

# **"Without Vision, the People Perish"**

**by Bruce Sterling**

**Speech Given at "CRA Conference on Grand Research Challenges  
in Computer Science and Engineering"  
Airlie House, Warrenton, Virginia, June 23, 2002**

Hi, I'm Bruce Sterling. I write novels.

Ladies and gentlemen, I bring unique qualifications to this computer-science gathering, because unlike the rest of you, I have the sublime creative freedom of not knowing what I'm talking about. Besides, I am the only man in this house who is wearing a tie. So I must be keynoting.

I am a science fiction writer and I am 105 percent vision thing. The very idea of the likes of me, at this august event of yours, blue-skying it with the legendary likes of Gordon Bell, and Rodney Brooks, and Alan Kay... And Bob Metcalfe... okay, granted, I can handle Bob Metcalfe with no problem.

Imagine the sheer gall, the chutzpah this requires on my part. Anyone with common sense and a smaller ego would quail, but I am up for this grand challenge! I am totally with the program. I am cocking my shotgun and I am going to give you both barrels. I just wanted to take a second to relish the rich literary irony of this situation. Folks, I am really going to enjoy this. I am enjoying this already.

Okay, so what's the story with this "Grand Challenges" theme, huh? How come the computer revolution, so mighty, so high-tech, so all-encompassing, is on a quest for new spark plugs? Well, I can tell you. That subject is within my bailiwick. The computer industry is my favorite industry. She is my heart's darling. I have been watching her for a long time, and I'm all used to her weird little vagaries.

This is happening because computer science is the only major branch of science that is named after a gadget. And gadgets get old. It doesn't matter how lithesome and charming and sexy they were in their youth. They get old. They settle down. They get domesticated. They have mouths to feed and socks to wash. Machines lose their aura of the technological sublime.

The computer is a gizmo, and it's a great gizmo, but it's not an ultimate gizmo. Computer science has been the slave of metaphysics ever since Alan Turing invented the Turing Test, but a computer is not a metaphysical entity. It's not free of objective reality. Its bits are bits of atoms. The only ultimate gizmo is a clock. The clock never stops ticking. The clock has been ticking for the computer for quite a while.

It's not just that the pace of basic innovation has slowed in your field, although it has. It's not just that computers have lost the lipstick of their geek gadget romance, although they have. That which was accomplished in the 1980s and 1990s is under attack. There is a backlash.

This ought to be obvious to anybody who uses the Internet. All you need to do is examine your email. Where is Al Gore's idealistic, civilized Information Superhighway? It's a red-light district. A crooked flea market. A nest of spies. An infowar battlefield. That is the state of cyberspace 2002. There are fire sales on every block. It has anything but grandeur. It's decadent and sinister.

I've had the same email address for 13 years, and I'm not budging. That's where I staked my little claim on the electronic frontier, and by gum, I remember the Alamo and I ain't a-goin' to go. Therefore, my email in 2002 is full of 419 fraudsters from Nigeria. And unsolicited porn ads. And a galaxy of farfetched medical scams from malignant, unlicensed quacks peddling Viagra and growth hormone. With unreadable, unicode, collateral bomb-damage from the gigantic spam mills in China, Korea, Thailand and Taiwan.

Let me put this to you straight: cyberspace has become a slum. It's a diseased slum, festering with Microsoft Outlook viruses. The viruses turn people into unwilling, unwitting agents of corruption and destruction. If you dare to use Microsoft's web products, which are so easily and cruelly sabotaged, then you run a gruesome, unconscionable risk of doing horrible virus damage to your best friends and your closest collaborators. You can give AIDs or herpes to the people who choose to have sex with you, but you can give Klez.E or ILOVEYOU to people you don't even know. That is a pretty far cry from the antiseptic Euclidean vistas of virtual reality. Cyberspace in 2002 is a high-tech low-life slum straight out of William Gibson's NEUROMANCER. That's a great book, but the people who have to live in that book are pretty damn far from happy.

