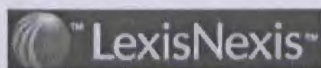


IRWIN JACOBS, CHAIRMAN AND CEO, QUALCOMM

- Irwin Jacobs is best known for being involved in the manufacture of boats of all types and running one of the biggest companies in the country.

Jacobs also owns and operates Forrest L. Wood Outdoors, the largest professional fishing organization in the world.

- Research on the use of digital technology to transmit information inspired Jacobs to write a textbook while teaching at the Massachusetts Institute of Technology in the late 1950s, and later compelled him to create the OmniTracs tracking system for the transportation industry.
- Jacobs also is an inventor of the Code Division Multiple Access technology used in digital wireless applications.
- In the 1980's he made tens of millions of dollars in stock transactions as a result of takeover runs against Disney, RCA, Kaiser Steel, Avco, Holly Sugar, Phillips Petroleum, ITT, AMF, Minstar, Internorth, Tidewater Inc
- Irwin Jacobs confronted ITT chairman Rand V Araskog at annual meeting and reiterates his proposal that company spin off operations to restructure itself into three or four separate companies May of 1985
- Awarded the 1994 National Medal of Technology
- His penchant for acquiring troubled concerns, and selling them off piece by piece, has earned him the nickname Irv the Liquidator. "There's nobody that can buy or sell as well as Irwin Jacobs,"
- Jacobs made the first cell phone call from an airplane July 15th, 2004. (He called Steve Largent)



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August 28, 1985

SECTION: Vol 3; No 10; Sec 1; pg 42

LENGTH: 1086 words

HEADLINE: The Man Behind Irwin's Image

BYLINE: Jim Buckman

DATELINE: Minneapolis; MN; US

BODY:

AN EXAMINATION of **Irwin Jacobs** as a leader must begin with the mythology surrounding the term "raider."

There are some intriguing parallels between **Irwin Jacobs** and the head "Raider," Al Davis, owner and guiding force behind the Los Angeles Raiders football team.

Both are outsiders, not members of the club. Both are winners in the courtroom or on the field. Both have fearsome public images that contrast strongly with the perceptions of their friends and working associates. Both attract strong, talented people, pay them well and give them a long leash. Both bend the rules of the club and create new opportunities where none previously had been perceived.

In a business world populated mostly by gray, cautious corporate executives, **Irwin Jacobs** stands out in stark black and white.

After looking at Irwin as a leader (friends do not refer to him as "Irv") and interviewing the man and those who surround him, I came across several descriptions repeatedly.

The first and most important characteristic is his personal honesty: "When Irwin gives you his word, you can take it to the bank."

"He's highly principled."

The second attribute, closely related, is his ability to generate trust, loyalty and friendship.

Carl Pohlad says Jacobs is "as close a friend as I've got."

Dan Lindsey, who works for Jacobs, adds, "After these years together, I see him as a friend."

Says Jerry Schwalbach, of Jacobs Management, referring to his boss's takeover experience, "If we can ever get beyond the lawyers and investment bankers so that people can meet Irwin the man, things are

much easier."

Pohlad also believes Jacobs is the "most perceptive individual I've met. He's great not only at seeing opportunity -- which a lot of people can do -- but in acting quickly without a lot of unnecessary analysis." Others see that same characteristic as flexibility and a willingness to change quickly.

At the source, perhaps, of that ability to move quickly is Jacobs' tendency to see things in black and white. "With Irwin, you're either for him or against him," says one associate. "There's no gray with him."

I realize I am getting only part of the picture by talking with Minstar people or with Pohlad about **Irwin Jacobs**. Yet my purpose is not reportorial "objectivity."

I am interested in looking at the man, and in seeing Minstar and his other interests as a "shadow" of Jacobs' personality and character.

Of particular interest in all this is the huge gap of understanding most of us have about who this man is, how he operates and what he has created.

Because he has been termed a "raider" -- and lumped by both national and local media with the likes of T. Boone Pickens, Carl Icahn, Saul Steinberg and Victor Posner -- it is very tempting to dismiss Jacobs' accomplishments.

But to focus on "Irv the Liquidator" can bring one quickly -- and inaccurately or incompletely -- to two conclusions: that he buys living business entities and sucks them into his empire, destroying their individuality in the process, and that he is primarily a manipulator of people and paper, rather than a man of substance.

This "raider" mythology is laughably off the mark compared with the real **Irwin Jacobs**. Pohlad says it best: "Raider?! What the hell is that? Irwin is not a raider at all. He is an active partner-manager-investor, that's all. He's the same as any other investor, only a hell of a lot better."

Despite that "raider" media image, and the rapid growth of Minstar and other interests by hostile takeover, it seems the real story of **Irwin Jacobs** is not how he buys companies but how he runs them.

On the surface, at least, I am impressed with him and his people as operators. Rather than creating a large, complex bureaucracy to run their acquisitions (a la ITT), they manage a nearly \$ 2 billion enterprise with a corporate staff of fewer than 15 people.

Lawyers are few, the staff is small and rules are practically nonexistent. (Making a profit and operating by the Golden Rule are the only ones I'm aware of.)

Irwin has created a near-perfect prototype of what Tom Peters has long extolled: an organization built on trust, friendship and speed of action.

An example of Jacobs' and his people's ability to run companies is the Aegis Corp. takeover. They paid \$ 59 million for Aegis and within 90 days had sold off three of the six divisions. Those divisions contributed only 7 percent of the corporate sales volume. Yet they subtracted 50 percent of the profits generated by the healthy divisions.

In addition, they shut down the corporate office in Coral Gables, Fla., saving \$ 3.5 million per year. After selling off the unprofitable pieces for \$ 8 million to \$ 10 million, the net investment was about \$

50 million and the profits now being generated are over \$ 24 million per year!

Furthermore, product quality and employee morale in the remaining divisions are vastly improved, a fact Jacobs attributes to the feeling of being winners.

"The people at Wellcraft love it," he proclaims. "They are now our best salespeople in bringing Hatteras (yachts) into the fold. And so it just keeps on going. That sense of winning is starting to spread in AMF."

The "raider" mystique has strong connotations of greed, arrogance and egotism. If that were anywhere close to the mark, **Irwin Jacobs** would not have attracted powerful men like Ted Deikel, Tom Epley, Carl Pohlad, Jerry Schwalbach, Dennis Matheson, Dan Lindsey and Jim Farrell to rally 'round him.

In talking to these people and others, I found no fear of Irwin, no reluctance to disagree with him, and lots of candor and smiles -- in short, few of the symptoms I've come to recognize in organizations run by tyrants and egotists. (And I've seen plenty.)

And so, I suppose, I've also come under the man's spell. But Irwin is not St. Francis of Assisi, either. You clearly wouldn't want to be on the wrong side of a fight with him.

Despite a lot of talk from Irwin and others about the importance of family, the man is ambitious. "Don't let anyone kid you," one source says. "Irwin works his butt off -- and so does everyone else around him."

