

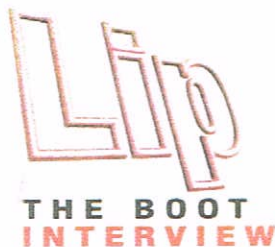


“Xerox works hard and typically brings things out first. But IBM is in a position to have a high impact and I want to have an impact.”

E.J. "TED" SELKER

Sitting in his lab at the IBM research facility nestled in the sun-drenched hills above San Jose, E.J. Selker talks about smart machines and even smarter people, and how his inventions get them to communicate.

Many know Selker as "Ted," some know him as the father of the TrackPoint, most know him as...



IBM's Thinkman

boot: The IBM facility here at Almaden is very impressive. What's your job here?

SELKER: I'm an "IBM Fellow." [laughs] And that's a new title for me. I'm the manager of a group called User System Ergonomic Research and we work on graphical, physical, and cognitive interface. My Ph.D. training is in artificial intelligence and I've brought myself up learning about modern tool building technologies, so that's how I got into computer science and A/I. But there is something about myself that's always interested in understanding and creating physical things. My fingernails are always dirty. I'm always building things.

boot: But how did you wind up here? How does one get to be an "IBM Fellow"?

SELKER: I was always this way, even as a child, I wanted to be an inventor. People used to think of me as a flake, and they'd say so to my face. And I'd be very embarrassed. I was always upset by this, and, as a result, I was always doing bigger and bigger projects. I was at Xerox PARC for a while, but I could

see that I was only a little part of a bigger project. So when I got an offer to go demonstrate that I could create on my own, I decided to leave Xerox and go to IBM for a couple of years. I thought, and maybe finish my Ph.D. At the same time, I did lots of other things—I like to use one activity as a recreation from another activity.

boot: What's an example of an "other" activity that has taken you somewhere unexpected?

SELKER: I once made an Atari 800 run a force-feedback ski boot. And this gadget [holds up a small box with a wire coming out and a pen attached to the end of the wire] was sufficient to actually land me a job at Atari. Unfortunately, Atari did not survive very long as a place where ideas can

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survive. But still... it's amazing to me that a scientist's best tool is the pen. It's shocking how much we use pens in this day and age of high tech. So, I went and made a pen that is better than a pen.

boot: Is *everything* fair game to improve on?

SELKER: Sure. I mean, on one hand, I'd like to encourage others to improve on their own work. And I prefer to work on things other people are not working on, so lots of people will get to have these tools and solutions. There is this struggle: Am I a jealous inventor or a generous inventor?

boot: So which is your role in the world?

SELKER: I've always been a guy who likes ideas. In the last few years, I've been lucky enough to have a few of my ideas turn into things that lots of people are using. Specifically, the TrackPoint device that allowed IBM to get into the notebook market. The TrackPoint embodies a lot of the ideas I consider important. Working from the scenario of understanding how people

and machines work together, in order to create a tool that allows people to work better with their computer.

Since the early 1900s people have been playing with keyboards, because they could

type twice as fast as they could write. But in the '80s, we started integrating graphical interfaces and, unfortunately, it takes 1 3/4 seconds to grab a mouse. I started thinking about how to integrate the keyboard and the mouse. It was a long and scientific road to integrate analog selection into the [keyboard] space, but still, I didn't think it was going to be a big deal.

"You don't make things easy to use by saying they are easy to use. You only discover it by watching other people's responses."

Well, it turns out people had not been able to make a joystick with the performance quality needed to make selections before. They didn't understand the synchronicity of finger and eye tracking speed. They didn't even know what the problems were. By building a joystick into the keyboard, I found myself in a position of making that move. We had lots of ideas that were proved wrong, and we slowly improved

