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ODD OFFSHORE CRITIC

When American manufacturers shift production abroad to save on labor costs, they are hurting the U.S. economy. The thought is nothing new, but the criticism is now coming from a strange corner.

Intel President Andrew Grove told a Silicon Valley audience recently that the practice is having a "terrible, long-term effect" on the economy. Grove answered a question from the audience, saying, "We [Intel] have contributed to that migration, and every time we do that...we contribute" to the problem.

Grove told the *San Jose Mercury News* (December 3, 1987) that he wants Intel to stop moving plants out of the U.S., not close down existing foreign operations.

Intel has always done most of its chip and systems assembly in Asia and the Caribbean, but it maintains a greater share of its workforce onshore than some of its U.S. competitors, such as National Semiconductor.

KOREA

Reports from South Korea confirm that labor disputes have taken place this year at several South Korean electronics companies, including Geum-Sung Electronics, Dae-Woo Electronics, Korea Tokyo Electronics, Orion Electronics, and Geum-Sung Alps Electronics. (*Around the Circuit*, November, 1987, citing the Korean Labor Association, 3185 Sepulveda Blvd., #4, Los Angeles, CA 90034.)

The *San Jose Mercury News* (November 30, 1987) reports that workers at Anam Industrial, the world's largest assembly subcontractor, recently won a 27% raise. Anam, in Seoul, employs about 10,000 assemblers, chiefly women. Anam performs assembly for numerous U.S. firms, including Motorola, Intel, Texas Instruments, Advanced Micro Devices, Signetics, Sprague, and VLSI Technology.

In the wake of South Korea's explosion of labor (and farmer) unrest, *Korea Report*, (1314 14th St., NW, Suite 5, Washington, DC, 20005,

September-October, 1987) has published a detailed description of South Korean working conditions, not focused on electronics, but for all manufacturing industries. Writer Young Il Choi argues, "The simple fact underlying South Korea's labor strikes and farmer agitations is that the wealth generated by the so-called 'miracle economy' has not filtered down to the workers or the farmers."

Young compares average 1983 South Korean manufacturing wages and hours with pay in three other countries, claiming that South Korean workers have fared poorer than workers in other East Asian industrial centers. It notes that Korean pay levels are overstated by the inclusion of payments in kind such as meal and transportation services.

South Korea Compared to Its Neighbors (1983)

<u>Country</u>	<u>Hourly Pay</u> (US\$)	<u>Hours/Month</u>	<u>Monthly Pay</u> (US\$)
Japan	6.60	178.0	1,175
Singapore	1.89	208.9	393
Taiwan	1.52	209.0	318
South Korea	1.20	236.1	285

International comparisons vary over time, particularly as exchange rates move up and down, but Young also presents data showing that South Korean workers have earned little by Korean standards. In 1985, for example, 86.9% of South Korean workers earned less than the minimum cost of living for a four-person family, as calculated by the Korean Federation of Trade Unions (until recently considered a government-controlled trade union center).

More telling perhaps, in 1985 more than 765 thousand women workers, 63.9% of all female urban workers, earned less than the minimum cost of living for one worker. More than 293 thousand men, or 13.2% of South Korea's urban male workforce, earned less than a slightly higher minimum cost of living figure for men.

South Korean workers labor an average of 54.4 hours per week, more than workers in any

(continued on page 2)

other country recorded by the International Labor Organization. And, says **Korea Report**, "South Korea's industrial accident and death rate is one of the world's highest; last year alone more than 23,000 were killed or crippled in industrial accidents."

SILICON CAMBRIDGE?

For years, industrial regions and university towns throughout the Western world have been trying to develop their own versions of Silicon Valley. There's a lot of hype, but few such areas are likely to succeed. In September we reviewed Jeff Henderson's study of the semiconductor industry in Scotland. Here we look at AnnaLee Saxenian's latest paper, a study of Cambridge, England, which says that area's success is limited as well. ("The Cheshire Cat's Grin: Innovation, Regional Development, and the Cambridge Case," MIT Political Science Department, October, 1987.)

Saxenian, who earlier explored the roots of high-tech growth in both Silicon Valley and Massachusetts, says Cambridge appears well qualified to become a high-tech growth center. She writes, "If the conventional wisdom were correct, it would be difficult to imagine a better set of conditions for a flourishing of innovation and high-tech growth. Not only is Cambridge well endowed with the prescribed attributes, but the often elusive process of new firm formation and entrepreneurship associated with high-tech growth region is healthy."

Cambridge has a solid record of high-tech startups—more than any other spot in Europe. Saxenian reports, "By 1985 it was the home of over 400 high-tech companies."

But those startups don't seem to go very far. Their employment achievement is meager by Silicon Valley standards. She observes, "Local high-tech firms employed approximately 16,500 workers in 1986, and the majority of these jobs existed in the late 1960's prior to the onset of the 'high-tech boom.' At most, 6,000 jobs have been created by the hundreds of new firms started during the past decade. The preponderance of industrial employment in Cambridge thus remains in a small number of large, older firms."

Saxenian places the blame on national, not local conditions. First, she says that Cambridge suffers from Britain's protracted decline as an industrial economy. There is little demand for high-tech products, a limited supply of managerial and engineering skills, and a lack of a 'technical infrastructure.' Second, she argues that the cozy

relationship between the UK Defence Ministry and a handful of large, established electronics companies has left little business for small, new firms in the weapons sector. Ironically, those problems remain despite the Thatcher government's promotion of venture capital.

She concludes that Cambridge lacks the exchange of ideas and information that has long characterized Silicon Valley: "There is little to integrate the economic activity of local firms: it is a disarticulated collection of small technology enterprises and service activities. While successes may emerge in Cambridge, it is difficult to view the region as a supportive environment for innovation and the growth of high-tech industry."

