# Prospective very young asteroid pairs

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Several tens of asteroid pairs can be discerned from the background main-belt asteroids. The majority of them are thought to have formed within only the last few $10^6$ yr. The youngest recognized pairs have formed more than $\approx 10$ kyr ago.

As some details of pair formation are still not understood well, the study of young pairs is of great importance. It is mainly because the conditions at the time of the pair formation could be deduced much more reliably for young pairs. For example, space weathering on the surfaces of the components, or changes in their rotational properties (in spin rates, tumbling, coordinates of rotational pole) could be negligible since the formation of young pairs. Also, possible strong perturbations by main-belt bodies on pair formation can be reliably studied only for extremely young pairs. Some pairs can quickly blend in with the background asteroids, so even the frequency of asteroid pair formation could be determined more reliably based on young pairs (though only after a statistically significant sample is at disposal).

In our regular search for young pairs in the growing asteroid database, only multiopposition asteroids with very similar orbital and proper elements are investigated. Every pair component is represented by a number of clones within orbital uncertainties and drifting in semimajor axis due to the Yarkovsky effect.

We found that, if the previously unrecognized pairs (87887) 2000 $SS_{286}$ – 2002 $AT_{49}$ and (355258) 2007 $LY_4$ – 2013$AF_{40}$ formed at the recent very close approach of their components, they could become the youngest known pairs. In both cases, the relative encounter velocities of the components were only $\sim 0.1\,\mathrm{ms}^{-1}$. However, the minimum distances between some clones are too large and a few clones of the latter pair did not encounter recently (within $\approx 10$ kyr).

The age of some prospective young pairs cannot be determined reliably without improved orbital properties (e.g., the second component of a pair (320025) 2007 $DT_{76}$ – 2007 $DP_{16}$). It is because some components suffered recently repeated close approaches to Ceres or other large main-belt perturbers.

In general, the uncertainties in age estimation can be heavily reduced after the physical properties (e.g., sense of rotation, shape, size, binarity) of the pair components are determined.

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