The blood and guts of a professional society are the volunteers who make things happen. This special issue is the result of the concern of Peter Rony, editor-in-chief of IEEE Micro, to support and publish standards in the microcomputer field. His strong encouragement made this issue happen.

Traditions

You probably remember Tevye, the father in Fiddler on the Roof, singing to his three daughters about the importance of and the need for tradition. But in the field of computers, tradition is laughed at, ignored, and sometimes held up to ridicule. In some cases it produces amusing results—such as how we still speak of semiconductor RAM as “core.” Some traditions are able to defy the deliberate efforts made to destroy them. Note that Fortran still is the language used by the large majority of professional programmers. Some traditions are good. Consider the changing of automobile models each year; it allows technology and styles to slowly evolve, while keeping the steering wheel on the same side. But some of the traditions in the computer field need improvement. One tradition could definitely be dispensed with—the tradition of computer manufacturers whiplashing both computer professionals and end users alike by refusing to adopt sensible standards. Consequently, unnecessary burdens are repeatedly placed upon us in a way that we’re sure each of us has already experienced.

The efforts within the Computer Society to develop standards in the microcomputer field started with the formation of the Microprocessor Standards Committee one August evening in the summer of 1977 in a restaurant in beautiful downtown Los Altos. The decisions made that night led to several efforts which are now enacted IEEE standards, such as 696, 770, and 796, and still others which are complete except for “sponsor” ballots and IEEE Standards Board approval. Some efforts originally planned were never carried out—such as P697, which had among its purposes the development of floppy disk format standards. In hindsight, we blew it on that one. If there is one class of standard that is still long overdue, it is that one.

In a “win a few, lose a few” world, the IEEE Computer Society has pretty much just about broken even...
IEEE celebrates its 100th birthday . . .

... And this issue of IEEE Micro has been selected to honor that celebration. The development of needed standards has long been an activity of the AIEE, the IRE, and the IEEE. The AIEE was one of the five founding organizations that created the American National Standards Institute in 1918. While there is no question that the primary good the IEEE provides the profession lies in its publications and conferences, some IEEE standards have similarly provided great good for us. This issue deals with the now and future in microcomputer standards.

A hundred years are past. What will the IEEE's 200th birthday be like? Will the ACM and the Computer Society still be separate organizations? Will RAB and TAB still be at each other's throats? Will USAB really become significant? Will a large fraction of IEEE members still join just for the low-cost insurance? Or will we all disappear in a nuclear holocaust?

Certainly the last 100 years have been spectacular. The onset of creativity unleashed by Mauchly and Eckert pales the total effort through the millennia in the field of mathematics. The temperamental point contact transistor brought to us by Bardeen and Brattain and extended to the more stable junction device by Shockley has evolved into today's unbelievable miracles in fabrication. Ted Hoff's simple CPU has become today's minicomputer on a silicon chip. With submicron channel lengths, the MOS transistor will have gate delays in the hundreds of picoseconds range. Truly tomorrow will be spectacular.

May the IEEE adapt and grow and continue to be a great organization undertaking great tasks for a great profession.

when we talk about microcomputer-related standards. The leaders of major corporations are delighted to accept awards from the IEEE; frequently they then do not provide significant help to those IEEE efforts that might bring a semblance of sanity to the bad whiplash situation which has existed in the past, which certainly exists now, and which appears to be getting worse as time rolls on. Sound like the prophets of old predicting doom? No, we don't think so. It's not doom—just damn maddening.

Successes

The successes to date include IEEE 696, a standard which greatly augmented the capability of the MITS Altair or S-100 bus. A simple protocol change, to let bus driver glitches settle for one bus cycle at the change of bus masters, significantly enhanced the data transmission reliability of this bus. The IEEE 770 Working Group developed a standard for Pascal relatively quickly, working in cooperation with CBEMA's X3 committee. Another important effort, particularly from the perspective of a developing technology, is the P754 project. (The "P" means the activity is still in project status.) The P754 proposed draft for floating-point arithmetic has been implemented by six chip houses at a cost to them estimated to total about $25 million. Its sequel, P854, is both the subject of and is contained in an article in this issue. We hope you find it brilliant and stimulating, as we did.

