

Computers

Ivars Peterson reports from San Francisco at the spring meeting of the Institute of Electrical & Electronics Engineers' Computer Society

A simpler path to faster computers

At the processing core of a modern computer is a maze of thousands of interconnected transistors on a silicon chip. These integrated circuits have become increasingly complicated as designers have tried to build in functions that are usually performed by a computer program. However, such "computers-on-a-chip" take years and millions of dollars to design. Two companies are now trying to reverse the trend toward increasing complexity by designing computers based on a simpler computer architecture (integrated-circuit design). This simplicity, the companies predict, will lead to lower-cost, but higher-speed, computers.

Ridge Computers of Sunnyvale, Calif., has designed a machine for engineering applications that can easily handle, say, 400,000 lines of a computer program. The key to its improved performance is implementation of a small set of simple instructions (including arithmetic and logical operations such as add, subtract, AND and OR, and memory functions such as LOAD and STORE) that the integrated-circuit chip can perform quickly as called for by the commands in a computer program. The computer "is the first commercially available computer system using a simplified instruction set designed explicitly for speed," said David Folger of Ridge Computers.

Another company, Pyramid Technology Corp. of Los Altos, Calif., about a year ago began designing a "supermini" computer that could handle the computer languages C and Pascal and operating systems like UNIX. Like the Ridge computer, this design also incorporates a simple instruction set to speed up processing. In addition, Pyramid promises a scheme for modifying or extending the computer hardware so that the machine can be changed as needs or applications change.

Talking back to computers

Computer users have a variety of ways to direct a computer's attention to a place on a video screen or to tell the machine what to do. The keyboard is the principal input device for personal computers, but its usefulness and convenience is limited by a typing speed that rarely exceeds a few characters per second. Even special keys that move a pointer or cursor around on a screen have similar limitations. Although analog input devices such as the graphics tablet and "mouse" are faster, in the past other problems have limited their usefulness. Recent research has focused on improving these devices to produce more efficient, inexpensive methods of talking to a computer.

David D. Thornburg, chief scientist at Koala Technologies Corp. in Mountain View, Calif., described a newly developed, low-cost graphics tablet. This device allows a user to locate a point on a video screen simply by touching, with a pen or a finger, the equivalent point on the surface of a special touch-sensitive tablet. The technique's advantage is that it mimics the convenience and speed of working with pencil and paper. Thornburg predicted that this device, priced at less than \$100 and much less expensive than previously available graphics tablets, will open up many new computer applications.

The mouse is a palm-sized device that positions a pointer anywhere on a video screen. By moving the mouse on a desktop, the user can point to and select objects on the screen. Stuart K. Card of the Xerox Palo Alto Research Center described the 20-year history of the development of the mouse and his own experiments on the human limitations of pointing devices. Based on current designs, Card concluded that movement times for the mouse are close to the minimum movement time that reflects the limits on human eye-hand coordination. "There is little likelihood of designing new devices which outperform [it] in speed, at least not devices that use the same muscles," Card said. The mouse also appeared to have a lower error rate than other pointing devices to which it was compared.

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Behavior

Uncertain social scientists

Do sociologists and psychologists have more qualms about their work than physicists and chemists? Thomas Kuhn argued 20 years ago in *The Structure of Scientific Revolutions* that the social sciences are less mature disciplines than are the physical sciences, that they lack clear standards, and that, as a result, social scientists should be less certain about their research. Two social scientists have now put Kuhn's theory to the test, and their findings show that psychologists and sociologists do indeed lack the confidence of physical scientists. Reasoning that scientists reveal their uncertainty about their ideas when they have colleagues review their work before publication, psychologists Jerry Suls and Barbara Fletcher of the State University of New York at Albany studied more than 600 published manuscripts in four disciplines to see how frequently the authors sought comments from their peers. They found that physicists and chemists were about equal in acknowledging prior review by colleagues and that they did so much less often than did psychologists and sociologists. Sociologists were more apt to seek help (as measured by acknowledgments) than were psychologists. Suls and Fletcher also analyzed the psychology journals more closely to see if psychologists in the "harder" subdisciplines — animal learning, for example — behaved differently than did specialists in personality and social psychology; they found no significant differences. They also found no evidence that physicists and chemists are less gregarious, less likely to acknowledge assistance, or more competitive about priority in publication. As Kuhn suggested, social scientists may lack clear rules and values by which to judge the soundness of their own work. Contrary to their own hypothesis, Suls and Fletcher acknowledged only one colleague in their *MARCH JOURNAL OF PERSONALITY AND SOCIAL PSYCHOLOGY* article.

American IQ jump

The international intelligence race continues. Last May, psychologist Richard Lynn reported in *NATURE* that Japanese children had made dramatic increases in IQ score and were, on the average, 11 points ahead of American children (SN: 7/10/82, p. 28). Japanese children also outscored European children, and their intellectual advantage, Lynn argued, might explain Japan's economic success. But according to James R. Flynn, a political scientist at the University of Otago in New Zealand, Lynn's conclusions are invalid. Writing in the Feb. 24 *NATURE*, Flynn claims that the IQs of children in the United States have been rising also. When today's children take older IQ tests, Flynn says, they do better than they do on modern tests; their performance on a 1947 version of the IQ test indicates that they have gained eight points over the previous generation. Furthermore, Flynn argues, errors in Lynn's analysis exaggerated the difference between Japanese and U.S. children. A more accurate comparison, he says, would put Japanese children only six points ahead of their American counterparts — a difference that is unlikely to have affected the course of economic history.

Apnea and male hormones

Sleep apnea — a life-threatening disorder characterized by frequently blocked breathing — is much more common among males than females, and scientists have suspected that sex hormones may be involved somehow. Scientists have now reported the first good evidence of such a link. Writing in the March 3 *NEW ENGLAND JOURNAL OF MEDICINE*, Robert E. Sandblom and co-workers at the University of Washington report that the administration of testosterone — a male sex hormone — markedly increased apnea in a research subject. When testosterone was discontinued, his disordered breathing improved, suggesting that the steroid plays a role (still unknown) in the condition.

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