M.I.T. '78 VLSI System Design Course:

Correspondence re arrangements for mask-making
and wafer-fabrication of the student-project chips.

Nov. 2, 1978 - Jan. 10, 1979

November 2, 1978.

To: Professor Paul E. Gray
    Chancellor   3-208

From: Professor Jonathan Allen

Subject: Fast   turnaround   IC   mask   and   wafer   fabrication   via
          Bob Noyes at Intel

    Industry people have been complaining that MIT is not active in
the IC field and not providing students. Now we have a new course,
"Design of VLSI Systems", being taught to 35 students (and 6 faculty)
by Lynn Conway from Xerox PARC. She uses a book written by Prof.
Carver Mead (of Caltech - Noyce knows him) and herself, and in 6-8
weeks has brought this group of students from ground zero up to
ability to design and layout mask specifications for a project chip.
This chip will contain 10-15 student projects, including some very
sophisticated designs (such as a CRT controller, associative memory,
LISP microprocessor).

    The final mask spec (a data file) will leave here on Dec. 5 via
the ARPANET for Xerox PARC in Palo Alto. They will convert this file
to another file formatted for a pattern generator machine. This file
will be ready by Dec. 12. Now for maximum impact of the course, we
need wafers back here by Jan. 15, 1979. If we slip into February or
March, much of the impact will be lost, including student interest.
Further, if we can fabricate the masks and wafers in a month, this
will indicate what can be done and provide impetus for government
(e.g. ARPA) support of a fast-turnaround fabrication facility.

    So what we want/need from Bob is:

        1)   Top priority at Micromask (a mask fabricator which
        Intel   has invested in heavily) for mask fabrication,
        starting Dec. 12, and if possible, top priority wafer
        fabrication (given the masks) at Intel, for a single-poly
        NMOS process with conservative design rules. What we really
        need is Bob's power and prestige to push through the entire
        mask and wafer fabrication in one month. We could get the
        wafer fabrication done elsewhere, but it would be best to
        coordinate the whole process through Intel.   I emphasize
        that the Xerox people helping us have experience dealing
        with Micromask.

2) Mask fabrication should cost ~ $6000, and wafer fabrication about $2000. We could pay for this, but it would be nice if Bob would pick up the cost.

What is essential is the <u>fast</u> service. Please don't let cost slow things down.

What does Bob get out of this? This is a one-time demo of what can be done by Industry/University cooperation, and will attract a lot of attention if we succeed. It is an aggressive move, that will be noticed by DoD. We plan to describe it at a special conference in late January at Caltech attended by very high-level people from industry and government. Lynn Conway will chair a fabrication session there, and give a lot of attention to our effort. So Bob gets some glory, a piece of the emerging industry/university action, an image for Intel of strong contribution to the training of design engineers, and a chance to strongly fulfill his role as a member of the EE/CS Visiting Committee. Please emphasize that we see this as a one-time contribution, and not a continuing service. The important thing is to provide fast service for impact to our students, to national LSI design efforts, and a clear signal to the government and industry that we <u>can</u> respond.

Speed in all of this is clearly essential.

P.S.   Bob's phone number is: (409) 246-7501.

c.c.   Prof. G. Wilson
       Prof. L. Conway

November 7, 1978

MEMORANDUM TO THE FILE

FROM: Paul E. Gray

SUBJECT: Conversation with Dr. Robert Noyce, Intel

I called Bob on Monday, November 6 to seek his assistance with mask and wafer fabrication in connection with the new course here (Design of VLSI Systems) which is being taught this term by Professor Conway.

I described to him the background and general circumstances (as outlined in the attached outline from John Allen), and asked for his assistance in moving ahead with fabrication on a highest-priority basis.

Bob asked if the data file would be formated for mass production in a photo mask process rather than an electron beam process. I told him that it was my impression that it was.

He asked that we send to him promptly the complete specifications for the process so that he could come to some conclusion about whether our wafer could be inserted into one of the twenty-five or so standard processes used at Intel.

The conversation ended with Bob indicating that while he could not now commit himself to help us in the manner we had requested, he would look into it and call me back very soon.

xc: Jonathan Allen
           Lynn Conway
           G. L. Wilson

Dr. Noyce's office called.   408-987-8165 Dr. Noyce
                              408-245-7342 Micromask

Said:

Dr. Noyce was talked to Micro-Mask.

They understand priority situation.

Contact: Bob Whiteside, MICRO-MASK.

I called   "   " . He sounded
very enthusiastic. Noyce had asked for
a one week mask turnaround.
(Possibility of using the E-Beam machine)

To Lynn Conway
Date Nov 7   Time 11:45

WHILE YOU WERE OUT

M Dr Noyce
of Intel
Phone 408-987-8165

Area Code   Number   Extension

TELEPHONED		PLEASE CALL	X
CALLED TO SEE YOU		WILL CALL AGAIN	
WANTS TO SEE YOU		URGENT	
RETURNED YOUR CALL			

Message_____

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Operator

8 November 1978

Dr. Paul E. Gray
Chancellor, M.I.T.

Dr. Gray:

Regarding the fast turnaround LSI project set effort:

Following our phone conversation on Monday, I had the
necessary technical information immediately communicated
to Dr. Noyce's office.

Dr. Noyce's secretary called me early yesterday morning.
She indicated that Dr. Noyce supported our effort, that he
had already talked with Micromask management, and had
arranged for our project set to have very high priority.
A specific Micromask employee was assigned responsibility
for the task.

Key staff members from my group at Xerox PARC are meeting
with Micromask, probably today, to do some advance planning.

The issue of wafer fabrication isn't yet resolved. Dr. Noyce
didn't volunteer Intel's facilities, but he didn't exclude
the possibility. This is not quite as pressing a matter
as maskmaking, since we do have some alternatives.

Thank you for your help in this matter.

Lynn Conway

Copy: Jon Allen

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
CAMBRIDGE, MASSACHUSETTS 02139

January 10, 1979

Dr. Robert N. Noyce
Chairman, Intel Corp.
3065 Bowers Avenue
Santa Clara, CA   95051

Dear Bob:

I'm writing to thank you for all your help in getting our student project chip fabricated. As you probably know, the mask spec left here on December 6, and HP completed the wafer fab on January 5. We are now starting electrical and functional testing.

The course, "Introduction to VLSI Systems", taught by Lynn Conway, was very successful, and we are extremely indebted to you for all your help. Many people said we couldn't achieve one month turnaround, but it has happened. Your contribution was crucial to this success.

With best wishes for the New Year.

Sincerely,

Jonathan Allen,
Professor.

c.c.   Professor Paul Gray
       Professor Lynn Conway
       Professor Gerald L. Wilson

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
CAMBRIDGE, MASSACHUSETTS 02139

January 10, 1979.

Dr. Merril Brooksby
Hewlett-Packard
1501 Page Mill Road
Palo Alto, CA   94304

Dear Merril:

I'm writing to thank you for all your help in achieving our short turnaround time for wafer fabrication with our student project chip. We're now turning to electrical and functional testing, and the student interest remains very high.

Monday, February 12, looks like a good day for your visit, and I certainly look forward to it. Again, many thanks for your help.

Best wishes for the New Year.

Sincerely yours,

Jonathan Allen,
Professor.

c.c. Professor Paul Gray
      Professor Lynn Conway
      Professor Gerald L. Wilson

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