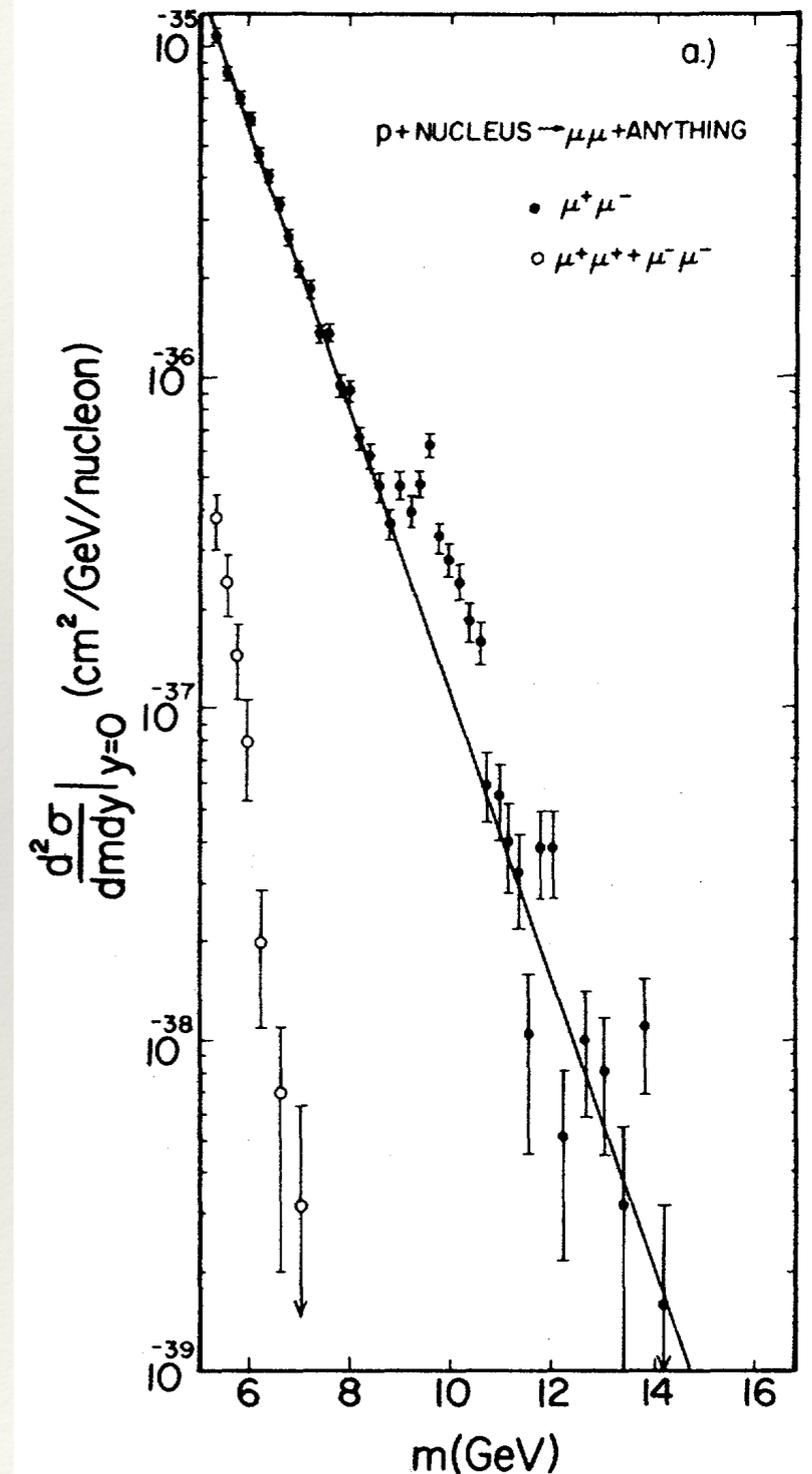
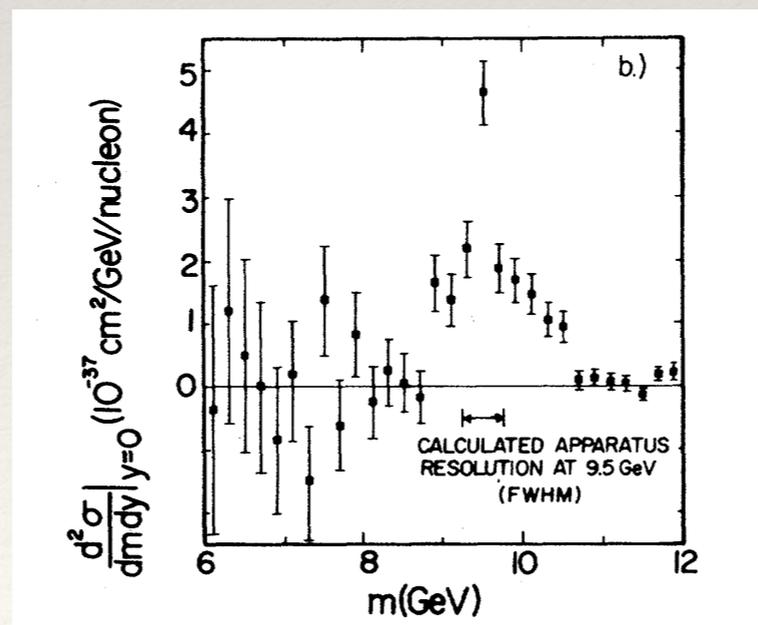
and

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(Received 1 July 1977)

- ❖ Subsequently in 1977 the true Upsilon was discovered at 9.5 GeV.



Happy birthday b-quark

- ❖ The subsequent discovery of b-hadrons held other surprises for the field, notably the long-lifetime of the b-hadrons, allowing successful tagging of b-hadrons using vertex-detectors.
- ❖ What is remarkable is that 40 years later we are initiating a new program to study the b-quark in even greater detail at BelleII as well as the continuing program of LHCb
- ❖ We can anticipate that in 2052, we will be still involved in the detailed investigation of the Higgs boson....

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Higgs Maxwell Meeting

chaired by Keith Ellis (IPPP)

Wednesday, 8 February 2017 from **10:30** to **18:00** (Europe/London)

at **Royal Society of Edinburgh**

22-26 George St, Edinburgh EH2 2PQ

Description The b-quark at 40

Wednesday, 8 February 2017

10:30 - 11:00	10.30-11.00 <i>Registration & Coffee</i>
11:00 - 11:05	Welcome 5' Speaker: Prof. Keith Ellis (IPPP)
11:05 - 11:50	Prospects for flavour physics with Belle II 45' Speaker: Bostjan Golob (Ljubljana)
12:00 - 12:45	CKM elements from semileptonic B decays 45' Speaker: Paolo Gambino (Turin)
12:45 - 14:00	Lunch
14:00 - 14:45	Status and prospects for flavour physics with LHCb 45' Speaker: Greig Cowan (Edinburgh)
14:55 - 15:40	Lattice results for flavour physics 45' Speaker: Andreas Juettner (Southampton)
15:40 - 16:10	Tea
16:10 - 16:55	Flavour anomalies 45' Speaker: Diego Guadagnoli (Annecy)