2 PhD (OIO) positions available in Amsterdam and Utrecht

The evolution of stellar collision products

Applications are invited for two Ph.D. positions for research in theoretical and computational astrophysics; one at the University of Amsterdam and one at Utrecht University.

In dense stellar environments such as globular clusters, as well as the dense cores of young clusters, close encounters between stars are very frequent and many stars collide and merge. This has been demonstrated theoretically and recently confirmed by direct N-body simulations. Stellar mergers and close encounters can give rise to a large variety of exotic objects, such as blue stragglers, contact binaries and stars with a mass $\gg 100\,M_\odot$, which ultimately collapse to black holes. Since these stars stand out observationally, they can serve as important diagnostics of the dynamical processes taking place inside the cluster.

In order to evolve an entire star cluster the details of (multiple) collisions must be taken into account accurately. We must therefore understand the remnants of such collisions. We aim to achieve this by (1) performing smoothed particle hydrodynamics simulations of stellar collisions and (2) continuing the evolution of the collision product using a detailed stellar evolution code.

The student in Amsterdam will work under the supervision of Dr. Simon Portegies Zwart, and will become part of an active group working on star cluster ecology. The candidate will study the circumstances under which stellar collisions occur in dense star clusters. The collisions will be modeled using hydrodynamics simulations. The ultimate goal is to implement the stellar collision code in an N-body simulation environment to study collision products and the formation of intermediate mass black holes in dense star clusters. We are looking for a candidate with interest in astrophysics, numerical techniques and computer science. Some prior experience with smoothed particle hydrodynamics simulations or N-body techniques is an advantage but not necessary.

The student in Utrecht will work under the supervision of Dr. Onno Pols, and will become part of an active group working on stellar and binary evolution (see http://www.astro.uu.nl/siu/res-sen.html). He/she will study the evolution of the merger remnants using a detailed stellar evolution code. An existing evolution code will have to be modified so that it can handle the starting models supplied by the hydrodynamics simulations. Furthermore, the ultimate goal is to implement the code into a full-scale star cluster simulation. Therefore the code will have to be made robust, so that it can run through the entire evolution of a star without human intervention. For this position we are looking for a candidate with an interest in stellar evolution and in numerical techniques. Some prior experience with stellar evolution calculations is an advantage but not required.

Both positions are closely related to the MODEST collaboration (MOdeling DEnse STellar systems, see http://www.manybody.org/modest.html). The candidates are expected to work closely together, and will be integrated in a large international collaboration (Amsterdam, Utrecht, Cambridge UK, Princeton USA, Tokyo Japan, Vassar College USA). The candidates will be appointed for four years and paid according to standard Dutch Ph.D. student salary scales.

Applications should include a curriculum vitae (with a list of exam grades), a brief statement of research experience and interests, and the names of two people who can provide a reference. The deadline for the application is August 15, 2003. The position is open to students of all nationalities with the equivalent of a Masters degree in a relevant field. Please send applications and requests for more information to:

Simon Portegies Zwart, Astronomical Institute "Anton Pannekoek" and Section Computational Science, University of Amsterdam, Kruislaan 403, 1098 SJ Amsterdam, The Netherlands.
Tel: (31) 20 5257510. Email: spz@science.uva.nl

or to:

Onno Pols, Astronomical Institute Utrecht, P.O. Box 80000, 3508 TA Utrecht, The Netherlands.
Tel: (31) 30 2535209. Email: O.R.Pols@astro.uu.nl