

Just Say Nokia

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 SAVE

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Fearred nemesis of the KGB, Iiris Konttinen is disarmingly articulate in any language she chooses. One day she was spotted in several countries – East Germany, Turkey, Czechoslovakia – on a single afternoon. Then, the machine guns were cucumbers, the pistols bananas, and the long-range artillery planks of wood. Today, the Mannerheimintie, the broad central avenue that runs down the center of Helsinki, is the Berlin Wall. Checkpoint Charlie is a tunnel under the street. But the mobile phones play themselves.

Iiris Konttinen is the future – not just the future of Finland, but of the networked world. At 16, she is one of only two students in her English class at Ressu Comprehensive School who doesn't own her own mobile phone yet. Like the other kids who joined her in creating the role-playing game called East Berlin Rush Hour, she's already thriving in two parallel universes. One is her native Helsinki (called by locals simply *Stadi*, "the city"), where dusk lingers at the horizon until midnight in spring and all the beautiful glassed-in phone booths are empty. The other is a new social landscape that her peers are creating using the mobiles – no one calls them cell phones here – and mapping over the streets of *Stadi*.

In the last couple of years, Finnish teenagers have quit referring to mobile phones as *jupinalle* – "yuppie teddy bears" – and started calling them *kännykkä* or *känny*, a Nokia trademark that passed into generic parlance and means an extension of the hand. The ubiquitous *kännys*, with their custom ringing tones broadcasting chipmunked miniatures of pop hits, have transformed the ways young Finns roam the city. They've taken a feature first introduced by Nokia in 1992 – Short Message Service (SMS), a form of email you can send from phone to phone – and made it their primary means of mobile communication. Like schools of fish, kids navigate on currents of whim – from the Modesty coffee bar to the Forum mall for a slice of pizza or a movie to a spontaneous gathering on a street corner, or to a party, where SMS messages dispatched on the phones summon other kids or send the whole group swimming somewhere else.

While her father's generation maps out the mergers and rollouts that will write tomorrow morning's *Financial Times*, Konttinen and her role-playing friends are already using wireless technology to script shared dreams.

Last year, more mobile phones were sold worldwide than automobiles and personal computers combined. Out of the 165 million phones sold, 41 million were made by Nokia. And the market is nowhere near saturation. In Finland, the number of subscribers to mobile-phone services has already leapfrogged over the number of fixed-line subscribers. Ericsson estimates that the total number of wireless subscribers will grow to 700 million by 2002. A year after that, Motorola believes, the market will hit 1 billion.

Nokia alone employs many more engineers than Finland – with roughly the population of Dallas-Fort Worth – can train. Though a ravaging recession in the mid-'90s still lives in the collective memory, Nokia's surging growth now accounts for more than half of the activity of the Helsinki stock market. One telecom entrepreneur here, Mikael Roos of Softline Technologies, told me, "Nokia has validated the whole idea of Scandinavian companies playing an important role in the development of the global market. When we travel now, it's easier for us to be accepted. People listen."

Nokia sells 75 percent of the mobile phones bought in Finland, but for Konttinen and her peers, there may as well be only one brand of phone. "Here in Finland, Nokia is an absolute," Eetu Mäkelä, one of three young gamemasters who orchestrated East Berlin Rush Hour, told me in an email. "Only Nokia designs *look* like mobile phones to us." Just saying the name Nokia – properly accented on the first syllable – gets home-team grins from teenagers in the Ressu schoolyard. (Imagine a mention of Microsoft causing skateboarders in a Seattle mall to burst out in high fives.) And the phones are only the most visible face of Nokia's story. One-third of its \$15 billion-a-year business is infrastructure: the base stations, switching networks, and software the company sells to telecom operators to set up their own mobile networks. In places like rural Africa, where scavengers dig valuable copper wires out of the ground, it's cheaper to set up a few base stations, and hire guards to stand around them 24 hours a day, than to lay in a fixed-line network. With markets in 140 countries, Nokia is thriving under more flags than McDonald's.

Founded in 1865 by an engineer who opened a pulp mill north of Helsinki, Nokia meant durable rubber boots, cables, and toilet paper to previous generations of Finns. The company weathered several dark nights of the soul before coming of age in the late '90s: A series of logistical blunders in 1995 cut the value of Nokia stock in half, forcing company-wide reorganization to increase communication among its many divisions. In 1988, Kari Kairamo, Nokia's CEO, committed suicide. Kairamo believed Finnish manufacturers like Nokia could ride the consumer-electronics wave into the global marketplace. He was right, but the scope of the vision needed to be narrowed. By lopping off other product lines (like TV sets, cables, and PCs) and maintaining a laserlike focus on digital phones and networks, Nokia boosted its market cap from \$1.7 billion in 1988 to \$70 billion last year, when the company edged past Motorola to become the world's leading manufacturer of mobile phones.

In many ways, the story of Nokia's success is the story of the digital-telecom standard that helped create a unified European mobile market in the '90s: the Global System for Mobile Communications. The widespread adoption of GSM was not locked in from the start. In development from 1982 on, the project was dubbed the Great Software Monster by engineers debugging the slew of new applications required to support such ambitious features as international roaming, call forwarding, and SMS messaging.