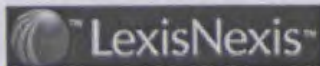
But whether one comes, as I have, to enjoy **Irwin Jacobs**, there is no denying one thing: This rag-picker's son is one of the most powerful and extraordinary leaders in the country.

After 10 years in the consulting business, I've met fewer than 10 people for whom I'd want to work as an employee. Despite barely knowing him, **Irwin Jacobs** is one of them.

GRAPHIC: Photo

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Wireless News

September 4, 2004

LENGTH: 181 words

HEADLINE: Wireless Events: Qualcomm's Dr. **Irwin Jacobs** Headlines San Diego Telecom Council Event

BODY:

WIRELESS NEWS-4 September 2004-Wireless Events: Qualcomm's Dr. **Irwin Jacobs** Headlines San Diego Telecom Council Event ©2004 10Meters - <http://www.10meters.com>

The San Diego Telecom Council (SDTC), an organization developing and cultivating awareness of the region's telecommunications industry, will host wireless technology pioneer and co-founder, chairman and CEO of Qualcomm, Dr.

Irwin Mark Jacobs, for his first appearance in front of the council's membership in six years at the next Headliners event September 14, from 5pm to 7:30 p.m. at the La Jolla Marriott.

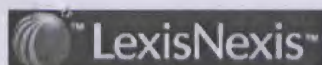
Dr. Jacobs will be interviewed by industry analyst, Andrew Seybold on the mobile communications revolution and the industry's transition from second-generation to third- generation technologies.

Dr. Jacobs will discuss the latest developments in wireless from the incorporation of location services and multi-megapixel cameras to the addition of applications such as digital video in the latest handsets.

(Comments on this story may be sent to newsdesk@10meters.com)

(Distributed via M2 Communications Ltd - <http://www.m2.com>)

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April 14, 2003 Monday
Late Edition - Final

SECTION: Section C; Column 2; Business/Financial Desk; Pg. 1

LENGTH: 1848 words

HEADLINE: As Qualcomm Plots Future, C.E.O.'s Son Awaits Role

BYLINE: By MATT RICHTEL

BODY:

As a young man, Paul E. Jacobs discussed antennas and data transmission rates with his father the way many of his friends and their fathers talked balls and strikes. So in 1985, when Irwin M. Jacobs started Qualcomm, a pioneering firm in mobile phone technologies, it was natural for his son to spend summers working there.

"We would talk about all the angles sitting at dinner, driving everyone else crazy," said Paul, who began work on a doctorate in electrical engineering at the University of California at Berkeley the same year Qualcomm was founded. "We had a mission."

Qualcomm, now a \$3 billion maker of software and microprocessors for mobile phones, has steadily grown into one of the titans of wireless software though consumers may now know it best for its Eudora e-mail software.

Today, **Irwin Jacobs**, a founder and driving force of Qualcomm, holds the corner office. Down the hall is Paul Jacobs, the president of Qualcomm's Internet and wireless group, one of the company's most important divisions, and who is considered by many inside the company and by some outside of it to be a strong candidate to succeed his father as chief executive.

For now, the elder Mr. Jacobs, at 69, is showing no signs of quitting or reducing his role in the company. And he has offered no indication about who his successor might be. But Paul Jacobs, 40, has made quite clear that he hopes to be chosen. Asked when his father might step aside, Paul Jacobs laughed and said: "Ask him when that might be. Then tell me what he said."

The company's board might see promise in having another Jacobs at the helm. The younger Mr. Jacobs is generally favorably regarded by the board and Wall Street as an innovative engineer. But a potential strike against Paul Jacobs is that he was the manager in charge of Qualcomm's troubled handset division, which briefly ceased production in 1998 because of connector problems within its mobile phones. The division was later sold. Also in his disfavor, thorny management problems are often raised by having a family member succeed another in a Fortune 500 company.

Corporate governance watchdogs are often skeptical when succession turns into a family affair. In businesses large and small, there are at least as many examples of children faring worse in the family business than there are of those who did better than their parents.

In the case of Qualcomm, said Nell Minow, the editor of the Corporate Library, a corporate governance research group, "This board should be very clear about what their succession plan is, and they're going to have to do better than say, 'This guy is in the family.' "

Neither the company's annual report to the Securities and Exchange Commission nor its Web site, for example, mentions the Jacobs's familial relationships, said Paul Hodgson, a compensation expert with the Corporate Library. A second Jacobs son, Jeff, also works at the company as the leader of its global development division.

According to Mr. Hodgson, **Irwin Jacobs** earned \$63.5 million last year, \$61 million of that from stock options. Paul Jacobs earned \$4.2 million last year, with \$3.4 million from options. Salary information for Jeff Jacobs was not available.

Although family connections are a prominent part of corporate life at Qualcomm, Wall Street analysts have not necessarily found that situation to be a hindrance to the company's performance. On the contrary. "Against a very strong headwind and against all of these critics, Qualcomm has won," said Mark A. Roberts, an analyst with Wachovia Securities.

In the mid-1990's, the company had to overcome skepticism that its technology would take hold. It pioneered the commercial use of CDMA, which stands for code division multiple access, one of the two dominant standards for how data and voice traffic are delivered over wireless networks. Already, that standard is used by 40 percent of mobile phone subscribers in the United States for voice traffic.

But worldwide, 80 percent of phone users rely on the competing standard, GSM, or global system for mobile. Both standards are poised to upgrade to a third generation -- the so-called 3G of mobile networks -- which will allow faster delivery of data. These new networks will enable phones to become mobile entertainment devices with animated games, video capability and high-speed Internet access.

Qualcomm currently earns a royalty of around 5 percent of the wholesale price of each cellphone sold that relies on CDMA technology. It expects eventually to get a similar percentage for 3G phones based not only on its new standard, CDMA2000, but also on those based on the competing standard, W-CDMA, the wideband version of CDMA, which includes both CDMA and GSM software. The reason is that in Europe, Asia and the Middle East, where GSM is dominant, mobile phone carriers have said they intend to make their phones compatible with CDMA, making them likely to adopt the W-CDMA standard.

But it may take as long as a decade before W-CDMA becomes widespread. And there is the risk that another wireless technology could emerge in the interim. Still, some Wall Street analysts are sanguine about Qualcomm's prospects for remaining a leader in its field.

"Assuming 3G gets deployed, I liken Qualcomm to a toll road," said Mr. Roberts, the Wachovia analyst. "If you want to get on the road, you'll have to pay a toll to Qualcomm." Within six years, 50 percent of cellphones in the United States will use CDMA, Mr. Roberts predicted. He said he believed Qualcomm would eventually receive royalties on 80 to 90 percent of all mobile phones because they will include some form of CDMA. Others are more skeptical about whether CDMA is the best long-term technological solution.

