Previously in Digital Culture:

"The Digital Philosopher," by Harvey Blume (December 9, 1998)
Can robotics shed light on the human mind? On evolution? Daniel Dennett -- whose work unites neuroscience, computer science, and evolutionary biology -- has some provocative

Behold the toys of tomorrow

by David Shenk

January 7, 1999

"The killer app is the eyes," Erik Strommen tells me as he rotates his right hand to cover up two painted plastic eyes on the head of a plush, bright-purple dinosaur doll sitting placidly in front of us. The doll, about a foot long with a lime-green belly and six yellow toes, is a miniature replica of Barney, the popular children's television character; in place of the human being stationed within the polyester and foam of the life-size Barney, this rendition is packed with electronics and microprocessors courtesy of Microsoft. It's not alive, but it pretends to be. As soon as Barney's eyes are shielded from the light in the room by Strommen's hand, the doll reacts. "Whoa-oh-oh-oh!" Barney sings out in his familiar, punchy voice. "Where did you go?" When Strommen pulls his hand away, Barney blurts out, "Oh, there you are!"

"That's the killer app," Strommen repeats with a youthful grin. "The kids just can't get enough of that."

Here is one phrase I did *not* hear buzzing around the crowded showrooms and elevator wells at the 1998 Toy Fair, the frenzied

answers. Is he on to something, or just chasing the zeitgeist?

"Coming of Age in Cyberspace," by David S. Bennahum (October 28, 1998)
In the bedrooms, the arcades, and the high school computer rooms of the 1980s, kids of the Atari generation invented today's digital culture. An excerpt from David Bennahum's memoir, *Extra Life.*

"Portable Musings," by Sven Birkerts (September 10, 1998)
The book is the network, the network is knowledge, and soon you'll be able to curl up in bed with all of it. This calls for some serious rumination.

"The Invisible World Order," by Andrew Piper (July 29, 1998)
If digital technology is to serve humanity (and not the other way around), we'll have to come to terms with the database and all that it implies.

More on **Technology and Digital Culture** in *Atlantic Unbound* and *The Atlantic Monthly.*

annual New York City convergence of more than 20,000 toy makers and toy sellers. At high-tech conventions such as COMDEX, "killer app" is one of those expressions that gets tossed out so often it tends to hang in the air like cigarette smoke. But not here, not yet. After all, this was only Microsoft's second year at Toy Fair.

Microsoft is so new to the toy industry, in fact, that it hasn't yet figured out a way to steal the show. I actually had a difficult time locating Microsoft's sales suite, finally chancing upon it at the end of a ninth-floor corridor, tucked away like an afterthought. Quietly, though, the software giant is off to an extraordinary start: the debut of ActiMates Barney, Microsoft's first toy, introduced in time for the 1997 Christmas buying season, was a smash success, with 350,000 units sold (at the premium price of $110) in its first six months. More importantly, the ActiMates toy line is shockingly innovative, clearly a harbinger of future playthings. Is Bill Gates on the verge of delivering the pulse and hubbub of the information revolution to my unsuspecting two-year-old? The prospect fills me and many other parents I've spoken to with a powerful mixture of hopeful curiosity and prickly anxiety.

ActiMates Barney represents an entirely new class of toy, a "real category breaker," Strommen says. It's designed to be more of a nurturing companion than an amusing trifle.

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Microsoft ActiMates

"He looks like a plush doll," Strommen says of Microsoft's Barney, "but he's actually a cuddly little computer." The chief content developer for ActiMates, Strommen has brown hair with straight, cropped bangs, a broad smile, and a tendency to end declarative statements on an up note, as if he's asking a question. It's his way of politely making sure the listener is keeping up -- of asking, "Are you still with me?" without actually saying the words. The rhetorical style suits his ambitious twenty-minute presentation, an amalgam of technical detail ("the technique is called horizontal overscan digital insertion"), multimedia *Wow!*, and daring educational pretension, all in service to the larger message: *This is not your father's teddy bear.* ActiMates Barney represents an entirely new class of toy, a "real category breaker," Strommen says. It's designed to be more of a nurturing companion than an amusing trifle.

