

TCW @ UCD 1958-1966



David Fegan
School of Physics, University College Dublin

All of Trevor's schooling was taken in Dublin, at CUS (Catholic University School) from 1946 to 1958

Trevor entered UCD as an undergraduate, on a Dublin Corporation Scholarship, in 1958, graduating in 1962

On the basis of his final year's performance he and colleague Kevin MacKeown both won UCD Science Postgraduate scholarships in 1962. However, Trevor decided to remain in Dublin as a member of Neil Porter's group, despite a tempting offer to work at Durham with Arnold Wolfendale. Kevin went to Durham in place of Trevor.

Kevin MacKeown and Trevor Weekes (c 1962)



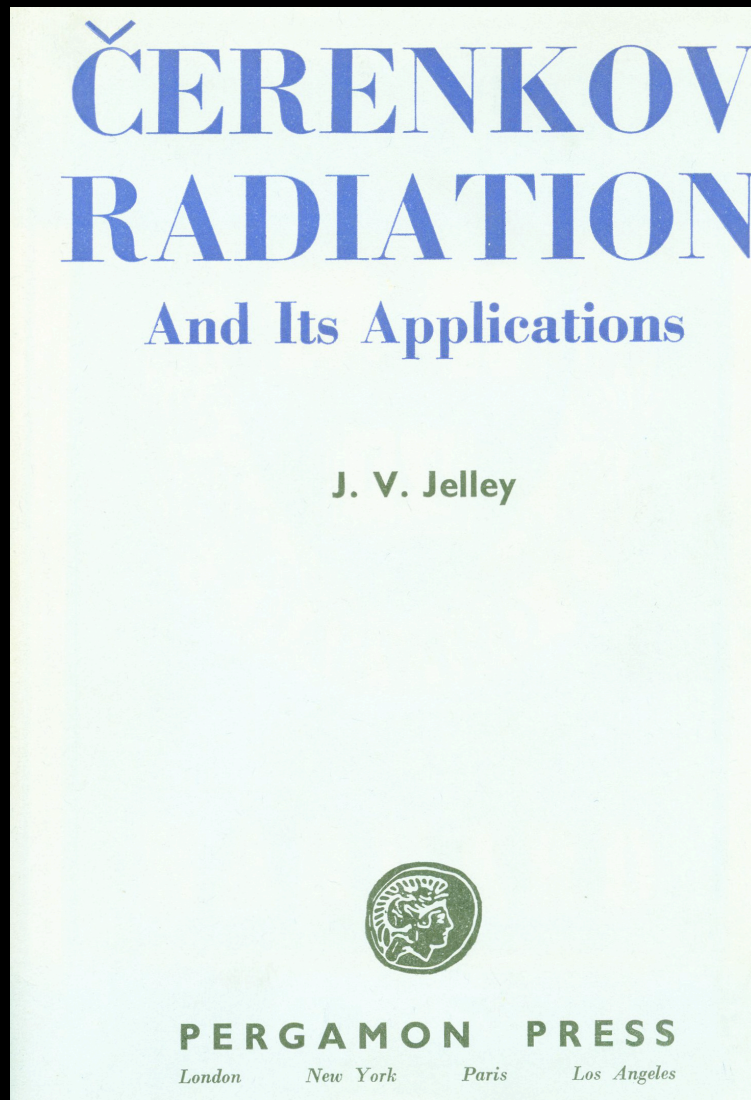
Neil Antony Porter (NAP)



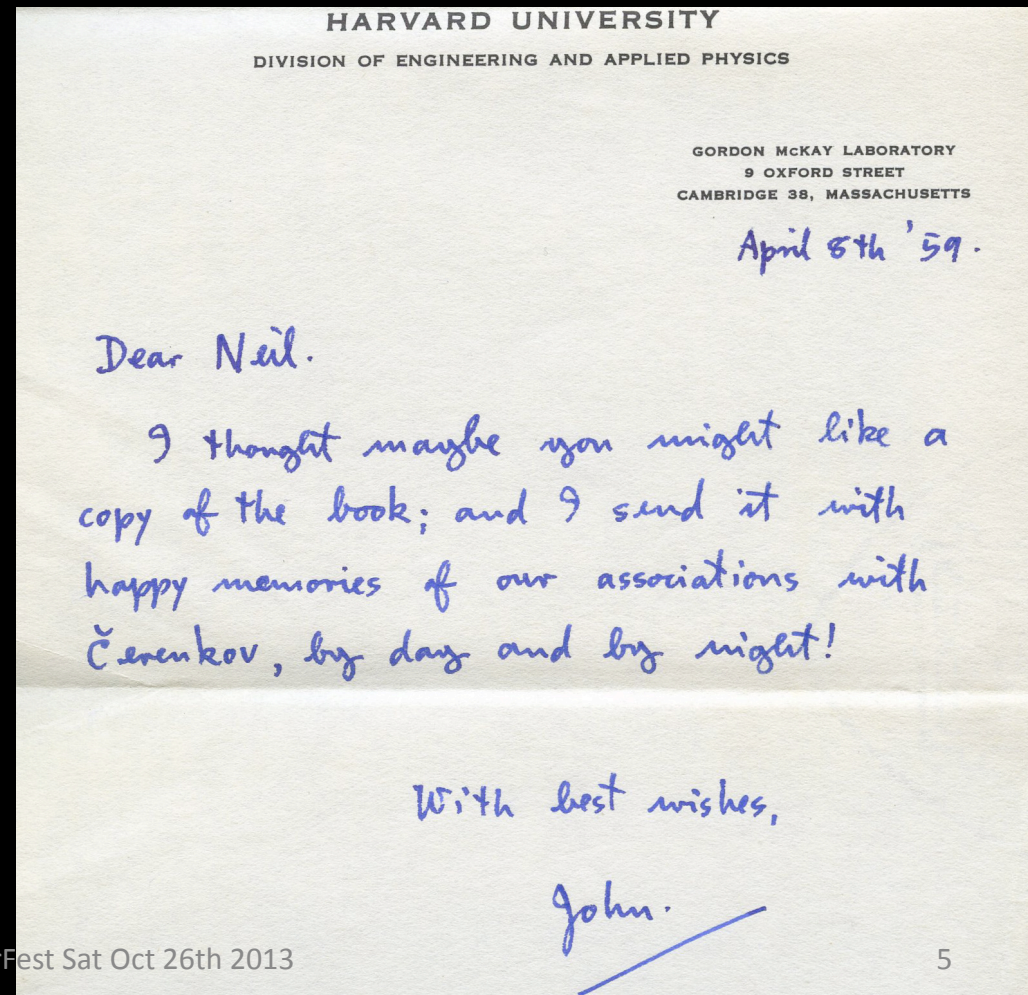
Mentor, PhD supervisor and lifelong friend