CDMA licensing is one of the two pillars of Qualcomm's business. The other is the manufacturing and sale of the chip sets that power mobile phones. That line of business is less certain and generally less profitable than collecting CDMA royalty fees. But it can offer the prospect of high revenues, which explains why Qualcomm has begun an ambitious effort to expand its chip set business where its only real competition is Nokia.

In the future, Qualcomm wants to be a leader in manufacturing chip sets for use in the W-CDMA standard, which means it will have to engage in fierce competition with Motorola, Texas Instruments and Intel, among others. Whether Qualcomm succeeds is "the billion-dollar question," Mr. Roberts said.

In the shorter term, the question is whether Qualcomm can keep its stock price from eroding. The price reached \$200 a share in early 2000, and then declined along with the rest of the technology industry. It closed Friday at \$31.88, but even at this price some analysts worry that the stock is valued too highly compared with the rest of its sector.

For now, the challenge of leading Qualcomm falls to **Irwin Jacobs**, who taught electrical engineering at the Massachusetts Institute of Technology from 1959 to 1966 and was a founder of a company called Linkabit, which designed telecommunications equipment in the 1970's and early 1980's.

In the summer of 1985, while driving from Los Angeles to San Diego, he came up with the idea for using CDMA for mobile networks. The telecommunications world initially dismissed this approach because TDMA, or time division multiple access, another technology, was considered the one likely to become the basis for mobile phone communication.

Mr. Jacobs proved that CDMA could provide better clarity and security than TDMA. And now Verizon Communications and Sprint, among others, use CDMA to operate their networks. With astute marketing, he has created a hugely profitable intellectual property business. In the first quarter of its 2003 fiscal year, which ended Dec. 29, the company announced \$1.07 billion in revenue and \$344.7 million in profit.

"Irwin is one of the world's best communications scientists," said Robert E. Kahn, a member of Qualcomm's board, a former colleague of Mr. Jacobs's at M.I.T., and one of the creators of the Internet. "He understands the theory and the practical application."

Paul Jacobs has as intense an interest in the science of telecommunications as his father. Instead of entering the academic life as a professor, he joined Qualcomm in 1990 shortly after he received his doctorate from Berkeley. During his early years at Qualcomm, he worked on the engineering for the antenna of Qualcomm's OmniTracs system, which is used to track the routes of freight trucks. He worked on the speech compression algorithm for CDMA, and holds a patent for part of the technology -- one of more than 25 Qualcomm patents that he helped develop. (Qualcomm currently has 2,655 patents issued or pending.)

In 1995, he took over Qualcomm's fledgling handset business. The goal was to make phones in a partnership with Sony that would prove the viability of the CDMA technology. But that enterprise was plagued by manufacturing problems and in 2000 Qualcomm sold the handset business. Paul Jacobs said that episode created strains in his relationship with the board that are still evident. "I suspect I'm still working on it," he said.

More recently, he has been the driving force behind BREW, the binary runtime environment for wireless, a platform that allows the development of numerous applications for mobile phones, including games, that Qualcomm hopes will drive demand for wireless networks.

"I have a vision for this company," he said. "I believe the wireless Internet will become bigger than the wired Internet." But whether he can lead Qualcomm with that vision will depend on the board. "If the board thinks it'll happen, it'll happen. If they don't, it won't."

For now, board members are not talking about a successor. "The board isn't going to get into a deliberation on that until it's clear that Irwin is stepping down," Mr. Kahn said. He added that Paul Jacobs has compiled a good track record. "He has a very strong technical background and he's been given a lot of challenges. He has coped with all of those challenges."

The board itself will come under scrutiny in coming months. The Corporate Library plans to publish its annual ratings of corporate boards in late May. Ms. Minow said the group has concerns that Qualcomm's board is not providing sufficient oversight. For now, she said, one of the board's top priorities should be determining how it will deal with the eventual departure of a chief executive who turns 70 in October. "The No. 1 job of the board is C.E.O. succession planning," she said.

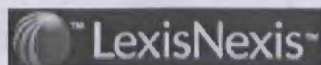
For his part, **Irwin Jacobs** is saying little about his future. He said that he continued to love his work. He also said, in an apparent nod to his son Paul: "This business has been quite successful with someone who has an engineering background. You take good people wherever you can get them."

Whether the board will agree is an open question, but there is no doubt that **Irwin Jacobs** is proud of the connection between his family and his company. When asked how many of his 10 grandchildren he would like to see at Qualcomm, Mr. Jacobs responded immediately, "I'd like to see 11."

URL: <http://www.nytimes.com>

GRAPHIC: Photos: Paul E. Jacobs, above, is president of the Internet and wireless group of Qualcomm, which is led by his father, Irwin M. Jacobs, left, a founder of the company. **Irwin Jacobs** is 69 but has not indicated he plans to retire or reduce his role at Qualcomm. Paul is viewed as a strong candidate to succeed him as chief executive. (Photographs by Dave Gatley for The New York Times)
Graph: "Growing Steadily" Despite the technology industry downturn, Qualcomms business is growing. CDMA, the wireless phone technology it developed and the wideband version, W-CDMA, are gaining in worldwide market share. Graphs track spending on network equipment by technology, semiconductor sales for handsets and Qualcomms revenue for Fiscal years ended Sept. 30, since 2000. (Sources: The Yankee Group; In-Stat/MDR; Wachovia Securities)(pg. C2)

LOAD-DATE: April 14, 2003



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Fortune

March 3, 2003

SECTION: FEATURES; Pg. 142

LENGTH: 4200 words

HEADLINE: Heads We Win, Tails We Win;

As cellphones continue their takeover of the world, one company is certain to succeed: Here's how Qualcomm does it.

BYLINE: James Aley, Reporter Associate Ann Harrington

BODY:

If you're lucky enough to find yourself in the 18th-floor ballroom of the Beijing Hotel when the weather is clear and sunny, as it was one crisp day this past December, you'll be treated to an amazing view of the Forbidden City, Tiananmen Square, and, if you lean way out over the terrace railing, the famous portrait of Mao Zedong. I, however, wasn't looking at any of that, because the Korean guy in the chair in front of me was showing me a porno movie on his cellphone. Pretty good picture quality too.

There we were, waiting for a speech by **Irwin Jacobs**, CEO of Qualcomm, the wireless technology company. The official topic of these proceedings was third-generation, or 3G, wireless technology. You remember 3G. It was hyped relentlessly back in the bubble days: We would all soon be watching TV on our mobile devices--which wouldn't just be phones. We'd be downloading and listening to music, using real-time global-positioning-system maps, shopping for shoes while we waited for the bus, and on and on. European carriers spent upwards of \$ 100 billion just on licenses for the radio spectrum necessary to offer 3G. Yet the planetary 3G transformation simply hasn't happened as fast as predicted. As problems with equipment and even more problems with rolling out a worldwide technical upgrade set back the industry's plans, hype over 3G reversed into extreme skepticism. But now, one recession later, I had just caught my first really good look at our future. For there is no more convincing sign of a technology's impending arrival than a naked woman writhing on a color screen.

