UNIVERSITY SCENE

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The emergence of a group of major universities as important centers of VLSI system design and research is an exciting recent development. A lot of the intellectual "action" in this field has suddenly shifted to these universities.The purpose of this column is to keep readers of LAMBDA informed of news and interesting events in the growing university VLSI system design community. It is hoped that this information will foster communication and collaboration among the various university groups, introduce new schools to the community, and help university students identify courses and research programs at schools in their local areas. We hope the column will also stimulate contacts between industrial groups and the universities. There are many ways firms can provide support to the new university programs, and, in return, benefit from exposure to new people and ideas.

And so, on to some news reports from the universities.

One question we often hear these days is "*Where can I take a course on VLSI systems design?*" Here's a brief survey of some of the courses offered during the '79-'80 school year:

During the fall quarter, *Doug Fairbairn* taught the VLSI design course at Caltech. Doug ran a project-oriented course for a group of 43 seniors and grad students with the help of two teaching assistants, Dick Lang and Greg Efland. Doug's students used the LAP symbolic layout language (designed and implemented by Bart Locanthi) to describe their designs; students edited their LAP programs using CRT terminals on a PDP-10, producing checkplots on HP7221A four-color pen plotters.

At MIT, *Jonathan Allen* taught a project-oriented VLSI design course (Course 6.371) in the fall semester of '79. His class of 30 students used the AIDS (APL Integrated-circuit Design System) symbolic layout system, designed and programmed by Paul Penfield, to encode their layouts. An interesting feature of the course was the use of a switch-level simulator in laboratory sessions that parallelled the early homework assignments. Students worked out their stick-diagram and transistor circuit diagram solutions to implement various functions, and then encoded their solutions in the lab and ran them on the simulator. The simulator, MOSSIM, was programmed (in CLU) by Randy Bryant, who was also the TA for the course. Both AIDS and MOSSIM run on a DECsystem20 under the TOPS20 operating system.

Stanford University, long a leader in research and education in integrated circuit design and fabrication, offered its first course in VLSI system design this past fall quarter. The course, EE292V, taught by *Rob Mathews* and *John Newkirk*, had an enrollment of 71 registered students and 40 auditors! This was the first of a two-quarter sequence. The sequence will be oriented around student projects, with most students completing their projects during the winter quarter. Jim Meindl's integrated circuit lab is planning to do the fabrication. We understand that EE292V will be offered again in the spring quarter of '80.

Blair Proctor

Bart Locanthi

Blair Proctor

The University of Rochester is offering its first VLSI design course, EE492/CS492, during this fall semester. The course was taught by a team of CS and EE faculty members, and was attended by 14 students. Mark Kahrs, the TA for the class, organized the computing environment for supporting student project design. The CS department at University of Rochester has a number of Alto personal computer systems; students in the VLSI design course used the ICARUS interactive layout system to create their layouts.

The University of Washington in Seattle has gotten off to a strong start in this field thanks to *Carver Mead's* "Course for Teachers of VLSI Design" offered there this past summer [see NEWS, p. 5, for details]. During the fall semester, *Ted Kehl* taught the first regular VLSI design course to be offered at the University of Washington. The course (CS590) was attended by 15 graduate students and faculty members. This was a project-oriented course, with the students using LAP running on a DECsystem20 and HP7221A plotters for checkplotting.

Jacob Abraham of the Electrical Engineering department at the University of Illinois, Urbana, is now teaching the first VLSI design course to be offered there. This is an experimental course, with 15 graduate students in attendance. Jacob plans to run the course again in the spring semester, with the enrollment expanded to about 40 students.

It is reported that *Reiner Hartenstein* organized a VLSI design course for this fall semester at the University of Kaiserslautern, in Kaiserslautern, West Germany. The course was taught by Reiner Hartenstein, Peter Liell, and Michael Flototto to 20 experienced graduate students. We've heard that these faculty members have also planned a three-semester electronic-design course sequence for undergraduates. These courses were to introduce basic logic-design this fall, electronic-circuits, semiconductor fundamentals, and basic nMOS circuits in the coming spring semester, leading up to a large number of undergraduate students able to take the VLSI design course next fall as the third course in the sequence.

During the coming spring semester, *Bob Sproull* will again be teaching the VLSI design course at Carnegie Mellon University. Bob's past offerings of

this course have stimulated a lot of interest in VLSI at CMU. CMU has a very strong computer science program, and there's some exciting theoretical and architectural VLSI system work now being done there. We'll report on some of that work in a future column.

Carlo Sequin will be teaching his integrated system design course (CS248) at UC Berkeley during the coming winter quarter. We've heard that Carlo is planning this as a project-oriented course this year.

John Murray of the EE/CS department at the University of Colorado, Colorado Springs, is now running a VLSI seminar series, and planning and organizing a VLSI design course, probably to be offered there this coming spring semester. John is in a great location for university-industry collaborations: Colorado Springs is rapidly becoming another focal point of industrial activity in this field. Companies are flocking to the area, and Pikes Peak has even acquired the nickname "Silicon Mountain"! (See *Electronic Engineering Times*, Oct. 1, 1979.)

Irene Buchanan is teaching the first VLSI design course to be offered at the University of Edinburgh during the winter quarter. Edinburgh has quite a strong computer science program, and we look forward to future reports on VLSI system research and design activities there.

All this new university activity naturally leads designers and managers in industry to ask: How can my company get involved, help out the university programs, collaborate with university reseachers? One way is to support short, intensive courses, such as the one at University of Washington mentioned above. Another way is by collaborating to provide fast-turnaround mask-making and fabrication of integrated system design projects done by university students and researchers.

For example, consider an effort now under way: Xerox and Hewlett-Packard are collaborating to implement "MPC79," the fall 1979 multiuniversity multiproject chip set. The participating universities so far are: MIT, Caltech, Stanford, Univ. of Rochester, CMU, and UC Berkeley; projects from a few other universities may also be included, and there'll be 70 to 100 projects in the chip set. The design cutoff date was December 4, 1979, and the organizers estimate the total turnaround time from design cutoff to packaged chips will be about four weeks. Information management for MPC79 is being provided by the LSI Systems Area of Xerox PARC (Xerox is also funding the mask-making); electronic message and CIF design file communications are being supported by use of the ARPANET; Micro Mask will do the mask-making; wafer fabrication is being provided by Hewlett-Packard at its Deer Creek Research Laboratory; the universities will take care of packaging. This effort will enable students and researchers to have their projects implemented very quickly, and also provide a test of prototype software and operational procedures used to coordinate the implementation service. Thus, the effort will benefit both the university and the industrial participants. Watch this column for reports on the outcome of MPC79 and for news of other collaborative university-industry multiproject chip efforts.

In future columns we'll be reporting in detail on courses and research programs at individual schools, on joint projects among schools, and on collaborative university-industry efforts. If you have university news to report, or ideas for interesting topics for this column, we would really like to hear from you. You can contact us by writing to: The University Scene, LAMBDA Magazine, P.O. Box 50503, Palo Alto, California 94303.