"Future Directions for Computer Engineering"

by David A. Patterson, Pardee Professor of
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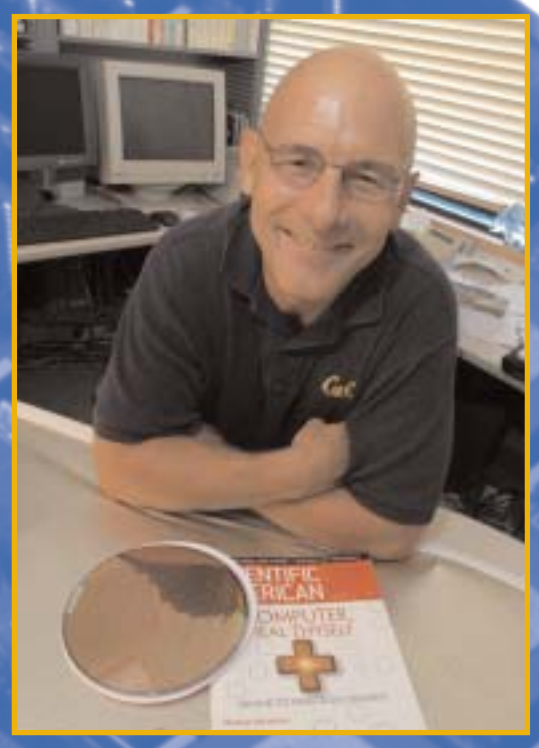

David A. Patterson, who joined the faculty at the University of California at Berkeley in 1977, is one of the pioneers of both reduced instruction set computers (RISC) and redundant arrays of inexpensive disks (RAID), now widely used throughout the industry. He has coauthored five books, including two with John Hennessy, current president of Stanford University, that have been popular in graduate and undergraduate courses since1990. He has served as chairman of the Computer Science Department at UC Berkeley, the Association for Computer Machinery Special Interests Group (ACM SIG) in computer architecture, and the Computer Research Association. Currently he serves on the Presidential Information Technology Advisory Committee, Microsoft's Trusted Computing Academic Advisory Board, and IBM's Autonomic Computing Advisory Board. He is a member of the National Academy of Engineering and a fellow of the Association of Computer Machinery and the Institute of Electrical and Electronics Engineering, and he has received education and research awards from both societies. His current research project—recovery oriented computing (ROC)—assumes that human mistakes, software bugs, and hardware failures are facts of life to be coped with rather than considered as problems to be solved.

Future Directions for Computer Engineering

The last 20 years of computer engineering have led to a renaissance in performance. Our computers are 1,000 to 10,000 times faster than they were in 1983, which is quite an accomplishment. There are unintended consequences of our obsession with performance. First, we have developed a brittle technology that is frustrating to use. Second, computer security is an oxymoron, and our privacy has probably never been more public. Finally, advances in cost-performance have made computers ubiquitous and so the world now depends on them, despite the fact that we never demonstrated nor promised that we merited that trust.

Our next set of challenges should include these:

- Synergy with humanity: We need to make the technology match human abilities. Thus, we must care as much about the human cost of operating information technology as about the cost of purchasing it.
- Dependability: We need to create a technology that the world really can depend upon, since it's already doing so with a technology that doesn't deserve our trust.
- Security/Privacy: We need to invent the technologies that help make our societies secure without sacrificing privacy.

There are new opportunities as well as new challenges in the twenty-first century. A 64-bit pipelined RISC soon will be not that much larger relatively than the first transistor in an integrated circuit. Thus, the transistor of the future may be a processor. We need advances in algorithms, programming systems, and computer-aided design to make the micro-massively-parallel-processor a reality. If we consider challenges beyond just performance, perhaps we can finally uncover the El Dorado of computer engineering: powerful computers constructed from very many simple ones.

William A. Anthony

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William A. Anthony. ca. 1877. Faculty Biography Folder. Division of Rare and Manuscript Collections, Cornell University Library.
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