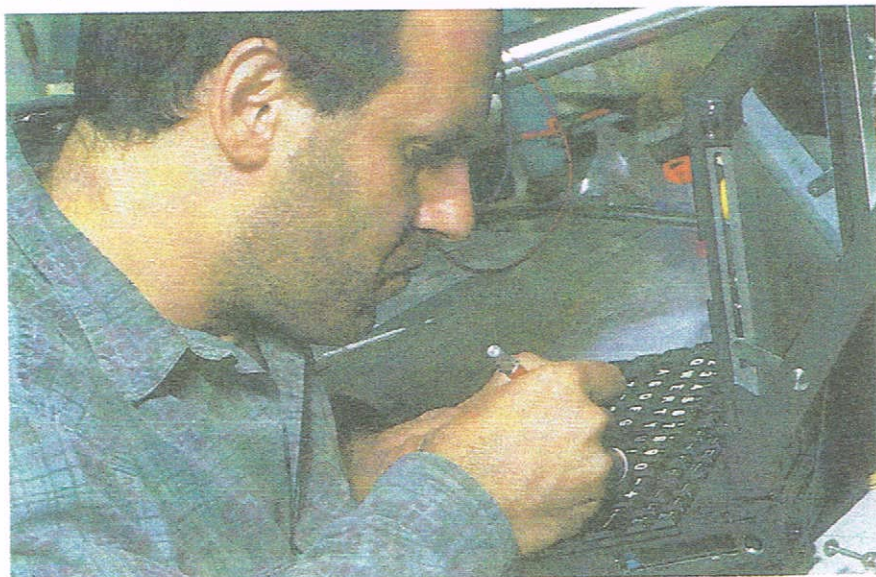
what is necessary to making anything work. But if you stay obsessed about anything specific, you don't have any perspective. I try to keep a balance.

My religion is being interested in people.

I start off with a scenario and try it myself. Then, I have other people try it and I run human factor experiments to get data out. I love data. Data is very different from

just wondering if it works or just trying it out. I was reading this Unix page about some mail program this morning and it said it was "a comfortable, easy-to-use way to send and receive mail," but it was amazingly arcane. You don't make things easy to use by saying they are easy to use. You only discover it by watching other people's responses.

It's like this notion that a hammer is



"There is something about myself that is always interested in understanding and creating physical things," says Selker from the IBM think tank in Almaden where he creates the future. "My fingernails are always dirty."

the TrackPoint by scientific experiments to the point where TrackPoint 3, which is currently available on IBM notebooks, can outperform any pointing device for mixed typing and selection.

I like to think about a problem and then design a tool to solve it and I get excited about it.

boot: For your ideas, do you spend more time studying people or their machines?

SELKER: How do you make things serve people? It's a tough balance to be fascinated with machines without forgetting your religion. I think being obsessed with things is

ready to use in your hand. You don't sit there and learn about it. It just makes nailing a lot easier. And after it is in your hand, you don't think about the hammer, you think about the plywood.

boot: The hammer makes nailing easier; what does the computer make easier?

SELKER: Well, people use everything to augment their thinking. When I'm designing, sometimes I'll go into a hardware store. I'm using the hardware store to help me think. And I go to the woods to declutter my mind. Anything we pick up and start using becomes a part of us.

The computer allows tremendous potential. I get to try out ideas and express them faster. I take this laptop computer everywhere, and it has everything I need on it. It is the opposite of the Web. Instead of being all "over there" at the end of a pipe, it is all "over here." And if I'm in a meeting and need to show everyone something, I just put it on an overhead projector, and whatever I've been doing suddenly becomes public. I'm able to share my arguments, my ideas, and my perspectives. I've sat in a room full of people arguing and put up one image on this laptop, which focused everyone's attention, and the arguments have stopped. It just changed the direction of the conversation. People don't have as good a memory as they want, so keeping the idea in the air keeps it in everyone's consciousness.

