

# Ultrafast star escapes black hole

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At last astronomers have a method to accurately measure the speed of stars within a galaxy containing a black hole. Dutch researcher Alessia Gualandris developed the algorithm for this in cooperation with the Astronomical Institute "Anton Pannekoek" and the Amsterdam Informatics Institute. The outcomes of this groundbreaking research provide convincing evidence for the relationship between galactic nuclei, heavy black holes and ultrafast stars in the Milky Way.

Galactic nuclei are the cores of galaxies, groups of thousands to millions of stars that are held together by gravity. As stars in the nucleus are so close together, interactions readily occur. If ultraheavy black holes (black holes several million times heavier than the sun) are also involved, stars can be slung out of the galaxy (for example the Milky Way) at speeds of more than one thousand kilometres per second. The astrophysical reasons for this are simple but can only be demonstrated with detailed calculations on specially developed computers.

The interdisciplinary research team of which Gualandris was a member (and that cooperated with Japanese, German and US researchers) spent the past four years developing algorithms and special computers in order to accurately calculate the dynamic and internal evolution of a galactic nucleus. However, these calculations can only be performed if the interactions between all of the stars are very accurately described. Gualandris developed a special new algorithm to perform these calculations efficiently on a parallel computer. With this it was at last possible to simulate systems of more than one million stars.

The research results are important for further research into galaxies, black holes and the interaction between these. Dense stellar systems like star clusters or galaxies are fascinating for both astrophysicists and computer scientists due to their enormous physical diversity and because calculations of their high mobility are numerically very complex. Up until now these calculations were

difficult to perform as these systems are unsuitable for analytical methods and approximations are not accurate enough. With Gualandris' method the numerical problems have been solved and the origin of ultrafast stars in the Milky Way can be explained.

Source: NWO

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