The Gee Whiz Company

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Any sufficiently advanced technology is indistinguishable from magic.

--Arthur C. Clarke from The Lost Worlds of 2001.

What do you call the ability to conjure up computer-generated dinosaurs for the movie Jurassic Park and make them look so stunningly real that the audience gasps and cringes? Or to bring President John F. Kennedy and John Lennon alive to meet actor Tom Hanks in this summer's Forrest Gump? Or to let you fly impromptu dogfights in flight simulators so convincing you can lose your lunch?

Mere parlor trickery? O.K., if virtual reality and velociraptors sound old hat, check this out: The same computers that performed these stunts have also helped design everything from jumbo jets to an ice-cream-bar shape that minimizes melting in the midday sun. And by giving doctors ways to locate tumors with pinpoint precision, these machines are instilling new hope in victims of once-inoperable brain cancer.

It's all the work of the most magical computer maker on the planet: Silicon Graphics Inc. It may not have the name

recognition of an Apple Computer Inc. or an IBM. But not since Apple dazzled the market with the trend-setting Macintosh has a computer company so captured the public imagination or promised so much for the future. From movies to molecular science, interactive TV to hyperactive video games, the digital imagery conjured up by SGI technology is pushing the computer industry into a new dimension--the third one, to be exact.

SGI's magic: eye-popping three-dimensional graphics. Its engineering workstations and computer servers transform reams of mind-numbing data into 3-D images that mere mortals can comprehend--whether these images are airplane wings, population trends, or a theoretical universe. It's not just playing back video, which any multimedia PC can do. With Silicon Graphics machines, intricately detailed and textured images can be turned and viewed from any angle or modified at will. It's no wonder they're used--or coveted--by the most demanding scientists and technology gurus.

In an industry marked by huge hype, Silicon Graphics is the genuine article: a truly innovative company with clearly unique products. "They're the new Apple," says Morgan Stanley & Co. analyst Steven M. Milunovich. Then, mulling Apple's recent struggles, he corrects himself: "The Microsoft of computer graphics."

Heady stuff. But it doesn't overstate the ambitions of Chief

Executive Edward R. McCracken. The 50-year-old engineer, a 26-year veteran of Silicon Valley, aims to bring SGI's "visual computing" to a wider audience in the same way Apple's easy-to-use Macintosh opened computing to the technologically challenged. Sales of multimedia personal computers with rudimentary graphics are already booming. McCracken figures that SGI's 3-D graphics will give the masses an entertaining roadmap to cruise the Information Superhighway.

At first blush, McCracken seems an unlikely leader for SGI's bold mission. An electrical engineer by training, he hails from a Midwestern farming family and is known for his stiff, introverted demeanor. In short, he's no Steve Jobs. But don't be fooled. McCracken isn't your typical CEO: He encourages what is now Silicon Valley's most freewheeling corporate culture and even takes time from his schedule to teach meditation classes for harried execs.

Most important, over the past several years, McCracken has steered SGI into a series of initiatives and partnerships that put it laps ahead of other computer makers on the Infobahn. When Time Warner Cable's interactive-TV trial starts in Orlando this fall, for example, SGI video servers will dish up movies on demand to homes with set-top boxes built around SGI chips. And the next big push by Nintendo Co. will be a videogame machine being designed jointly with SGI. In June,

SGI signed on AT&T to help sell SGI video servers and Nippon Telegraph & Telephone Corp. to use SGI servers to test interactive TV in Japan. "Everybody in the world seems to want to do business with us," says SGI attorney William M. Kelly.

BEIGE BUSTERS. No wonder, given SGI's overriding goal: Make computing fun. That's why the techno-cognoscenti are flocking, too. In addition to flashy graphics, SGI machines sport a hip, sexy look, boldly colored in anything but standard-issue beige. Normally jaded scientists, product designers, and video engineers regard the machines--which carry such monikers as Iris, Indy, and Onyx--with awe. Buy a $15,000 SGI machine, and you're part of a cult. "People are addicted to them," says Michael J. Zeitlin, an expert in computer visualization at Texaco Inc., which uses SGI workstations to penetrate seismic data.