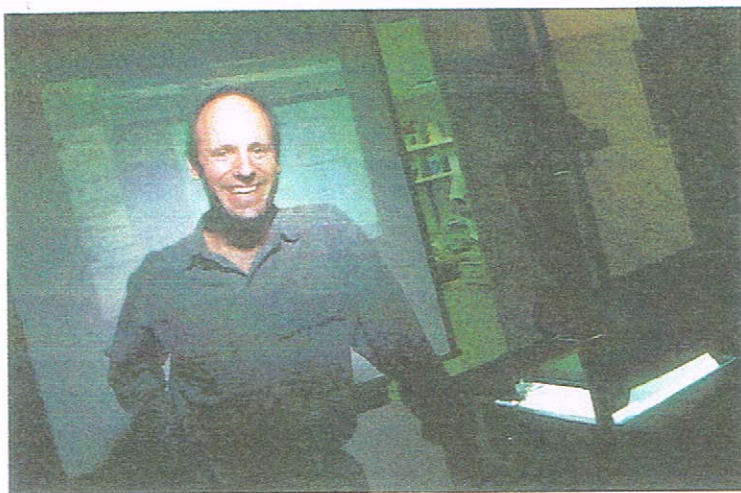
Sometimes people need a large amount of visual memory in front of them to understand an idea. Imagine a lot of papers scattered out in front of you. What if we projected these things onto a wall, everyone points at them with laser pointers, and you can actually pick them up off the wall with a laptop device. Now you can spread out everything on your table and see it up on the wall without having to take it out of the filing system. This is a working prototype of a product we call "Room with a View." **boot:** This sounds like an advancement of the concepts behind the Web.

SELKER: [Laughs] Isn't it miraculous that just as we declared mainframes, and that god-awful half-duplex interface IBM got every airline in the world to use, dead, along comes the Web? We decided as a community to rebirth servers. We have reinvented centralized computing, so everything is everywhere anytime. And this is all in direct contrast to the notebook computer, which has been selling more and more.

Another reason we need the centralized servers is socialization, which is really only possible on the Web. The Web will sink down into our unconsciousness—just as the VT-100 is not something you think about that often but was miraculous in 1979 when it became possible to look at a whole screen page at once.

boot: Will people treat their Web browsers like the next VT-100 or like TV sets?

SELKER: Well the VT-100 is more of a television for me than television is [laughs]. It's not the Web browsers, but the content. We have RAT, a WBI [Web Browser Intelligence] that looks at information and decides how valuable it is, relative to things you looked at



Selker's ever-present laptop casts the screen image on a wall with the aid of a common overhead projector. "I've sat in a room full of people arguing and put up one image... and the arguments have stopped," he says.

in the past. After looking at a few sources, we found that the Web had *no* information. And newsgroups were almost just as bad... compared to the abstracts. So when I search, I need a consistently reliable source of information. This is referenced material. On the Web, you don't know when something is *really* published and when it isn't. It's kind of disjointed, like the gossip approach to finding out information. When we treat the Web as seriously as we do our libraries, there will be quantifiable value.

boot: Do you feel there should be an overseer to filter ideas on the Web? And who should that be?

SELKER: Yes, I do, but I don't want to get into that now.

boot: Well, [pause] how many great ideas are there here in this office?

SELKER: We probably get one or two a week.

boot: How many make it to the marketplace?

SELKER: In any research environment, I use the number five percent. About five percent of our ideas—maybe more here—actually get deployed.

boot: What is one of your recent ideas that actually went public?

SELKER: Last week we put a proxy on our site on the Web that you can download, which watches what you do and watches what the Net does. It lights up each link it finds with either a red, orange, or green light. The red light means it's down, the orange light means it might take a while, and the green light means it should be quick to get to. It sits as a background application trying to build intelligence by just watching what you do.

I'm very excited about the idea of watching behavior and building intelligence. I remember there was a paper I once read that said it would be impossible in the

foreseeable future to have a computer that could keep up with your rate of using the computer and figure out anything by reasoning and learning. At that point, the challenge becomes: Can I make a computer that does reasoning and learning at the same time? My *COACH* [Cognitive Adaptive Computer Help] application sits and annotates your graphical user interface. *COACH* records statistics of whether you have used something before, how many times you've used it, and then uses that information to decide what kind of help will be appropriate for you.

boot: Will you take this approach to the next level? Where the system actually "thinks" and starts to configure itself?

SELKER: Well what you have here is an "implicit" agent, and it acquires the knowledge without your implicitly acting on it. Agents can be either assistants or advisors. *COACH* was an assistant that proved to be five times more helpful than an advisor. I think the assistant is the most exciting kind of agent. The first agent I ever made was

for a kaleidoscope program, which changed if you pushed a lever. This system can take an art critic and turn him into an artist. If assistants keep doing things for you, a private language develops between you and the computer. And this private language speeds you up. I think it's great for me to learn things, but I also think it's great for me not to have to pay attention to things.