At least, that's the hope of the wireless industry, which needs help. Consumers around the world will buy 460 million cellphones this year and spend \$ 390 billion on their cell services, according to an estimate from Yankee Group, a research firm in Boston. Yet competition among carriers has driven down the average per-minute revenue they collect from their users. In the U.S., wireless calls cost close to 10 cents a minute--about half what they were three years ago, according to Mark Lowenstein, head of Mobile Ecosystem, a consulting firm in Wellesley, Mass. Enabling users to buy games or pay for add-ons like multimedia messaging, the thinking goes, will increase bills.

Wireless technology--even the G-rated first-and second-generation kind--is about as close as most of us get to an everyday miracle. The fact that it works at all is a triumph of mathematics, physics, and fantastic sums of money. The system we have today is also a product of protracted strife. Technology has a way of making itself widespread and practical only after going through a period of struggle between competing standards. Think VHS vs. Betamax, Microsoft vs. everyone else--those have been some of the most dramatic stories in business. As it staggers into 3G, the wireless industry is going

through the same travails. The process resembles nothing so much as a three-dimensional game of Twister, with a scrum of transnational companies frantically contorting themselves into favorable positions to influence how 3G will unfold.

There is a discernible order here, however, and it comes down to two loose, overlapping alliances of carriers and governments and network-equipment and handset manufacturers. On one side are Verizon Wireless, Sprint, all of South Korea, and various other companies abroad, which all rely on a standard called CDMA (code division multiple access). On the other, much larger side, are Nokia, the biggest manufacturer, and pretty much the rest of Europe; AT&T Wireless, Cingular, and T-Mobile in the U.S.; and a whole lot of carriers and manufacturers from even more parts of the world, which all adhere to a standard called GSM. (This used to stand for "Groupe Systeme Mobile" but changed to the more ambitious-sounding "global system for mobile.") Along the way to 3G, each side is arguing about what's real 3G and what's merely "2.5G." These arguments involve even uglier thicket of acronymic horrors--we'll spare you. But the end result is that 3G is coming in two flavors: CDMA2000 in the CDMA world and WCDMA among the GSMers. (For more on the brave new world of cellphones in the U.S., see Alsop on Infotech.)

Here's what makes **Irwin Jacobs** more excited than the man sitting in front of me: No matter which of those alphabet soups comes out on top, Qualcomm wins. The company's technology and patents reside at the heart of both standards. For years Jacobs was the outsider fighting to be accepted in the wireless world; now his company is essential to its future. The story of how he pulled off this transition provides a lesson for any company struggling to succeed in tech: Fielding great technology helps; owning the playing field is even better. "Qualcomm has largely won the war," says Lowenstein. "Every major vendor of equipment and devices for 3G has to use CDMA. To live and breathe, they have to use CDMA. And to do that, they have to license from Qualcomm."

So Qualcomm knows it has a sizable stake in 3G, but how big it will be--ah, there's the question. Of course, other major players, most notably Nokia, are betting huge amounts in this game as well. And right now the most furious action is taking place in China, which helps explain why Jacobs had flown all the way from California to attend this one-day meeting in Beijing. But we're getting ahead of ourselves.

In the beginning--or, anyway, in the early 1990s, which was about when the standards battle began--there was GSM. GSM had long been the focus of the European telecom industry, with equipment manufacturers, carriers, and governments devoting roughly a decade to hammering it out. The initial goals, among others, were to offer digital service and continent-wide roaming; the result was a standard that swept the world. Today about three of every four of the world's cellphone subscribers use GSM. And the standard's rise launched at least one name into the Marlboro/Coca-Cola class of global brand recognition--Nokia, which rode the GSM wave better than anyone. There's probably no better example than GSM of how governments and industry can come together to create something truly useful, lasting, and profitable. There's also probably no other type of technology that gives Europeans as warm a feeling of superiority over Americans.

That feeling would be even more satisfying if **Irwin Jacobs** hadn't come out of retirement. A tall, rangy man, Jacobs, who will turn 70 in October, grew up in New Bedford, Mass., and still has the accent: His speech in Beijing referred to "lahge mahkets," and "data" was rendered "dater." Jacobs has a calm and patient demeanor that's somewhat surprising given the intensity of the industry he's in. If anything, he comes across much more as the professor he used to be than the high-tech potentate he is now.

By the time he founded Qualcomm, Jacobs had already built a name for himself in telecom. He had taught electrical engineering at the Massachusetts Institute of Technology and the University of California at San Diego and had started and run a company, Linkabit, that developed, among other

technologies, satellite communications for the military. In April 1985, at age 51, he began his retirement. It lasted until that July, when he and six associates launched Quality Communications, now Qualcomm, in San Diego. Jacobs had long been familiar with CDMA. (The idea of CDMA has been around a long time. In fact, an early patent for one of the technological building blocks of CDMA was granted to, of all people, the Hollywood actress Hedy Lamarr. She's much more famous for appearing in one of the first nude scenes in film history, proving once again that there's no more convincing evidence of a technology's arrival than a woman writhing on a screen.) Jacobs says that one day as he was driving down Interstate 5 from Los Angeles to San Diego, it just kind of dawned on him to use CDMA for commercial purposes.

It was not an obvious idea. The telecom industry at the time was already in the middle of planning its upgrade from analog to digital networks, and the front-running technology in the U.S. was TDMA, which stands for "time division multiple access." (TDMA is also a part of the GSM standard.) Jacobs and his team experimented with CDMA and became convinced that it was a better choice. They spent a year developing a prototype system, which they brought to an industry conference in Chicago in 1989. Then came the really hard part for Jacobs and his engineers: finding a huge customer willing to trust their tiny firm to create a real, live CDMA network.

Thus began what industry people, especially Americans, call the "holy war" era. Qualcomm was just a small group of commandos trying to secure a beachhead in a world dominated by an entrenched rival, GSM. At conferences and in the press, Jacobs and his crew took every opportunity to proclaim that CDMA offered better voice quality and was cheaper to run. That is, it gave carriers more capacity for a given slice of the radio spectrum. Qualcomm also touted its technology's ability to do a "soft handoff," which is technical jargon for the network activities that occur when you and your cellphone move out of one cellular tower's range and into another's.

After having invested so much effort and money (and pride) in GSM, the Europeans and their technological fellow travelers were, understandably, not very receptive to a bunch of smarty-pants Americans. "Everyone knows CDMA is technologically superior to the early GSM," says Lauri Rosendahl, a telecommunications analyst for Deutsche Bank in Helsinki. "But it's like having a railroad built in your country. Say the railroad has three feet between the rails. Someone comes by five years later with a better system, but that system demands four feet between the rails. It's irrational to rip out track that's already been built. It's not practical to replace one thing with something slightly better. It has to be hugely better."

