50 & 25 YEARS AGO

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JANUARY/FEBRUARY 1973

www.computer.org/csdl/mags/co/1973/01/index.html

From the President: The Computer Society and ACM; Anthony Ralston (p. 1): "No one seems to have very good statistics—ACM has never been very good at using computers!—on how many people are members of both societies but the best guess is about 5000." (p. 2) "In order to provide a vehicle for furthering cooperation between ACM and the Computer Society, ACM has recently established a committee on relations with the Computer Society. … Before merger of the Computer Society and ACM can be considered seriously, four prerequisites must, I believe, be satisfied:" *[Editor's note: The first three conditions actually look at a closer cooperation between the Societies that could lead to a merger if the members of the Societies see a benefit in such a merger. The fourth one, however, assumes the goodwill of IEEE itself, and that, I believe, was not really present at that time. As we know now, nothing ever became of those ideas, whereas cooperation in conferences and other things is still lively today.]*

Computers for Teaching; Dean Brown et. al. (p. 16): "Ways of teaching with the computer are multiplying and being validated in hundreds of schools. … The idea of computers in the school conjures images of large expensive machines doling out arithmetic drills to children queued up patiently for their "dose of medicine"." (p. 17) "Computer teaching is potentially one of the most important aspects of educational technology. … The computer', on the other hand, when properly programmed, follows and guides the interests of each child. It can respond moment-by-moment to the fluctuations of his curiosity, and yet provide him with immense resources at the command of his fingertips." (p. 21) "The problem with an important innovation is that it comes to be taken as a panacea. The use of computers for teaching is as vulnerable to this aberration as all of the other good ideas that have come along." *[Editor's note: This is really worth reading. If we think that those statements and others made in the article were made 50 years ago, we realize how little of what has been hoped for, and is still hoped for, has actually been achieved. Communication between children has decreased; teacher interaction with the children has not improved; and the overall education level became very "goal oriented" to the detriment of general adoptable knowledge that clearly is needed in today's rapidly changing environments. We became more dependent on preformulated and premanipulated knowledge than ever before.]*

Introduction to SPLM; R. Hokom et. al. (p. 23): "this is an introduction to, and an overview of, the Space Programming Language Machine (SPLM), which is an architecture for a class of machines designed for efficient execution of on-board, aerospace computation functions." *[Editor's note: The rather complicated programming language and its associated computer architecture described in this article do not seem to have made it as I have found no later references to them.]*

Minicomputers in the Digital Laboratory Program; Taylor, L. Booth et. al. (p. 28): "It is now highly desirable that undergraduate electrical engineering students be introduced to the minicomputer and learn how it can be used as a system component. To meet this need the undergraduate curriculum must be designed so that a student has an opportunity to work with a minicomputer as an integrated part of his educational program. The availability of one or more minicomputers is an absolute necessity for a computer engineering curriculum." (p. 31) "The task of selecting a minicomputer is formidable because of the number of different machines and peripheral devices that must be considered and evaluated. This part of the report has been prepared to aid in the selection process and will start with a general overview of the hardware and software features that must be considered in specifying a minicomputer system." *[Editor's note: The article, 15 pages out of the much larger COSINE task force report VII (1972), goes into many details on how hardware and software have to be structured for such an undergraduate education. In hindsight, the report was somewhat out of touch with the very fast development of minicomputers. For example, the Xerox ALTO appeared in 1973.]*

Digital Object Identifier 10.1109/MC.2022.3218165
Date of current version: 9 January 2023

JANUARY 1998

www.computer.org/csdl/mags/co/1998/01/index.html

New Era for Digital Signal Processors; David Clark (p. 10): "Digital signal processors were once the backwater of the chip industry. ... DSPs' ability to provide real-time performance is particularly valuable in cellular phones and other products that cannot tolerate performance delays. ...The primary challenge the industry now faces is making DSPs fast, functional, inexpensive, and plentiful enough to keep up with demand. ... Currently, DSPs generally perform up to 300 million multiplies per second, according to Turley. He predicted that DSP speeds will increase to over one billion multiplies per second by 2000." *[Editor's note: The article successfully predicted the success of DSPs. Currently, the performance of DSPs reaches toward teraflops, a 1,000-fold increase.]*