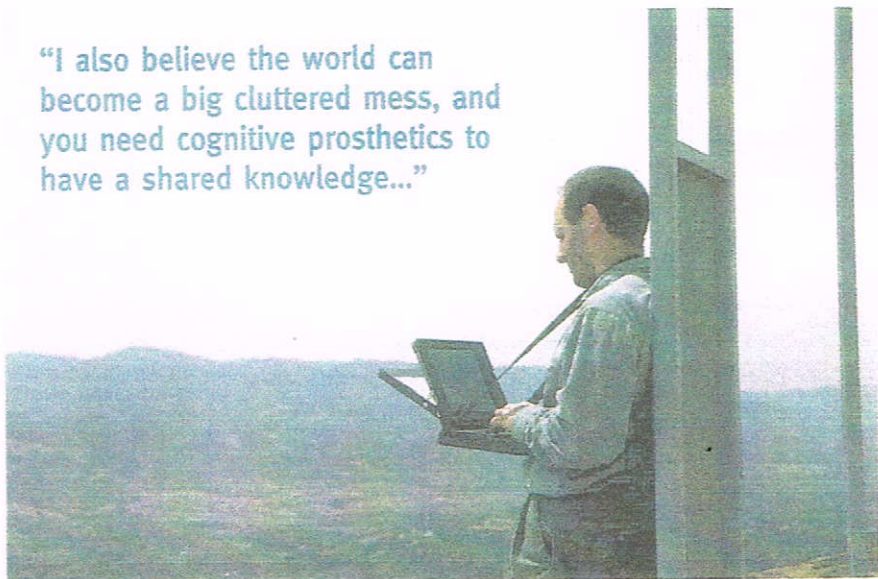
boot: So what is goal ultimately? Is it to train the user or train the machine?

SELKER: It is to get things done. I believe in evolution and, now, we are training the computer. It is amazing that machines are of any value at all. I think the big jump for humans is to be dealing in this manner with inanimate objects. We are going to party together. We're fortunate that we're able to have representations that are transferable without the filtering of ideas.

boot: What do you see the user interface evolving toward? Is Windows the ultimate, or will some 3D virtual world replace it?

SELKER: Well, when I'm reading text, I don't read it in perspective. I read it flat. Reading is one time when people can focus on ideas. I love the whole authoring process of text. And I don't see it embellished by three dimensions. But there are a few three-dimensional things you can do to text, like illustrating history or the previous versions of the text. Dimensionality is only one of the techniques that our body is good at incorporating. Perceptual experiments show that drop shadows in menus tie in to our shadow memory. Turns out there are about six other phenomena we detect well. We can tell convexity very well. But drop shadows

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Using the sun as a backlight for his laptop, Selker steps outside the think tank to "declutter his mind."

are the only technique people are using in GUI. Why aren't they using the other six? And what is it about 3D that is so cool?

Is 3D even necessary?

People have always been good at navigating physical spaces. It helps with priorities. So there are lots of techniques we can use to make information more real. I also believe the world can become a big cluttered mess, and you need cognitive prosthetics to have a shared knowledge—especially where you don't have everything you think about together in front of you at all times. How you communicate a shared background is going to be part of designing the user interface of the future. In a personal relationship, you rely on that.

boot: What role can machines play in personal relationships?