... *Kännykkä* - slang for mobile phone - means an extension of the hand. ...

In 1989, Nokia and two Finnish telecom operators made an alliance to get the first GSM network up and running. Fearing they would go out of business competing as providers of analog mobile services with Telecom Finland - which had a long-standing, state-sanctioned monopoly on long distance calls - the Helsinki Telephone Corporation and the Tampere Telephone Company formed a company called Radiolinja. Radiolinja bought \$50 million of infrastructure from Nokia, though the startup didn't even have a license for its new network.

Jorma Ollila, who had been brought into the company by Kari Kairamo, became the head of Nokia's mobile-phone division in 1990. "The GSM project was in disarray. There was a lot of disillusionment with the spec and the difficulty of the technology," he recalls. "People were saying we wanted a racehorse, but some committee got into the design process and we ended up with a camel. But we continued because we believed in digital." Ollila appointed a new manager for the GSM team.

On July 1, 1991, the first call ever placed on a commercial GSM network was made by the prime minister of Finland - on a Nokia phone. "There was a lot of difficulty, a lot of pain, a lot of soul-searching before we got there," says Ollila. His turnaround of the GSM project sufficiently impressed the Nokia board that they made Ollila the CEO a year later.

When Nokia poured its resources into GSM, it was a moderately successful company from a small country betting against billions of dollars of entrenched infrastructure and a widely accepted standard. GSM took off - not only all over Europe but also in Asia, Latin America, and elsewhere.

Now Nokia is taking a leadership role in the development of third-generation wireless services, or 3G. In telecom speak, analog cellular was the first wave, and digital networks the second. The third generation of data and voice communications - the convergence of mobile phones and the Internet, high-speed wireless data access, intelligent networks, and pervasive computing - will shape how we work, shop, pay bills, flirt, keep appointments, conduct wars, keep up with our children, and write poetry in the next century. Every buyout and consolidation in the headlines leads us into a realm of essential questions about the roles communication and connectedness will play in our lives as the Net and the phones in our pockets converge.

Nokia and the Finns, inseparable from their *kännykkäs*, somehow got there first. To understand where we're headed, we need to understand who they are.

"We're basically a company from nowhere. Finland? That's a town in Minnesota, isn't it?" Anssi Vanjoki is exaggerating, but as senior VP of Nokia's mobile phone division in Europe and Africa, he's smiled politely through his share of clueless questions about where he's from. Partly owing to canny product placements in films like *The Saint* and *The Matrix*, a Finnish official remarked last year, Nokia is now more widely known across the globe than Finland itself. A surprising number of savvy people still think that Nokia is a Japanese company - an accident of Finnish phonetics and the fact that the brand name shows up on small, sleek consumer electronics products that work. (Nokia does have an outpost in Tokyo, along with satellite offices and laboratories in Beijing, Boston, Budapest, Copenhagen, Dallas, London, Paris, Singapore, South Korea, and Sunnyvale, California.)

The Web may be pulling us like a magnet toward shared global standards, but many of the decisions that carved out bands of available radio frequency for cellular services, and determined local protocols for voice and data transmission, were set 10 or even 20 years ago. The result is the confusing proliferation of the three- and four-letter network systems that make mobile phones work, from analog-era AMPS to the digital GSM used throughout most of Europe to more recently promoted data-friendly standards like TDMA and CDMA.

To the Japanese, Nokia markets snappy little retro Lifestyle phones that let you communicate over Japan's PDC network and dial by voice, rather than use kanji. Nokia markets its 5100 series in South Korea, where the government mandated a switch from analog AMPS services to digital CDMA to give homeboys Samsung, Lucky Goldstar, and Shinsegi a strategic advantage in the emerging world market. For European frequent flyers, Nokia furnishes everything from dual-mode GSM 900/1800 phones to the Communicator, the first handheld device that lets users make calls, surf the Web, and transmit data and faxes. To the welter of competing systems in the US, Nokia serves up phones that work on TDMA, CDMA, GSM, and analog networks.

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In a holy war of acronyms, Nokia is like an arms dealer, quietly selling munitions to every side. Other manufacturers haven't been so quick to think out of the box. Motorola came out with the eminently pocketable StarTAC - which every gadget groupie in the Valley flashed around for a couple of months - but was late to the digital convergence. Playing catch-up, Motorola signed a deal in May with Bell Atlantic Mobile to ship a million CDMA phones. Ericsson excelled in TDMA-based technologies, but also "missed the boat when CDMA took off," says Naqi Jaffery, wireless-industry analyst for Dataquest. Ericsson was able to recover when it wisely ended a two-year patent dispute with Qualcomm by buying the company's CDMA division in a highly publicized deal last March. "Nokia's advantage is that it has been involved with all of these technologies from the beginning," Jaffery observes.

"Nokia is all over the world - it learns what's good in every culture it works in, and combines it all," says Johanna Lemola, my guide in Helsinki, who is also the city's official spokesperson. With a Finnish weakness for assonance, Nokia president Pekka Ala-Pietilä calls his company's readiness to adapt to local conditions "selecting horses for courses." As digital cellular breaks into markets like Russia and China, where fixed-line phone service never gained a foothold, the company from nowhere is galloping everywhere.