Jacobs did manage to sell his technology outside Europe. Six years and much pavement-pounding after that demo in Chicago, the first commercial CDMA network was launched in Hong Kong in 1995. Bell Atlantic (later absorbed into Verizon) rolled out the first U.S. network the following year; today about 40% of the cellphone subscribers in the U.S. are on CDMA systems.

Since that time, Qualcomm's business changed too. It used to manufacture both handsets and network equipment, but by 2000 had sold off both businesses to Kyocera and Ericsson, respectively. Those moves have left Qualcomm with two big-money businesses that provide 84% of its \$ 3 billion in annual revenues and 98% of its \$ 360 million in earnings: CDMA chipsets for cellphones (Qualcomm designs the chips and outsources their manufacture) and technology licensing. Since Qualcomm owns many of the core processes that make CDMA cellular systems work, anyone who wants to get into the CDMA game will at some point have to pay up. That's translated into healthy 12% net margins in an industry known today mostly for its financial wreckage.

If Qualcomm does nothing in a 3G world but license its technology, it thrives. If it does that and continues to sell a lot of chipsets for all those new phones--whether they're for the U.S. or Europe or

anywhere else--it thrives even more. And the best case of all? That we all turn Korean.

If South Korea were part of the U.S., its license-plate motto would be THE CDMA STATE. It is a nation of early adopters who possess the tech savvy to rival that of anyone else on earth. Korea was the second country to launch CDMA networks--in 1996--and it's been all-CDMA ever since. It's also the best place to see CDMA2000 in action.

One thing you notice in Seoul is that Koreans don't seem to regard their cellphones as cellphones but rather as miniature multimedia entertainment/information centers. Koreans use their phones for multiplayer games over the network, snapping and sending pictures or videoclips, and soon they'll be using them as maps.

Korean carriers don't just sell minutes and free weekends; they sell whole lifestyles. If women in their 20s or 30s buy a wireless package called Drama from one of the big local carriers, for example, they get access to Drama House, a chain of exclusive clubs for which the closest American analog would be an airline's red-carpet lounge. Despite being male and a Drama noncustomer, I was permitted entry into a Drama House in Seoul. The luxe decor is variations on white, sprinkled with random sayings in English. (The wall in the Internet cafe area inexplicably reads A FRIEND IN NEED IS A FRIEND INDEED.) There's a cosmetics counter, a library, an ATM-like contraption called a Drama Health-Age Analysis machine, and a cappuccino bar.

At Sang Moon High School in Seoul, I met a whole classroom of 16-year-old boys on their lunch break. When the teacher asked for volunteers to show off their cellphones, none of the students moved. It could have been that the windows were all open and the temperature was not much above freezing. More likely it was the fact that cellphones are not allowed on campus. So the teacher made it clear that he was offering a kind of temporary cellphone amnesty, and phones magically appeared around the classroom. Out of 30 or so kids, maybe three or four weren't carrying phones. Those weren't crummy units either--they had color screens and lots of bells and whistles. A couple of the kids broke into a multi-user game, one phone against the other. Several were taking pictures.

Korean carriers as a group have watched their data revenue, as a percentage of total revenues, triple over the past two years, according to Merrill Lynch. The country is a living example of the "tastes great" rationale for 3G, as one industry executive, Don Listwin of mobile-phone software company Openwave, puts it. That is, 3G promises to let telecom providers sell all manner of lucrative new services based on data--games, photo and video messaging, mapping. Then there's the "less filling" part of 3G: It allows much more traffic to be carried over the same amount of spectrum. If there's one thing the wireless industry tends to agree on, it's that a 3G world would be a good and profitable world.

The question in GSM-land was how to get there. Over the years GSM proved an amazingly successful workhorse of a standard. But the technology was based on a circuit-switched approach, allowing voice to travel as one continuous stream. To send data efficiently, the network needed to be able to chop information up in packets, which the original GSM didn't allow. In the mid-1990s the GSM world started the painstaking process of plotting its future. The players considered a handful of technologies, and after a period of deliberation, a consensus emerged. The third generation of cellular technology would be called UMTS--universal mobile telecommunications system--and would use a CDMA-based technology called wideband CDMA, or WCDMA.

You'd think Qualcomm would have been delighted with the Europeans' decision to embrace CDMA. But no. The details are complicated here, but Qualcomm thought they were going about it all wrong. For one thing, WCDMA wasn't completely compatible with existing CDMA networks. More than that, Qualcomm insists that the WCDMA decision was an attempted end run around the company's patents.

"The only reason WCDMA exists is because Europe wanted to do something different that wasn't done by Qualcomm," says Rich Sulpizio, Qualcomm's former president and current head of its China operations.

Yes, well, only their hairdressers know for sure. The result is the same: By summer 2002, Qualcomm says it had signed licensing agreements with virtually all companies planning to use WCDMA technology--deals that Qualcomm says provide royalty rates comparable to those that it earns from CDMA2000 contracts. Not satisfied with just clipping coupons from his patents, Jacobs quickly set out to create the chipsets for the phones and equipment the GSM world will need to power its 3G upgrade. Qualcomm has introduced a line of chipsets for WCDMA phones, which are already sold in Japan, and is working on chipsets that will run both WCDMA and CDMA2000.

Qualcomm says it is happy with both standards, but pull executives aside and they'll admit that they would rather see CDMA2000 flower across the globe. The company makes money in both worlds but will make more of it--and make it faster--with CDMA2000, for two reasons. The first is that CDMA2000 has already taken off, with 37 CDMA2000 networks up and running around the world, vs. two WCDMA networks. (To be fair, GSM partisans say most of today's CDMA2000 networks haven't attained true 3G status yet.) In the U.S., where the technology has taken longer to get off the ground than in Korea, Sprint has completed the first phase of its upgrade, and Verizon is most of the way there. The second reason is that Qualcomm has fewer competitors turning out CDMA-2000 chipsets. Last year the company sold 79 million cellphone chipsets; most were CDMA2000. "Qualcomm has a commercial interest in pushing CDMA2000. The market is there," says Herschel Shosteck, chairman of the Shosteck Group, a telecommunications consulting firm in Wheaton, Md.

Investors appear to be expecting nothing less than perfection. Qualcomm was one of the best-performing stocks of the 1990s, reaching a high of \$ 179 in 2000. At a recent \$ 37.65, Qualcomm was still trading at 27 times expected 2003 earnings, vs. 16 for the S&P.

So Qualcomm has come full circle. A decade ago its main task was to prove that CDMA would work commercially. Today the issue is how big it's going to win in the next generation of wireless. "**Irwin Jacobs** is my hero," says Joe Nordgaard, who runs wireless-industry consulting firm Spectral Advantage in Fair Haven, N.J. "Dr. Jacobs and his team have had to maneuver among some of the largest corporations in the world. A number of these companies went to great lengths to try to muscle Qualcomm out of the game." Does Dr. Jacobs feel vindicated by all this? "Well," he says, "let's say I'm pleased."