SGI's sprawling Mountain View (Calif.) campus has become sort of a mecca. Celebrities such as artist Peter Max, director Milos Forman, and author Michael Crichton stop by to "grok" the latest technology. The offices look like a Soho gallery, what with exposed beams, winding steel staircases, and unusual art--mostly sculpture, as befits a 3-D company. This is the promised land--at least to its 4,200 employees and the 2,500 hopefuls who apply for jobs each month. The unofficial company motto: "Serious fun."

And serious money. When SGI reports fiscal year results on July 20, analysts expect a $141 million profit on a sales jump of at least 35%, to $1.5 billion--the third straight year of accelerating growth (chart). Its 52% gross profit margin tops workstation rival Sun Microsystems Inc.'s 42% and is more than double the level of PC powerhouse Compaq Computer Corp. Even though it is largely confined to a 3-D niche, SGI passed IBM and Digital Equipment Corp. in 1993 to capture third place in the $10.5 billion workstation market, according to International Data Corp. And with its shares trading at around 23, SGI's $3.3 billion market value now tops those of DEC and Sun. Even President Clinton has noticed. When he and Vice-President Al Gore unveiled their technology policy in Silicon Valley last year, their only corporate stop was SGI.

But can SGI keep the magic going? In targeting everything from supercomputers to videogames, SGI may be taking on more than it can handle. What's more, few companies have managed to make a smooth transition from selling leading-edge technology to serving high-volume consumer markets. That will stretch SGI's management and marketing skills as never before.

But SGI seems to love a challenge. In all of computing, there are few tasks more complex than the creation of 3-D graphics. Until SGI, most workstations could create only crude 3-D "wireframe" images that resembled skeletons.

The microprocessors, or silicon brains, in the workstations didn't have the power to draw complex graphics. No wonder. To create 3-D solids on a computer, you have to position thousands of different-shaped figures side by side, like pieces of a puzzle. Then, the figures must be converted into visible images by assembling tens of thousands of picture elements, or pixels--the myriad dots of light on the screen. Finally, to make the images move fluidly, they must be redrawn 30 times a second.

Two key innovations, based on the ideas of founder James H. Clark, make SGI's graphics fly. While an assistant professor of computer science at Stanford University from 1979 to 1982, he and six students came up with novel ways for building a cheap graphics computer. The result is the Geometry Engine, a collection of custom chips for speeding up model creation, and the Graphics Library, a set of 120 software rules that help developers create programs that turn models into realistic 3-D images.

By taking the graphics burden off the machine's central microprocessor, the Geometry Engine vastly speeds up the creation of 3-D models. The microprocessor can then concentrate on turning those models into images on the screen. Other computer makers, such as Hewlett-Packard Co. and Sun, also have add-on graphics circuits, but customers say their speed and realism trails that of SGI.

Says Carl Rosendahl, president of video production studio Pacific Data Images: "The others give interactive 3-D graphics a lot of lip service, but they haven't caught up."

VIRTUAL ACTORS. The lead in 3-D gives SGI a critical advantage. Basically, people find it easier to understand pictures rather than raw data. That's because half the human brain works like a graphics computer, rendering a 3-D world from 2-D images sent by the retina, says Richard Mark Friedhoff, author of Visualization: The Second Computer Revolution. So when a computer presents information visually, people can focus on the problem at hand. Says Friedhoff: "Visualization is the central driving economic force in the computer industry today."

It's no wonder customers quickly created hundreds of applications for SGI's 3-D graphics--many of them jobs never envisioned in 1984 when SGI sold its first workstation. At the University of Toronto, medical researchers use SGI computers to visualize the physics of cell surfaces to better understand diseases and immune responses. Most of the major commercial aircraft companies employ SGI machines to model airflow around a craft--without spending the time and money to construct physical models and test them in a wind tunnel. Ford Motor Co. uses hundreds of SGI machines to visualize future car styles and simulate crashes.

Then, there's film. In countless movies from The Abyss to

The Mask, a comedy due out July 29, SGI gear has turned special effects upside down. Where once each frame was painstakingly created using physical models, now software running on SGI equipment can create whole action sequences automatically--even virtual actors. While making The Crow, star Brandon Lee was killed before filming was completed. The movie was finished by using SGI equipment to digitally insert Lee into the new footage. The same techniques are making SGI a favorite on Madison Avenue, where agencies are using its gear to create dancing crackers, rubber phones, and other attention-grabbing graphics for TV commercials.