TrevorFest Sat Oct 26th 2013

John Valentine Jelley (JVJ)



Meticulous collaborator (AERE)

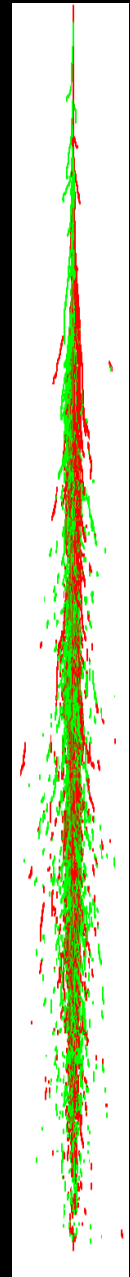


Čerenkov Radiation from the Night Sky, and its Application to γ -Ray Astronomy

J. V. Jelley and N. A. Porter

Quarterly Journal of the Royal Astronomical Society, Vol 4, 1963

This was a very influential paper from the perspective of the development of the Atmospheric Čerenkov Technique. It set the research agenda at both Harwell & UCD, in the quest to find cosmic 'point' sources of γ -rays in the energy domain between 10^{12} eV to 10^{13} eV



Primitive technological capability underpinning research

No formalised agency support for scientific research

Financial austerity & chronic underfunding

Low-cost solutions to technical challenges were mandatory

Electronic devices all designed by postgrads & technicians

This was the era of vacuum tubes, relays and cable delay lines

No Opamp, microprocessors, storage/digital oscilloscopes

For example, in 1969, a small USAF grant to Neil Porter helped

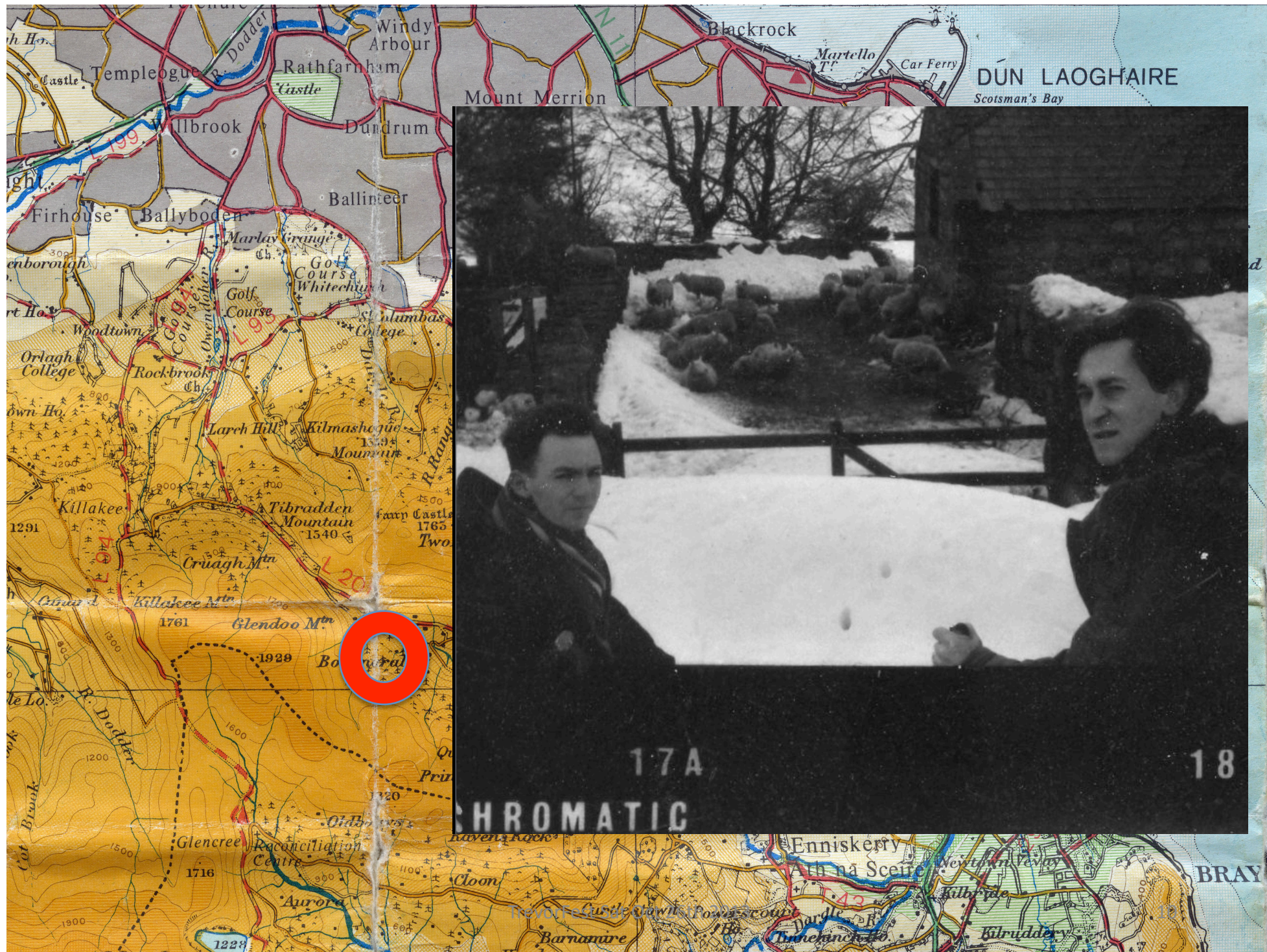
Post grads carried out calculations with adding-machines and slide-rules

