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Revisiting the Research by Thorne and Horne, and Horne and Thorne

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Richard Thorne and Richard Horne started work together in the late 1980s in what became a long and fruitful collaboration. They published 80 papers together. In this talk we review some of the work they did together in the 1990s onwards. We show examples of their work on the propagation of electromagnetic ion cyclotron waves in the magnetosphere showing how waves are reflected at the bi-ion hybrid frequency, and how the amplification and polarisation of the waves change during propagation. We discuss the two mechanisms they put forward for wave heating of heavy ions: heating at the second harmonic of the Oxygen cyclotron frequency and of Helium at the bi-ion hybrid frequency. We show some of their work on the propagation of whistler mode chorus and electron cyclotron harmonic waves and how they identified which waves are responsible for the origin of the diffuse aurora, not by looking at the precipitated particles, but by predicting and observing the distribution of electrons left behind in space. We review their ideas on the acceleration of electrons by chorus waves at Earth and Jupiter and how this led to a paradigm shift in our understanding of how the radiation belts at the Earth are formed. We discuss how this work led to the scientific objectives of the Van Allen Probes mission and how the idea of chorus wave acceleration was taken up by most, if not all, of the international scientific community. We put all this work in the context of the time, that most of the ideas were conceived over warm English beer, in the various pubs in and around Cambridge, England.