Seeing Double – The Discovery of Binaries in the Edgeworth-Kuiper Belt

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The demotion of Pluto as a planet really started in 1978 with the discovery of its moon Charon. Once it was known to be in a binary system, it was just a matter of time before the determination of Pluto's mass, along with the discovery of other transneptunian objects (TNOs), would lead to its declassification. This example highlights the fact that binary discoveries are critical for determining the mass of TNOs in the Kuiper belt. If we can determine the orbit of a binary system, we can find the mass. An independent measurement of the size of the components then leads to a determination of the bulk density. From the bulk density we can deduce the characteristic composition and structure of these objects. The successful measurement of these fundamental quantities has and will continue to advance our theories on the formation, structure, and evolution of bodies in the outer solar system. This talk focuses on the discovery of binary systems in the Kuiper belt and the current state of our knowledge. To date there are over 50 confirmed binary systems, a number that is an extreme lower limit to the true binary population. In this talk, I'll highlight past and current searches led by Keith Noll (STScI) to find binary systems using the Hubble Space Telescope (HST). My role in this research will be discussed and will lead to a discussion on some of the techniques we are using to identify binary systems at extremely small angular resolutions. Members of our group led by Will Grundy (Lowell Observatory) are calculating orbits for a few of the binary systems, and highlights of his results will be presented. The talk will then conclude with some statistics relating the binary frequency of TNOs to their dynamical classes, and explore what this could imply about the structure and formation of the Kuiper belt.