A postgraduate's desk (c 1962) ...

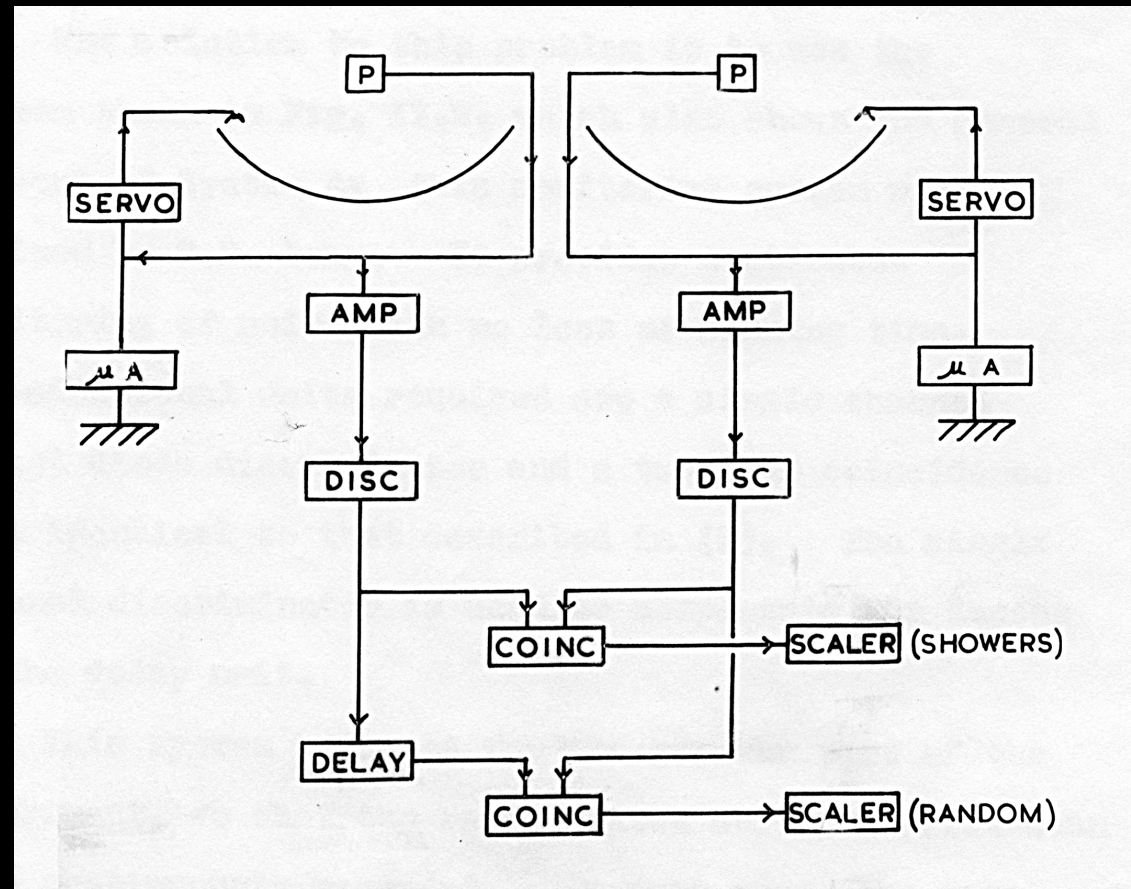
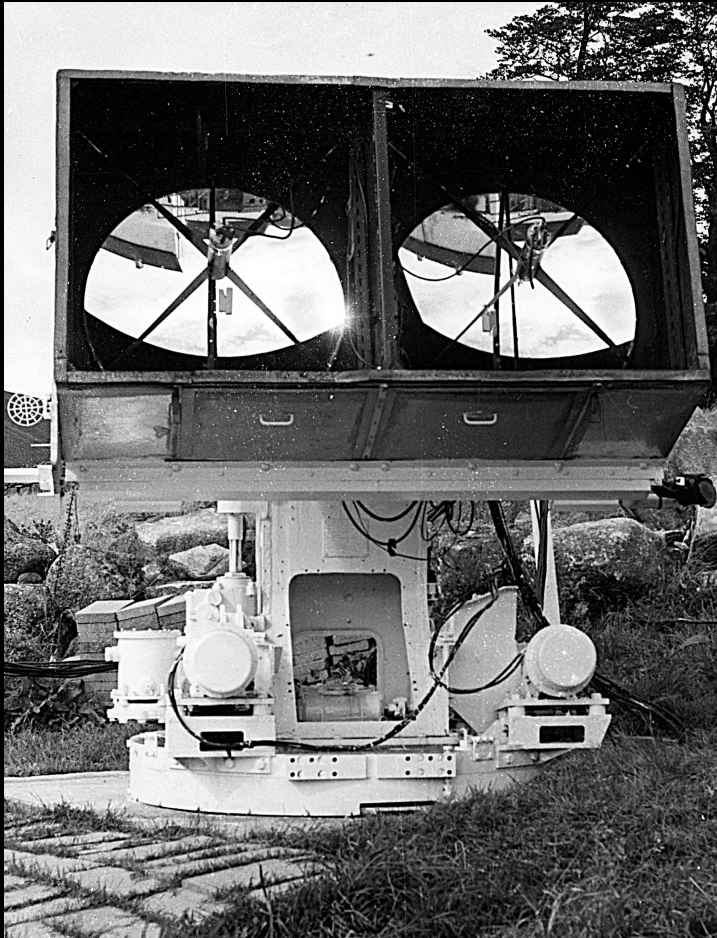