We believe that another activity of the Computer Society, the 802 local-area network standards sponsored by the Technical Committee on Computer Communications, can be classified as a success. But there are those who believe otherwise. The 802 committee, under the guidance of Maris Graube of Tektronix, has wrought a family of standards which acknowledges the fact that there is more than one way to skin the local network cat in terms of physical implementation. Despite the different possible hardware implementations, 802 achieves a coherent software interface as seen from a higher level of the ISO Open System Model.

Predicting future successes is perhaps unwise. Yet our hope springs aborning for the future of the Futurebus, P896. Several articles in this issue deal with this proposed standard. The P896 bus is unique in that it fully provides the true benefits of a standard, i.e., freedom from arbitrary device and manufacturer dependencies. Such freedom is a subtle but fundamentally important feature of a communication highway between different vendors' products. P896 amalgamates good ideas from predecessor designs with new acts of invention, as the articles by Balakrishnan, Taub, and Borrill and Theus spell out. An interesting phenomenon has occurred—some manufacturers have copied or borrowed certain aspects of P896 and proceeded to develop their own 32-bit buses with a Eurocard format, rather than work cooperatively with the P896 committee. Then, for marketing reasons, they have asked the IEEE to rubber-stamp their designs and make them IEEE standards. Is this a wise use of the Computer Society and the IEEE? We hope that readers will react with their opinions on this question.

In our opinion, a "standard" should not only be a method of achieving compatibility between different manufacturers' products—which requires only a degree of adequacy in its technical content—but should also become a criterion of excellence to which manufacturers can design their products. It should be of enduring value in this world of increasing technological change.

Another poor situation presently taking place is the advertising on national TV. Microcomputer systems with poor technical capabilities are merchandised to the general public by comedians. On whom is the laugh? In one
About the cover

On a spring day in May 1869, the Central Pacific Railroad met the Union Pacific Railroad to span the continent by rail. Fortunately, by this time American railroads had by and large settled upon a single track-gauge standard—four feet, eight and one-half inches—after having experimented with gauges of up to six feet. Our cover illustration speculates on what might have happened had the nineteenth-century railroads behaved like some twentieth-century computer companies.

To this day, the four-foot, eight-and-one-half-inch measure is simply known as "standard gauge." Its economic benefits were enormous—it enabled American railroads to exchange cars easily throughout the nation's rail network. Gone was the expensive change-of-gauge station, where freight had to be taken off cars of one gauge and loaded into cars of another before it could continue its journey.

Fifteen years after the joining of the rails, American railroads, again out of economic necessity, forced the adoption of another standard that affects each of us still—the standard time zones. Prior to standardization of time zones, each town along a railroad's line was free to set whatever local time it wished. This, to say the least, complicated railroad scheduling and operations.

The railroads were America's first great technical enterprise. Their early history was characterized by innovation, incredibly rapid growth, and an almost debilitating lack of industry-wide standards. Railroad technical departments of the day believed that any technique "not invented here" was suspect. Sound at all familiar?

The railroad industry matured, however, and even such giants of the day as the Erie Railroad had to abandon their nonstandard gauges. Will America's great technical enterprise of the late twentieth century emulate the example of its nineteenth-century predecessor? Will it ever mature? Will end users' demands for some common sense kill off all those superfluous "gauges" that now plague the industry?

This special issue provides at least a tentative answer to these questions. Its articles evince a high level of standards-making activity. It tells us that there is, at least, hope.

—J.S.

