

members of EUREKA joined forces to launch the Joint European Submicron Silicon Initiative.

JESSI originated in discussions held among French, Dutch and German industrial leaders over a period of years. Its implementation phase was launched at the EUREKA ministerial conference in Vienna in June 1989. JESSI's mission "is to put Europe back in the running in the world microelectronics market, by giving it the means to negotiate successfully the major change in the development direction of chips expected before the end of the century," according to a EUREKA publication. The main objective is the competitive manufacture of chips with features of 0.3 micron compared with 1 micron at present. The definition-phase budget for JESSI was set at 555 million ECUs (\$650 million), and Pandolfi has indicated that the EC may contribute as much as 25% via the same bureaucratic network that manages ESPRIT.

JESSI is managed by a board that includes representatives of Thomson, Siemens, Philips, Bosch, Alcatel (a firm headquartered in Holland that is mainly a Belgian-French concern), Olivetti (Italy) and Electrotech (Great Britain), plus an academic representative, P. Balk, a professor at Delft and Aachen. An operating group consists of representatives of the same organizations, with each member spending about 20%-30% of his time on the operating group and the rest at the parent company. The small headquarters of JESSI is in Munich.

The chairman of the JESSI board, Cees Krijgsman, says that the big difference between JESSI and Sematech is that all the work at JESSI is done by the participating companies and research organizations. "The advantage is that the commitment [to JESSI] by the companies is 100%," Krijgsman says. "The disadvantage is that everybody has to travel a lot."

The general objective of JESSI often is described as the development of the 64-megabit memory chip, but this is an oversimplification, Krijgsman says. "That's just the last step—the 64 M." He says JESSI encompasses development of every kind of advanced chip with 0.5- or 0.3-micron features. Management of the program is divided among four subprogram boards for long-term research; semiconductor manufacturing equipment and materials; CMOS technology; and applications, that is, application-specific integrated circuits or ASICs.

Noting that Esprit has been "extremely successful," Krijgsman em-

phasizes that Esprit is devoted to specified research areas. JESSI, on the other hand, is a "comprehensive program with a lot of vertical and horizontal integration."

World market in perspective

While Europe appears to be moving rapidly and effectively to build a position in the global chip and computer markets, its general position remains disadvantageous by comparison not only with Japan but also with the United States.

According to statistics prepared by Dataquest, a firm in San Jose, California, that specializes in collecting data on the semiconductor industry, the United States and Japan each supplied about 30% of the world semiconductor market in 1988. The data were reproduced last November in "Strategic Industry at Risk," a report prepared by the President's National Advisory Committee on Semiconductors. They show that Japan's market share increased from less than 30% to about 35% between 1981 and 1988, while the US share dropped from 60% to 30%.

Statistics quoted regularly in the business pages of major newspapers say that roughly two-thirds of the chips currently manufactured for the world market are made by Japanese companies. But it is important to note that the standard statistics have some important flaws. Charles Ferguson, an expert at MIT on the computer and chip industries, says that data for Japanese companies are reported differently than those for US companies, so that Japan's share of the chip market is systematically overstated. The Japanese statistics typically include both "merchant" manufacturers, firms that produce mainly for external customers, and "captive" manufacturers, firms that produce chips primarily for themselves, whereas the US statistics usually include only the merchant manufacturers. Thus the statistics for the United States often exclude IBM, for example, and Hewlett-Packard—not minor players in the chip game.

Ferguson says that IBM produces about \$4 billion worth of semiconductors each year. If that output were sold externally, he says, the statistics would show that IBM accounts for between 5% and 10% of the world chip market, and maybe 20% of the world market for dynamic random access memories or DRAMs.

Other statistics suggest that IBM produces about \$5 billion in semiconductor products annually, that Japan's NEC runs a very close second

with about \$4.8 billion, and that Toshiba is a distant third.

IBM-Europe relationship

Last year, when IBM appeared to be spearheading a drive to establish a US manufacturing consortium called US Memories (see box, page 69), three major blocs seemed to be emerging in the world chip market: Japan, Fortress Europe and Fortress America. Sematech, the US research consortium, often was characterized as a response to Japan's cartel-like practices in the chip market, and JESSI typically was described as Europe's answer to Sematech. Early this year, in evident imitation of an anti-dumping agreement the US government reached with Japan four years ago (PHYSICS TODAY, October 1986, page 69), the European Commission reached an agreement with 11 Japanese manufacturers regulating their sales of semiconductor products in the European market and setting minimum prices for Japanese semiconductors.

But with the demise of US Memories, and the closely coupled announcement of manufacturing and marketing agreements between IBM and Siemens and Intel and NMBS, it may be that we are seeing the emergence of two rather than three major industrial systems: a European-American grouping, in which IBM and Siemens are the biggest partners, and a Japanese-American group, in which NEC, Intel, Texas Instruments, Toshiba or Hitachi will be the heavyweights.

IBM for decades has been the symbol of US economic and technological supremacy in western Europe. As such, it is the object of suspicion and resentment, and it remains a touchy issue for EUREKA. At the ministerial conference last June in Vienna, IBM's European units were invited to participate in EUREKA projects, provided they used only their own resources. More recently, the JESSI board announced that IBM's European units would be welcome to submit proposals for JESSI projects. But IBM as a whole continues to be barred from EUREKA, though EUREKA's governing bodies repeatedly have discussed letting it in.

—WILLIAM SWEET

IN BRIEF

Optics: A Career Spectrum, a brochure describing careers in optics, is available from the Optical Society of America, 1816 Jefferson Place NW, Washington DC 20036. ■