Image
intensifier
pictures of
Cherenkov
light from
 10^{16} eV
showers

DAVE HILL
JOHN WHITE
&
NEIL PORTER
1961



Glencullen 1962-1967



2fold coincidence system, visually counting PROMPT SHOWERS & RANDOMS

Glencullen Valley 2013



UCD 1963-64, – a downtown Dublin campus in transition from the 'classical' (1908) style laboratories ...



... to a “state-of-the-art” modern facility at Belfield campus in south Dublin ...



with much contingent disruption to research & teaching during 1964-65 !!!

The serendipitous path to radio detection of EAS

1958 Jelley proposed that given the v.dv spectrum of Cerenkov radiation that emission might be detectable at microwave frequencies.

1962 Askaryan published (in Russian) a paper stating that in a dense medium a cascade initiated by a HE-particle would exhibit preferential decay of positrons in flight, resulting in a net excess of negative charge.

1963 Alikanyan's follow-up paper (referencing Askaryan) was noted by Porter who was asked to write an English language abstract for publication,

BUT

the Askaryan paper was not available in Ireland,

SO

Porter forwarded the Alikanyan paper to Jelley who then obtained Askaryan's paper.

1963 While Porter was skeptical on the basis of the Alikanyan paper, Jelley realised that the negative excess offered the possibility of detecting COHERENT as opposed to INCOHERENT emission from 10^{16} eV EAS

The Dublin skyline (early 1960's)

