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# GLOBAL ELECTRONICS

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## FOUR "TIGERS" AND G.S.P.

President Reagan has announced his intention to disqualify the four "tigers" or "dragons" of East Asia—Hong Kong, Singapore, South Korea, and Taiwan—from duty-free treatment under the Generalized Systems of Preferences (GSP). The GSP is an internationally sanctioned scheme to promote the economic growth of poor countries.

Faced with growing pressure to lessen the U.S. trade imbalance, particularly in manufactured goods from the highly visible, rapidly growing tigers of East Asia, Reagan has declared that the four countries had graduated from GSP. That is, they don't need subsidies any more.

Since electronics products are not covered under the GSP, the action will have no direct impact upon electronics trade. Two major industry trade associations, however, have expressed their concern over the indirect consequences.

In the last few years, Congress has enacted legislation linking GSP treatment to U.S. policy aims, such as assuring the rights of workers and protecting U.S. copyrights. Not surprisingly, the American Electronics Association (AEA) and the Computer and Business Equipment Manufacturers Association have focused on the latter.

Before the latest move, the U.S. government had used the threat of removing GSP benefits for non-electronics exports to strengthen its hand in negotiations designed to get those governments to extend protection, in a serious way, to the intellectual property—copyrights, trademarks, and patents—of U.S. based companies.

William Krist of the AEA told *Electronic News* (February 15, 1988), "These efforts succeeded in Singapore last year, where copyright laws were significantly strengthened to protect U.S. intellectual property. But the Singapore government may feel betrayed, when the US threatens to remove them from GSP status anyway. Other developing nations may well drag their feet in strengthening their copyright laws, fearing they could lose GSP status in any event."

## WOMEN IN BIOTECHNOLOGY

In the electronics industry, one of the most common explanations of the paucity of women in top management positions is that high-tech companies are founded and run by engineers. If there were more women engineers, there would be more women officers and directors. Our 1980 data shows that women made up 11% of officers and managers (not just top-level) in high-tech electronics, vs. 15% of the professionals in the same industries.

A recent informal survey of women in 15 leading biotechnology companies, however, indicates that there must be another explanation. According to the *San Jose Mercury News* (March 7, 1988), women often make up half the staff of scientific professionals at biotech firms. Indeed, "Of 192 managers in top science-related jobs, 58 (or 30 percent) were women."

However, of the 108 directors of the 15 companies survey, only 3 were women. Of 130 corporate officers, only 14 were women. The most balanced corporation, California Biotechnology, has three out of ten women officers.

## INTRA-INDUSTRY TRADE RIFT

The 1986 Semiconductor Trade Agreement with Japan and President Reagan's subsequent sanctions on Japanese electronics exports marked the political ascendancy of the Semiconductor Industry Association (SIA). For years SIA members had been protesting that the Japanese were illegally undercutting the prices that they charged for their commodity chips.

However, in September, 1987, the SIA changed its tune, complaining that Japanese semiconductor makers were now producing too few circuits and charging too much for them. This prompted the editors of the *San Jose Mercury News* (September 17, 1987) to call the SIA leadership "crybabies."

The SIA switch was a belated response to pressure from chip customers, primarily U.S.-

*(continued on page 2)*

based computer firms. The American Electronics Association (AEA), another Silicon Valley-based trade association that includes chip users as well as producers, had set up a task force to look into chip shortages, and other AEA companies were leaning on the SIA.

It looks like the SIA's dominance of high-tech trade policy is waning, as chip users and makers of semiconductor production equipment recognize that their interests frequently differ from those of merchant chip companies.

To resolve those differences, top high-tech executives recently met privately in Silicon Valley to establish a framework for hammering out a unified trade policy. The meeting, organized by the AEA, was attended by high-level executives of more than a dozen firms, including chipmakers Intel, National, and Motorola; chip users Apple, Hewlett-Packard, Tandem, and 3Com; and chip-equipment producer Perkin-Elmer. (San Jose Mercury News, January 13, 1988)

## FERROELECTRIC R.A.M.'S

High-tech trade magazines, the business press, and even the mass media are devoting a great deal of attention these days to the discovery of "high"-temperature superconducting materials. In the long run, superconductors may have an enormous influence on the electronics and other industries, but more immediately another, less glamorous technology is likely to shake up the memory chip business. It is receiving very little publicity.

Today at least two U.S. start-ups are producing a new kind of memory circuit, the ferroelectric random access memory (FRAM) circuit, which soon should be cutting into the market for electronically erasable programmable read-only memories (EEPROM's). As ferroelectric RAM densities increase, they should compete with static RAMS. And some analysts suggest that the ferroelectric devices will eventually challenge dynamic RAM's, the commodity chips today that are the bread-and-butter of the Japanese semiconductor industry.

The FRAM is based upon a physical effect first discovered in the 1920's. It is called ferroelectric because those who originally studied the phenomenon incorrectly suspected a link to the magnetic properties of iron. Ferroelectric materials, however, are crystalline substances that polarize when a field is applied, and their polarity reverses when the field is reversed. *Electronics* (February 18, 1988) characterized their electronics properties: "ferroelectric materials can be modeled

as bistable capacitors with two distinct polarization voltage thresholds."

Two companies, Ramtron of Colorado Springs and Krysalis Corp of Albuquerque, announced ferroelectric RAMS this year. Both firms build the chips by depositing thin films of lead zirconate titanate (PZT) or a derivative on conventional silicon chips. The current products are low-density demonstration models, but by next year both Krysalis and Ramtron promise 256 kilobit FRAMS.

