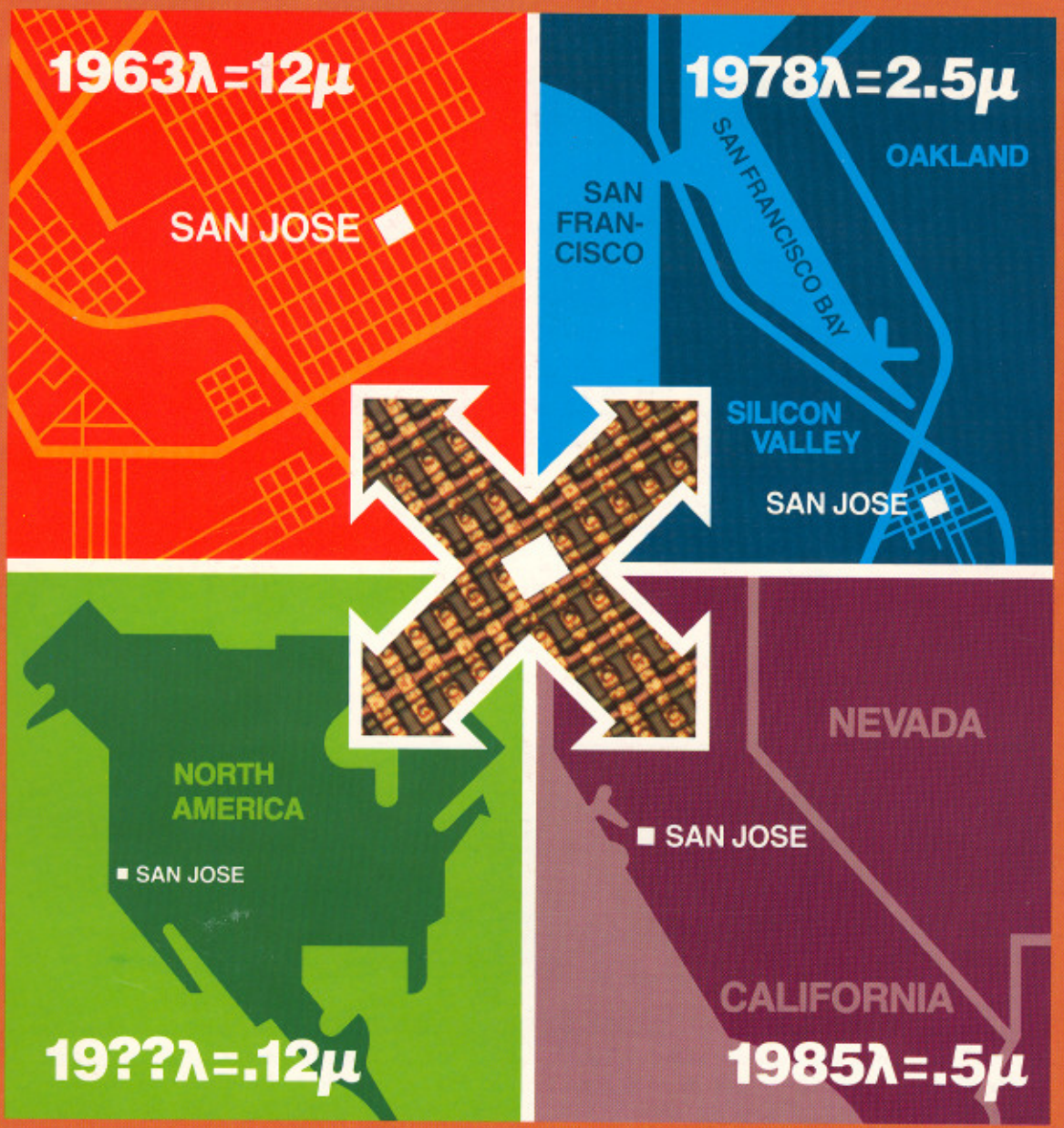
LAMBDA

The Magazine Of VLSI Design
First Quarter 1980



This circuit/roadway analogy illustrates complexity scaling in VLSI.