Nokia is not out to please **Irwin Jacobs**, but you won't hear much of that kind of talk in Nokia's peaceful headquarters. In fact, one of the most common words you'll hear from Nokians--actually, from wireless types in general--is "agnostic." As in "Our view has always been technology agnostic"--those being the words of Jorma Ollila, Nokia's CEO. He's sitting in a conference room outside his office in the de facto seat of the GSM world, also known as Nokia House, the company headquarters complex just outside Helsinki. The building is lovely--lots of glass, steel, and soaring walkways, all of it warmed by a liberal use of wood. Imagine an atrium hotel designed by Ikea. It's a practical, unassailably reasonable place, just like the words that come from Ollila. "We always saw CDMA as a technology that has a role," he says. "I was there in 1991 when we signed our first technology-licensing agreements with Qualcomm. We've had a cordial relationship ever since. I see **Irwin Jacobs** twice a year. He flew to Helsinki last year, and we had dinner together with our wives."

Nokia executives persistently emphasize that "radio protocols" like WCDMA or CDMA2000 are of secondary importance. "We need to make the next phase happen," says Sari Baldauf, president of Nokia Networks. "The next phase is less about radio protocols than about the services that people want to pay

for to make their lives better." Nokia even has a whole CDMA division (in San Diego, of course) that has been making CDMA handsets for years.

Yet for all its talk of cordiality and agnosticism, the \$ 32-billion-a-year giant would really prefer that the planet bloom with WCDMA systems. Nokia was one of the main powers behind the push to get GSM to go WCDMA. By having had a major hand in the development of the standard, it knows the technology inside and out. For the past eight years or so, the company has spent billions of dollars in R&D on WCDMA products. The WCDMA world offers Nokia vast new markets for its handsets and network equipment.

Most industry observers predict that WCDMA will eventually run 70% to 80% of the world's 3G networks simply because GSM already has such a market-share advantage. The actual number will depend largely on several factors, the most important being what happens in China.

China has already overtaken the U.S. as the largest mobile-communications market on earth. In the past two years Jacobs has flown countless trips to China on his personal Global Express jet to meet with government officials or joint venture partners, or to go to the occasional conference, like the one in Beijing, which represented Jacobs's sixth trip to China in 2002 alone. (Ollila went four times last year.) One big reason for all the face time is that the Chinese government is planning to award 3G licenses sometime this year.

Yes, that's vague. As with everything that involves the Chinese government, the situation is a bit murky. The government may decide to make the licenses WCDMA-only, or CDMA2000-only, or, most likely, to allow both technologies. (To make matters even murkier, China is considering a third 3G standard, called TDS-CDMA. However, few observers outside the country believe that standard is much more than a negotiating tool for the Chinese to wring better licensing terms from foreign vendors.) Whatever happens, whenever it happens, China's choice of a standard will probably affect decisions made elsewhere in Asia and beyond.

Most of China's 200 million customers are now using GSM phones, but during the past couple of years CDMA has been growing rapidly too. Around 80% of China's citizens don't have mobile phones, so the competing standards have a lot of territory to fight over. And if Kurt and Mr. Zhang are any indication, this market is still up for grabs.

Kurt and Mr. Zhang were the guide and driver, respectively, for a tour I had booked to the Great Wall. Chinese consumers, like Korean consumers, seem to know all these acronyms, so I ask Kurt, who's in his late 20s, what he thinks of GSM vs. CDMA. He says a lot of his friends are switching to CDMA because it's cheaper and they like the ring tones better, but that he won't switch until CDMA covers as much area as GSM. "A lot of our drivers are switching to CDMA," Kurt adds. Even Mr. Zhang, who as we speak is gabbing on a GSM phone? Kurt asks Mr. Zhang in Chinese. "He hasn't changed phones because there isn't enough coverage yet. He says he'll change maybe in a year."

The 3G game is far from over, but one thing we can be sure of is that technology won't stop there. Qualcomm and Nokia certainly aren't going to quit researching and developing, nor will entrepreneurs stop coming up with whole new technologies and companies to make them.

A specimen of the latter category is a three-year-old startup in Bedminster, N.J., called Flarion. As Qualcomm once did, Flarion is working on a wireless technology based on a communication method invented many years ago, this one called OFDM. The idea is wireless Internet access that's twice as fast as the best 3G speeds and faster even than Wi-Fi. The technology is still in trials, with one test network operating in the U.S. and three others in, of course, South Korea.

Flarion CEO Ray Dolan, a former Bell Atlantic executive who saw plenty of action in the holy wars, is careful not to make incendiary proclamations. Flarion is "pre-revenue," he says, meaning "no customers yet." There's no way to predict how the company will fare, or even whether the technology will work commercially. Dolan just wants to fine-tune his product and make some sales. If it all works, maybe we'll witness a whole new standards war.

But that's several years off at the earliest. Meanwhile, Jacobs has 3G to worry about.

The Beijing summit has just ended, and Jacobs sits back in his seat as his hired Mercedes rolls past the gigantic portrait of Mao. He's asked the driver to make a scenic U-turn around Tiananmen Square on the way back to the hotel. We talk about China, its economy, and Qualcomm's prospects there. He's very much at ease, despite having just spent a long day in evangelizing and glad-handing mode--and despite the fact that what happens in China will have a profound impact on his company's future. He's been through this before. Then, as we complete the detour and again pass the portrait of that most cunning of master strategists, he says, "What would Mao think of all this?"

BOX STORY:

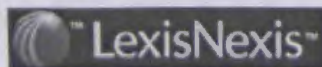
FEEDBACK jaley@fortunemail.com

Qualcomm says publicly that it has no favorite standard. But its dream? That we all turn Korean.

With 3G, carriers hope to sell new services like games, photo messaging, and mapping.

GRAPHIC: COLOR PHOTO: MARK LEONG, [T of C] 142 Seoul mates: South Korean teens don't go anywhere without their third-generation cellphones. "Every major vendor for 3G devices has to use CDMA," says a consultant. "And they have to license from Qualcomm."; TWO COLOR PHOTOS: PHOTOGRAPHS BY MARK LEONG, Phones like this, with Qualcomm's technology, have hooked Korea. Now CEO Irwin Jacobs, shown opposite on Wangfujing Street in Beijing, is maneuvering to capture China.; COLOR PHOTO: MARK LEONG, Despite a ban on cellphones at Sang Moon High School in Seoul, students still sling the most souped-up 3G product available.; COLOR PHOTO: PAUL SCHIRNHOFER, Helsinki is Nokia territory, with mobile phones everywhere from factories to frozen ponds. Like the rest of Europe, it's taking a GSM path to 3G.; COLOR PHOTO: PAUL SCHIRNHOFER, Nokia CEO Ollila has a lot to gain from a WCDMA world.; COLOR CHART, Holding the Phones The GSM and CDMA worlds know how they're getting to 3G, but China's a wild card. Even with low penetration, it is already the largest single cellphone market.; COLOR PHOTO: MARK LEONG, In Korea, 3G phones with GPS are starting to proliferate.

