The Solar System beyond Neptune

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In this review talk I will describe the properties of the trans-Neptunian solar system, as discerned from recent ground-based observations. Twenty-three trans-Neptunians have been identified at the time of writing (May 1995), mostly from on-going surveys conducted on Mauna Kea. These are the first detected members of a trans-Neptunian swarm that comprises about 35,000 objects larger than 100 km in the 30 - 50 AU heliocentric distance range. Vast numbers of smaller objects may also be present, as well as large but more distant objects that are too faint to detect.

The dynamical natures of the new objects fall into at least two groups. About half of the new objects (1992 QB_1, 1993 FW are prime examples) have orbits of low eccentricity with perihelia beyond 40 AU, and so are relatively immune to Neptune perturbations. These objects, as well as the distant 1994 ES_2, 1994 EV_3 and 1994 JQ_1 (heliocentric distances 46, 45 and 43 AU, respectively) are likely members of the predicted Kuiper Belt. Other objects at smaller distances (e.g. 1993 RO, RP, SB, and SC) appear to occupy the 3:2 mean-motion resonance with Neptune. They are presumably dynamical analogues of Pluto, which occupies the same resonance. Other resonances (e.g. 4:3) may be occupied by trans-Neptunian objects in our sample.

We will present the observational status of the solar system beyond Neptune and discuss the impact of this region on theories for the origin of comets and the growth of planetesimals.