Nokia's dream of a wireless information society is at least as old as the first phone call ever made to an automobile. In 1906, a radio engineer named Lee de Forest transmitted a message to an experimental phone in a car idling on a New York street: "How do you like your first wireless ride? The fire department, steamships, and railways ought to adopt the same method of communication." Not as dramatic as Samuel Morse's "What hath God wrought?", but the press release sent out by the president of De Forest Wireless turned out to be prescient. "Hereafter," he declared, "we hope it will be possible for businessmen, even while automobiling, to stay in constant touch."

For CEO Jorma Ollila, the creation of the third-generation networks is a matter of shaping tools that are more like us - always in motion and awake to their surroundings. I spoke with Ollila at Nokia House, the company's corporate headquarters in Espoo, a suburb of Helsinki on the Gulf of Finland. There are no dark corridors at Nokia House: The building is transparent to the sky and water, covered by a thermodynamically efficient layer of 26,000 plates of glass. Ollila, who earned graduate degrees in political science, economics, and technology before coming to Nokia, combines Finnish directness with an almost confrontational intensity. A look, tilted up through tortoiseshell spectacles, is a challenge, as if to say, "What have you got?" I asked him what the wireless information society would look like at the beginning of the next century.

"The desktop isn't going to die, but there will be tremendous flexibility in office work," he replied. "Many of the services - accessing information, making transactions, and working in a team - will happen in a wireless environment."

In 1998, Nokia, Ericsson, Motorola, and Psion (a British manufacturer of handhelds) formed the Symbian alliance, a private consortium for the development of 3G wireless systems. The Symbian strategy for the next generation of computing is to ratchet up bit rates in mobile-phone networks and marry those accelerated networks to the Internet. The goal, says Ollila, is "to put the Internet into every pocket."

From the focus on phones and networks that carried it to the top of the heap of second-generation manufacturers, Nokia is aiming high again, to take advantage of upgrades that operators will be building into mobile-phone networks all over the world in the next few years. The next wave of telecom products will employ three kinds of data and voice transmission - "three layers of radio," explains Pekka Lundmark, senior VP of Nokia's wireless-business-communication team - to remain in constant touch with the Net and each other. The comparatively slowest layer of coverage will be available anywhere you can use a mobile phone. A series of upgrades to mobile-phone networks in the next couple of years will bring bit rates from the current 9.6 Kbps to three times the speed of ISDN connections, or 384 Kbps.

The next notch up in speed, but with more limited areas of coverage, is wireless local area networks, which Nokia started selling for offices in July. Siphoning datastreams from this layer, a laptop computer will eventually be able to stay jacked into the company intranet and the Net at speeds up to 54 Mbps. Nokia is pitching wireless LANs to hotels and airports to create high-bandwidth "hot spots" where business travelers can log in, and the company foresees wireless LANs replacing cables in the home when prices come down.

The third layer is a limited-range, low-power radio network that will allow every device you carry in your pockets or briefcase to communicate with every other device in your immediate area. The Symbian alliance's protocol of choice for this "personal networking" layer is called Bluetooth.

The wedding of the Web and wireless has already begun, with Nokia's Communicator, the Palm VII, and the release this summer of mobile phones - like the Qualcomm QCP-1960, the NeoPoint 1000, and the Motorola i1000 Plus - that use Phone.com's UP.Browser and UP.Link Gateway with Wireless Application Protocol (WAP) to fetch and display data from the Net. With its wireless LAN products, Nokia took on a whole new army of heavyweight competitors of the IP world - the Ciscos, Lucent's, and 3Coms. If Nokia can ride this next wave, it won't be the first time the Finns have stolen the future.

Even in the most wired country on the planet, wireheads get dissed. "The cultural mystery remains," the *Helsinki Culture Guide* muses, "why Finnish students of technology (*teekkarit*) are so much fun, whereas our engineers are usually sour-faced and uninspiring bores." The authors couldn't have been thinking about Neuvo. Ruddy-faced and powerfully built, Neuvo, in his late fifties, radiates both optimism and pragmatism about the future. He comes from a family of scientists - there's an asteroid named after Neuvo, and a crater on the moon, Väisälä, was christened after his grandfather. The young engineers at Nokia love him. For 17 years, Neuvo was a professor of electrical engineering at the University of Tampere. He was perfectly happy as an academic, he says, enjoying visiting professorships abroad and racking up patents. By the time he turned 50, he had granted almost 200 master's degrees and 30 doctorates. Then his aunt decided to leave Finland for Africa to tutor Namibian children in mathematics. Neuvo realized he was not too old to reinvent himself.

One of his babies is the sleek, silvery Nokia 8810, the eye-catching pocket model that's often compared to a Zippo lighter. Code-named Small Beauty when it was first conceived, the 8810 was rushed through development and introduced at CeBIT '98 in an effort to "surprise the market," Neuvo says. It succeeded in surprising at least one Ericsson executive, who had the misfortune of sitting beside Neuvo on a panel in Stockholm. When the moderator suggested the panelists show off their phones, Neuvo pulled out his 8810. The Ericsson rep demurred, saying, "I'm sorry, I don't have my phone with me." Then something started ringing in his pocket.