LOAD-DATE: February 18, 2003



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Business Dateline;
San Diego Daily Transcript

September 15, 1994

SECTION: Sec A; pg 1

LENGTH: 604 words

HEADLINE: Qualcomm's Jacobs gets National Medal for achievement

BYLINE: Mario C Aguilera

DATELINE: San Diego; CA; US

BODY:

Qualcomm Inc.'s chairman and chief executive officer, **Irwin Jacobs**, punctuated a year of recognition yesterday by capturing the nation's highest honor in technology, the 1994 National Medal of Technology.

U.S. Commerce Secretary Ronald Brown yesterday lauded Jacobs in Washington, D.C., for "his vision, innovation and leadership in the field of digital wireless communications over the past 26 years."

Brown also cited Jacobs' role in developing CDMA (code division multiple access) technology, which has picked up steam lately in vying to become the standard for digital cellular carriers.

President Clinton will present the award to Jacobs and five others in an Oct. 3 White House ceremony.

The presentation comes in a year full of honor for Jacobs, including Cornell University's Entrepreneur of 1994, the 1994 HumanUnity Award from the National Conference of Christians and Jews and the 1994 Spirit of San Diego award from the San Diego Chamber of Commerce.

"Those were all very, very nice," said Jacobs, "but this one is exceedingly special because the president is making the award presentation and it's on a nationwide order."

Jacobs said he is honored to join the list of NMT winners, a group that includes Bill Gates of Microsoft Corp., Joe Juran of the Juran Institute, Bob Galvin of Motorola Inc. and Steve Bechtel of the Bechtel Group Inc..

Congress mandated the NIT in 1980 to recognize U.S. technological competitiveness, and the connection between high-tech innovation and economic growth. Today the NT is administered by the Department of Commerce's Technology Administration.

The first NMT was distributed in 1985. Past winners include Steve Jobs and Steve Wozniak of Apple Computer Inc. in 1985, David Packard of Hewlett-Packard Co. in 1988 and John Mayo of AT&T Bell Laboratories Inc. in 1991.

Jacobs, the only individual honored from California this year, characterized the award as "the highlight of a whole career."

He received a bachelor's degree from Cornell University, and advanced degrees from the Massachusetts Institute of Technology, each in electrical engineering. He became assistant-associate professor of electrical engineering at MIT and co-authored "Principles of Communication Engineering."

In 1966, Jacobs joined UCSD's Applied Electrophysics Department. Six years later he co-founded Linkabit, one of the building blocks of San Diego's telecommunications industry, with Andrew Viterbi. He stayed with the company until 1985, when he left to form Qualcomm.

Jacobs shares some of the NMT glory with his supporting work force at Qualcomm.

Now 1,800 workers strong, Qualcomm is the fastest-growing employer in San Diego, averaging a new hire every five hours. Last year the company earned \$ 12.1 million, or 50 cents per share, on revenue of \$ 168.7 million.

Other NMT winners for 1994:

* Amgen Corp., based in Thousand Oaks, is the first biotechnology company to win an NMT. The 14-year-old firm is the world's largest independent biotech with \$ 1.4 billion in sales and more than 3,200 employees.

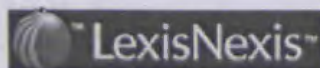
* Corning Inc. won for a variety of products, including pollution-controlled materials, space shuttle windows .and optical fiber. The company is based in Corning, N.Y.

* Joel Engel of Ameritech in Chicago and Richard Fenkiel of AT&T in New Jersey won a joint NMT. The duo was recognized for fundamental contributions to theory, design and deployment of cellular mobile communications systems.

* H. Joseph Gerber of Gerber Scientific in South Windsor, Conn., won for advancements in automation systems, particularly in the apparel industry. He holds 600 patents.

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LOAD-DATE: October 27, 1995



Copyright 1985 Chicago Tribune Company
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March 31, 1985 Sunday, SPORTS FINAL EDITION

SECTION: BUSINESS; Pg. 7C; ZONE: W

LENGTH: 1077 words

HEADLINE: JACOBS SETS STAGE TO STALK CORPORATE PREY

BYLINE: Knight-Ridder Newspapers.

DATELINE: ST. PAUL

BODY:

Minneapolis investor **Irwin Jacobs**, a widely watched figure in the high-stakes world of corporate acquisitions, may soon unleash a \$220 million war chest assembled by Minstar Inc., a publicly held firm he controls.

A string of seemingly unrelated announcements by Jacobs in the last month provides a new tool for the man whose stock trading last year shook up Walt Disney Productions, ITT Corp. and Phillips Petroleum Co., among others.

Almost all of Jacobs' multimillion-dollar deals until now have been done by Jacobs personally or with a small group of wealthy private investors, including Carl Pohlad, a Minneapolis banker and owner of the Minnesota Twins baseball team.

However, with new money in Minstar, Jacobs intends to use the corporation and its funds to stalk other companies.

"There is no question the emphasis will be in Minstar," Jacobs said last week. "It's like a company with a new skirt on. Now, it can go out dancing."

Although he said he has no specific targets in mind, Jacobs is far from tired of the fray.

"The money is not burning a hole in our pocket, but undoubtedly you will see some activity this year," he said. "Our record speaks for itself. We're very proud of what we've done. We have great ambitions."

Minstar is the corporation Jacobs built from the skeleton of Arctic Enterprises Inc., a Minnesota snowmobile manufacturer that Jacobs reorganized through bankruptcy. Minstar expanded in 1983 by acquiring Bekins Co. of California, one of the nation's largest moving and storage firms, and again last year with Aegis Corp., a diversified Florida manufacturer with interests in boat building.

Minstar's performance improved dramatically in 1984. The acquisitions pushed sales up 128 percent, to \$598 million, which should qualify the firm for the Fortune 500. Profits rose 73 percent, to \$23.2 million, and earnings per share gained 51 percent, to \$2.40.

Minstar stock also has been a strong performer in recent weeks. Traded

nationally over the counter, Minstar is selling for about \$26 a share, up 20 percent from the beginning of the year.

Buying Bekins and Aegis strained Minstar's balance sheet, however. As recently as September, the company had only \$25 million in cash against long-term debt of \$140 million. Jacobs is reversing the trend by increasing cash reserves and decreasing debt.

Because Jacobs will be channeling more of his ambitions through Minstar, small investors can join in his corporate raids by purchasing Minstar stock.

For most of Jacobs' deals, following in his wake has meant buying stock in his target companies after he announces his intentions and selling after he sells. That has two drawbacks: Small investors often can't buy or sell soon enough to take full advantage of price shifts in target companies, and outsiders don't share in any premium that Jacobs may command by trading large blocks of stock.