If you could find all these busy people who are ruining the Internet for us, all these swindlers and vandals and porn-whores and stock kilters and so forth, and you could get them to surround this beautiful little gated community of ours here, man, would they look scary. You'd never physically choose to hang out with the likes of these malefactors, but the Net ships 'em right into your office or bedroom, rain or shine, 60-60-24-7-365. So, you know, where is the civility? Where is the law and order? Where is the government? There ain't any. Spies, that's what we've got instead of any legitimate government. Man oh man, there are a lot of spies on the Internet. More every day. The place is crawling with 'em.

Consider last week's British Internet scandal. The British government declares, "Well, we're going to store everybody's websurfing records and their email, so if any government official wants to spy on what you're doing, they can make that happen pronto!" What a grand vision, eh? Wonderfully comprehensive: Orwell would blush.

So the British press and citizenry are like, "What? You're storing \*everything\* I do on the Net, and you want to filter it and mine it and show it to \*anybody\*? Oh my God, doesn't that contravene the Helsinki Declaration, and the UN declaration of human rights, and fifteen leventy-dozen European privacy statutes, and even the Magna Carta?" But the British government and their happy spies say, "Aw come on! It's just the Internet!" They expect everyone to accept that, because really, could the standards there be any lower? How could \*spies\* make it worse? Spies are as happy as a pig in slop!

People think I make this stuff up. And it \*is\* like science fiction. Because it's all about "the technological sublime." It's all about the sense of wonder, and its limits as a

political and industrial policy. The Vision Thing. You are supposed to have a vision thing, even if you are one of our President Bushes. Because without vision, the people perish. Without vision, the means always dominate the ends. Without vision, the least little shock to the system is an existential crisis of confidence.

A "sublime" thing inspires awe and wonder. It's fantastic, amazing, and astounding. It has grandeur, it ruptures the everyday. The sublime is a liberating spectacle that lifts the human spirit to the plateaus of high imagination. Science fiction dotes on this practice. You can go back to the historical roots of science fiction, and you can see science fiction methodically using the technological sublime as a kind of all-purpose cleanser. It's rooting out the sewers of a stale civilization by making extravagant promises of better things to come. Railroads, photography, aviation, giant dams, rural electrification (I know that sounds corny to us, but the Soviets used to be very big on that), atomic power and atomic weapons, space flight, lysergic acid, television, computers, virtual reality, and the Information Superhighway. All grist for the mill, folks. The clock never stops ticking.

The true grandeur of technology is not to be found in any actual technologies. It's AM/FM, the severe difference between Actual Machines, AM, and Fantastic Magic, FM. A grand challenge is a grand challenge because it's not an actual machine but a sublime concept, a goal, an aspiration. Once it's a machine, it's no longer a challenge, it is hardware. Science-fiction is crammed with imaginary technologies: time machines, interplanetary starships and human-like robots. They stay sublime, they don't get stale. Because they're never made real.

Due to human nature, familiarity breeds contempt, especially for technology. Technologies that are integrated into the fabric of everyday life can no longer be perceived as "technology." No matter how grand and elaborate and complex they may be. My teenage daughter has a Pentium III running Windows 95. She knows it's a piece of junk. Because it is. It's stale and old. It doesn't matter how much fantastic press it got in 1995.

Many technologies of profound cultural importance, such as immunization, plumbing, recycling and the birth control pill, never become sublime. They are high technology without the high. The height within high technology has very little to do with the scientific principles involved or any inherent difficulties of the engineering. The height is entirely a social judgment. It has distinctly metaphysical overtones. Science fiction is one of the arenas in which these judgments are cast, in which some forms of technological advance are valorized as marvelous and worthy of mass attention, while others remain the obscure work of specialists or even die off entirely. And the clock never stops ticking, especially for science fiction. Sublimity is as thin as lipstick, it wears off at a kiss. The sense of wonder has a very short shelf-life.

The Space Shuttle is still sublime, even though it is three decades old. It's clunky, and it's rusty, and it has severe software and hardware problems, and it kills people, and it has no destination to which to "shuttle". But the Shuttle is still romantic and futuristic. Why? Because it's not familiar. You can't buy one on eBay or Amazon.

