

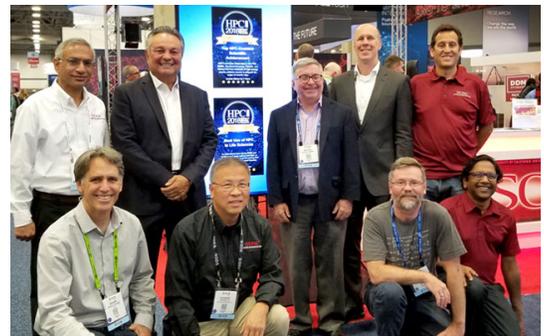
November 14, 2018 | By Jan Zverina

SDSC Receives HPCwire Awards for Top HPC Achievement, Life Sciences

SDSC's 'Comet' Supercomputer Lauded for Aiding Autism & Astrophysics Research

SDSC was recognized by the online publication with the following honors:

- **Editors' Choice for the Top High-Performance Computing (HPC)-Enabled Scientific Achievement**, for *Comet's* role in assisting an international team of scientists at the National Science Foundation (NSF)-funded IceCube Neutrino Observatory in [finding the first evidence](#) of a source of high-energy cosmic neutrinos.
- **Editors' Choice for Best Use of High-Performance Computing in the Life Sciences**, recognizing *Comet's* use in new findings related to autism spectrum disorder (ASD). The [new study](#) was published in the online edition of the April 20, 2018 issue of the journal *Science*.



(Back row L to R) Amit Majumdar, division director, Data-Enabled Scientific Computing, SDSC; Tom Tabor, HPCwire publisher; Mike Norman, director, SDSC; Bob Sinkovits, director, Scientific Computing Applications, SDSC; Christopher Irving, manager, HPC systems, SDSC; (front row L to R) Shawn Strande, deputy director, SDSC; Haisong Cai, HPC Data Engineer, SDSC; Frank Würthwein, lead, Distributed High-Throughput Computing, SDSC; Mahidhar Tatineni, group lead, user support, SDSC. Credit: Cindy Wong, SDSC

This year's awards were presented by HPCwire at the 2018 International Conference for High Performance Computing, Networking, Storage and Analysis (SC18), in Dallas, TX.

Top HPC-Enabled Scientific Achievement

SDSC shared this award with several other organizations, including the NSF's IceCube Neutrino Observatory and its eXtreme Science and Engineering Discovery Environment (XSEDE), as well as Stanford University, the Pittsburgh Supercomputing Center, and Globus, a research data management service.

Comet was also used in the verification and analysis of last year's landmark discovery of gravitational and light waves generated by the collision of two neutron stars eons ago. That discovery, made by researchers at the NSF's Laser Interferometer Gravitational Wave Observatory (LIGO), earned three researchers the 2017 Nobel Prize in Physics for their detection of gravitational waves in the universe as hypothesized by Albert Einstein in 1915.

SDSC's *Comet* was one of several HPC systems used to confirm the newest finding as well as the initial discovery. As before, LIGO researchers benefited from high-throughput computing via *Comet* and the Open Science Grid, a multi-disciplinary research partnership specializing in large-scale computing services funded by the U.S. Department of Energy and the NSF.

Through a partnership with XSEDE, OSG scientists have access to resources such as *Comet* to further their research. The integration of *Comet* into the OSG provisioning system was led by a team including Frank Würthwein, SDSC's lead for distributed high-throughput computing and an expert in experimental particle physics and advanced computation. Würthwein also serves as OSG's Executive Director.

"As an astrophysicist myself, this award is especially exciting for us," said SDSC Director Michael Norman. "*Comet*'s contribution to the discovery of gravity waves occurred in 2015, but since that initial discovery LIGO has detected a total of five binary black hole collisions and one binary neutron star collision. In every case, *Comet* was part of the cyberinfrastructure that helped detect and verify those fantastic findings. Now *Comet* is contributing to another spectacular discovery, this time from IceCube. This illustrates the power and potential of an integrated national cyberinfrastructure."

Life Sciences Award

HPCwire's 'Best Use of High-Performance Computing in the Life Sciences' award for 2018 is for recent findings related to ASD. While researchers established earlier that *de novo* mutations contribute to approximately one-third of cases of ASD, they identified a culprit that differs from previously known genetic causes of autism.

"For ten years we've known that the genetic causes of autism consist partly of *de novo* mutations in the protein sequences of genes. However, gene sequences represent only 2 percent of the genome," said Jonathan Sebat, a professor of psychiatry, cellular and molecular medicine and pediatrics at UC San Diego School of Medicine, and head of the Beyster Center for Molecular Genomics of Neuropsychiatric Diseases.

To investigate the other 98 percent of the genome in ASD, Sebat and his colleagues analyzed the complete genomes of 9,274 subjects from 2,600 families. One thousand were sequenced at Human Longevity Inc. (HLI) and at Illumina Inc., and DNA sequences were analyzed using *Comet* with the assistance of SDSC Distinguished Scientist Wayne Pfeiffer and SDSC Bioinformatics Programmer Analyst Madhusudan Gujral, who is also a co-author of the paper.

With *Comet*'s 1,984 compute nodes at the time of the research, along with several petabytes of scratch space for analysis, tens of genomes could be processed simultaneously, according to Pfeiffer. "Instead of months, with *Comet* we were able to complete the data processing in weeks," he said.

"Whole genome sequence data processing and analysis are both computationally and resource intensive," noted Gujral.

In 2017, SDSC received an HPCwire's Editors' Choice for Best Use of HPC in the Life Sciences for *Comet*'s role in research that identified structural changes activating the gene-splicing technology called CRISPR-Cas9.

"Life sciences is one of our three key strategic priorities at SDSC, so we are gratified for this continuing recognition by HPCwire," said Norman. "Awards such as these underscore the significant role that high-performance systems are playing in helping to advance discovery in many areas of life sciences."

The annual HPCwire Readers' and Editors' Choice Awards are determined through a nomination and voting process with the global HPCwire community, as well as selections from the HPCwire editors. More information on these awards can be found at the [HPCwire website](#) or on Twitter through the following hashtag: #HPCwireAwards.

"This year marks the 15th anniversary of the HPCwire Readers' and Editors' Choice Awards," said Tom Tabor, CEO of Tabor Communications, publisher of HPCwire. "These awards serve as a pillar in our community, acknowledging major achievements, outstanding leadership, and innovative breakthroughs."

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