Improvements needed

Improvement in the method of creating and adopting computer standards is needed on an international basis. American manufacturers have gone to ECMA (the European Computer Manufacturers Association) and the IEC (the International Electrotechnical Commission) to have those organizations adopt their designs as standards, and then come back to American standardization committees with a fait accompli, to leverage them into adopting their proposals...an example of whiplash occurring in the standards-making process itself.

The "turf" battles among the standards bodies are indefensible. In our opinion, it is essential that users, both professional and nonprofessional, have equal weights with manufacturers in the standards organizations. In some American standards bodies, the weighting is approximate-ly 15 to 1 in favor of the manufacturers... (talk about steamrollers). The voting and attendance rules, and the fees charged, make it impossible for individual users to participate. The voluntary nature of standards enforcement in the US should be contrasted with the benevolent interest of labor unions coupled with governmental enforcement in Europe. As a consequence, several user-oriented standards, such as ones for ergonomic terminals and EMI-free computers, have arrived on the American scene from Europe. It is indeed time that the US government's interest in computer standards, as presently evidenced by the National Bureau of Standards, be significantly enhanced by appropriate actions by the Congress and the Justice Department.

Gazing into a crystal ball, we hope that the need for consistent control codes for terminals and printers will be met in the future. The variety of interfaces needed to couple software to operating systems grossly impedes software portability. The P855 MOSI activity discussed in this issue deals precisely with that problem. The relocatable object code standard, P695, a draft of which
was published in the August 1983 issue of *IEEE Micro*, deals with another critically important area for software portability. A uniform modem protocol is also badly needed. Absolute reliability and integrity of transmitted data must be assured. The incompatibilities among different microprocessors are now an accomplished horror story, one beyond salvation, with which several articles in *IEEE Micro* have dealt.

**Issue contents**

Five articles in this issue deal with hardware:

- Bus tutorial. This article helps explain the processes involved in designing a bus.
- P896. Three articles deal with the innovative design of the Futurebus's protocol, arbitration method, and electrical specification.
- P1000. An I/O channel for the bigger buses, and the successor to the STD bus, on the Eurocard, are discussed.

And four articles deal with software:

- P854. The proposed radix-independent floating-point arithmetic standard is discussed.
- P855. The microprocessor operating systems interface (MOSI) is described.

**Happenings**

For reasons that are not clear to us, the activities of standards-making working groups are regarded as dull, unintellectual, and prosaic. Of course everyone is entitled to his own opinion, but many of the meetings of Computer-Society-sponsored committees can be classified as "happenings." Brilliant prima donnas have managed to work together to evolve enhancements to the state of the art. It has been real fun to work with them. We all owe them an enormous thank you.

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Borrill is the chairman of the IEEE P896 Futurebus Committee. He was elected to the Governing Board of the IEEE Computer Society for a two-year term starting in January 1984. He is also serving as secretary to the IEEE Computer Society for 1984. Borrill's research interests include multiprocessor systems, computer buses, and fault-tolerant operating systems.

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Robert G. Stewart is presently the first vice-president of the IEEE Computer Society, with responsibility for technical activities. He has been a member of the Governing Board, the Publications Board, the Magazine Advisory Committee, the New Publications Proposal Committee, the Computer Standards Committee, the Microprocessor Standards Committee, and the 694, 696, 754, and 896 working groups, and is an associate editor of *IEEE Micro*. As a member of the Governing Board he was instrumental in starting *IEEE Micro* and initiating efforts to investigate merger with the ACM.

He served as chairman of the Computer Standards Committee for three and a half years and was responsible for initiating numerous standards activities and for having drafts published in *Computer*. He also served as chairman of the Santa Clara Valley Reliability Chapter, which was awarded the IEEE Chapter of the Year Award during his tenure. He received the Honor Roll Award from the Computer Society for "distinguished service in promulgating important standards in the microprocessor area."

Stewart now works for Exxon in San Jose. He holds a PhD from the Illinois Institute of Technology in Chicago and is a senior member of the IEEE and a member of SID, Sigma Xi, and Phi Mu Epsilon.

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