$E_p = 10^{16}$ eV primary energy

$N = 10^6$ particles

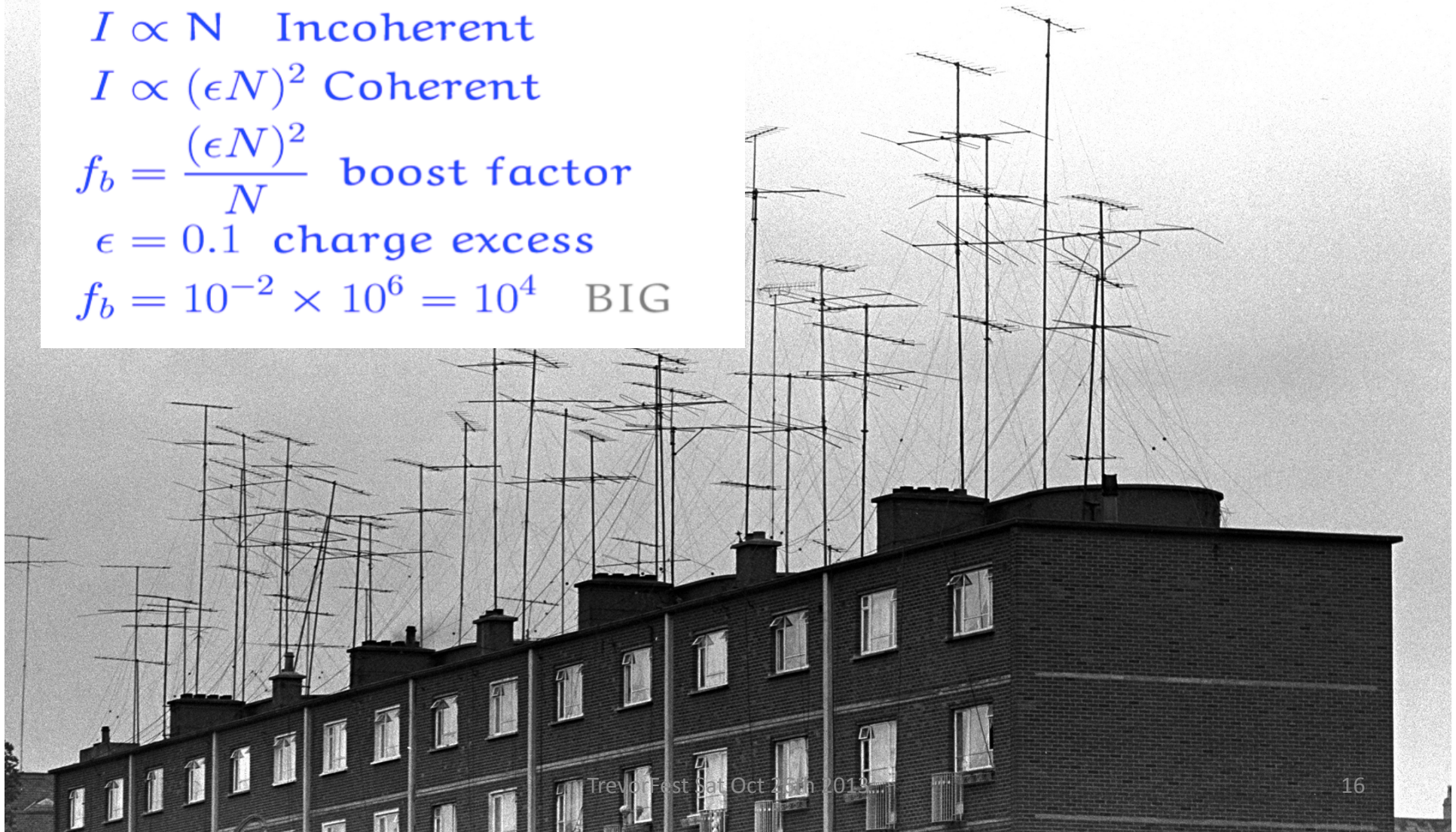
$I \propto N$ Incoherent

$I \propto (\epsilon N)^2$ Coherent

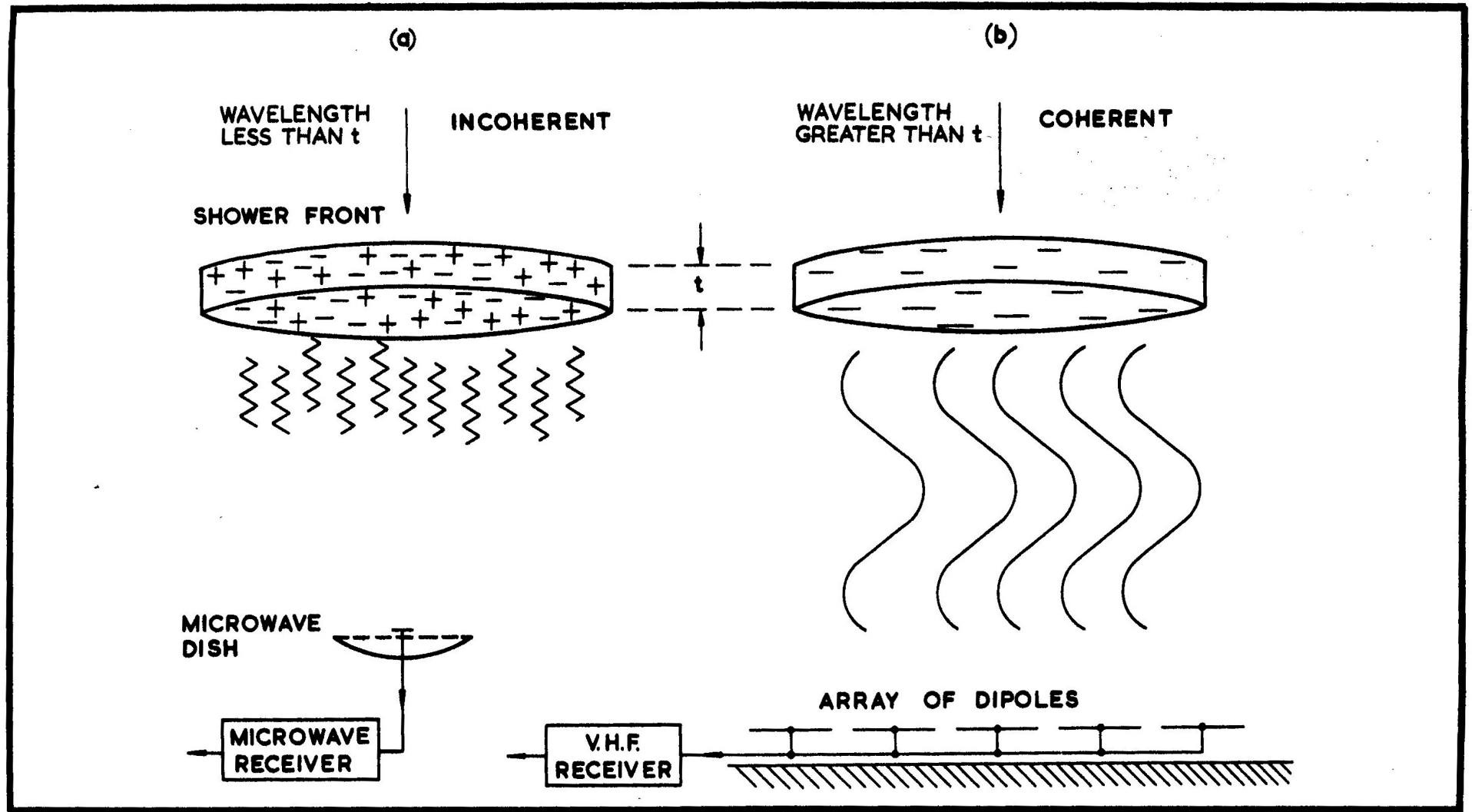
$f_b = \frac{(\epsilon N)^2}{N}$ boost factor