Saxenian does not explain why that interchange is not present in the UK, but we think the difference lies in U.S. politics, both formal and informal. For example, U.S. government set a precedent for the widespread licensing of semiconductor technology when it insisted, from the start, that AT&T not only share, but actively disseminate transistor technology. And when the personal computer movement began to challenge the rule of large machines, whiz kids like Lee Felsenstein, Steve Wozniak, and even Bill Gates insisted that computer designs be "open."

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edited by Lenny Siegel

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UNCLE SAM COMPUTES

The U.S. federal government does not dominate the computer industry the way it did during the 1950's and early 1960's, but it is still an extremely significant customer. **Business Week** (November 23, 1987) reports, "The fiscal 1988 federal information-systems budget adds up to \$17 billion, nearly twice the 1982 level and one-tenth of the entire U.S. market for computers, software, and services.

The magazine presents International Data Corporation's projection of U.S. computer procurement, from 1987 through 1992, at the federal agencies with the largest computer budgets:

<u>Agency or Department</u>	<u>1987-1992 Procurement</u> (\$ Billions)
Defense Department Total	14.6
Army	5.0
Navy	3.9
Air Force	3.7
Office of the Secretary	2.0
General Services Administration	7.3
Treasury Department	6.1
National Aeronautics and Space Admin.	5.2
Agriculture Department	3.4
Justice Department	2.0
Commerce Department	1.8

PENTAGON CHIPS: SMALL MARKET, MUCH RESEARCH

It is likely that the Department of Defense (DOD), through Sematech (the semiconductor manufacturing consortium now being organized by the semiconductor industry), will once again become the sugar daddy of the U.S.-based integrated circuit industry. It is now more important than ever, therefore, to assess the influence that the military has over chip markets and technology.

The Congressional Budget Office, in an otherwise lackluster review of the Sematech proposal (**The Benefits and Risks of Federal Funding for Sematech**, September, 1987), provides some useful insights and data about the Pentagon's role.

The CBO presents 1986 market information developed by the market research firm Integrated

Circuit Engineering. In that year, the military accounted for 15% of the U.S. integrated circuit market (by value, not volume). In Europe, the military share was 5%; in Japan, the figure was 0% (which seems a little too low).

The report's authors point out that the federal government already spends several hundred dollars a year on semiconductor research, but most goes for military--oriented research with little or no commercial value, at least in the short run.

The following table summarizes U.S. spending on semiconductor research and development in fiscal year 1987. It does not include projects indirectly funded by the government, such as the Pentagon's Independent R & D program or research supported by the Incremental R & D Tax Credit.

Note that the \$55 million in funds expended by the Sandia National Laboratory is primarily in support of military missions, but that it does not include Defense Department-funded projects at Sandia, which is a major center for research to make chips less vulnerable to ionizing radiation and electromagnetic pulse.

Federal Semiconductor Research in 1987 (millions of dollars)

Department of Defense	
Very High Speed Integrated Circuits (VHSIC)	122
Strategic Defense Initiative Organization (SDIO)	60
Air Force	60
Navy	28
Army	25
Defense Advanced Research Projects Agency (DARPA)	16
Manufacturing Technology (ManTech)	14
Microwave and Millimeter-Wave Monolithic Integrated Circuits (MIMIC)	10
Defense Nuclear Agency	7
Department of Energy	
Sandia National Laboratories	55
Photovoltaic research	15
Other national laboratories	8
National Science Foundation	30
National Bureau of Standards	4
TOTAL	454

The CBO notes, "these programs reflect DOD's awareness of the role that a competitive industrial base plays in the nation's defense."

But it concludes, "Most of these programs,
(continued on page 4)

however, have reflected DOD's intention to drive the technology of an emerging area in a direction more compatible with anticipated defense needs. This, rather than commercial success or a 'response' to foreign challengers, was the intention of the VHSIC program. This highly focused approach has been taken with such technologies as the radiation hardening of chips (which allows them to survive nuclear war) and the use of gallium arsenide a semiconducting material. Given this orientation, DOD has consistently managed these programs to achieve technological performance at the expense of cost. For example, high-speed gallium arsenide 16K SRAM's [16-kilobit static random access memory chips] are planned as part of the Strategic Defense Initiative at a cost of \$1,200 each in 1988; an existing fast commercial version is available for \$20 or less. It is not surprising that prototypes of new technological devices have these costs. But the purpose of Sematech is to develop cost-effective commercial technologies, not to pursue technologically demanding but commercially irrelevant directions.

As an alternative to direct Pentagon oversight of Sematech, CBO considers an interagency committee, to be chaired by the Defense Department. It suggests, however, that under present

circumstances such a committee would be dominated by the Pentagon and the weapons-related branch of the Energy Department.

Perhaps in recognition of political realities, the CBO does not consider other alternatives. In fact, most of the issues raised by the entire report are glossed over without solution.

As we go to press in December, it appears that Congress will provide Sematech with \$100 million as part of the DOD continuing appropriations bill for fiscal 1988. Two conditions have been added: a study of possible limits on the transfer of Sematech technology to the foreign operations of U.S.-based firms; and DOD consultation on Sematech's site. (San Jose Mercury News, December 19, 1987)

A.T.&T. IMPORTS

AT&T no longer manufactures any consumer equipment, such as residential telephone sets, in the U.S. Instead, it contracts production out to suppliers in Singapore, Taiwan, South Korea, and Hong Kong. At least one Hong Kong-based contractor, Termbray Electronics, makes AT&T equipment inside China. (The Report on AT&T, September 21, 1987)

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