... In a holy war of standards, Nokia is an arms dealer selling to all sides. ...

Neuvo maps the transition to 3G services as a sequence of steps toward an infrastructure that will support mobile devices that are always connected, accessing information and displaying it when requested - with no waiting for startup, setup, or logging in.

High Speed Circuit Switched Data (HSCSD) transfer, which is already online from some European operators and should become widely available next year, will boost wireless data-access speeds on phone networks from 9.6 Kbps up to 57.6. General Packet Radio Service (GPRS), rolling out on GSM networks in 2000, will jack up bit rates to at least twice that. More impressively, GPRS will also allow devices to stay connected to the network all the time, while users are billed only for the time spent actually sending or receiving bursts of data. With higher-speed continuous connections, users will be able to do on their mobile devices what they've gotten used to doing online - have real-time conversations with databases, and scroll and click through menus that live not on their terminals but on the Net. As you read the morning's top stories in the *Times* on your handheld, subsequent articles will fill in behind what you're reading. When you pick up your mobile, your email will be there waiting for you. Neuvo calls this "intuitive connectivity."

Also next year, another cellular network upgrade, called EDGE, will boost bit rates on GSM and TDMA networks even higher, up to 384 Kbps. By 2001 or 2002, true third-generation protocols like broadband CDMA and CDMA 2000 will not only throttle mobile networks up to a ripping 2 Mbps, they will also allow, finally, the introduction of true "world phones" that roam anywhere without falling off the map. International commuters won't have to wait until 2002 to stop packing three handsets in their flight bags, however. Neuvo says researchers at the Nokia lab in Salo are working on software-defined radio - phone chips that adapt to incoming signals from any mobile network: a software solution to the holy war.

"If we have really high beams, we can see to 2005," Neuvo told me. "Every year we'll be getting something fundamentally new. At 2009 we can't see anything - it's completely dark."

To see in the dark, consult an oracle - or a professional futurist. Risto Linturi, the principal research fellow for the Helsinki Telephone Corporation, lives at the intersection of the deep past and the distant future on an island 2 miles from the center of Helsinki, called Laajasalo. The house he had built for his family on the shore of the Gulf of Finland has sensors in each room that control air circulation and lights when someone walks in. He can lock or unlock his front door by calling a number on his mobile phone, and if someone rings his doorbell while he's away, his phone rings and he can ask who it is. There are 10 kilometers of wires running through his house - 10 times the usual amount. Though he enjoys showing off his house and making extravagant predictions about the third wave of telecom, Linturi has profound respect for old things and old Finnish ways.

Sometimes those ways mean a willingness to accomplish things very slowly. He and his wife spent 10 years reading ads in the paper before finding the spot of land they were looking for. Then, for 6 months they sipped coffee on the rocks by the water - which freezes 3 feet deep in winter - and contemplated the rock formations and mature trees on the property before deciding where to put the house. The sauna outside of Linturi's house is of the old-fashioned, birch-fired type that takes four or five hours to get up to the proper temperature, when the stones glow so red and hot, he says, "you can almost see through them." There's a cottage on the land made of pine logs spliced in the archaic and beautiful manner known as salmon-tail joinery - practically a lost art in Finland - and insulated with moss. In the cottage, there's an old crank phone manufactured in 1916 by M. Ericsson & Co. of Stockholm. There's also a well near the house. "If everything breaks," he says, "we could survive."

Even by halting Finnish standards, Linturi speaks very deliberately, each phrase emerging like a new geological feature after a tectonic interval of consideration. Lean, graying, but still boyish, Linturi began a lifelong romance with computing in 1977, when he sold his ham radio to buy an early microcomputer. A year later, he was writing interfaces and

applications for the Helsinki Telephone Corporation, which had embarked on an admirably early attempt to computerize its switching stations. By 1980 Linturi was designing experimental speech-synthesis programs for the first electronic banking system in Finland. A friend of Linturi tells me that he once called her when he was walking his dog, and she asked if he was working. "Of course I'm working," he replied. "I'm *thinking*."

To understand Finland, Linturi says, start by examining something as simple as the mobile-phone numbers printed on everyone's business cards. In America, he points out, high-ranking executives print their general office number on their cards - a line that will be answered, it is understood, by an administrative assistant, who will filter calls and pass the important ones up to an executive assistant. In Finland, even the presidents of large corporations print their mobile-phone numbers on their cards. It's not only because office culture in Finland has become more peripatetic, he explains. It's because Finns have an essentially different understanding of the way power flows through large organizations.

"In Germany and the US, you're not supposed to call your boss until he calls you. People find it degrading if their subordinates call them," Linturi observes. "In Finland, if I want to be important, I keep my phone on all the time, so I'll be available when decisions have to be made. In most other countries, people think mobile phones give them power because of who they can call conveniently. Here, people think mobile phones give them power because of who can call them."