$\epsilon = 0.1$ charge excess

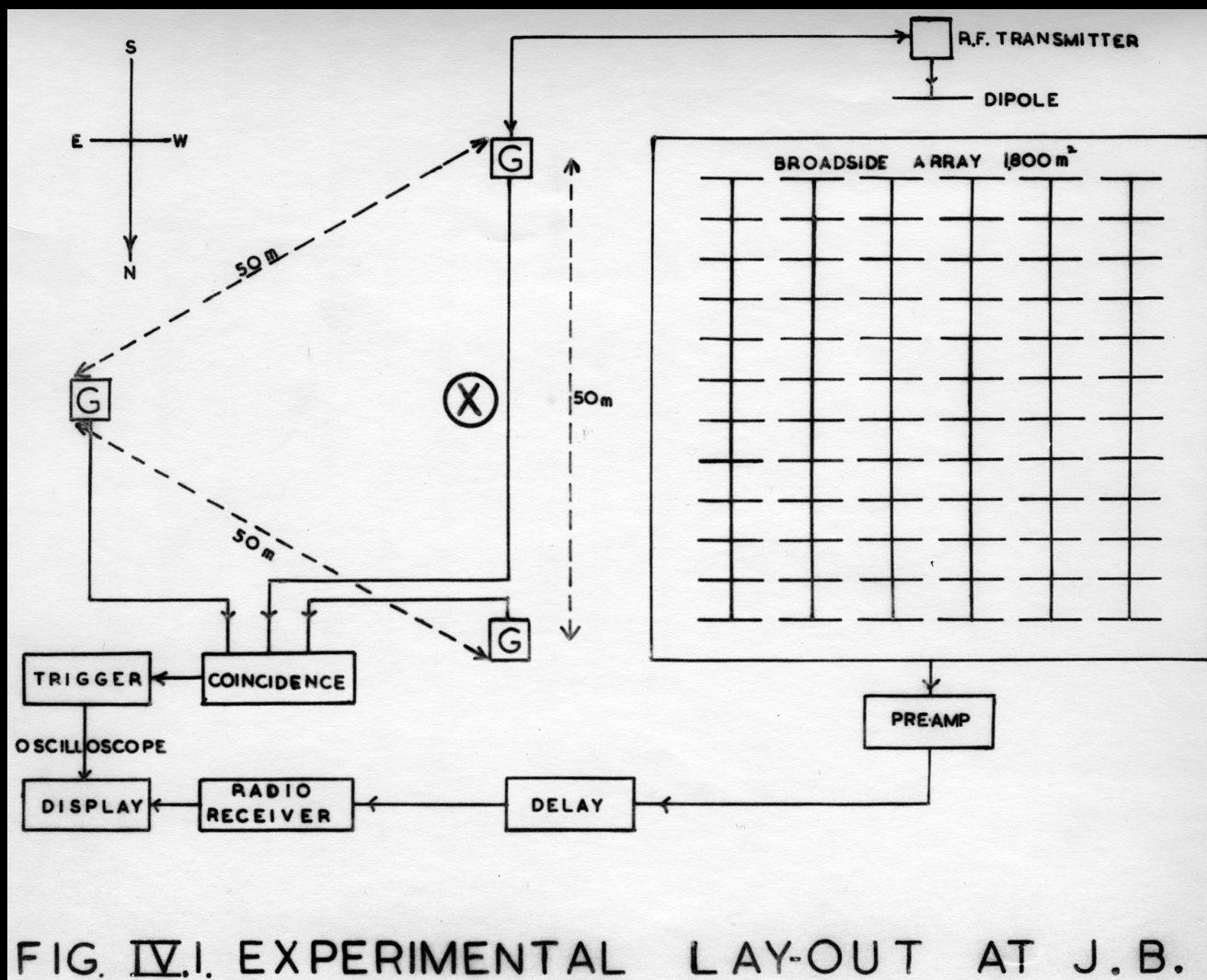
$f_b = 10^{-2} \times 10^6 = 10^4$ BIG



Incoherent vs Coherent



Collaboration of (U of M, UCD & AERE) at Jodrell Bank (UK)



TCW - responsibility for the design and building of EAS trigger system, which first became functional at Jodrell Bank, in July 1964

