“Bumps, Blips and Bulges – the Science of Localised Things”
Professor Alan Champneys of Bristol University.

Science is a model of reality and we are accustomed to a natural equilibrium or periodicity. When the unexpected occurs e.g. clusters of a particular disease or crime hotspots, it is natural to try to identify specific reasons. However this may not always be the case: there may be no need to find localised causes, they are more often the consequence of non-linear systems. The use of non-linear mathematics and solitary wave theory can be used as a means of understanding and explaining the unexpected. Professor Champneys attempted to simplify this complex subject through an entertaining history of the development of the subject of solitary wave theory.

In 1834 John Scott Russell, a Scottish engineer, was watching a horse-drawn canal barge when as a result of the ropes becoming tangled, the barge stopped suddenly. However the mass of water that had been put in motion ahead of the barge continued forward at speed and Russell followed the wave on horseback for almost two miles. Following this discovery, he built a 30' wave tank in his back garden and made further important observations of the properties of the solitary wave

Throughout his life Russell remained convinced that his solitary wave was of fundamental importance, but 19th and early 20th century scientists thought otherwise. His fame has rested on other achievements such as ship design - he was involved in the design of Brunel’s “Great Eastern “ and Britain's first armoured warship ("Warrior").

It was not until the mid 1960's when applied scientists began to use modern digital computers to study non-linear wave propagation that the soundness of Russell's early ideas began to be appreciated. He viewed the solitary wave as a self-sufficient dynamic entity, a "thing" displaying many properties of a particle.

When Professor Champneys moved onto the third body problem and Poincare’s experiments with a pendulum at least some of the audience were struggling but the effort was worthwhile.

He ended by summarising some of the applications of this aspect of mathematics. From the modern perspective, wave theory is used as a constructive element to formulate the complex dynamical behaviour of wave systems throughout science. It has been used in hydrodynamics, non-linear optics, from plasmas to shock waves, from tornados to the Great Red Spot of Jupiter, from the elementary particles of matter to the elementary particles of thought.

Given on Wednesday 13 April at the Royal Agriculture College