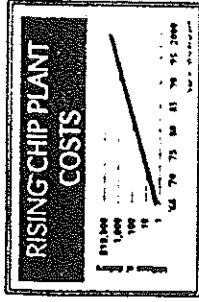




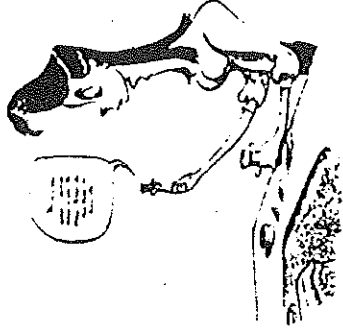
PIRUMS NO ONE IN THE WORLD has a better sense of this than Motorola's Brian Wilkie. His division is the world's largest producer of microcontrollers. "Chips have quietly, almost invisibly, changed the world around us," Wilkie says. "Your telephone was an electromechanical device, now it is electronic. And the cell phone in your car has more user-friendly features than the ones on most desks. Your hotel door lock has an electronic key that can tell the room to wait five minutes then turn off the lights."

"What many businesspeople don't realize is that the real design challenge was moving from mechanical to electrical, adding the switches and the little electrical motors. The next step, to intelligence, requires an incredibly small incremental cost increase. That's the great opportunity but also the great risk, because you need to worry about whether your competitors will beat you to it."



"And no business is immune," he says. "Even if I was designing children's clothing in Indianapolis," he says, "I'd be thinking hard about whether I should add intelligence to my designing, cutting, manufacturing, even to the clothes themselves. A few years from now kids could be wearing leather jackets with built-in dis-

plays." Wilkie, a Scotsman, laughs. "But what I'm waiting for is for someone to come up with the smart golf tee. It would register your swing as it comes down, then lean left or right to find the sweet spot on your club."



MOORE'S LAW IS THE VERY EMBODIMENT OF the old fable about the Chinese emperor who agreed to the terms proposed by a craftsman—to get paid in a quantity of rice that would double with each square of a chessboard. Halfway down the squares, the emperor realized these terms had committed him to give the clever man all the rice in the world.

As described by Moore's Law, the electronics industry undergoes the equivalent of the great Industrial Revolution every two years. And it isn't slowing. As Tim Bajarin notes, "Moore's Law may actually be accelerating, such that we may see by the end of the century, three or four times jumps in performance every 18 months."

TAKE ME, I'M YOURS
Pill bottles will remind us it's time to take our medicine.

"Eventually, of course, it has to end. As Moore noted in *Forbes* recently, if the semiconductor industry will soon represent 1% of the world's economy, by the middle of the 21st century, it would total 100% of it, which seems impossible.

There are also technical questions. As the features on the surface of the chip continue to miniaturize into submicron widths, they collide with the rules of quantum physics. The walls of the pathways literally become bumpy with molecules. The miniature circuit sizes throw off ever-stronger electric

NEW \$500 MILLION+ FABRS IN THE U.S.

COMPANY/COST (\$ millions)	CITY	STATE	FAB NAME	YEAR	PRODUCTS
AMD \$1,300	Austin	Tex.	Fab 25	1995	MPU Flash
AT&T Microelectronics \$600	Orlando	Fla.	Orlando 2	1997	ASIC Graphics
IBM \$900	Gresham	Ore.	N/A	1996	16/64 MB DRAM
Hyundai \$1,300	Eugene	Ore.	E-4	1997	16/64 MB DRAM
Intel \$1,200	Manassas	Va.	N/A	1997	16/64/256 MB DRAM
Intel \$1,350	Albuquerque	N.M.	Fab 11.2	1995	MPU
Intel \$500	Santa Clara	Calif.	D2-Exp	1996	Advanced MPU
Intel \$735	Hillsboro	Ore.	Phase 1B	1998	MPU
Intel \$1,300	Chandler	Ariz.	Fab 12	1996	MPU
Intel \$565	Hillsboro	Ore.	Phase 1A	1996	MPU
LSI Logic \$900	Gresham	Ore.	Phase 1	1997	ASIC
Matsushita \$594	Puyallup	Wash.	N/A	1997	4/16 MB DRAM MCU
Micron Technology \$1,300	Lehi	Utah	Phase 1	1996	64 MB DRAM
Motorola \$1,500	West Creek	Va.	MOS-19	1998	Power PC MPU
Motorola \$1,200	Phoenix	Ariz.	COM-1	1996	Telecom
Motorola \$1,000	Austin	Tex.	MOS-13	1995	SRAMs Power PC MPU
Motorola/Siemens \$1,500	N/A	N/A	N/A	1998	64 MB DRAM
National Semiconductor \$650	South Portland	Me.	MOD 1	1996	Telecom
National Semiconductor \$650	South Portland	Me.	MOD 2	1996	Telecom
NEC \$1,100	Roseville	Calif.	M2	1998	16/64 MB DRAM
Philips \$1,500	Austin	Tex.	N/A	1997	16/64 MB DRAM ASIC
SGS Thomson \$615	Phoenix	Ariz.	N/A	1995	MPU Flash MPEG
Tecate Instruments \$600	Dallas	Tex.	DMOS 5 Phase 2	1996	MPU Custom
TSMC \$1,300	N/A	N/A	Fab 6	1998	Foundry

SOURCE: SEMI-TECHNOLOGY ASSOCIATION

