J P V Madsen and University of Queensland Physics 1935-1945

(Hugh Colin Webster, CMG (1905-1979).)

Prepared by R W Madsen 24 March 2026.

Introduction

It appears that the first involvement JPVM had with Queensland was in November 1924 when he was nominated by the Australian Institution of Engineers to undertake a consulting role for the Rockhampton City Council in relation to its recent acquisition of the power station there which had been in operation for some 25 years. This assignment involved travelling by train from Sydney to Brisbane to make enquiries there before continuing by train to Rockhampton and shortly after making an interim report. There was coverage in the local press at this time & subsequently the events were relived in a defamation court case brought by the Mayor of the Council against the newspaper, which he lost in early 1925.

In 1934-35 George Munro of the RRB (Radio Research Board) moved his CRDF (cathode ray direction finder) recorder from Melbourne up to Toowoomba for 6 months to do simultaneous recordings at Mt Stromlo of lightning strikes in order to precisely map atmospheric noise on the east coast of Australia. At Toowoomba Hugh C Webster was also involved with this RRB work. Brisbane was known as a centre of high summer lightning activity and George Munro had developed a technique of real time directional data. The base line for triangulation from Mt Stromlo to Toowoomba was 570 mile & was much longer than the Melbourne to Mt Stromlo (Canberra) base line.(280 miles). In 1935 JPVM was invited by the University of Queensland Senate to deliver the Macrossan Lecture that year in October as a prominent scientist involved with the new area of radio and the ionosphere., which resulted in a lengthy paper by Madsen of research results by the RRB and internationally up to that time.

At the start of WW2, Arnold L Reimann & Hugh C Webster who were both working at the University of Qld offered their services to JPVM who was staffing up the Radiophysics Laboratory in Sydney to work on radar, and both were seconded for the duration. As it turned out both Munro and Webster worked with JPVM on scientific liaison work in Washington & London respectively during the War.

To assist with radio communications through Brisbane in 1943 an ionosonde station provided by the RRB (Frank Wood) was operated with the assistance of Professor Thomas Parnell of the Physics Dept. of the University of Qld.

Hugh Colin Webster CMG-(Companion of St Michael & St George): HCW originally from Tasmania obtained a BSc in 1926 at the University of Tasmania, an MSc in 1928 from the University of Melbourne and on an 1851 Exhibition Scholarship at the Cavendish in Cambridge obtained a PhD in 1932.

After working at Bristol University in 1931-33 as an Assistant Lecturer in Physics he returned to Australia to work in the RRB from 1933 to 1937 & then obtained positions with the University of Queensland until 1949 when he became Professor of Physics until 1970.

Of special interest is a paper by HCW published at the Royal Society (“The artificial production of gamma radiation”) on a submission on 19 January 1932 on the energy of Gamma radiation produced from Polonium on Beryllium & Boron using Polonium made available by James Chadwick which indicated the possibility of a neutron particle which he published in Nature on March 2nd 1932 (attached). James Chadwick had announced on 27 February his initial findings on the neutron & followed that up in May 1932 with a detailed Roy Soc paper in which at the outset he acknowledges Webster’s paper & restates Webster’s conclusion that the gamma radiation had a quantum energy of 7 X 10^6 electron volts for Beryllium & 10X 10^6 electron volts for Boron which was more penetrating than Beryllium. (Atomic weights: Be 9.0, B 10.8)

HCW used 2 methods to carry out his investigation following firstly the Germans Bothe & Becker (one using a very effective Geiger-Muller counter and the 2nd using a high pressure ionisation chamber).(see attached Fig 1 for first method apparatus where materials to be bombarded are on a wheel which is rotated in a vacuum so that the bombarding alpha particles possessed their full range). In his Nature article HCW refers to a future Roy Soc paper but only the January 1932 was published & publication was left to Chadwick in May.

[This gamma work with neutrons is reminiscent of JPVM’s Gamma experiments in 1908 using alpha particles].Polonium provided an intense source of alpha particles without gamma radiation which was different to Radium. Chadwick obtained Polonium 210 by separating old radon emanation tubes & also old radium solutions.

In the summer of 1934-35 George Munro & HCW at a high plateau (2000 feet with a panoramic view) overlooking Toowoomba , made intensive observations over 6 months of lightning strikes using triangulation on a 570 mile base line from Mt Stromlo (2500 feet) where Arthur Higgs had his CRDF & was making simultaneous observations.