Oscilloscope traces @ 44 MHz

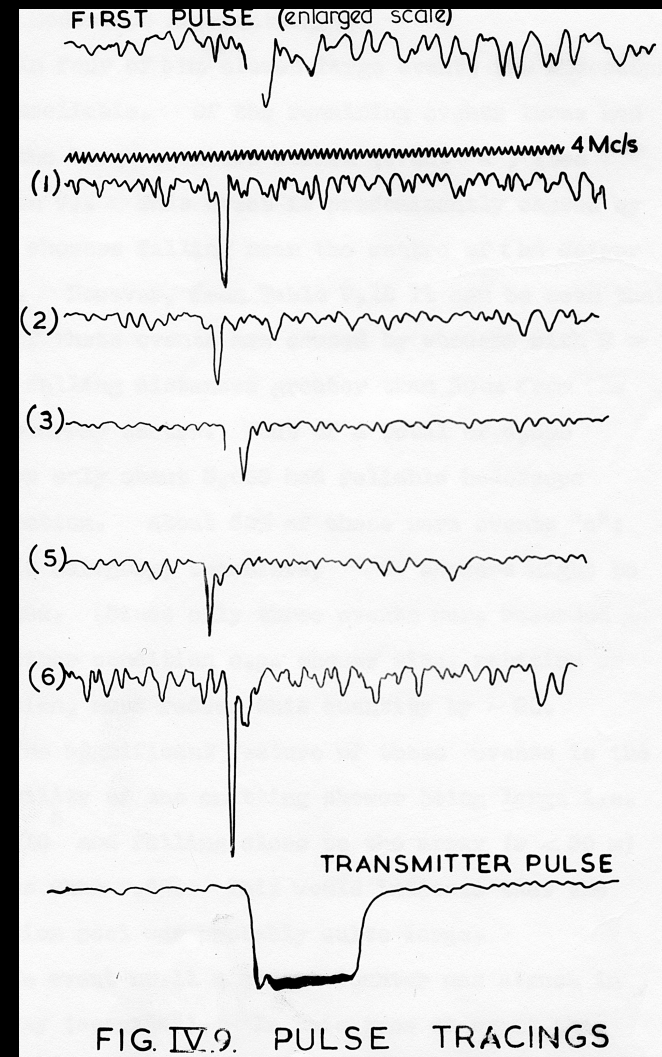
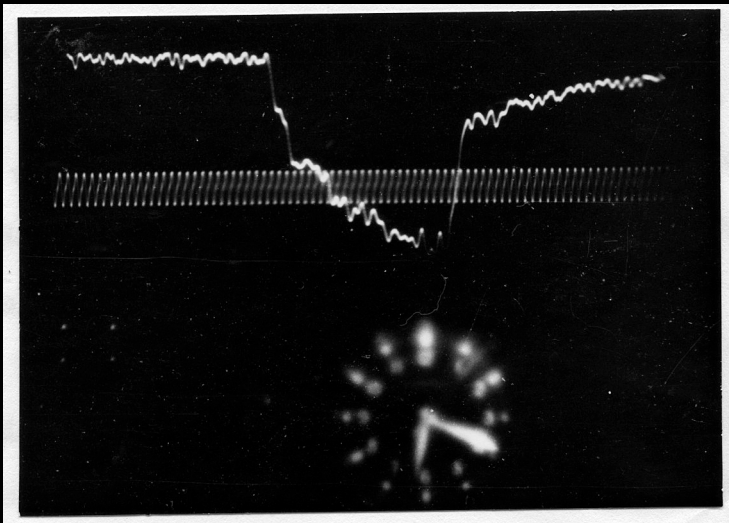
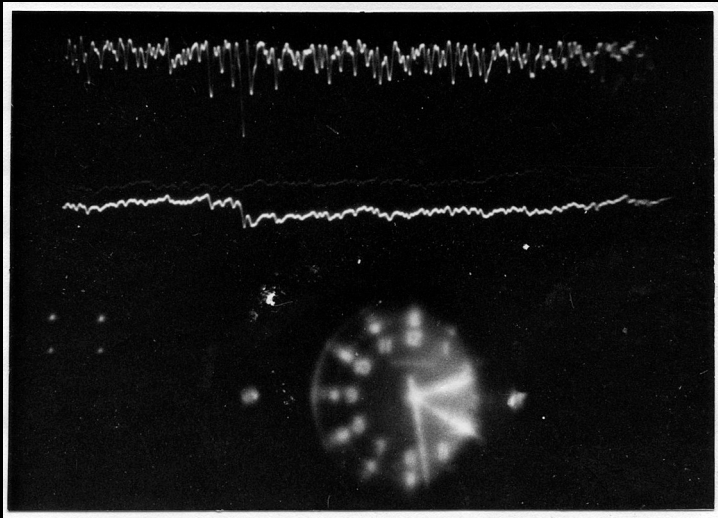


FIG. IV.9. PULSE TRACINGS

A sample of some of the 'larger' radio pulses

Writing in 2001 about the Jodrell Bank days, Trevor recalled the anticipation and excitement of being trusted with responsibility for implementing the obligatory “**JELLY LIST**” pertaining to the first night of the first ... August 19th 1964 ... he original ...

He also referred to his girlfriend Ann ...

“ I was scheduled [‘64] and out of good arrangements to me every day; romantic letters with day-to-day of the experiment!”



Frequency histogram of occurrence of 'largest' pulse on each timebase

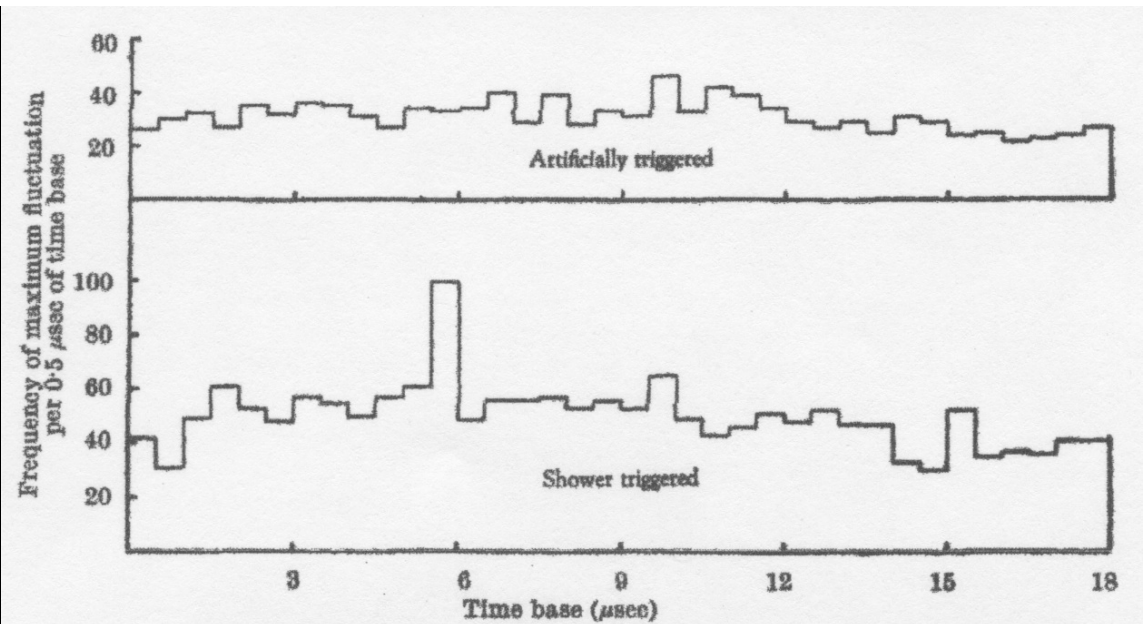


Fig. 2. Histograms showing frequency of occurrence of the fluctuation of largest amplitude along the time-base, between 0 and 18 μsec . The upper histogram is for 1,117 randomly triggered recordings, and the lower histogram is for 1,794 shower-triggered recordings