We need the technological sublime. The technological sublime is a narrative, it's a cultural story. It's something we tell ourselves to get out of bed in the morning. It has its difficulties and its shortcomings, but the other narrations are \*worse.\* Like the narrative

of Al Qaeda necromancy, which boldly claims that history will stand still, and we'll all be holy and sacred forever, just like in the mythic early times of the Koran, if only enough of us blow ourselves up.

I'm not going to overdo it here with my literary topics, ladies and gentlemen. Osama bin Laden may be a noted poet, but we American pop authors have some interesting technical challenges of our own. Here's a good one: how the hell do you write a thriller novel in a world that has cellphones? I happen to be writing a thriller novel right now: in fact, I'm here researching it, not that you'd ever guess. I'm not really here to pontificate at you. I'm here to soak up your grand ideas for use in fiction, because I need them even worse than you do.

It's amazing how little technical room is left for the customary cliches of a thriller novel, in this, our modern, digitized, networked society. No more car chases == because I just use my cellphone and I call the cops in the next town. No more gunfights in deserted warehouses == I just use my cellphone and I call the cops. No more trailing the spy to his sinister lair == I just use my cellphone and I call up the cop's video monitors.

I'm an author, but I get it about gizmos. I have to, but I don't mind that much. I'm eager to get with the machinery. I've got a feverish literary need to step closer to the techno-fire here. I'm blissfully yielding to the hands-on imperative.

So let get right down to some brass virtual tacks here, shall we? Let me demo a couple of my favorite blue-sky notions out of your field of endeavor. Nothing up my sleeves, but I'll pull us a couple of sci-fi rabbits from way outside of the box here. We'll see if they interbreed.

Here's my first pitch. It may be slightly familiar to those of you who watch Jordan Pollack's lab, because heaven knows I do. Jordan Pollack is into genetic algorithms, he likes to evolve machines. He had some jointed plastic blocks in the lab that are wriggling around at random. Their performance is measured, the best models get rewarded and replicated. Pretty soon they are wriggling around on the lab bench with some impressive ease and fluidity.

So much for the real world. It's grand sci-fi vision time. Let's imagine this experiment ramped way up to petaflops and exaflops capacity. Very high granularity. Exquisitely accurate simulated physics. At that level of computational power you could go a lot farther than primitive jointed blocks. I'll propose that you could get a petaflops computer to grow machine tools. That's right. I mean actual three-dimensional, fully working, mechanical devices. They're not made on assembly lines, they're grown inside computers. They're virtual, and they do all their research and development as virtual objects, and when they get good, then you make them real.

Yes, I know this notion is farfetched, but I wrote a science fiction story about this. It won an award and was widely anthologized, so hey, that concept is definitely paying off for me.

Maybe you start small, by simulating and evolving, say, some primitive, simple tools, like can-openers and mousetraps.

It's pretty easy to scan and input a can-opener or a mousetrap. You might seed your artificial physics with the design of some conventional mousetrap, and see how they evolve. But it's yet more interesting to simply litter the simulated landscape with objects that act like mice, and attack them with soft, helpless, gelatinous blobs. You don't want to pre-judge the phase space of the problem by making any human decisions about possible methods of trapping mice. Get the human out of the loop entirely, that's the scheme. Reward any possible mechanical entity that can grab or mangle a simulated mouse.

Let them crossbreed. Like the mice themselves, I guess. Kind of a genetic-algorithm, arms race thing. Have an overseer program keeping tabs. Whenever a mouse gets whacked, a bell goes off. You run to the screen, and you see this hour's brand-new mousekiller doing its virtual stuff.

Human beings rush over and stare with eyes like saucers and == man, they can't believe it! Nobody would \*ever\* have thought that a device like that could ever catch a mouse == but you know, we got the complete design specs for it right here in memory! We just hit 'print' and this unprecedented mousetrap will be smelted out for us on the spot! We'll see how it works in real life! Maybe we can put our logo on it and sell a million of them on eBay! Ralph Waldo Emerson, stand back! We \*grew\* a better mousetrap! The world's beating a path to our door! Call the reporters! Put it on the website!

Once we've got that part of the grand challenge down... and hey, I'm not claiming it's easy == we want to extend the process to the big stuff. Heavy iron. For instance, internal combustion engines.