In a single severe electrical storm over Brisbane some 300,000 strikes have been recorded.

The atmospherics observed had a range from 1000 to 2500 miles (covering east coast Australia & out into the Tasman) and the wavelength of a lightning flash was found to be 3 X 10^3 metres.

When the temporary RRB station was set up, contact was made with Professor Parnell to see if any undergraduates would be interested in assisting with this work but apparently none came forward.

When HCW joined the Radiophysics Lab in 1940 it appears that he was working with Joe Pawsey.(an 1851 Exhibition Scholar to the Cavendish in 1931-1934). On 7 February 1941 David Rivett (CEO of CSIR) wrote to Harold Holt (the CSIR Govt Minister) outlining JPVM's proposal for Scientific Liaison with England, America and Canada in which HCW was to accompany JPVM to England leaving on May 1, 1941. Holt approved of this proposal.

JPVM was to remain in England until the end of October 1941, then to return to Australia to follow up regarding the radar control of the Singapore naval defence batteries, at which time HCW remained in charge of Scientific Liaison work in England until mid 1943. On return to the RPL ,HCW found a role with " Section 22" RCM (radar counter measures) working in Brisbane with liaison type activities with GHQ and on occasion visited frontline activities in New Guinea.

Arnold Luehrs Reimann (1898-1991: BSc (1919 Adelaide), DSc -Hons (1922 Adelaide), PhD (1926 -Berlin), General Electric Research Labs (1926-1936), Cavendish Laboratory (1936-1938), University of Queensland Physics Lecturer (1939-1949), CSIRO Research Physicist (1950-1968), RadioPhysics Laboratory- Valve Development (1940-1944).

In 1938 Parnell received 26 very highly qualified applications for the vacant position of Lecturer in Physics out of which Reimann was chosen.

Of great interest to JPVM for valve development of 1.5 metre radar valves (VT 90) which critically involved thoriated tungsten would have been 2 papers by Reimann in 1937 (Roy Soc -Thoriated Tunsten) & 1938 (Phil Mag-The evaporation of atoms, ions and electrons from tungsten).

On going to the RPL in 1940 ,Reimann formed a valve group until the magnetron work at 10 cms was transferred to Melbourne University at the end of 1942 to overcome a laboratory space problem at which time Reimann turned his attention to Solid-State devices which he continued on his return to Brisbane.

Thomas Parnell (1881-1948): At Cambridge he did an MA in 1903 (subsequently an MA in 1907) and went to Melbourne University in 1904 before taking up an inaugural position with Physics as a lecturer at the University of Queensland in 1911. After an absence from January 1917 to May 1919 with the AIF in Europe (with artillery & as Aust. Corps Gas Officer) he returned to Brisbane to be appointed to the Chair of Physics until 1948. (He was a keen fly fisherman catching trout in the NSW New England area, which is something that would have appealed to JPVM).

In 1935 Parnell was the Dean of the Faculty of Science & was a member of the University Senate & it would seem that in these roles that JPVM came to be selected as a prominent scientist, to deliver the 1935 Macrossan Lecture.

Frank Wood in Sydney was the only physicist retained in the RRB (Radio Research Board) at the start of the War to work on ionospheric prediction services for the 3 services as JPVM realised that this vital communications work was needed to provide support on a proper scientific basis. All other RRB physicists had been brought into the work of RPL-radar.

It was realised, with the involvement of F W G White, that ionosonde data was needed to especially cater for the tropical conditions in New Guinea & also in the Brisbane region for suitable wavelengths to be selected at each hour of the day forecasting 3 months ahead. Ionosondes (an ionosonde is like a small radar set detecting electron densities at various heights) on east coast Australia were located at Sydney, Brisbane & Cape York,