Hollywood provides more than just good PR. Says McCracken: "That market is stretching the rubber band the furthest for us in technology." In other words, says Thomas A. Williams, special-effects chief for Industrial Light & Magic, producer of the Jurassic Park special effects, "We drive them crazy." McCracken expects entertainment sales to double, to $400 million, in fiscal 1995.

Movies are only the start of SGI's move into entertainment. The deal with Time Warner Cable, a division of Time Warner Entertainment Co., could take SGI equipment wherever the cable system stretches. In the Orlando test, up to 4,000 homes will get stripped-down SGI workstations to surf through such interactive services as movies on demand,

home shopping, and videogames.

BLOWN DEADLINE. Nestled in a corner of SGI's headquarters is the "Time Warner Living Room"--complete with couch, easy chairs, coffee table, and TV. Since December, SGI has hosted couch potatoes in focus groups to see how they use SGI's on-screen program navigator. Unlike interfaces that require people to actively seek information, SGI's navigator software works almost like a videogame. The laziest sofa spud can "fly" effortlessly into virtual theaters and malls.

The payoff could be millions of set-top boxes based on SGI technology. SGI is feverishly working to embed many of the graphics features of its $5,000 Indy workstation into a $500 set-top box for Time Warner that will be manufactured by Scientific-Atlanta Inc. It's no easy job. In addition to chucking components such as monitors and disk drives, SGI must design in Scientific-Atlanta's technology and figure out how to shrink the whole thing into a few chips so that the boxes can be manufactured profitably. Already, SGI failed to meet a deadline for stripping down the Indy into a prototype for the set-top box, which helped push back the Orlando trial from April until at least October.

A success in set-top boxes would do more than open a new market. The added volume would help ensure the future of the microprocessors SGI uses. SGI wound up paying $231

million for chipmaker MIPS Computer Systems Inc. in 1992 after Compaq pulled out of a consortium called Advanced Computing Environment that was aimed at making MIPS-based PCs an industry standard. It was critical for SGI to ensure the future supply of MIPS chips, but the purchase led to an $118.4 million loss, its first since going public in 1986.

SGI's deals with videogame makers could also pump up the MIPS volume. Last August, Nintendo chose the chip for the forthcoming Ultra64 game machine, which will boast 3-D graphics. That deal could not only boost production of MIPS chips but also bring SGI $300 million in royalties by 1998, estimates Prudential Securities Inc. This spring, Sony Corp. announced plans to use a version of the MIPS chip built by LSI Logic Corp. to power its first videogame machine.

SGI technology is showing up on Main Street, too--in virtual-reality arcades where you can "ride" fighter jets, hovercraft, or prehistoric pteranodons. On July 1, Disney World's Epcot Center unveiled a virtual reality setup that lets you ride a magic carpet through Agrabah, the city in Aladdin.

For all the new efforts, SGI hasn't forgotten its traditional customers, which still account for most sales. For number-crunching scientists, SGI is pushing out ever more powerful computers such as the new Power Challenge servers, which perform as well as some multimillion-dollar supercomputers while costing $120,000 to $900,000. And on July 11, it will

introduce Challenge servers starting at only $12,000.

SHORT CYCLES. McCracken can take much of the credit for SGI's success. After 16 years at HP, where he was a fast-track manager running several computer systems group, he joined SGI in 1984 as CEO. The son of an Iowa corn farmer, he manages SGI's finances conservatively, helping it to produce seven straight quarters of on-target or better results. Founder Clark, however, regarded him as too conservative and left in January to start his own software company, partly because he wanted SGI to push more quickly into consumer markets than McCracken thought prudent. Clark's new company is writing software to help navigate the Internet.

Paradoxically, McCracken's cautious business philosophy allows SGI to make big bets in technology. He forbids managers from planning products more than two years ahead. "Nobody's smart enough to plan long-term in this industry," he says. Instead, SGI rams through product cycles as fast as possible--12 to 18 months--so the latest technology can be incorporated. If the Indy workstation design had started just three months earlier than it did, he says, it couldn't have included a new digital camera.

Remarkably soft-spoken--with a voice "like he's telling a bedtime story," says one manager--McCracken has replaced former Apple CEO John Sculley as Silicon Valley's man in

Washington. A lifelong Republican, he became a Clinton booster because of the Democrat's technology policies. Friends say McCracken is much less button-down than he looks. He has, for example, taken Silicon Valley's casual atmosphere far beyond Friday afternoon beer bashes. Two years ago, when two divisions were split into five, employees staged a wake, including a New Orleans band and cardboard coffins. Another SGI institution: an annual lip-sync competition that takes The Gong Show to new lows.