We go over to Bill Ford's River Rouge plant. Bill Ford is a grandfather himself by now, but you know, Bill Ford is still a visionary. And we tell him: Bill, Mr. Ford, my good man, let's put a big piece of Detroit iron in this computer here. That's right, Bill, here in this titanium laptop. We're running Linux in this baby and not only is it freeware, we actually \*grew\* all the code in this laptop. So there. You can trust us with your industry and your revenue stream, Bill, we're computer scientists, we know what we're doing. You just stick the manufacturing specs for the latest Ford engine in here, and we start systematically disturbing its components in random ways. We'll see which configuration delivers the most horsepower for the least fuel consumption.

Ladies and gentlemen, I know that simulating an entire automobile engine at very low granularity would be a rather difficult task. But once you've done that, you ought to be able to subject this virtual engine to all kinds of unprecedented indignities. You can explore huge regions of the possible design space that would never occur to any merely intelligent human being. If evolution can bring us pterodactyls and coral reefs, why can't it make us a car?

Or for you DARPA types: what happens when you crossbreed a Predator aircraft with an Israeli Bulldog drone? Of course, billions of these bastardized spy aircraft will be total junk, they won't fly at all and can't communicate their data from sensor-to-shooter, but who cares? Computers are great at sorting. An exaflops machine just keeps remorselessly grinding out new models, like monkeys typing Shakespeare. You never see the billions and trillions of failed mutants. You'll only see the lottery winners.

Let's go just a little further with the concept, shall we? One more dainty step down the garden path. Suppose you simulate the human body. Human bodies usually have pretty good on-site system administrators, but just how well have their capacities really been exploited? It's pretty amazing how long it took people to devise the Australian crawl in swimming. There may be aspects of human body movement that never occur to us == because we live inside human bodies. We lack the proper objectivity, that's the problem. What we need is a kind of New Economy, new business model breakthrough for moving our own bodies.

How many undiscovered judo throws are there, for instance? It's all corny, mystical Eastern handicraft, judo, and karate, and yoga, and such; we never digitized all that, we never worked it out methodically as a problem in physics. Imagine a soldier trained in forms of hand-to-hand combat that had been discovered in computer searches of the entire phase space of the physical mechanics of combat. He might perform weird but deadly movements that are utterly counterintuitive. He's simply stun the opponent through sheer disbelief. When he got wound-up, it would look like outtakes from THE MATRIX.

Ladies and gentlemen, yes, I know that THE MATRIX is a sci-fi movie. In my game, you get the good stuff where you find it, okay? I don't have to name-check sci-fi movies up here. I could have stolen you something nice and exciting from the many bright and accomplished people at Microsoft Research and Development. I pay attention to them, too. I know they're into stuff like a Sensory Pocket PC that that detects touch, tilt and motion; and Chinese text-to-speech software that probably detects Chinese piracy in real-time. So I tried that. I Googled it. I surfed over to the Microsoft Research "Archived Headlines", but since they are a modern computer company instead of a big-budget science fiction movie, this is what I got off their web page:

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[Microsoft][SQL Server Driver] Invalid object name 'features'. Drivers error '80040e37'
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So, back to the science fiction. Now I'll tell you what's really got my attention lately, the stuff in your field that I consider really groovy and with-it and hip. Ubicomp. Oh yeah. I know it's got a million names. All kinds of jargon. Pervasive computing. Wearable computers. Intelligent environment. Wireless internet. Peripheral computing. Self-configuring, adaptively coordinated Embedded Nets. Things That Think. Locator Tags. JINI. Wearware. Personal Area Networking. And so forth. This kind of disruption in my beloved English language is like the rumblings of a tectonic fault. The signs are very good that something large, expensive and important will tear loose there.