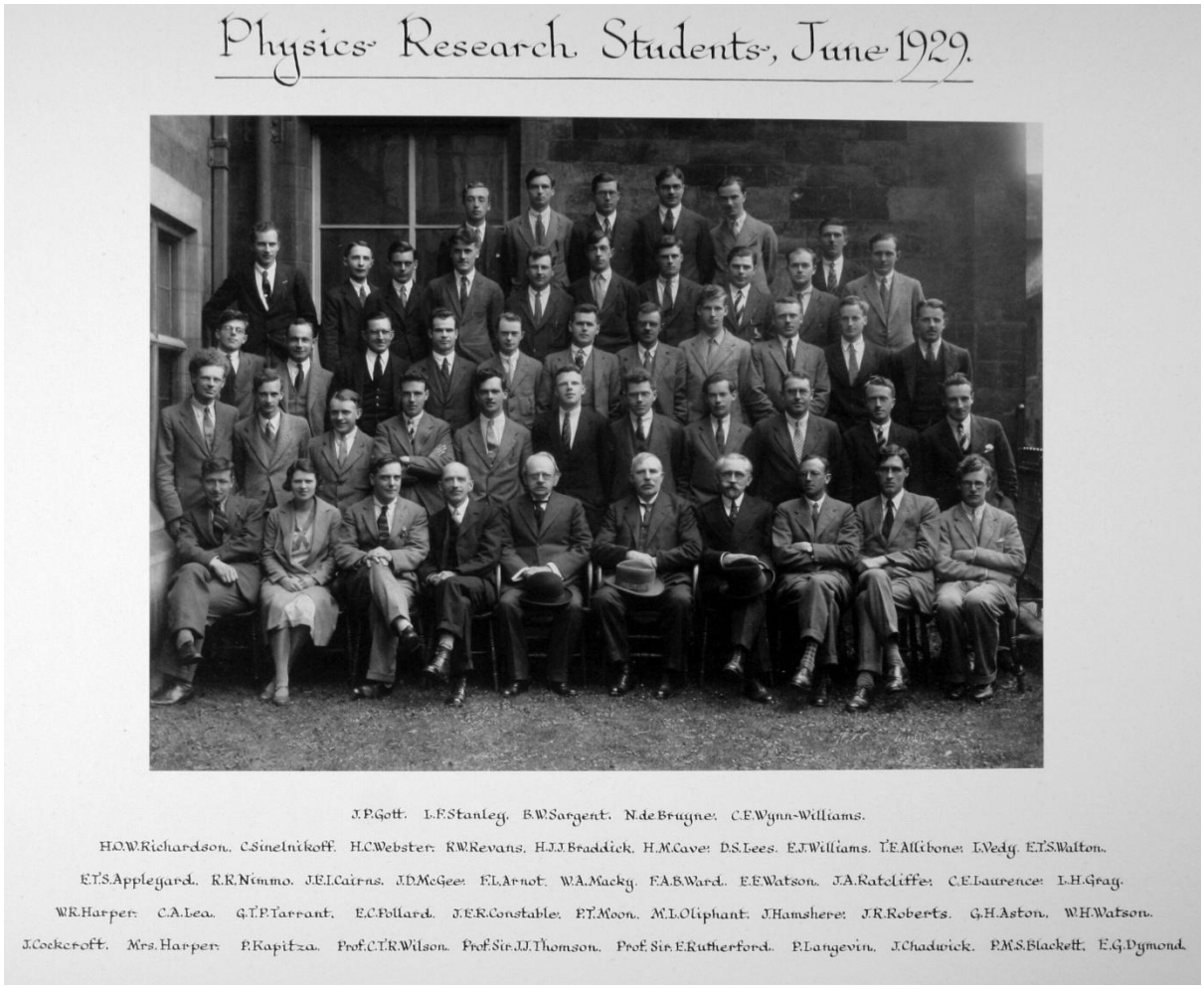
Frank Wood & Arthur Higgs did the design and build of ionosondes at the RPL in Sydney and the set located at Indooroopilly was operated under the supervision of Parnell & his Physics Department. This facilitated the radio communication that Macarthur had to east coast America.

The 1935 Macrossan Lecture on the Ionosphere: On Monday 28 October 1935 JPVM arrived in Brisbane on the Manoora with his daughter Phyllis acting as hostess at a supper party held at Lennons after the 2nd evening of the lecture on the Thursday the 31st of October with Sir Henry Barraclough (President of the Institution of Engineers) and Professor Parnell in attendance. (The return to Sydney on the Duntroon departed on November 5).

The Lecture is very significant as a summary of the very valuable work done by the RRB over the previous 6 years which had established an international reputation for work on the ionosphere using the Breit & Tuve pulse technique. This led into the pulse technique used in Australian radars on the 1.5 metre wavelength with aerial duplexing.