Martti Ahtisaari, the first president of Finland elected by a direct vote, published his email address in 1994 and skims through his own in-box every night, Linturi says. In Finland, a manager is considered more effective if the employees in his or her division are not afraid to jump-start major team initiatives on their own, rather than hang back for the top echelon to sign off. "Decisions don't wait to trickle down through the hierarchy, and contacts between companies don't always go through formal channels," Linturi explains.

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Distrust of authority is deeply inscribed in the Finnish character - not surprising, perhaps, for a country that figured out how to maintain its national identity through periods of Swedish and Russian rule, working out an intricate dance of autonomy with the Communist bear for most of this century. The postwar novel that had the greatest impact on the Finnish psyche was Väinö Linna's *The Unknown Soldier*, published in 1954. Linna painted a complex portrait of the Finnish national character by depicting the lives of a group of Finnish soldiers in World War II, one of whom - the hero - refuses to obey an autocratic commander's senseless orders. What this means to a modern Finn working in a large corporation, says Linturi, is that "you might tell your boss what you think of him."

Anssi Vanjoki agrees: "We've had hierarchy and authority to the east and west, and we've been trapped in the middle. Hierarchy is not very practical, because it can suppress skills and talents. Above all, Finns are very practical. There is no fear of bosses at Nokia." The metaphor that Yrjö Neuvo uses to describe the way employees at Nokia feel about their superiors is that of a jazz band. "We have a common piece of music to play - yes. We have a conductor - yes. But we improvise."

If leveling pyramids, opening back channels of communication, collaborative improvisation, and subverting despots all ring a bell, these have also proven to be emergent dynamics in the social petri dish of the Internet. It's not just that Finns are embracing the Net and figuring out ways to create mutually beneficial links between it and the world of wireless telephony. It's that the Net is, you might say, essentially Finnish.

If that seems overreaching, note that for a country with just over 5 million people, Finland has pumped out a disproportionate number of bright ideas influential in the refinement of what could be called Internet family values. Consider Johan Helsingius' late, lamented, Helsinki-based anon.penet.fi, once the most popular anonymous remailer in the world. In 1995, a police raid at the behest of the Church of Scientology - which claimed that its secret documents were being stolen and illegally posted to Usenet using Helsingius' server - persuaded its beleaguered owner to shut it down. Consider Internet Relay Chat (IRC), which allowed anyone to tap through the walls of the global village and strike up a conversation - invented in 1988 by Jarkko Oikarinen, a computer science student at the University of Oulu. Both innovations had the effect of putting everyone on equal ground, and of encouraging even reserved people to speak their minds. When Oikarinen was asked in a rare interview in 1997 how he felt about having his name mentioned in most of the Internet histories, he deflected the praise. "IRC is the accomplishment of all IRC users and developers during the last nine years," he said. It was a very Finnish response, full of *nöyryys*, the willingness to acknowledge one's own limitations and recognize the strengths of others.

The open source movement is *nöyryys* in action. Consider Linux, brought to life by Linus Torvalds in a subdirectory at the University of Helsinki and refined by thousands of code jammers over the Net. Commitment to open standards is the rallying cry of the Symbian alliance, which chose Psion's EPOC as its open operating system. The closed, proprietary Windows CE versus the open, symbiotic EPOC makes for snappy headlines in the trades, but the enthusiasm for open standards in Finland goes all the way back to the birth of the telecom industry here. The Russian czars decided that telegraph cable was of military importance and should be regulated, but telephones were not. By the 1930s, there were more than 850 local telecom operators in Finland. "That laid the groundwork," says Johanna Lemola. "With that many operators, they had to develop methods of billing and working across boundaries. They had to cope with each other."

When Denmark, Norway, Sweden, and Finland formed the Nordic Mobile Telephone Group in 1969 to plan a new mobile infrastructure to replace the early VHF networks, the requirements for the new system included network and terminal compatibility among all four countries, full roaming throughout the Nordic region, and open specifications - with no exclusive rights granted to any supplier. The ability to roam between systems encouraged the development of a common switching interface where subscriber information could be efficiently handed off between operators during calls. Garry Garrard, the author of *Cellular Communications: Worldwide Market Development*, observes that these design goals were "based more on market needs than technical parameters - an unusually forward-looking approach, but one that characterized the Nordic telecommunications environment." This attentiveness to consumer needs differentiated the Nordic approach from that of most other countries, where state monopolies dominated the industry.

One of the things that excites Linturi most about Symbian's strategy for the future is Bluetooth, the close-to-the-bone layer of radio that lets devices talk to other devices within a range of about 10 meters and doesn't require line-of-sight alignments, as infrared does. Bluetooth's curious moniker was an internal codename that stuck - a tip of the hat to King Harold of Denmark, aka Harold Bluetooth, who unified his empire under Christianity in 986, between the reigns of Gorm the Old and Sweyn Cleftbeard (paging Monty Python!).

Intel will be distributing the first experimental Bluetooth chips this fall. Slated to be introduced commercially early next year, Bluetooth will allow your PC to zap documents directly to your printer, and the contact list in your Palm to automatically sync up with the database in your PC when you walk into your office. The laptop in your briefcase won't have to wait to get back to your wireless LAN or an airport hot spot to fetch needed files: It will just prompt the phone in your pocket to dial in. For that matter, your VCR could call out for an extra-large pizza and a couple of six-packs half an hour before *Family Guy* came on. Any device with a keyboard and Bluetooth - a mobile phone, for example - could become a universal remote.