I personally prefer the word "ubicomp" because it sounds so cheap. Ubicomp: that sounds like you go down to the hardware store and buy a few gallons. You don't have to genuflect to it, but it's still a grand challenge. Because ubicomp is truly a profound idea. It has grandeur, and better yet, it's not metaphysical. You don't have to handwave with any big verbal catch-all terms like "artificial intelligence". Or "evolution." Or "nano-" anything. Or "virtual" anything. And that's \*good.\*

Ubicomp is about physicality. So ubicomp's got what my friend and colleague Judith Berman likes to call an "empirical referent." When you've got an empirical referent, you can't just make it all up and sell stock in it. You have to demo or die. You're got an anchor point in consensus reality. This is, of course, the very opposite of what Judith

Berman and I try to achieve when we are writing science fiction, but that's why we're not in your industry.

Suppose that ubicomp really took off. What would that mean, how would that feel? Well, the first suggested uses for ubicomp are pretty primitive: because the chips are too big and they need a lot of power. A refrigerator is always plugged into the wall. So maybe my ubicomp refrigerator reads the bar-codes on all the groceries that enter and leave it. It answers my cellphone when I call it from the grocery, and it gets me up to speed how old the yogurt is.

Cars have plenty of onboard power. So my ubicomp car gets to become a dangerous, highly distracting, mobile office on wheels. It's reading textfiles aloud over its radio speakers. It's taking voicemail. It asks for handy directions from satellites overhead and the local street-signs. The tires complain when the tread gets low. The gas tank knows all its favorite gas stations in the area.

These innovations just add a sexy blink and smile to products that already exist. They aren't grand ubicomp challenges. The grand challenge in ubicomp is to reform the basic, primal relationships between humanity and things.

If physical objects misbehaved as badly as modern computer software does, then human life would become hellish. It would be murderous. This is definitely a grand challenge, because it is also the kind of nightmare one reads in the darkest tales from RISKS DIGEST. "Risks to the Public in Computers and Related Systems" from the ACM == I love that publication, I read it faithfully. The comic potential alone makes it more than worth my time as a novelist.

Well, when \*everything\* public is a "computer related system," then there's no limit to the risk. A single instant's bad driving can kill you and your family. Automated kitchens can slice, dice and fry the unwary. So those aren't good places to start.

So what is a good place to start with ubicomp? Let's talk about express shipping. Here we have a nice big camel's nose in the tent for a break-out ubicomp scenario. With the modern express package, chip-function is added to a portable object in a way which is not only convenient, but a definite competitive advantage. I can follow a package via Internet from distant New York right to the doorstep of my business.

If I could keep that schedule for all raw materials that down to the minute, then I could reschedule my inventory, keep stockpiles low and lean, do just-in-time assembly, and make a whole lot of money.

I don't need a "smart" package or an "agent" package. I don't much want to "talk" to a package. I don't want a package tugging my sleeve, stalking me, or selfishly begging for attention and commitment. If a package really wants to please me and earn my respect, it needs to tell me three basic things: What is it? (It's the very thing I ordered, hopefully). Where is it? (It's on its way at location x). And what condition it is in? (It's functional, workable, unbroken, good to go). The shipping company already needs to know these three things for their own convenience. So they might as well tell me, too. So I don't have to swallow my ubicomp like castor oil. My ubicomp arrives in a subtle way, as a kind of value-added service.

So the object arrives in my possession with the ubicomp attached. It's a tracking tag. When I sign for that object, I keep the tracking tag. It's mine now. Ho ho ho!

Let's say that it's something I'm really anxious to have: it's a highly evolved mousetrap. The mice in my house are driving me nuts, because I'm a programmer. I eat nothing but take-out Szechuan food, and everything in my house is fatally disordered.

Luckily my new, computer-designed mousetrap quickly and horribly slaughters all my mice. Not one vermin is left alive. That's great service, but now I'm anxious to get rid of it. I really don't need a super-mousetrap attracting attention, if I get lucky and a hot date comes over to help me play "The Sims."

Given that I'm a congenital slob, of course the mice soon return. But by then, I've already forgotten my mousetrap. Out of sight, out of mind. I paid a lot of money for it, but I already forgot where I put it.

But suppose that my mousetrap still has that shipping chip. That means that the mousetrap answers when called. I just look up its location on my home tracking network. The mousetrap is still responding to my three basic questions: (1) it's a mousetrap, (2) it's in the northeast corner of the attic, and (3) it still works fine! Those mice are in peril of their lives!