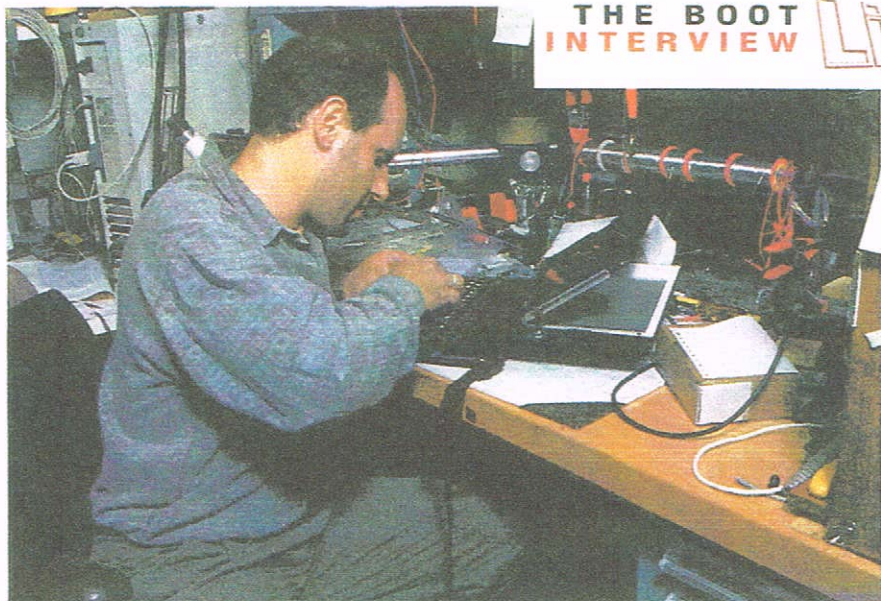
SELKER: There's still tension between concentration and socialization. You are in a social situation. What kind of tools do you want to support that interaction? I mean, if you're really excited about that person, you want nothing to come between you. Hopefully the sheets are gone, and the clothes are

"I think it is a tough balance to be fascinated with machines without forgetting your religion... My religion is being interested in other people."

gone, but not everything can be done naked in the bed.

I was walking down the street in New York with friends of mine from NYU and Columbia, and we went into one of these cybercafes. My friend was able to show me his home page, and guess what? It turns out that this is incredibly lovely, because he can show me everything about himself in living, breathing color. So computers are now serving a really different purpose than before. Now I can send a telepresence, where in the past people had to really go and visit you.

boot: Well, with all these powerful abstract ideas, do you ever find yourself pressured to



The Almaden lab is the source of "one or two" great ideas every week, but only five percent ever go public.

just settle down and make commercial products?

SELKER: No pressure. [Smiles]

boot: So, this is a "pure" think tank?

SELKER: Well, all of the research community has been under tremendous pressure from everyone, from the government to all

the companies that are cutting research funding. So...

boot: Is this process selling out long-term benefits for short-term rewards?

SELKER: [Shakes his head] I think it is just terrible and should be stopped. IBM now has more physicists than most large universities... but I think it's important for IBM to have a strong research team, in order to develop a strong leadership in science.

boot: Will you be with IBM forever? Is this your stopping point?

SELKER: That's a hard decision. I remember sitting at Xerox PARC and my boss saying "Why are you leaving?" I said, "Because if I was at IBM, my pointing device would sell on millions of keyboards. And if I was at Xerox, it's unclear even how our pointing device would sell." Xerox works hard and typically brings things out first. But IBM is in a position to have a high impact and I want to have an impact.

I should be publishing more and I should take more time to make sure people understand my ideas. As a user interface scientist, I usually grow things and put them on a shelf. Science, in my view, is having an idea that makes other people have ideas. If people reference your product, that is good. But if people don't

remember what it is they are referencing, then it's not science. Science is the record of ideas aggregating other ideas.

boot: Ultimately your role is not necessarily to build a better computer, but to advance how people communicate with their machines.

SELKER: Exactly. I'm not the type of guy who would be proud to say, "I invented the microprocessor." What is the microprocessor actually used for? Was it good or was it bad to invent it? When I create something with a purpose, then I feel it was something worth making.

boot: Do you think any of your inventions will ever be used for evil?

SELKER: Well, certainly someone is using the TrackPoint right now to avoid paying taxes or funnel their money to the wrong candidate [laughs]. I mean, what is "evil?" Sure I have moral dilemmas.

boot: Are you ever afraid someday you'll be looked back on as the "TrackPoint man"?

SELKER: I hope not. I hope I create lots of things. Keyboards have stood the test of time and have been pretty popular for 100 years, but that could change. As it changes, the value of the TrackPoint might change also. But I am very proud of the TrackPoint.

boot: With all your achievements, which idea are you most proud of?

SELKER: I always thought of this pointing device as a science fair project to keep me busy while I worked on my agent stuff. However, I worked very, very hard for 10 years on the TrackPoint and have sold millions of them, and I'm proud of that. And I'm also proud of those ideas I have that are way out there, but for entirely different reasons. ☐



Selker brought his TrackPoint device to IBM so it could make an impact.