News Briefs: Sun Gets OK to Propose Java Standards (p. 21) "Of the countries that belong to the JTC [Editor: Joint Technical Committee, of the International Organization for Standardization and the International Electro-technical Commission] 20 voted in favor of Sun's application and two abstained. Only the US and China voted against the proposal. Thirteen of the 20 approval votes included concerns to which Sun must respond before submitting specifications to the ISO." *[Editor's note: As we now know, Sun withdrew all such applications, and Java, up till today, remains a de facto standard controlled by the Java Community Process founded in 1998.]*

News Briefs: Domain Name Plan Is Delayed (p. 21) "The controversial plan to move the Internet domain-name registration system from the public sector to the private sector will not be ready on schedule. ... Under the plan, any applicant organization that meets technical and financial qualifications established by the Internet Council of Registrars can serve as a registrar." *[Editor's note: This discussion was resolved by the end of 1998, and the Internet Corporation for Assigned Names and Numbers (ICANN) was created and became as cited from* https://icannwiki.org/ICANN: *"While ICANN began in the U.S. government, it is now and continues to be, an international, community-driven organization independent of any one government. ICANN's management of an interoperable Internet covers over 330 million domain names, the allocation of more than 4 billion network addresses, and the support of approximately 95 million DNS look-ups every day across 240 countries."]*

News Briefs: ISO Approves C++ Standard (p. 23) "After eight years of work, the International Organization for Standardization (ISO) has approved a C++ standard. The standard is designed to ensure comparable cross-platform functionality by compliant tools, especially compilers." *[Editor's note: It took quite some time to standardize something that had about 1 million users in 1998. Since then, new versions were standardized, with C++20 the latest.]*

Cover Feature: Innovation and Obstacles: The Future of Computing; David D. Clark et. al. (p. 29) "In this multidisciplinary glimpse forward, some of this decade's key players offer opinions on a range of topics —from what has driven progress, to where innovation will come from, and to obstacles we have yet to overcome. ... In this excerpt from "Visions for the Future of the Fields," a panel discussion held on the 10th anniversary of the US Computer Science and Telecommunications Board, experts identify critical issues for various aspects of computing." *[Editor's note: I am not going to go into the details of this discussion and the position statements of eminent computer scientists of the time. If you are interested, I suggest you read the article. Among the many things predicted, one gadget is glaringly missing; it is the* ***smartphone****, that is, a phone that plays the role of multimedia communication device, computer, and storage media and utilizes innumerable applications.]*

[Editor's note: The next six articles of this issue of Computer *are all concerned with chip design, its principles, and obstacles to gain more power beyond the year 2000. I will list only the titles and the principal author here as I believe that most of the issues discussed are not so relevant today, while others have increased in importance. The interested reader is welcome to access them via the IEEE Computer Society Digital Library or* Xplore.*]*

Challenges and Trends in Processor Design; Janet Wilson (p. 39): "Although the problems are manifold, chip architects from Sun, Cyrix, Motorola, Mips, Intel, and Digital see challenges rather than walls."

Increasing Work, Pushing the Clock; Marc Tremblay (p. 40)

Reining in Complexity; Greg Grohoski (p. 41)

Challenges, Not Roadblocks; Earl Killian (p. 44)

Managing Problems at High Speed; Paul I. Rubinfeld (p. 47)

Introduction to Predicated Execution; Wen-mei Hwu (p. 49)

Inside Microsoft Research; Scott Hamilton (p. 51) "THE MSR PHILOSOPHY: As a corporate research lab, MSR is unapologetic about its intentions to identify and fund technologies and new applications that are relevant to Microsoft's corporate strategy. ... PCs that are intuitive to even neophytes, programming paradigms and tools that improve programmer productivity and program maintainability, and next-generation systems for the enterprise. ... Researchers are free to pursue their research without significant administrative oversight apart from periodic reality checks to see if the initial hypothesis still holds." *[Editor's note: The article then dives into the most important research areas of MSR around 1998. Despite the important research contributions that MSR made over the years, I believe that its orientation toward the PC made*

Microsoft miss quite a number of important developments. Just think of smartphones and their software (for example, Android); servers and their software (for example, Apache); etc.]