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Bluetooth and other emerging short-range technologies should start replacing inexpensive infrared in home wireless devices when prices come down, says Dataquest's Jaffery. A competing technology, HomeRF, which uses an open standard called Shared Wireless Access Protocol, has the support of Ericsson, Microsoft, and Proxim, a leading manufacturer of wireless LANs.

Linturi believes that once wireless devices speak a universal language, the pressure for open, cross-platform standards will intensify as documents and data, voice, and video streams pour across the network from device to device. This, he hopes, will be the long-awaited undoing of champions of proprietary standards like Microsoft, even loosening their hammerlock on office software. "The Symbian alliance is creating a platform that is open and independent of Microsoft's decisions," Linturi says. "This is something Microsoft is very much afraid of."

Bruce Kasrel, a wireless analyst at Forrester Research, notes that after Microsoft protested the creation of new standards like WAP – claiming loudly that it was an impure form of HTML while pushing its own handheld operating system, Windows CE – the company ended up joining the Symbian-sponsored WAP Forum last May. At the least, Kasrel says, Microsoft is becoming conscious of the fact that in the emerging wireless market, it has less weight to throw around. "On phones, Windows CE is a joke," he tells me. "There's not a phone vendor in the world who's going to get nervous that Microsoft might take away its Windows CE license: 'There go four units I won't sell.' This shows it can't force-feed Windows CE to this market." Redmond's comeuppance is long overdue for Linturi, who has steadfastly – Finnishly, you might say – refused to upgrade from Word 95.

To Linturi, the roaming, spontaneous gatherings of kids in the streets of Helsinki are not just a glimpse of our wireless future, but a resurgence of our collective past: the rediscovery of an ancient unity coded in our senses. "We are herd animals," he says. "These kids are connected to their herd – they always know where it's moving." Pervasive wireless communication, he believes, will "bring us back to behavior patterns that were natural to us and destroy behavior patterns that were brought on by the limitations of technology."

Linturi speculates that within 20 years, we will have wireless communicators embedded in our throats and ears, allowing subvocalized thoughts to be transmitted to our friends and colleagues anywhere in the world. Then, he concludes, engineers would finally have invented practical telepathy. He reflects a moment. "I should have patented telepathy," he says.

While Linturi's longest-range predictions may seem far-fetched, researchers at Nokia's Wireless Future lab in Tampere are thinking along lines that are nearly as ambitious. Nokia maintains more than 1,000 researchers at labs in Beijing, Dallas, and Sunnyvale, and underwrites academic work at MIT, Rice, Rutgers, and UC San Diego and Santa Barbara. Nokia also taps Finland's best and brightest at the University of Tampere – when he was a professor there, Yrjö Neuvo's signal-processing patents went into Nokia phones, base stations, and TVs.

Nokia spins businesses out of its R&D divisions by a process that Hannu Nieminen, head of Nokia's Visual Communications Technology laboratory, calls "internal startup." As a promising technology is refined into a business model, the researchers transfer from the lab into business units to track the idea's progress in the real world. (No one is allowed to drowse themselves into a rut at Nokia, where even the top executive positions are rotated every few years.) One successful internal startup was the Smart Traffic project, which feeds navigational and diagnostic information to cars. A number of European manufacturers – including Volvo and Daimler-Benz – have begun incorporating Smart Traffic products into their new high-end vehicles. Though nearly 80 Nokia technicians are involved in very long-term experimentation with commercial applications that are years away, the question "Where's the money?" is never far from the minds of researchers, says Nieminen. "In Finland, we have always lacked resources. That mind-set is deeply rooted in our culture."

Much of the long-range work at the Wireless Future lab pertains to what researchers there call the "personal bubble," the customized data environment that will follow you everywhere. It's easy to imagine the applications that will come soonest, in the next year or two: Check into a hotel and your Sony PlayStation games will be there, saved at the levels you last played them. Your address book, correspondence, and favorite movies, and the contents of your company intranet, will be available anywhere there's a phone network. Some of the work is concerned with making the walls of that bubble virtually stronger than iron, even in a hostile data environment – say, when tunneling into your office server from a competitor's office. The personal bubble is the ultimate extension of the SIM cards in every GSM phone, which allow Europeans to move their contact lists, preferences, and account info easily from phone to phone.

The long-range vision, however, is delivery of what Nieminen calls "augmented reality." Once we stop thinking of the phone as a handset with a keyboard, it becomes the point of contact between the personal bubble and the global datasphere – it could be a transmitter/receiver worn on our belts or as a piece of jewelry. The display technologies will, in Nieminen's words, evolve toward "applications that bring the information close to your senses": eyeglasses, earphones – wearable wireless. Combined with locational services like GPS, the network could not only know where you are, it could also know where you are in relation to others. Nieminen shows me slides simulating augmented-reality applications: On a train-station platform, a line of text visible in your data glasses informs you the train is 15 minutes late; more text captions flash over the heads of others on the platform, telling you who they are or who's just around the corner.