The FRAM's are non-volatile. That is, unlike dynamic RAM's, they do not lose their information when the power is turned off. They do not wear out, like EEPROM's. They have fast write times as well as read times, and they naturally tend to be resistant to radiation. In theory, contends Krysalis, one cell of memory can be built with a single transistor element and a single ferroelectric capacitor. This means, unless significant production difficulties persist, that they could quickly overtake static RAM densities. Static RAM cells require six transistors.

To meet their promises, FRAM-makers will have to significantly scale up their densities. Ferroelectric materials do pose problems. For example, reports *Electronics*, "ferroelectric materials do not polarize instantaneously, and polarization thresholds are not perfectly defined."

Thus far, the major merchant semiconductor firms have not jumped upon the FRAM bandwagon, with one exception. National Semi plans to ship circuits based upon the Krysalis RAM design. (*Electronics*, February 4, 1988.)

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## P.S.C. MONITORS MILITARY CALIFORNIA

PSC is now publishing a new newsletter, the **California Military Monitor**. Every two months the **Monitor** publishes data on and analysis of the U.S. military's activities in California, including regular reports on Department of Defense contracts within the state. We are attaching, for our North American subscribers, a copy of our first pilot issue. Other **Global Electronics** subscribers may receive the pilot issue, free of charge, upon request. Subscription information is included in the **Monitor**.

### THE FAB 684

The world's top 12 semiconductor manufacturers own more than 38% of all wafer fabrication cleanroom floor space worldwide. The same twelve companies produce over 68% of the world's chips (by value).

#### Wafer Fabrication Space, Worldwide

<u>Company</u>	<u>Square Feet of Cleanroom</u>
IBM	835,000
Motorola	710,000
National Semi/Fairchild	625,000
Texas Instruments	612,000
Hitachi	596,000
NEC (Nippon Electric)	569,000
Philips/Sigmetics	475,000
Toshiba	459,000
Matsushita	421,000
AT&T	400,000
Fujitsu	398,000
Intel	<u>343,000</u>
Subtotal	6,443,000
Total of All Companies	16,770,000

Of the 684 fab sites worldwide identified by In-Stat, Inc., 379 are in the U.S. Japan has 178 sites, but its facilities "tend to be larger and have higher output than the average U.S. facility." (**SEMI Outlook**, First Quarter, 1988). Europe has 96 fab operations. South Korea has 11.

### KOREA IMPORTS

South Korean electronics manufacturers, barely heard of a few years ago, are today recognized for their competitive strength in goods ranging from

VCR's to advanced memory chips. South Korea's well known exports, however, include a large proportion of components from outside of Korea. The **Far Eastern Economic Review** (January 7, 1988) reports that 38% of the components going into South Korean electronics products are imported.

In 1986 South Korea imported US\$1.5 billion worth of electronics equipment from Japan. As the volume of Korean production and exports rises, and as the dollar-value of the Japanese Yen skyrockets, that figure is likely to grow substantially.

### SCOTLAND UPDATE

In the December, 1987 issue of **Global Electronics**, we speculated that Scotland may have lost its only locally owned semiconductor manufacturer when California-based Seagate Technology bought Integrated Power Semiconductors. Since then, Jeff Henderson wrote us to confirm that Integrated Power Semis was the only Scottish-owned semiconductor firm he found in his 1986 survey of Scotland's Silicon Glen.

### CALIFORNIA PENSION FUNDS CONSIDER VENTURE CAPITAL

California's Public Employees' Retirement System, with assets of \$43 billion, and the state's Teachers' Retirement System, worth \$21 billion, are considering earmarking one percent of their holdings for investment in venture capital funds. Public pension funds are traditionally leary of risky business such as high-tech start-ups, the bread and butter of venture capital, but the October 19, 1987 crash and subsequent fluctuations in the stock markets illustrate that established stocks are risky as well. (**San Jose Business Journal**, February 22, 1988)

The \$640 million being considered for investment equals about two percent of the nation's \$30 billion venture capital pool. If it enters the market in one year, however, it could have a much greater impact.

While the primary goals of pension funds are maximizing and stabilizing income, public pensions fund can be subjected to social and political pressure. Employees covered by the California pension funds could insist that their money be placed in the hands of firms that provide most of their employment in the state, instead of overseas.

(continued on page 4)

Such a strategy would not necessarily hurt the funds' income-generating prospects, but it could strengthen the economic future of California's private sector, strength which is necessary to maintain public programs and employment.

### TOXICS UPDATE

• In Santa Clara County, the district attorney's office, as well as the public at large, considers the improper dumping of hazardous materials to be a serious crime. The president of Golden State Circuits, a Silicon Valley printed circuit board maker, has been convicted and sentenced to a year in jail for violating California's Hazardous Waste Control Act. He is the second area businessman jailed for toxics dumping.

In March, 1987, inspectors working for the San Jose-Santa Clara sewage plant detected a high level of copper of Golden State's wastewater. On a subsequent tour of the plant, inspectors found liquid containing a high concentration of copper in an open sink. (San Jose Mercury News, March 9, 1988)

• Meanwhile, the legal options for disposing of

hazardous solid wastes, including sludge, are diminishing. The last two hazardous waste dump sites in northern California have just been permanently closed by their operator, the International Technology (IT) Corporation. The two sites, in Benicia and Martinez, had been closed temporarily for violating state regulations.

This means that Silicon Valley companies that generate hazardous solid waste, including those that create toxic sludges by properly treating their wastewater, will only have the option of trucking wastes two hundred miles or more south. With only four hazardous waste sites left in the state, dumping costs could soar along with transportation costs. And the risk of highway spills is likewise increased.

The waste problem may finally force manufacturers to consider alternatives to dumping. A spokesman for the California Department of Health Services told the San Jose Mercury News (March 9, 1988), "There is no question that land-disposal costs have increased... and that, in fact, for a while has made alternative technology and treatment and recycling more cost effective."

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