THE STORY BEHIND THE CHIP STORY

Analysts assess the real ramifications of the AMD/Intel court battle and take an in-depth look into the semiconductor equipment industry.

By Clara Basile and Ellen Ullman

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For a moment last April, it looked as though the world would be flooded with AMD 486 clones. Federal Judge William A. Ingram granted Advanced Micro Devices a new trial on the question of AMD's right to use Intel microcode, and journalists rushed off to interview analysts. Intel's stock plunged from a pre-judgment high of $121.25 down to a post-judgment low of $85.5. Meanwhile, AMD's shares rose from $21.125 to $32.75. The market behaved as though the chip that had boosted Intel's profits, and its share price, would soon be selling like so many cheap components you can order from small-print ads in the back of *Byte Magazine*.

However, a few cool heads realized the difficulties behind the market's expectations. Before AMD could sell all the chips Judge Ingram had given it permission to clone, the company would have to fabricate those chips. And fabrication capacity was something AMD just did not have to spare. As AMD chairman and CEO Jerry Sanders told attendees at a recent Hambrecht & Quist conference, "We could do more if we had more capacity."

The Intel/AMD 486 battle made headlines, but behind the scenes chip makers face an on-going challenge in fabrication technology. Chip manufacturers must be able to produce ever more complex semiconductors and memory chips, and they must fabricate those complex chips in sufficient quantities to meet market demand. AMD is "fighting capacity constraints" on nonvolatile flash memories as well as 486 clones, according to Sanders. And Intel has capacity problems of its own. The New York Times cites "persistent industry reports" that Intel is having trouble raising production of its advanced Pentium processor.

While Intel and AMD battle capacity constraints and each other, there is an industry sector that stands to profit no matter who takes what share of the 486. For the semiconductor equipment manufacturers, the U.S. chip makers are simply customers with money to spend. These customers need to make enough 486s, to build chips like the Pentium with 3.1 million transistors, to use .6 micron technology in 16-Mbit memory chips, to devise processes for future 64- and 256-Mbit chips -- all of which will require new and enhanced equipment for chip fabrication and test. As Owen Linderholm, senior editor of *PC World* puts it: "Anyone who makes major breakthroughs in chip process technology is going to make a lot of money."

Despite the headlines, it was cycle analysis, not the press, that turned our attention to the suppliers of chip manufacturing equipment. As we reviewed the performance of the various sectors in *The Red Herring Technology 200*, we found that the semiconductor equipment sector had the strongest capital flows relative to the market as a whole. The group led all others in percentage of issues in an uptrend. And semiconductor equipment showed the strongest persistence in trend. Strongest uptrend *and* strongest persistence in trend: the combination is compelling.

Compelling as the these numbers may be, we must say at the outset that the semiconductor equipment group does not offer bargains. The sector has already risen significantly; we are well passed the bottom junctures. But our analysis indicates that there are buying opportunities into a continuing long-term upward trend.

Figure 1: ***Four- Phase Distribution of Capital Flow***
RED HERRING TECH 200
4/30/93

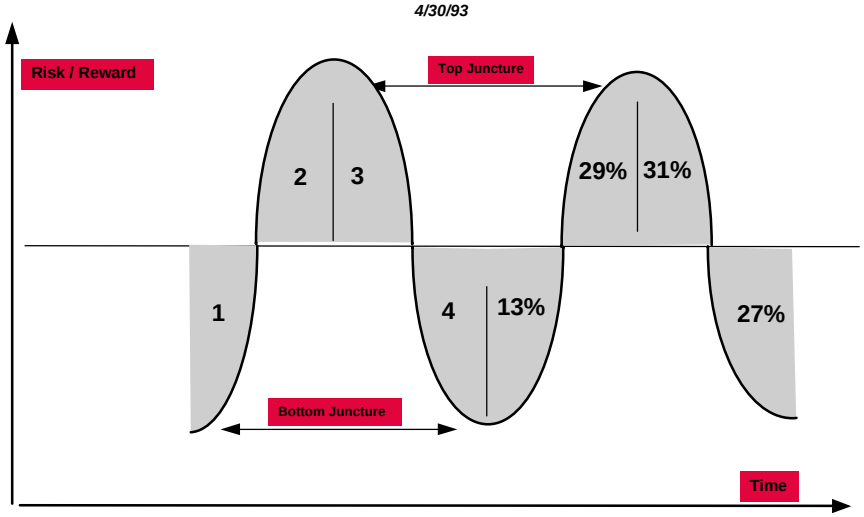
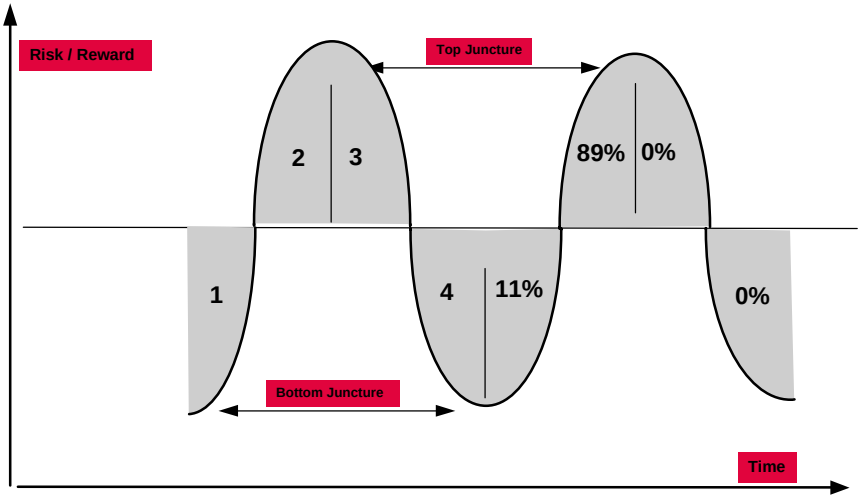
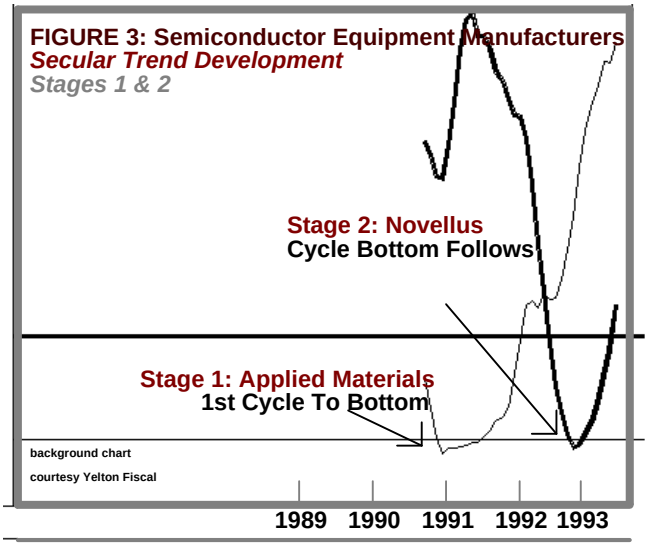