From a hardware perspective, ActiMates Barney is clearly in uncharted toy territory: it has a PIC microprocessor/ microcontroller with 192 kilobytes of RAM (more than my first PC), a two-megabit ROM chip, a transistor board, three motors, five sensors, and -- most significantly -- a two-way radio transceiver for wireless communication with television, videocassettes, and computers. Designed for kids aged two to five (the same demographic as the television show), Barney serves as a new sort of mediator for a toddler's interaction with the electronic world. A special radio signal, encoded into Barney TV broadcasts and built into a series of ActiMates CD-ROM software packages (software and transmitters sold separately) is detected and decoded by ActiMates Barney. As the show begins, the Barney doll sitting next to you or on your lap says, "I like watching TV with you," and then, "Here we go!" Soon it begins to respond coherently (if gratuitously) to the dialogue and images on the screen. During the course of any given program, the furry companion comments on the program content with steady bursts of affirmation ("This will be great fun!" "I like getting hugs!"); faux surprise ("Oh my!" "Look at that!"); and forced curiosity ("What is that?" "Let's look"). There are also partial sing-alongs, with the doll chiming in on choruses. Frequently, ActiMates Barney is simply giggling at or endorsing what the TV Barney is saying on screen:

TV Barney: "Will you help protect our earth and keep it clean?"

ActiMates Barney: "Yes!"

This provokes an instinctive creepy feeling in any adult who has never witnessed it before. After a while the agitation fades into annoyance, as the doll interrupts the television narrative with comments so consistently unnecessary that you'd probably worry if your own child were making them.

Apart from the TV and computer, ActiMates Barney functions as an "intelligent" stand-alone toy. Barney has a two-thousand-word vocabulary, sings seventeen songs, and plays twelve separate games. Squeeze his hand to play patty cake. Squeeze again to hear him meow like a cat, or play count-along. "I was bringing home early prototypes for my son to play with," Strommen says. "He loved it. We worked it into a bunch of our bedtime routines. For instance, if you don't do anything with Barney, he yawns, and then two minutes later he says, 'I'm sleepy --' and then 'Good night' as he powers down. So before bed, we used to take Barney in, sing a couple songs with him, and then just sit there and talk. Barney would yawn and say, 'I'm sleepy.' I'd say, 'Oh, it must be time to go to bed -- Barney's sleepy.' Then Barney would go, 'Good night,' and my son would say, 'Good night, Barney.'"

Strommen's son is now four, and is beginning to outgrow Barney. Happily for him, his father has developed two new ActiMates dolls for the next level up. "We were Barney people, and now we're growing into Arthur and D.W. people," Strommen says of the new plush toys, who are also modeled on top-rated PBS characters from a show geared to ages four to eight. Arthur and D. W. are a brainy brother-and-sister pair -- Arthur the one with the nerdy glasses and awkward self-consciousness, D.W. the laughably precocious mop-head. The personalities differ, but the content of the two dolls is equivalent. With 4000-word vocabularies (twice that of Barney), they have more than a hundred phrases grouped into different categories -- careers, tongue-twisters, holidays, and knock-knock jokes. "When we do testing," Strommen says, "usually at about the third or fourth knock-knock joke, the kid who's sitting next to me turns to me and says, 'I have one. Knock knock' -- and we end up telling knock-knock jokes to each other. It's a real social activity. It gets kids thinking about what they know."

Strommen is a developmental psychologist by training (one of

three psych Ph.D.'s on the ActiMates team), and an educational technologist in practice. Before coming to Microsoft in 1996 he spent seven years developing software for Children's Television Workshop. His seriousness of purpose comes shining through in his demonstration, in the dolls themselves, and in the accompanying software.

Strommen set out to develop a product that kids could interact with over a long period, and the hardware and software are indeed geared for a long-term relationship. Thanks to a calendar chip, Arthur and D.W. are able to track the time and date for the next ten years. They can be put to bed with your child, Strommen explains, and programmed to wake her in the morning with "Ding ding! Time to get up!" They can also "learn" and "remember" your child's birthday, for which they initiate a countdown sequence: "Five days to your birthday!" ... "Four days to your birthday!" ... and so on.

"He's like a little friend," I suggest to Strommen. He looks up at me and smiles. "Exactly," he says. "He knows you."

Next page ... "Thinking" Toys

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"Thinking" Toys

Toys that know you: here is an idea neither ahead of its time nor ten years too late, but which is right now perfectly, brilliantly ripe. Technologically, computers are just becoming small enough, powerful enough, and -- with the recent popularization of wireless infrared links -- communicative enough to fit anywhere and to record or transmit virtually anything. Economically, here are two separate industries, toys and computers, with impressive sales figures and large pools of creative talent, but also with flagging growth. Merge the two and suddenly you have a new market with a constantly replenishing source of fresh consumers and a pace of change speedy enough to attain that sublime condition of planned obsolescence. Venture capitalists spend their vacation days on the beaches of Cozumel fantasizing about synergies like this. Attaching microchips to squishy stuff is likely to make a lot of people very, very rich.