Having benefited once or twice by this, I take the logical next step. I tag everything that I already own, lawnmowers, garden rakes, tennis shoes, car keys, remote control, my eyeglasses, the works. Now I have a ubicomp menagerie. I even tag the mice. After all, if I know where the mice are at all times, then I don't have to kill them. I just haul the mice out of the walls and I sterilize them. Then the mice become a kind of tame garbage disposal system.

Other huge benefits ensue. I no longer need to sweat and struggle to put my possessions into order. My things can never get lost or misplaced. They can't even be stolen from me, because the ubicomp tags are too small to see, and any thief just becomes a kind of large mouse to be tracked down by bored cops and annihilated.

Ladies and gentlemen, I am a ubicomp groupie. I regard ubicomp as a really nifty, high-concept scheme. If it were just a matter of intellectual sexiness, sci-fi appeal, and technical brio, man, we could breeze for this technology. We'd be rolling out the old IPOs, and getting cover stories in WIRED magazine, and Dell would be underpricing us, and hoo boy, the sky's the limit.

But that's not the way your industry works these days. Because people, your industry is showing its age. And it has pulled that old Grand Challenge hat trick a few times too many.

Okay, check this out. Here is a clear precursor to ubicomp, poking its head above the trench here, getting ready to charge the no-man's-land. Ultra-wideband. Wi-fi. Airport. 802dot11. 802 dot 11 b and g. AirHead. Nokia Rooftop. Mesh Network SkyPilot IBurst base-station smart cells. Ladies and gentlemen, we are having a classic, distributed, heavily networked, spontaneous, logarithmic orders of magnitude, early-Internet style, popular eruption here.



This is the computer community at its anarchic, inventive finest, this ultra-wideband scheme. Only this time around, the clock has been ticking. The Digital Revolution has a track record, and it's not entirely pretty. The Non-digital Counter-revolution really gets it about the menace that a disruptive innovation like this represents to the status quo. They don't fight fair, because, frankly, neither do computer geeks. Fairness was never an issue here. Because "fairness" is a political word, it's not a technical word. There's no such thing as "technical fairness."

But there are still huge, severe issues of power and access and money. So, the many frightened opponents of ultrawideband are not sitting still like the wallflowers at the sock hop. On the contrary, they are going for the throat of this young thing. They are going to wallop that little genie on the back of the head with a blackjack and stuff it right back in the bottle. Check this out:

The U.S. Federal Communications Commission approves the technology for limited commercial use in February. But in come some heavy operators: all the major wireless carriers, the Federal Aviation Administration, the U.S. Department of Defense, satellite radio companies, and the entire global positioning system community. They want to strangle ultra-wideband in its crib == to kill it while it's still stuck in the standards.

Okay, just like the Internet, ultra-wideband is something used for decades by the military. It's spooky stuff. It is used to communicate wirelessly without being detected by opposition forces. All of a sudden the Silicon Valley crowd gets it about the raw potential. Not the "commercial" potential, really, because there doesn't seem to be a business app for it == but, you know, the good old-fashioned \*potential\* potential. Build it and they will come, right?

Ultra-wideband is low-cost, low-power, high-speed, and best of all, it is the number-one alternative to a whole crowd of normal-wideband, stocks-on-fire, money-losing technologies run by guys like Gary Winnick of Global Crossing, and Bernie Ebbers of Worldcom, and the Rigas family of Adelphia Communications.

So, ultra-wideband is a grand challenge with a lot of deadly enemies. Experienced enemies who are sick of being burned by disruptive new technologies. Out comes the Fear Uncertainty and Doubt. Nine hundred companies file concerns with the FCC. The GPS will fritz, they say; airplanes will fall out of the sky. This is cynical baloney. Everybody knows that, but evil stuff like that has to be said; because these are classic not-in-my-back-yard tactics. Cynical, tooth-gritting tactics that people use when their backs are against the wall.