SGI puts its own aggressive twist on Valley ways: While other companies hold aerobics programs, SGI employees take karate and form bungee-jumping groups. That's not because they're young. In fact, the average age is 36--old enough by Valley standards to cause McCracken's 25-year-old son to hesitate before taking a job there. The company barely controls chaos--offices may move three times a year--but people seem to thrive on it: The 10% annual turnover rate is about a third of the Valley average.

It's not going to be so easy keeping that culture charging forward. As SGI reaches $1.5 billion in sales--and as up to 1,500 new people join next fiscal year--some former employees say political cliques are developing, and current staffers openly complain of burnout. Such problems may be starting to infect SGI's product development and customer relations. One former engineer says product cycles on

workstations have stretched from as short as a year in 1988 to more than two years on the next generation. McCracken says cycles are only a little longer, and that's because products are more complex.

A bigger problem could be arrogance--the disease that nipped Apple. Mark Malmberg, president of Xaos Inc., a San Francisco video-production studio, says SGI people told him he would be foolish to consider using competitive machines from Kubota Pacific Computer Inc. or HP. And Lawrence J. Ellison, CEO of software giant Oracle Corp., says an SGI marketing exec berated him for not producing a piece of software, exclaiming, "You must be stupid!"

McCracken acknowledges that some employees are "prima donnas." But he relies on a cadre of a dozen top engineers, including five remaining co-founders, to keep SGI on track by searching out problems--technological and cultural. And most customers are still enthusiastic. Brad deGraf, director of digital media at video producer Colossal Pictures Inc., thinks SGI is the one alternative to Microsoft Corp. that can set a new agenda for the industry. "Microsoft is the Evil Empire," he says. "No one would ever say that about SGI."

SGI faces more daunting challenges than cultural turmoil. For one thing, rivals keep trying--so far unsuccessfully--to take away SGI's lead in graphics. In May, HP introduced 3-D workstations that match SGI's performance in mechanical

design applications. And on July 12, Sun will again take aim at SGI with new models. Even PC makers may get in on the act: In April, 3Dlabs Inc. in San Jose announced a $150 graphics accelerator chip that it claims will bring SGI-level graphics to PCs.

SGI isn't ignoring PCs completely. Microsoft plans to offer SGI's Graphics Library software in Daytona, the next version of Windows NT. But McCracken says it isn't worth trying to bring SGI's graphics directly to mainstream PCs, which he views as tired, hopelessly limited, and not very profitable.

Eventually, though, competition could force SGI to drop prices faster--or face getting left out of the mainstream. Warns Robert G. Pearson, director of Sun's advanced systems and a former marketing manager for SGI: "Apple had hot products, but then the volume standard [IBM-style PCs] eventually won."

Even if SGI doesn't broaden its appeal, it still has plenty of room to grow. But McCracken is determined to push beyond his niche markets. That's why he keeps prowling the Info Highway: He figures that if he can get others to back SGI's approach, he'll have it made.

Some rivals wonder if SGI's Lamborghini technology is too exotic for the Info Highway. Says James D. Olson, general manager for HP's Video Communications Div.: "It's like trying

to sell school buses into the minivan market."

For now, however, there's little downside to the consumer push. SGI is not manufacturing any consumer devices, and both Nintendo and Time Warner are paying for the R&D on their projects. Even if the Time Warner deal doesn't pan out, SGI will have pushed its chip designs, networking, and user interface in directions that could make its workstations far more appealing.

The bigger risk may be keeping the company on track. SGI has little experience in consumer markets mr in managing a high-volume business. Already, concedes Chief Operating Officer Thomas A. Jermoluk, "the company is bigger than anything any of us has ever run."

At this point, the company seems up to the task. Last fall, for instance, SGI proved it could still move quickly to avoid a major market blunder. When it realized a new version of its operating system was causing some programs to run like snails, Silicon Graphics stopped shipping machines for six weeks and mobilized hundreds of engineers to fix the glitches. Thanks to the quick action, it managed to post a record quarter.

That ability to turn on a dime may prove SGI's most potent weapon in years to come. Now, if it just doesn't go too Hollywood, SGI may well show the world the future of

computing--in living 3-D color, of course.