Investing in Minstar, by contrast, now will be a quick way of placing money under Jacobs' care.

"**Irwin Jacobs** is one of the best money managers in the U.S.," said Robin R. Young, an analyst with the Minneapolis investment firm of Piper, Jaffray & Hopwood. Young issued a research report earlier this month upgrading his recommendation on Minstar to a "buy" for investors willing to take a risk.

The first step in Jacob's new strategy was announced Feb. 26, when Minstar said it would call in all warrants outstanding to purchase common stock. (A warrant is the right to purchase a share of stock at a fixed price at some time in the future.) Minstar is eliminating 2.5 million warrants by handing out stock in exchange for either \$14.50 a share in cash or by canceling long-term debt agreements held by some Minstar stockholders.

Redeeming the warrants for cash increases Minstar's bank account because shareholders are handing over dollars in exchange for new stock issued by the company. In the case of shareholders who turn in IOUs, the company also benefits by reducing debt and thereby increasing borrowing power.

The second step occurred March 11, when Minstar disclosed it planned to sell \$100 million in 10-year notes to the public.

The third and most dramatic step came March 15, with the announcement of an \$8 million to \$10 million purchase of new Minstar shares by New York investor Carl Icahn, who launched the latest fight against Phillips Petroleum. Jacobs, too, is dipping into his personal wealth to buy more Minstar shares, as are several of his Twin Cities partners. Altogether, the stock purchases should raise \$66 million to \$88 million.

When all three steps are completed, probably within two to three months, Minstar should have \$220 million in cash, said analysts' estimates endorsed by Jacobs. That is up from just \$25 million at the end of last September and about \$50 million at the beginning of the year.

Wall Street, meanwhile, has been confused about the sequence of events involved in building up Minstar.

Last month, Leucadia National Corp. of New York said it had begun buying Minstar stock. Leucadia is run by investors who have raided some of the same corporations as Jacobs.

Rumors began spreading that Leucadia was intent on trying to take control of Minstar. Icahn, the rumors continued, was buying Minstar stock to help Jacobs repel the invaders after Jacobs had supported Icahn last year in his

fight with Phillips.

However, Jacobs and his partners control a majority of Minstar stock and will continue to hold more than 50 percent even after the new shares are issued, making it impossible for a hostile outsider to seize power at the company.

Also, though Leucadia originally said it might seek control of Minstar, a report to the Securities and Exchange Commission later was amended to say Leucadia would remain strictly a passive investor.

"We think it's a good investment, that's all," said a Leucadia spokesman who asked not to be identified. "We have a lot of confidence in **Irwin Jacobs**. I think they (Leucadia's owners) looked at Minstar as a chance to get part of **Irwin Jacobs'** brain."

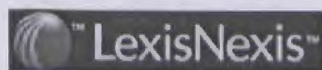
Leucadia now owns 1.1 million shares of Minstar, equal to 9.9 percent of the total.

Jacobs rejected the Wall Street version of events.

GRAPHIC: PHOTO

PHOTO: Investor **Irwin Jacobs**: "Our record speaks for itself. We're very proud of what we've done. We have great ambitions."

LOAD-DATE: September 16, 1993



Copyright 1994 Crain Communications Inc.
Radio Comm. Report

November 21, 1994

SECTION: Special Section; Pg. 39

LENGTH: 592 words

HEADLINE: QUALCOMM'S JACOBS SEES PCS PROMOTING MEANINGFUL CHANGES

BYLINE: Linda Kay Sakelaris

BODY:

Qualcomm Inc. founder Dr. **Irwin Jacobs** recalls the feeling he had in 1971 that he was facing a decade of important changes.

"We re-examined that idea in the 1980s and saw more changes coming. Looking ahead now, we clearly have 10 more years of change," Jacobs said.

The 61-year-old Jacobs sees the introduction of personal communications services as a major part of this new horizon, especially as intelligence is introduced into instruments that were originally a passive part of the communication process.

While equipment with intelligence will be revolutionary, most of the fundamental work on digital communications can be traced back to work done in the 1940s on information theory, Jacobs said.

Research on the use of digital technology to transmit information inspired Jacobs to write a textbook while teaching at the Massachusetts Institute of Technology in the late 1950s, and later compelled him to create the OmniTracs tracking system for the transportation industry. Jacobs also is an inventor of the Code Division Multiple Access technology used in digital wireless applications.

"At this time, that's all there is-digital and analog. In the future, I see enhancements developed in both," Jacobs said, such as the ability to give voice commands to personal digital assistants and computers.

"Vocal is very doable today. By speaking, you can enter data much more rapidly. I see telephones becoming more intelligent."

With the addition of new PCS spectrum, service costs should come down, he said. "The cost of infrastructure is coming down, the cost of airtime will go down and usage will go up."

"When we started Qualcomm (in 1985), cellular and cordless phones were out (in the market). We were struck by how more and more people wanted to be freed from the phone cord. And the growth of cellular surprised everybody. Even with the cost of airtime, people still used cellular phones," Jacobs said. About fifty percent of Americans are expected to use PCS services, he added.

With consumers willing to pay and the technology available, operators only need to acquire new spectrum. Jacobs said he isn't surprised the U.S. government is now selling spectrum for profit.

"My biggest surprise is that it didn't happen sooner. It will raise revenue for the government as well as regulate situations, to keep operators from overlapping. Overall, the regulatory situation is more open than I thought it would be," Jacobs said.

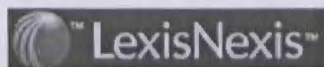
Plans to make PCS a seamless, worldwide network means all industries will need to work together, he said. "Companies have the opportunity to cooperate to make this possible. I'm hoping it will happen quickly with the availability of new frequency. It will attract additional consumers who will find different uses for the service," Jacobs said.

Jacobs envisions a PCS system consisting of fiber cables running into neighborhoods, radiating cell stations set up throughout the neighborhood and Ku band low-earth-orbiting satellites supplementing terrestrial PCS, filling out the worldwide footprint.

In line with that vision, Qualcomm is a partner in Globalstar, a planned \$1.8 billion, 48-satellite LEO network that markets itself as an enhancement to wireless services.

PCS' greatest impact will be felt in America's education system, Jacobs predicted. "Information will be available from all sources throughout the world," he said. "You can access it in a convenient fashion, quickly, changing the way we educate our children and our ourselves."

LOAD-DATE: April 06, 1995



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Information Bank Abstracts
WALL STREET JOURNAL

November 1, 1985, Friday

SECTION: Section 1; Page 8, Column 1

LENGTH: 23 words

HEADLINE: PRICE OF CBS STOCK SOARS AMID MORE TAKEOVER TALK

JOURNAL-CODE: WSJ

ABSTRACT:

Stock in CBS Inc rises \$5 per share on New York Stock Exchange on October 31, amid rumors of takeover bid by investor **Irwin Jacobs** (S)
