

Achievements of Jack Joseph Dongarra

■ Recipient

Jack Joseph Dongarra

Emeritus Professor, EECS Department, University of Tennessee

Turing Fellow in the Mathematics Department, The University of Manchester

■ Citation

For Contributions to High-Performance Scientific Computing and Its Applications.

■ Achievements

From the 1970s to the 1990s, the performance of computers improved dramatically, and simulations and analytical processing using computers became increasingly widespread. As hardware rapidly advanced, the development of high-performance software that matched these capabilities became essential. In particular, efficient and reusable numerical computation libraries were indispensable. Jack Dongarra made significant contributions to the development of these numerical libraries such as LINPACK, and the launch of the TOP500 project, which ranks computer performance. He also played a key role in advancing high-performance computing (HPC) technologies. Moreover, through the development of the Message Passing Interface (MPI), he worked to propagate distributed computing technologies. These efforts greatly contributed to the advancement and foundation of high-performance scientific computing and its applications.

Dongarra participated in an internship at Argonne National Laboratory (ANL) and took part in the EISPACK project, sparking his interest in mathematical software, while studying mathematics at Chicago State University. After obtaining his MSc in Computer Science from the Illinois Institute of Technology, he worked full-time at ANL from 1975, where he was responsible for the development of linear algebra software packages. In 1980, he obtained his PhD in Applied Mathematics from the University of New Mexico, and in 1989, assumed a joint position at the University of Tennessee and Oak Ridge National Laboratory. Over 40 years, Dongarra has been involved in the development and practical application of major numerical computation libraries, such as LINPACK, BLAS, LAPACK, ScaLAPACK, PLASMA, MAGMA, and SLATE. He has also engaged in the development of leading-edge techniques, such as autotuning, mixed precision arithmetic, and batched computations. These innovations greatly enhanced the performance and scalability of libraries, which are now foundational platforms used across a wide range of computers, from laptops to supercomputers.

Dongarra deeply influenced the establishment of MPI, the de-facto standard for inter-process communication in parallel computing. In the early 1990s, as HPC shifted to distributed memory



systems, vendor-specific communication libraries made portability difficult. Dongarra proactively engaged with the research community to standardize message passing for distributed memory environments, resulting in the release of MPI 1.0 in 1994. MPI offers robust message-passing capabilities broadly adopted in numerical simulation and scientific computing. MPI is widely used as the standard interface for HPC, and its development facilitated the abstraction of hardware differences, improving research productivity and enabling long-term sustained results.

Dongarra is also well known for creating the LINPACK benchmark to evaluate computer performance and for co-founding the TOP500 project, which ranks the world's fastest computers. In 1979, he published a table in the first edition of the LINPACK Users' Guide listing data for solving sets of linear equations for 15 computers, beginning the LINPACK benchmark tradition. He and his collaborators later created the TOP500 list, first published in 1993, which ranked the world's fastest computers. Since then, new lists have been published twice annually, and the LINPACK benchmark itself has evolved. TOP500 and its benchmarks have become key to tracking and analyzing trends in HPC performance.

Dongarra has contributed to the growth of the HPC community and the advancement of the HPC field through his important research and development of efficient linear algebra libraries, parallel programming mechanisms, and computer performance evaluation tools. These achievements have driven the progress of scientific computing, and the scientific discoveries and technological innovations originating from simulation and numerical analysis have become a driving force for accelerating social development. His accomplishments are highly recognized internationally, and the receipt of the C&C Prize is truly a tribute to these outstanding achievements.

■ Personal History and Major Awards

Born: July 18, 1950

1972	BSc degree in mathematics from Chicago State University
1973	MSc degree in Computer Science from the Illinois Institute of Technology
1980	PhD in Applied Mathematics from the University of New Mexico
1973~1989	Argonne National Laboratory resident student associate, 1973; research associate, 1974; assistant computer scientist, 1975–1980; senior computer scientist, 1980–1989;
1989~	University of Tennessee



	distinguished professor, 1989–2000; university distinguished professor, 2000–present; emeritus professor, -present
1989~	Oak Ridge National Laboratory distinguished scientist, 1989–2000; adjunct R&D participant, 2000–2025;
2007	Turing Fellow at the University of Manchester (UK) 2007-present

■ Major Awards

1994	AAAS Fellow
1999	IEEE Fellow
2001	ACM Fellow
2001	Member of the National Academy of Engineering
2003	IEEE Computer Society Sidney Fernbach Memorial Award
2004	Science Foundation Ireland E.T.S. Walton Visitor Award
2008	IEEE Medal of Excellence in Scalable Computing
2009	SIAM Fellow
2010	SIAM Activity Group on Supercomputing Career Prize
2011	IEEE Charles Babbage Award
2013	ACM/IEEE Ken Kennedy Award
2019	SIAM/ACM Prize in Computational Science and Engineering
2019	Foreign Member of the British Royal Society
2019	IETI Fellow
2020	IEEE Computer Pioneer Award
2021	ACM A.M. Turing Award
2023	Member of the National Academy of Sciences

