# Many famous comets originally formed in other solar systems

June 10 2010

Many of the most well known comets, including Halley, Hale-Bopp and, most recently, McNaught, may have been born in orbit around other stars, according to a new theory by an international team of astronomers led by a scientist from the Southwest Research Institute (SwRI) in Boulder, Colo.

Dr. Hal Levison (SwRI), Dr. Martin Duncan (Queen's University, Kingston, Canada), Dr. Ramon Brasser (Observatoire de la Côte d'Azur, France) and Dr. David Kaufmann (SwRI) used computer simulations to show that the Sun may have captured small icy bodies from its sibling

stars while it was in its birth star cluster, thereby creating a reservoir for observed comets.

While the Sun currently has no companion stars, it is believed to have formed in a cluster containing hundreds of closely packed stars that were embedded in a dense cloud of gas. During this time, each star formed a large number of small icy bodies (comets) in a disk from which planets formed. Most of these comets were gravitationally slung out of these prenatal planetary systems by the newly forming giant planets, becoming tiny, free-floating members of the cluster.

The Sun's cluster came to a violent end, however, when its gas was blown out by the hottest young stars. These new models show that the Sun then gravitationally captured a large cloud of comets as the cluster dispersed.

"When it was young, the Sun shared a lot of spit with its siblings, and we can see that stuff today," says lead author Levison.

"The process of capture is surprisingly efficient and leads to the exciting possibility that the cloud contains a potpourri that samples material from a large number of stellar siblings of the Sun," says co-author Duncan.

Evidence for the team's scenario comes from the roughly spherical cloud of comets, known as the Oort cloud, that surrounds the Sun, extending halfway to the nearest star. It has been commonly assumed this cloud formed from the Sun's proto-planetary disk. However, because detailed models show that comets from the solar system produce a much more anemic cloud than observed, another source is required.

Levison says, "If we assume that the Sun's observed proto-planetary disk can be used to estimate the indigenous population of the Oort cloud, we can conclude that more than 90 percent of the observed Oort cloud

comets have an extra-solar origin."

"The formation of the Oort cloud has been a mystery for over 60 years and our work likely solves this long-standing problem," says Brasser.

**More information:** The article, "Capture of the Sun's Oort Cloud from Stars in its Birth Cluster," by Levison, Duncan, Brasser and Kaufmann, was published in the June 10 issue of *Science Express*.

Provided by Southwest Research Institute