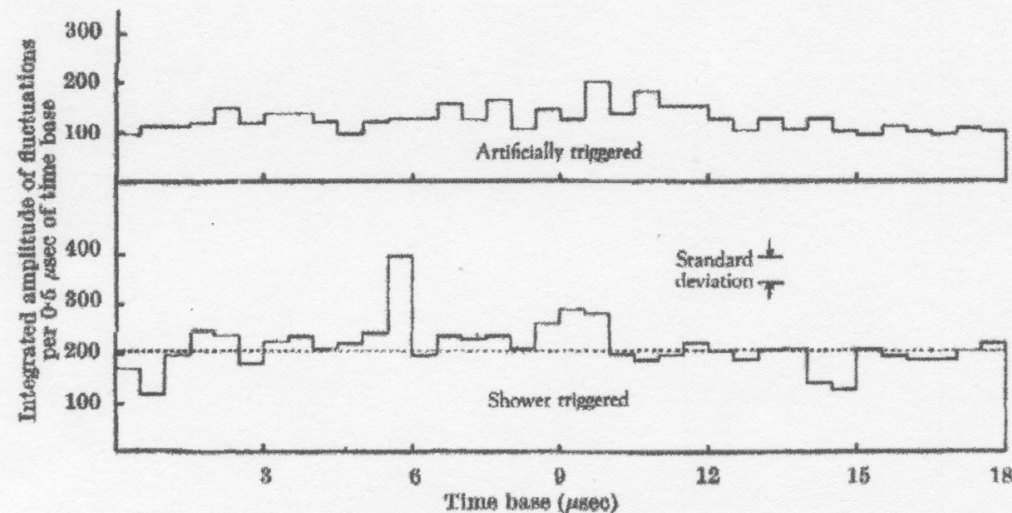


Fig. 3. Histograms showing integrated amplitudes of fluctuations for the same recordings as in Fig. 2

Integrated signal amplitude for the same trace samples

RADIO PULSES FROM EXTENSIVE COSMIC-RAY AIR SHOWERS

By DR. J. V. JELLEY and J. H. FRUIN
Atomic Energy Research Establishment, Harwell

PROF. N. A. PORTER and T. C. WEEKES
University College, Dublin

AND

PROF. F. G. SMITH and R. A. PORTER
University of Manchester, Nuffield Radio Astronomy Laboratories, Jodrell Bank



Jodrell
Bank array.
Late 1960s

TCW - Teacher to the UCD Physics class of 1966

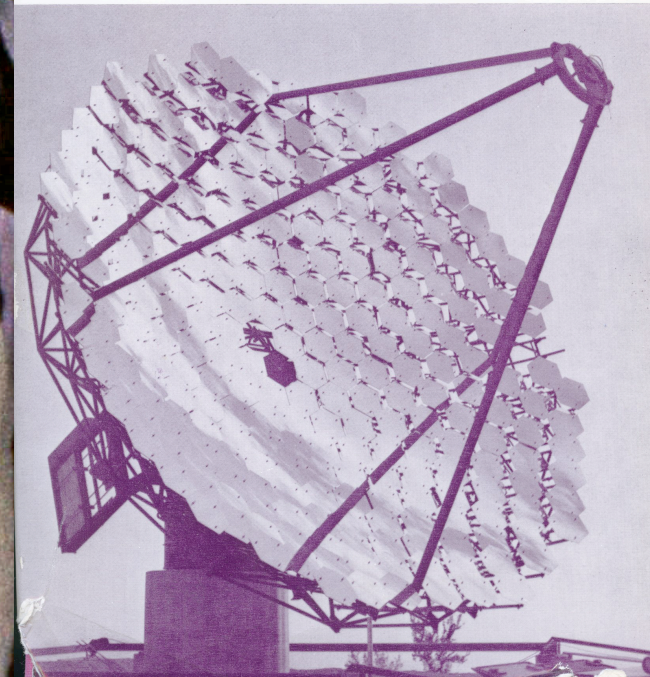
Acknowledgements

The monograph was written at the suggestion of Professor N. A. Porter who did much to kindle the author's interest in this subject and whose help at all stages in the preparation of this work is gratefully acknowledged. The text is based on a series of lectures to senior students in the Physics Dept., University College, Dublin, in 1966. I am grateful to Dr P. K. MacKeown for reading the chapter on neutrinos and to Dr C. D. Long and G. H. Rieke for reading the entire manuscript. Those mistakes that may still be present are the sole responsibility of the author.

T. C. W.

High-Energy Astrophysics

TREVOR C. WEEKES





RADIO AND OPTICAL METHODS OF DETECTING COSMIC RAYS

PhD thesis of T.C.Weekes ... submitted to the National University of Ireland on 3rd May 1966.

Acknowledgement: ... finally the help and encouragement of my wife throughout this work must be acknowledged:, in particular she has undertaken the typing and re-typing of this thesis.

Quasi-contemporary references to the 1960s optical and radio work

Trevor C. Weekes
Radio Pulses from Cosmic Ray Airshowers

American Institute of Physics
Conference Proceedings 579, p3-13
(2001).

D.J.Fegan
Detection of elusive radio and optical
emission from cosmic ray showers in the
1960s

Nuclear Instruments and Methods in
Physics Research A662,S2-S11 (2012)

