programmer may be able to perform tasks that the high-level language programmer will find clumsy or impossible.

Some programmers prefer to code in assembler because it gives them a more intimate feel for the machine for which they are programming. The vast majority of programmers today simply do not have a feel for the hardware on which their programs run; in most cases, they do not need to have that feel, but they desire it nonetheless.

In the world of programming, it is estimated that assembler programming today constitutes about 2 percent of all programs. Most programmers do not—and, probably, cannot—program in assembler languages any more.

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—*Robert L. Glass*

Association for Computing Machinery

The Association for Computing Machinery (ACM) is the oldest professional organization in the computer field. It was founded in 1947, only one year after the unveiling of the **ENIAC**. Today, ACM has more than 80,000 members in more than 100 countries. Its first president was J. H. Curtis, and the second was **John W. Mauchly** (1907–80), one of the ENIAC creators.

The journal *Communications of the ACM*, a scholarly publication covering all areas of computing, was published by the association from its inception. Later, with the diversification of computer science, the ACM began publishing various journals to cover the different fields. With the exception of the **Institute of Electrical and Electronics Engineers** (IEEE), the ACM is the single largest publisher of professional computer journals. With the advent of the Internet, the magazines and journals of the ACM have become available online in the ACM Digital Library.

ACM's members are organized in special interest groups (SIGs), which are very active in their respective domains of expertise. There are SIGs interested in algorithms and computational theory (SIGACT), com-

JOURNALS PUBLISHED BY THE ACM (PARTIAL LIST)

Collected Algorithms
Communications of the ACM
Computing Reviews
Computing Surveys
Crossroads: The International ACM Student Magazine
Graduate Assistantship Directory
IEEE/ACM Transactions on Networking (TON)
Intelligence: New Visions of AI in Practice
interactions: new visions of human–computer interaction
Journal of the ACM (JACM)
Journal of Experimental Algorithmics (JEA)
netWorker: the craft of network computing
StandardView
Transactions on Computational Logic (TOCL)
Transactions on Computer-Human Interaction (TOCHI)
Transactions on Computer Systems (TOCS)
Transactions on Database Systems (TODS)
Transactions on Design Automation of Electronic Systems (TODAES)
Transactions on Graphics (TOG)
Transactions on Information and System Security (TISSEC)
Transactions on Information Systems (TOIS)
Transactions on Mathematical Software (TOMS)
Transactions on Modeling and Computer Simulation (TOMACS)
Transactions on Programming Languages and Systems (TOPLAS)
Transactions on Software Engineering and Methodology (TOSEM)

puter architecture (SIGARCH), and even in the programming language **APL** (SIGAPL). The SIGs publish their own newsletters and have regular conferences.

The ACM presents several yearly awards, the most prestigious of which is the Turing Award, which can be considered the Nobel Prize of Computing. There is also the Grace Murray Hopper Award for the outstanding young computer professional of the year, and the Eckert–Mauchly Award for contributions in computer architecture. The ACM fellows program, established in 1993, also honors outstanding members of the ACM.

The ACM is very active in the public policy arena. It has several task forces which have produced recommendations on computer ethics, privacy, and computer science curricula. ACM also hosts the Committee on Women in Computing, aimed at promoting women in computer science. In general, ACM tries to have its voice heard in any public matter involving the national computer infrastructure or the national educational objectives.

—Raúl Rojas

"As We May Think"

by Vannevar Bush

In 1945, U.S. scientist **Vannevar Bush** (1890–1974) wrote a prophetic article called "As We May Think" in the periodical *Atlantic Monthly*. This postwar reverie speculated on how science and technology might be used to build on the achievements of humankind rather than destroy them. One idea in particular caught Bush's imagination: a mechanical device that would give people better access to the entirety of human knowledge and achievement.

When Bush wrote his article, the transistor, the integrated circuit, the **microprocessor**, and everything that followed had yet to be invented. Microelectronics was dream of the future, although the ideas of miniaturization were already familiar to Bush through the relatively new process of storing information on microfilm, which had been invented in the 1920s. Using microfilm, Bush believed that the *Encyclopedia Britannica* could be reduced to the size of a matchbox, a million books could be squeezed into one end of a desk, and the whole of recorded human knowledge could be packed into the back of a van.

From this starting point, Bush went on to propose a desklike personal memory machine called Memex, based on microfilm storage. Users would load in books, letters, articles, notes, and jottings, but even if they stored 5000 pages of information every day, the machine would still have room for hundreds of years' worth of data. Any of this information could be displayed at any time on large photographic projection screens. The Memex also featured levers for moving forward or backward through the information at different speeds, and it allowed its users to add notes to any of the information already stored. Perhaps most radically of all, it featured what Bush called an associative index, what today we would call **hypertext** links: an ability to connect related items together so that a piece of information stored in one part of the memory automatically called up a related piece of information elsewhere.

Bush's ideas were enormously influential. Although the technology of the day made building the Memex an impossibility, it inspired the work of Ted Nelson (1940–) on **hypertext** in the 1960s and is now fully appreciated as a distant ancestor of the **World Wide Web**. Bush's ability to glimpse the power of the Web before the invention of microelectronics made "As We May Think" a remarkable vision of the future.

FURTHER READING

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—Chris Woodford

Asynchronous Transfer Mode

Asynchronous transfer mode (ATM) is a technology used in telecommunication networks that is based on the transmission of fixed-length packets. ATM networks can transmit voice, video, and data, providing at