In 1930, Dr A L Green conducting an early experiment for the RRB & who had previously had experience with Appleton in England in 1928 with left handed polarisation of down coming waves to the north, found that at a comparable location from Coogee in Sydney to Jervis Bay to the south gave a right handed polarisation confirming a prediction in 1928.

From Madsen's paper the diagram of the layers of the ionosphere are shown with an indication of the electron density. (see below). The lowest region is at a height of 60 miles increasing to 120 then 160 miles at the uppermost layer. At midday for the NSW latitude in the Kennelly-Heaviside Layer the density was found to be 4X10^5/cc.



HCW on an 1851 Exhibition Scholarship to the Cavendish Laboratory. 3rd from left 2nd B

HCW taken from the Cavendish group photo above , aged 24. 3rd from left 2nd back row

THE UNIVERSITY OF QUEENSLAND

JOHN MURTAGH MACROSSAN LECTURES
1935

THE IONOSPHERE

AND ITS

INFLUENCE UPON THE PROPAGATION OF RADIO WAVES

BY

J. P. V. MADSEN, B.E. (Syd.), D.Sc. (Adel.).
Professor of Electrical Engineering, University of Sydney.
Chairman of the Radio Research Board, Commonwealth Council for Scientific and Industrial Research.

SYDNEY: SIMMONS LIMITED
1935

Thomas Parnell (1881-1948) Professor of Physics at University of Qld to 1948 originally from England after an MA degree at Cambridge University.

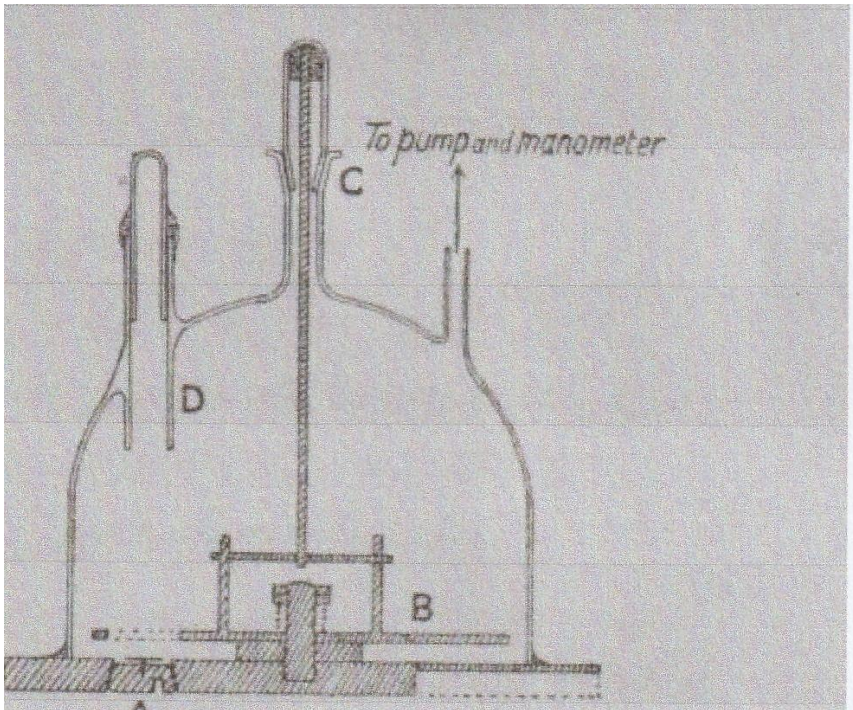


FIG. 1.