This is the sort of civil-disobedience fervor that we see from anti-genetics campaigners and anti-nuclear activists. Except that instead of being hippie zealots, it's guys the likes of ABC Disney and the music recording industry. Wi-Fi isn't Al Qaeda, they're not going to knock down any airplanes. But this is common or garden competitive practice for your industry these days. Obstructive incumbents. Monopolization. Vicious infighting. Phony-baloney regulatory obstacles.

Computation doesn't lack grand ideas. There's nothing gone wrong with Moore's Law. People in Nature magazine this week are making transistors out of single atoms! But it doesn't much matter how pretty these ideas are, because your industry has been

debased. The heavy players in your industry gave up expecting any justice from the Justice Department, or any civility from civil society.

They are having a civil war, where guys who own the operating system and guys who own the intellectual property go for each other like Lebanese militia factions. It is war to the knife inside the box. In the eyes of the public, your captains of industry have no honor. They are either fat cat swindling behemoths ruthlessly trampling the public good, or else they are self-appointed digital fire ants giving Mickey Mouse the death of a thousand bites. This is not a pretty sight.

Your best friends won't tell you == but I'm a science fiction writer, and most of you guys are academics or in government, so I'll tell you. The computer industry is full of smart geeks who never took out their garbage. They were so busy that they forgot about elementary business hygiene. They smell. They are becoming repulsive.

Now, computation is my favorite little industry. But you know, if you never take out your garbage, and the clock keeps ticking, then you've got vermin. It rots from the head down, the computer industry. The moguls in computing aren't knights in shining armor, these are some of the meanest robber barons anybody has ever seen. These guys are like ninja assassins armed with rusty stilettos. They are stealing each other's market oxygen. They are stabbing each other's babies. They went straight from Internet anarchy to feudalism monopoly domination. They went straight from the barbarism of the garage startup to the decadence of bribing the government, suborning accountants, and paying themselves with stock options that aren't on the company books. And oh my goodness did the chickens come home and start roosting.

They never clean anything up. They just dump the last box and start over. The Internet stinks right now because we are getting the Internet we deserve.

Ladies and gentlemen, it doesn't give me any pleasure to tell you these things. They are painful things, and they are ugly things, and they are shameful and demeaning things, things unworthy of a healthy industry, things unworthy of a functional government, things unworthy of a free people. But I'm telling you the truth, and you know it. You know it \*better\* than I know it.

Okay == to be painfully, totally honest == maybe it \*does\* gives me a little pleasure to tell you these things. But to have a garbage problem is not the end of the world. If you're a lazy hacker slob who lives on take-out Chinese and Cheetos, you can reform. I've seen it done. You grow up, that's the secret. You get older, you take responsibility, you face up to it.

Arthur C. Clarke, a great science fiction writer, made up an interesting aphorism once. "Any technology that is sufficiently advanced is indistinguishable from magic." But that doesn't mean that any technology ever \*is\* magic == just because the rubes up in the gallery can't tell the difference. You want to see an industry with a serious garbage problem, check out the \*nuclear\* industry. The computer industry is still young. It's not as young as it thinks it is, but at least it's still kind of imaginative and dreamy, it hasn't become a byword for warfare, radiological dirty-bombing and permanent contamination.

The truth is that ALL technologies have garbage. Until they can pick up after themselves, they are immature. Any garbage that is sufficiently advanced is also indistinguishable from magic. It may look magic, but it's still garbage.

Ladies and gentlemen, although I've been harsh with you, I am bringing you a message of hope and aspiration. What if it's \*smart\* garbage? When ubicomp become garbage (as all gizmos and gadgets are inherently likely to do) it can be smart garbage! It's garbage that knows that it's garbage. It's garbage that can identify itself to the junk recycler. It doesn't go out of sight, out of mind, where it's allowed to fester like a leftover computer virus. Without vision, the people perish; but \*with\* some vision, what the heck, let's live it up! The gizmos fold themselves right back into the production stream. They don't spew toxins or waste, because even the trash is computational. We've got a gizmo that is smart enough to make its peace with the clock. It truly got ahead of its time.

I see by my digital wristwatch here that time stops for no man, and I am out of time too. That's all I have to tell you tonight. Thanks for entertaining my speculations. I hope you have a great, productive conference.