With wearable outputs and GPS-like locational networks, there could be "arcades everywhere," says Nieminen – multiplayer games acted out in the real world, with virtual or actual objects that know where you are. East Berlin Rush Hour, with the work of imagining augmented by machines.

And the vision goes deeper, toward what Nieminen calls "memory prosthesis." All those displays could also be inputs, recording everything you see and hear, and shipping it all off to your personal server. Double-click on that name bobbing above the head of that guy who looks familiar and realize you had a terribly boring or interesting conversation with him at TED last year. What did you talk about? Keyword search, please. When I suggest to Nieminen that memory prosthesis will require heroic amounts of dedicated disk space, he replies that affordable 10-terabyte disks are "coming along anyway. We'd better find a use for them before they're filled with Office 2000."

... "In Finland, we have always lacked resources. That mind-set is deeply rooted in our culture." ...

Enemy of the State—scale issues of surveillance aside, the augmented-reality slide show is a little unnerving. Look at the cafes in Helsinki – or anywhere else. Many people are already walled in their personal bubbles, chatting away or typing SMS messages, communing with someone who is not there. It's not unusual to see pairs of people, walking down the street or sitting in a restaurant, ignoring one another. More global intimacy, but less local. Call-waiting as a lifestyle.

It's addictive – especially SMS, which offers the thrill of email without the trips back to the apartment or dorm room. Johanna Lemola and I agree to meet at 2 p.m. at the Café Strindberg. Out of respect for Finnish punctuality, I'm there at 1:55. By 2:05, no Johanna. I am nearly shocked. Then I realize I've buried my borrowed Communicator in my bag – too deeply to hear the ringing tone. I pull it out. Voilà – a message from Johanna: "I am at the Café Strindberg." Determined not to jump up and crane my neck, I dispatch a message: "So am I." Then, the call. Of course! There are two Café Strindbergs.

Within a week of getting our data glasses, we'll wonder how we ever made it through the supermarket without them.

The Web piped a world of news and gossip into our bedrooms, and the first WAP applications have emulated that global reach, serving up CNN headlines, stock quotes, sports scores, and other generalist fodder. The Finns' strategy for what's coming next to our phone screens is to bring what's right around us closer. They're using WAP to deliver local information, such as which gas station in a three-block radius has the lowest price per gallon, and whether a new release is in stock at the video store. This summer the Helsinki Telephone Corporation launched a service called City Art, which zaps historical background on more than 300 local statues, churches, and other landmarks to the screen of your phone as you walk around them.

The first thing Finns seek out when they start using these services, however, is not stock quotes or informative captions for statues of Johan Ludvig Runeberg. It's jokes about blondes, says Mato Valtonen, the founder of WapIT, one of about 50 startups in Finland working on Net/wireless applications. Blonde jokes – along with lawyer jokes, biorhythms, and horoscopes – have been among the most popular of the more than 200 SMS services offered by WapIT. In fair-haired Scandinavia, properly stinging blonde jokes have to be imported from England, where they're siphoned off a .uk Web server. An infamous ad for mobile services in Helsinki features a blonde whispering into a Nokia in the supermarket, "How did you know I was here?"

Last spring, WapIT introduced another innovation that caught on with Finns: anonymous chat on mobile phones using SMS. "They learn on the funny services and move on," says Valtonen. WAP-enabled devices, he believes, will prove to be even more of a boost for ecommerce than the Web has been because the payment systems are already in place: "Mobile is the Internet with billing built in."

As a reader of consumer habits, Valtonen is a genius of anticipation. In a subarctic climate where the same sturdy foodstuffs (salmon, reindeer, mushrooms, onions, potatoes, rye bread) cycle through almost every dish, Valtonen sparked a national craze for Tex-Mex by opening a taqueria. As an exploding white-collar job market in the '80s sucked Finns out of the north country and dropped them into cubicles, Valtonen launched Zetor, a raucous beer hall in Helsinki that dishes up reindeer meatballs just like Mummo used to make. With tractors, galvanized milk cans, sepia-toned portraits of hale rustics, and even a working sauna (until the fire department shut it down), Zetor became a second home for displaced Finns lonely in the city.

To date, Valtonen's most enduring cultural project is a furiously eclectic rock band called the Leningrad Cowboys. Even after 24 years of touring, they aren't chronicled in the *Rough Guide to Rock*, but in 1994 the band secured a place in the annals of rock-and-roll outrageousness at the farewell celebration in Berlin for the Allied troops. In the very shadow of the Marx-Engels-Platz, they serenaded 50,000 comrades with "Stairway to Heaven." "It's Only Rock 'n Roll (But I Like It)," and other classics of late-stage capitalist decadence – with backup vocals by the Red Army chorus.

A textbook early adopter, Valtonen installed a mobile phone on the Cowboys' bus 15 years ago, back when the units were, he recalls, "the size of a television." His Macintosh in the band's studio was one of the first in Finland. I met with Valtonen in the WapIT offices in Pitäjänmäki, the kind of humming industrial geek warren that ends up being called the Silicon Valley of whatever city it's in. As we walked past old bomb shelters in the marble hallway, I saw two phone kiosks with their receivers ripped out, wires trailing. No one had bothered to replace them.