Figure 2: ***Four- Phase Distribution of Capital Flow***
Semiconductor Equipment Manufacturers
4/30/93



To see how the semiconductor equipment group stands out from the overall market, first consider Figure 1, which shows cycle analysis of the *Technology 200* stocks over the long term (4- to 4 1/2-year cycle). The graphic illustrates the percent of stocks in each phase of our four-phase model. 13% of the stocks are in phase 1, where capital has begun flowing into the assets. 29% are in phase 2, the uptrend in which capital continues to flow in on expectation of continued good news. In 31% of the stocks, capital has begun to flow out on bad news or on the belief that good news has run its course. And 27% are in phase 4, where capital flows out in a continuing downtrend. What Figure 1 presents is a picture of a "rotational market": Capital is moving out of one group and into another, producing an overall sideways movement. There are up- and downtrends for individual issues, but there is no overall theme in the market.

In contrast, the semiconductor equipment manufacturers show a decidedly upward movement (Figure 2). Every single issue in this group is in a long-term uptrend, which is highly unusual. 11% of the issues are still in the early stages of attracting capital in phase 1, while 89% are in a fully advancing uptrend. The question presented by this picture, however, is whether this group is approaching a top juncture, as the preponderance of stocks in phase 2 might indicate.



Despite the large number of stocks in phase 2, we find little evidence that semiconductor manufacturers, as a group, have reached a top juncture. On the contrary, we see them continuing upward over the long term. The evidence lies in trend persistence. For example, our research indicates that Novellus' price would have to drop by 52% in order to signal a change in trend direction. That is a very strongly entrenched uptrend. Similarly, Silicon Valley Group would need a 38% drop in share price before its upward trend would reverse. Of the group, only market leader Applied Materials appears within potential striking distance of a top juncture; its trend can change with an 9% drop in stock price. But even well-advanced stocks like Applied may be headed for a re-accelerating uptrend.

The reason for the continued upward movement is the pervasive influence of the rising secular trend. As we discussed in our last column, the period 1987-90 was one of secular change. That period saw the end of a generation-long secular down cycle and the beginning of a new up cycle, which divided the computer industry into two nearly separate industries, one succeeding the other. That new secular trend is now exerting pressure on the shorter market cycles, pushing them upward.

The rising secular trend is a numerical concept, but behind the idea is the real-world growth in demand for integrated circuits. It is only a slight exaggeration to say that chips will eventually find their way into nearly all devices that use electricity. Memory chips and semiconductors are used not only in computers but also in automobiles, auto test equipment, telecommunications, aerospace, medical and office equipment, defense, and the emerging consumer electronics products for digital media. Building the chips for all these devices will take fabrication equipment. According to Bob Boehlke, vice president and CFO of KLA, over 55 new or expanded chip fabrication facilities are now on the drawing board. Dennis Key, vice president of sales for Lam Research estimates that there are 30 fabs slated for expansion and perhaps 20 to 25 new ones due to come on line. Says Key, "There is a certain amount of recession proofing in our business. We may not see major swings in the electronic economy -- unless we're very foolish."