Possible Existence of a Neutron

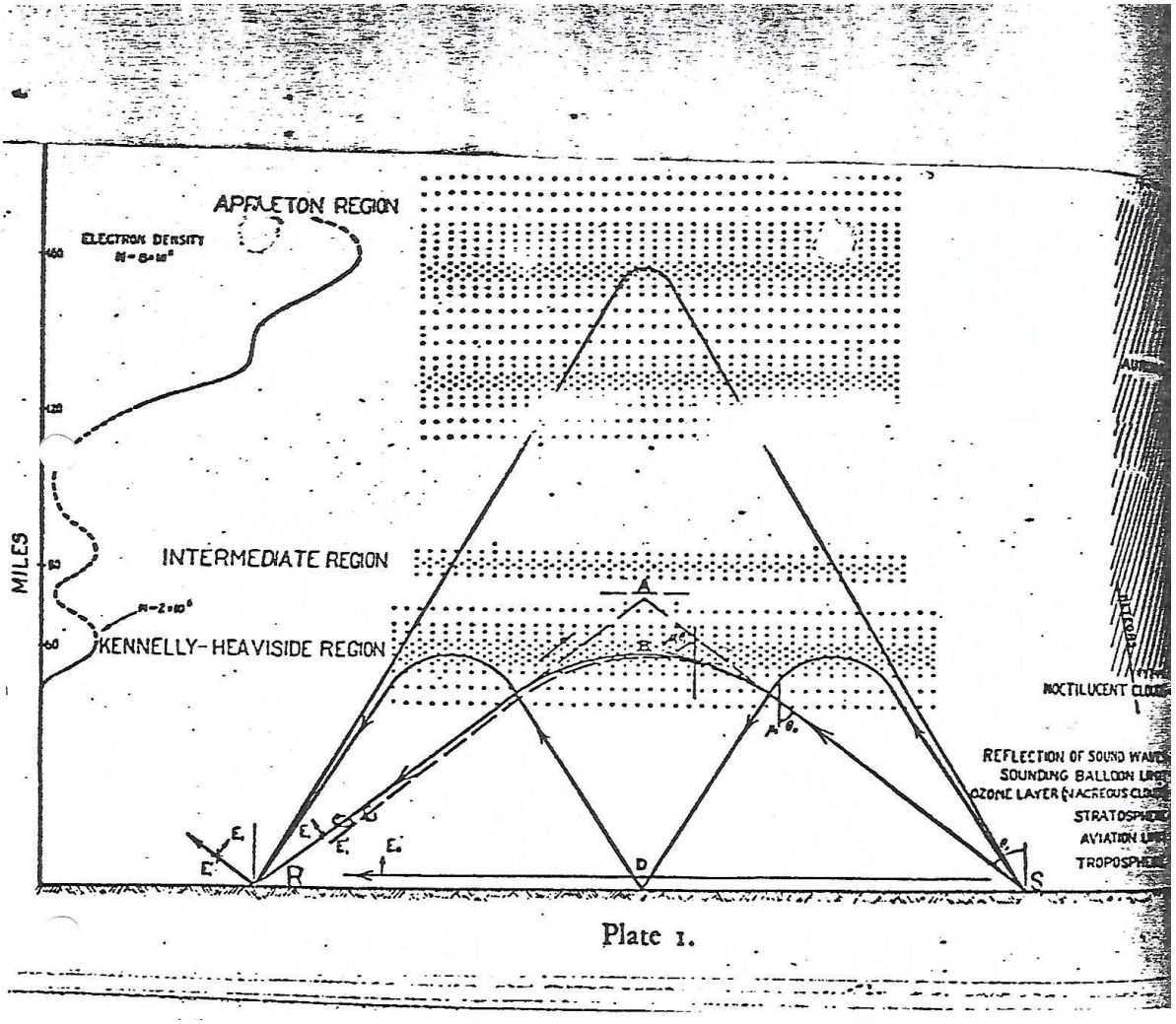
IN a paper to appear shortly in the *Proceedings of the Royal Society*, I have reported observations on the absorption of the radiations produced in beryllium and other light elements by bombardment with polonium α-particles. The experiments indicated that the radiations emitted from beryllium, boron, and fluorine in the 'forward' direction, that is, in roughly the same directions as the α-particles producing them, were less absorbable than those emitted in the backward direction. In my paper I show that this observation is very difficult to reconcile with conservation of momentum and energy if the radiations are assumed to be γ-radiations corresponding to the energy available.

Now that Dr. Chadwick has put forward evidence for the existence of neutrons,[1] this difficulty appears to be solved. Thus if the radiations are assumed to consist of neutrons, it follows immediately from the conservation laws that those emitted in the forward direction must have considerably more energy (50 per cent in the case of beryllium) than those emitted in the backward direction. This suggests that the radiations from boron and fluorine, as well as that from beryllium, consist at least in part of neutrons.

H. C. WEBSTER.

H. H. Wills Physical Laboratory,
The University, Bristol,
March 2.

[1] NATURE, **129**, 312, Feb. 27, 1932.



The ionosphere layers as shown in the Macrossan Lecture.