In Finland, Nokia's success is "pulling companies like WapIT along with them," Valtonen says. A company called Wireless Entertainment Services has struck gold by offering Nokia customers personalized ringing tones based on everything from the *Simpsons* theme to Mozart – with the same royalties that would be made from a single CD sale sent to the original artist every time someone downloads a tone from the Web.

... More global intimacy. Call-waiting as a lifestyle. ...

Nokia has also been shopping for US developers to pull along with it. President Pekka Ala-Pietilä spends two weeks every other month in Palo Alto at the offices of the Nokia Ventures Fund, brainstorming with NVF's John Malloy about promising startups. When I asked Ollila what Ala-Pietilä was doing in California, he sniffed the air. "Getting the right touch and smell," he said. "Looking at new things, listening, making our name known, making bonds with the right kind of people."

The sorts of ventures Nokia wants to cozy up to as an investor are those that extend our ideas about telephony – companies like Confinity and TalkStar. Confinity turns out a nifty product that lets anyone make payments to anyone else on handheld devices, including, eventually, mobile phones. You can split a restaurant or bar tab, borrow money, buy things, or settle debts – all with money drawn from your credit card. The payment is encrypted and transmitted via infrared (eventually via Bluetooth) and the software is free, so you can zap the program immediately into your friend's phone or Palm to make a payment. ("It spreads virally," Malloy enthuses.) TalkStar is revving up an equally keen product: free, IP-based voicemail that follows you anywhere and is accessible by a local call, wherever in the world you happen to be. TalkStar is working out a partnership in hopes of making its service available on Nokia's global networks.

Jouko Vierumäki, Valtonen's partner, says that of all the large companies he's worked with, Nokia is the most open to listening to developers' ideas. Valtonen attributes this approachability, in part, to Finnish egalitarianism and economics. The range of income levels in this formerly socialist country is much flatter than in the US or most of Europe – there are few rich people here. And, he adds, "no one is boss in the sauna."

"If you're thinking about making road maps to the future, you always end up in a sauna," a spokesman for Sonera (formerly Telecom Finland) told me. When I asked him if anyone was working on making heatproof *kännys* for use in that sacred sanctuary of Finnish life, he gave me a look. "In sauna," he explained patiently, "we don't even want to hear Bach."

Last year, Nokia and Sonera funded a study of mobile-phone use in Helsinki, by researchers Timo Kopomaa and Pasi Mäenpää of Helsinki University. The two observed young people they called "telesurfers," who hung out on *kännys* all day. One teenager sat for up to six hours a day in his favorite cafe, calling the same friend every half hour. Most of these conversations – in keeping with many of the conversations they overheard – consisted of little more than an answer to the question, "What are you doing *now*?"

"This kind of thing," they concluded in their report, "is less about exchange of information than the sharing of everyday life in real time. The question is one of the mobile phone supporting a shared feeling that people are living life together."

In Finland, 65 percent of the bit traffic on mobile phones is data, rather than voice. What kind of data? Not spreadsheets, not daytrading, and not yet videoconferencing, which will also be available on third-generation phones. For now, it's mostly just SMS messages sent by kids Iiris Konttinen's age to their friends in all the corners of the city: all the ways to ask, "What are you doing *now*?" in 160 characters or less.

Behind the transparent walls of Nokia House, a new kind of symbiosis is starting to take place between the senior staff, who saw Nokia through its darker times, and the young employees coming to work for the company, who grew up surfing the Web and chatting on *kännys* with friends. Ollila likes Finland's next generation.

"The youngsters that we're hiring today have the right kind of mind-set for the digital world," Ollila told me. "They are more ready than we ever were in the '80s for working in a can-do atmosphere, and working as part of a team. It's saddling, that mentality – like saddling a horse that's running fast."

In discussing the role that open standards will play in developing third-generation services, Ollila used a word twice that you don't hear much in corporate boardrooms: *comfortable*. "With open standards, there will be a lot of companies with opportunities to build applications and solutions on top of a common operating system that is truly open. That will help everyone feel comfortable," he said. "Proprietary standards are somebody saying, 'I have these patents. I'm going to push this with a huge marketing campaign and make a buck quick.' We come at it from another angle. We want to develop technologies that are easy to use and that make people feel comfortable."

It occurred to me that running a savagely competitive global business with the comfort of others as a priority was itself a kind of *nöyryys*. I asked Ollila how he felt about playing an instrumental role in transforming the ways we communicate.

"What it means is that every individual, every culture, every nationality has an opportunity to make a mark as part of a team, because there is a medium through which to work," he said.

... Mobiles support a shared feeling of people living life together. ...

He paused for a moment, and added, "This is a song for a small guy. Do you know what I mean? The network, and the new economy, give opportunities for a small guy to sing his song and be heard. You might say that there are no borders now, and that we would disappear as a country, but I think this has given us *more* identity. The access to information has made you aware of what is going on in this corner of the world, of the uniqueness here. That shines through much brighter than it ever did. Now we are there. We are part of the network."

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