That lack of "major swings" is another real-world indicator that the rising secular trend will keep the nearer-term trends going in an upward direction. KLA's Boehlke says that he is not seeing the classic seasonal pattern of March/April peaks and September/October valleys. Lam's Dennis Key says his company is "not experiencing seasonal fluctuation." And neither is Applied Materials, according to Mike Musson, the company's director of investor relations. The smaller seasonal and business cycles are being swamped by the overall upward movement of the secular cycle.

As new secular trends unfold, markets typically move in three stages. In the first stage, stock buyers are looking for "quality," and the stocks of companies with already-existing high revenue growth will advance. These "quality" stocks will tend to rise, consolidate somewhat, then move higher as the secular trend continues. In the second stage, buyers begin looking at the lesser companies within a strong group; that is, the market looks at those companies whose revenue growth is not perceived as certain. While "quality" stocks continue to advance, the secondary companies can be the largest percentage gainers as new investors are pulled into the market. In the third stage, key people start to leave existing companies to start new enterprises. This is the speculative phase -- there's money to be made, and entrepreneurs are out there to find it.

Our analysis tells us that we are in the second stage of a new secular trend. That is, we expect strong groups like semiconductor manufacturers to keep advancing, and we expect to see particular gains among the second rung of companies within the group.

The first-stage companies in the semiconductor equipment group are Applied Materials (AMAT - $42.625) and Lam Research (LRCX - $30.00). (All stock prices are as of 4/30/93.) They are the stronger companies whose "quality" stocks have benefited from the first stage of the new secular trend. Lam's stock price has gone up an impressive 815% since the cycle bottom in October 1990; it stands fifth among the *Technology 200* in stock price rise. Applied's has risen 443% in the same period.

There is every reason to believe that Applied and Lam can continue to advance over the long term. Both provide equipment to the makers of chips in the highest growth areas -- flash memories, 16-Mbit (and larger) DRAMs, and advanced microprocessors such as the Pentium, SPARC and DEC Alpha. Applied Materials sells products for multiple steps in the fab process, and the company is well-diversified globally. Lam sees the continuation of a sharp upturn that began last September. According to Lam vice president of sales, Dennis Key, the company expects that this year will see a doubling of shipments and revenues over last year.

While the stronger companies should continue doing well over the long term, we see a second-stage movement beginning to occur. Capital is starting to flow into Novellus (NVLS - $17.5), Silicon Valley Group (SVGI - $8.125) and Genus (GGNS - $2.25). The stocks of these three companies have not yet risen as a far as the group leaders. And, as suppliers of chip fabrication equipment, they stand to benefit over the long term from the increased demand for integrated circuits.

Novellus says that the "big guys" among its customers -- Intel, Motorola, Texas Instruments, AMD -- are strapped for capacity and are in need of expanded fabrication facilities. Company CFO Bill Wall predicts that "Q2 could be a record revenue quarter" for Novellus. For Genus, however, the gains may not come until the Japanese economy picks up. According to Kevin Conlon, Genus vice president of marketing, the company's products have principally been geared for the fabrication of memory chips, and the memory market is centered in Japan. Genus is moving towards product-line and geographical diversification, but it will not see an upward spike until Japan is "turned back on," says Conlon.

Also among the second-stage group companies are the makers of automated test equipment: KLA (KLAC - $12.25), Teradyne (TER - $14.125) and GenRad (GEN - $4.125). These companies may eventually benefit from the expansion of the semiconductor market, but their gains will lag in time behind the companies that make equipment for chip fabrication. KLA makes process monitoring equipment, and it claims to have 80% of the Japanese market. After a delay in releasing new products, the company sees improved business. GenRad makes board test equipment, which places it even further down the line in time from the chip equipment makers. The company saw demand for its products crash in the 1984-85 period but has now returned to a normalized growth curve. GenRad expects flat demand for its products over the first half of this

year, but sees benefits over from the long-term as the large computer makers contract out more of their board manufacturing, which, in turn, creates demand for board testing equipment.

The wild card in this whole sector is Japan. When the Japanese economy gets "turned back on," its memory chip makers will start to buy manufacturing equipment. And companies with a large stake in the Japanese market should prosper. We could not obtain numbers by press time from all the companies in the semiconductor equipment group, but of those reporting, Genus, Applied, KLA and Novellus saw the largest percentages of their revenues from activities in Japan. (Genus 32% in 1992, 38% in 1Q93; Applied 30% in fiscal year 1992, 20% in 1Q93; KLA 30% in 1992, 1Q93 not available; Novellus 20% in 1992, approximately 10% in 1Q93.) GenRad reported 14% of its revenues from Japan in 1992 and approximately 15% in 1Q93. Lam showed the lowest percentages: less than 10% in 1992, with 1Q93 continuing to be flat.

KLA's Bob Boehlke calls Japan "a classic case of pent-up demand," but our work has shown capital flowing into the Japanese stock market since January, 1993. Since stock prices tend to lead fundamentals, this capital flow may signal that some of the pent-up demand is about to be released, fueling an already-advancing market in semiconductor equipment. As Boehlke put it, "If the U.S. equipment industry is doing as well as it is now, what will it look like when Japan gets healthy?"

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