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NEWS RELEASE

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Linda Gesenhues and Markus Höhnerbach Named
Recipients of 2018 ACM-IEEE CS George Michael Memorial HPC Fellowships

NEW YORK, NY, August 15, 2018 – ACM, the Association for Computing Machinery, announced today that Linda Gesenhues of the Federal University of Rio de Janeiro and Markus Höhnerbach of RWTH Aachen University are the recipients of the 2018 ACM-IEEE CS George Michael Memorial HPC Fellowships. Gesenhues is being recognized for her work on finite element simulation of turbidity currents with an emphasis on non-Newtonian fluids. Höhnerbach is being recognized for his work on portable optimizations of complex molecular dynamics codes. The Fellowships are jointly presented by ACM and the IEEE Computer Society.

Gesenhues' work on turbidity currents may be a useful tool for scientists studying underwater volcanoes, earthquakes or other geological phenomena occurring on the sea floor. Fluids, including water, become turbid when the concentration of particles, such as sediment, rises to a particular threshold. Because of their density, turbid fluids move differently than non-turbid fluids—frequently cascading downward as they are impacted by gravity. The presence of turbid currents can indicate that mud and sand have been loosened from collapsing slopes, earthquakes, or other phenomena. For these reasons, scientists regularly place turbidity sensors on the sea floor to monitor geologic activity.

A challenge of understanding turbidity currents is cataloging the range of possible movements a fluid may make based on the variables in its surrounding environment. For this reason, employing supercomputers, which can process trillions of possible permutations, is an effective approach. The objective of Gesenhues' PhD project is to obtain a model for numerical simulation of turbidity currents that can predict the characteristics of such flows using non-Newtonian fluid behavior. Non-Newtonian fluids have a higher resistance to deformation than Newtonian fluids; for example, shampoo (a non-Newtonian fluid) loses its shape more slowly than water (a Newtonian fluid).

Thus far, Gesenhues has developed a "solver" (a numerical model) for a 2D simulation of turbidity currents that has been implemented, established and verified. Recently, she augmented her 2D solver to a 3D model. Here, first tests on small 3D benchmark applications were made, including a column collapse.

Markus Höhnerbach's research focuses on creating simulations for many-body potentials in molecular

dynamics (MD) simulations. MD simulations are an indispensable research tool in computational chemistry, biology and materials science. In an MD simulation, individual atoms are moved time-step by time-step according to the forces derived from so-called potential, which is the mathematical law that governs the interactions between atoms. The general idea of Höhnerbach's PhD project is to develop methods and tools to make the implementation of MD simulations simple and correct by design while generating fast code for a multiple of platforms. For example, in his paper, "The Vectorization of the Tersoff Multi-Body Potential: An Exercise in Performance Portability," he demonstrated the performance of a type of MD simulations in a wide variety of platforms and processors.

Recently, Höhnerbach has been working with MD simulations for the adaptive intermolecular reactive bond order (AIREBO) potential, which is frequently used to study carbon nanotubes. Many believe carbon nanotubes hold great potential for the future of computer architecture. Höhnerbach wrote a code for the AIREBO potential that has achieved 3x to 4x speedups when performing realistic large-scale runs on current supercomputers.

The ACM- IEEE CS George Michael Memorial HPC Fellowship is endowed in memory of George Michael, one of the founding fathers of the SC Conference series. The fellowship honors exceptional PhD students throughout the world whose research focus is on high performance computing applications, networking, storage or large-scale data analytics using the most powerful computers that are currently available. The Fellowship includes a $5,000 honorarium and travel expenses to attend SC18 in Dallas, Texas, November 11-16, 2018, where the Fellowships will be formally presented.

About ACM

ACM, the Association for Computing Machinery **www.acm.org**, is the world's largest educational and scientific computing society, uniting computing educators, researchers and professionals to inspire dialogue, share resources and address the field's challenges. ACM strengthens the computing profession's collective voice through strong leadership, promotion of the highest standards, and recognition of technical excellence. ACM supports the professional growth of its members by providing opportunities for life-long learning, career development, and professional networking.

About SC18

SC18, the International Conference for High Performance Computing, **sc18.supercomputing.org**, sponsored by ACM and IEEE-CS offers a complete technical education program and exhibition to showcase the many ways high performance computing, networking, storage and analysis lead to advances in scientific discovery, research, education and commerce. This premier international conference includes a globally attended technical program, workshops, tutorials, a world class exhibit area, demonstrations and opportunities for hands-on learning.

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