Information Appliances: Gadget Netopia; Ted Lewis (p. 59): While successful Information Appliances (IA) do multimedia, e-mail, fax, and other functions inherited from their PC parents, they must do it much better than the current machines. If they are to be truly viable alternatives to traditional technology, there must be no setup complexities nor any computer jargon required to use them. ... IAs connect to the Web and perform a small number of special functions for single users. Typically, an IA complies with emerging Internet and Web standards, such as TCP/IP and HTML, and hence IAs might also be called Web Appliances." (p. 68) "Information Appliances represent a step in the computer industry from over-priced, over-powered, over-designed desktops to value-priced, easy-to-use commodity gadgets. But the evolution of consumer acceptance will be slow due to difficult transitions in the technology. For one thing, IAs must pioneer an entirely new segment of the market using mostly new technology. ... In other words, Internet Appliances may eventually be free, but the service that makes them useful must pay for their development and manufacture." *[Editor's note: The historically interesting article then describes a plethora of gadgets, both Internet and telephone oriented, that existed at that time and tries to predict their future. Here, the predictions are amazingly correct but miss on the timescale. One issue may have been that such articles did not foresee the tremendous progress in computing power, and even more, so the storage capabilities in such devices.]*

Web on Wheels: Toward Internet-Enabled Cars; Akhtar Jameel et. al. (p. 69): "With the advancement of the Global Positioning System (GPS) and other position-tracking technologies, location awareness emerges as a distinctive characteristic of combining mobile computing and automobiles." (p. 75) "Passengers can also enjoy an enhanced multimedia environment for navigation, stereo, or streaming audio and video. The built-in infrared transceivers will allow PDAs, handheld PCs (HPCs), and smart phones to interact with the systems in the car and the Internet. For these new services, user interfaces will allow easy and safe handling of the interactive media. For the customer assistance centers that currently rely on telephony-based service, the Internet car provides an expanded datacentric multimedia environment to deliver new services, including operator's help-manuals, intelligent roadside travel assistance, and remote diagnostics." *[Editor's note: This visionary article describes prototype cars that include most of the features we find today in most of our cars. It just took longer for them to show up. Interestingly, self-driving is not an issue here despite the fact that Daimler-Benz had at that time such a car already working in Germany. I believe those cars, even today, are still far away from wide acceptance.]*

Engineering an Education for the Future; Edward A. Lee et. al. (p. 77): "Electrical and computer engineering has undergone rapid change and will continue to do so for the foreseeable future. These changes will have a profound effect on ECE education." (p. 78) "The interaction between electrical engineering and computer science is not only the interaction between electronics and computer hardware, but also between what electrical engineers call "systems" (here labeled EIS for 'electronic information systems"') and computer science theory and software." *[Editor's note: A very interesting and thoughtful article, well worth reading, that covers many concepts that are now part of advanced electrical and computer engineering (ECE) and computer science (CS) curricula. This close relationship has even led many universities to combine electrical engineering and CS departments into a single unit.]*

Content-Based Retrieval in Digital Libraries; Nabil R. Adam et. al. (p. 93): "Here we briefly address content-based retrieval and the issues of representation, storage, and retrieval of multimedia objects in digital libraries. ... Digital libraries must store and retrieve multimedia data on the basis of feature similarity. A feature is a set of characteristics. Features include text strings for text documents; color, texture, and objects for images; and objects, frame sequences, and camera operations for videos. Content-based retrieval uses content-representative metadata to both store data and retrieve it in response to user queries." *[Editor's note: The short article then identifies some metadata issues for the different types of digital library objects, like texts, images, and videos. This field is still an active research area as new types of data continuously have to be added to digital libraries.]*

The Future of Object Technology; Bertrand Meyer (p. 140): "Areas that had traditionally resisted the influx of OO ideas are no longer immune. Indeed, 1997 may be known in history as the year during which object technology finally reached the world of embedded and real-time systems. Even the scientific computing field is becoming increasingly OO, both with the spread of OO languages and libraries. ... At the moment, much of the buzz is about Sun Microsystems' Java and Rational's Unified Modeling Language (UML); I don't think either will matter very much in a few years." (p. 141) "If reuse becomes a way of life—and the chances are good that it will—the next few years will see as many advances as those of the past decade, profoundly affecting the software field and providing object-oriented enthusiasts with many new sources of excitement." *[Editor's note: The author has been right on the software reuse issue but quite wrong on Java and Unified Modeling Language, which are still thriving today.]* C