About the cover

The cover portrays an analogy between integrated circuit complexity and the complexity of something familiar to us all: a city street network. At several points in the evolution of the technology, a typical chip has been scaled up to make the spacing between conductors equal to one city block. The circuit can then be thought of as a multilevel road network carrying electrical signals instead of cars. In the mid-1960s, the complexity of a chip was comparable to the street network of a small town. Most people can navigate such a network by memory without difficulty. Today's microprocessor, using a five-micron technology, is comparable to the entire San Francisco Bay Area. By the time a one-micron technology is solidly in place, designing a chip will be comparable to planning a street network covering all of California and Nevada at urban densities. The ultimate one-quarter micron technology will likely be capable of producing chips with the intricacy of an urban grid covering the entire North American continent. Designers are just now beginning to face complexity and communications as central and dominant issues of the next stage of evolution. To realize the full potential implied by such complexity, entirely new design methods and system organizations must be invented.

[This enlightening analogy was first proposed by Professor Charles L. Seitz of Caltech]

What's in a name

During their collaboration on Introduction to VLSI Systems, *Lynn Conway generalized Carver Mead's work towards simplifying the mask geometry design rules by introducing the notion of making the rules ratioed one-to-another, and scalable to match changes in processing technology. The rules were thus related to a parameter of the fabrication process. Lynn called this basic parameter the length unit,* lambda.

The philosophy of introducing lambda *to simplify the details of VLSI design is what the magazine* LAMBDA *is all about. By abstracting the key concepts and constraints from each level in the design process we will be better able to understand the whole problem and manage the design of more complex systems.*

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Articles

Departments

LAMBDA was founded to explore, expand, and define the interrelationships between very large scale integrated circuits (VLSI) and computer architecture, design strategies, costs, and aids, as well as the electronics industry as a whole. LAMBDA is unique in that it is written by and for the participants in this dynamic field. It is our goal to be the communications focus of a new VLSI design community, encourage its development, and help define the community's future directions.

FROM THE EDITORS

The integrated circuit industry is entering a new era. The first two decades of its development have been marked by ever more surprising advances in technology, but the innovative application of this technology has not kept pace. Memories have gotten larger but not smarter; processors have gotten smaller but not better. These two basic elements of digital systems are still interconnected in the same architectures used when gates and core were the building blocks.

The integrated circuit industry's next decade will be different. It will be the decade of the designer, a time keynoted by new systems architectures and novel applications. No doubt the technology will continue to progress on its fast-paced course, but it will be the design groups who capture the innovation spotlight. The exciting ways in which VLSI technology can be applied to systems design are just now being widely explored.

There are a number of forces acting from within and without the industry that are combining to bring us into this new era.

David Bickford

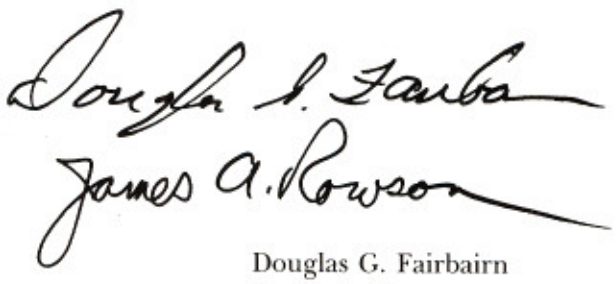
In the near future we will see a radical upgrading of design aids. These improved aids will not only allow more complex chips to be developed, they will also simplify the design process to the point where more people with a broader outlook can participate.

The relentless march of VLSI fabrication technology is both a problem and an opportunity. This advance is forcing us to develop new design methodologies and tools to cope properly with the circuit densities already available. On the other hand, with the increasing density, we no longer need to focus so strongly on packing density and speed optimization. We can now turn our attention to higher level optimizations and to minimizing the design time. The effort to utilize intelligently the extreme complexities of ICs while keeping the design time under control will lead to tremendously increased emphasis on design.

Within the last year, VLSI design programs have been started in many universities around the country. Whereas two years ago there were only one or two universities teaching courses in the systems aspects of VLSI design, there are now more than a dozen, with many more around the corner. The people emerging from these courses will be in a position not only to understand the implications of VLSI but also to *make it happen*. They will be the work force that determines the future course of the industry.

The increasing complexity of ICs is also having a dramatic effect on the industry's structure. As semiconductor firms move into the systems business, the traditional systems companies are forced to move into semiconductors, developing their own in-house LSI design and fabrication facilities. This development alone means a significant rise in the numbers of people actually structuring, designing, and testing *integrated systems*. The number in the design area will grow even more significantly as the smaller firms move into the custom IC design arena. They will be forced to do so to remain competitive.

When design activity is localized within small groups in a few companies, formal communications mechanisms such as magazines are not appropriate. Now that integrated circuit design has broken those bounds and is actively practiced by a large number of people in diverse companies and universities, we feel that a magazine devoted strictly to their needs is required. LAMBDA is that magazine.



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