The computerization of toys also dovetails nicely with the ambitions of computer evangelists, those whose life's mission it is to deliver the power of computation into every aspect of every person's life. Nicholas Negroponte, the director of MIT's famously innovative Media Laboratory (the Vatican of techno-evangelism), noted last year in his *Wired* column that toys are the "fastest evolving vehicles on the infobahn," meaning that because of their astonishing turnover rate (each year, 75 percent of the toys on shelves are newly designed), they're the only class of objects that can truly keep up with the rapid pace of hardware and software innovation. That, combined with the tantalizing prospect of winning young, impressionable children over to the virtues of

computers, has catapulted toy technology into high-priority status for the Media Lab. While researchers there have been exploring the issue for decades, they substantially upped the ante earlier this year with the formation of an industry-research consortium called "Toys of Tomorrow." A dozen or so companies, including Mattel, Tomy, Intel, and Bandai (makers of the infamous Tamagotchi "virtual pets"), have signed up, committing to at least three years of the $250,000 annual sponsorship fee. In return for the funding (a modest R&D investment for any sizable company), sponsors get first crack at the new technology and ideas -- a head start that seems bound ultimately to be worth many times that sum.

The Media Lab is a Willy Wonka factory for technophiles, where the only limitations are in the creators' imaginations. Intoxicated by the MIT fumes, one thinks: *How could this not be a boon to society?*

The promotional literature for Toys of Tomorrow is suffused with condescension toward objects (and their owners) still stuck in an analog world. "The digital revolution will transform the world of toys and play," the official TOT Web brochure boasts. "Old toys will become smarter. New toys will become possible. All toys will become connected. There will be new ways of playing, designing, learning, storytelling. When a Cray becomes a Crayola, when a teddy bear sends a hug halfway around the world, when the beads on a child's necklace communicate with one another to make lights sparkle or music sound, we will be playing with the toys of tomorrow." Media Lab researchers are experimenting with a wide variety of wearable, musical, and communicative prototypes, and don't seem in any particular hurry to bring half-baked ideas to market. Most won't see the light of retail shelves for years.

One product, though, made its debut alongside the three Microsoft ActiMates dolls at last year's Toy Fair: the Lego Mindstorms Robotics Invention System. The result of more than ten years of (pre-consortium) collaboration between the Media Lab and the Lego Company, Lego Mindstorms is an advanced set of Lego bricks with motors, gears, and built-in sensors (light, touch, and infrared) that are coordinated by a small, mobile "programmable

brick" computer brain. "You can build and program robotic inventions systems that move and think on their own," the promotional literature promises.

The computer that controls the Lego Mindstorms system

Mindstorms works much like any toy construction kit, with the additional component of some very basic computer programming. A child conceives an idea for a particular type of Lego-based robot (one that will deal playing cards to a certain number of players sitting around a table, for example, or that will "look" for a hockey goal and then shoot the puck), then assembles the bricks and gears into the desired structure, and programs the controlling brick by dragging and dropping icons using PC software. (The program is downloaded from PC to the Lego robot via infrared signal.) The project was originally inspired by Seymour Papert, a founding member of the Media Lab whose 1980 book, *Mindstorms: Children, Computers and Powerful Ideas,* is an impassioned treatise on how computers will enhance the intellectual development of children.

Mitchel Resnick, a forty-two-year-old associate professor at MIT and a protégé of Papert's, was the lead developer of the Lego Mindstorms prototype and is one of the principals behind the Toys of Tomorrow project. When I visited Resnick at the Media Lab in Cambridge, his third-floor office was stuffed with so many large computer boxes that it was almost impossible to get inside. The cluster of hardware, Resnick explained, was earmarked for a major new exhibit at Boston's Computer Museum, called Virtual Fishtank. The exhibit, underwritten by a $600,000 grant from the National Science Foundation, allows visitors to create and interact with schools of computer-generated fish, which are programmed to react to the movement of people in front of the screen and to

gobble up virtual food when it is "released" by onlookers. The fish also interact with one another in complex ways by following a few simple behavioral rules.

Virtual Fishtank is illustrative of Resnick's two overarching beliefs in the virtues of introducing computers to young children: (1) that computers can help kids understand dynamic systems in a way that traditional materials cannot; and (2) that the way to achieve these new levels of understanding is through creative design and construction. "Traditional toys are good for young kids if they're trying to make sense of fundamental ideas like number, shape, scale, and color," Resnick says. "But there are other concepts having to do with the dynamics of the world -- how things interact, how things change over time -- that they aren't so good for. It's wonderful for kids to build all kinds of sculpture just with broken combs and forks and everyday items. It's harder to build *behaviors* with everyday materials. We emphasize using the computational materials where they give you leverage in dealing with things that involve some type of motion or interaction."

While his mentor Papert has made a career out of trying to convince people that computers will enormously expand the geometric thinking of human beings by provoking a mathematical curiosity at an early age, Resnick seems most interested in the proposition that cleverly designed machines can, paradoxically, help kids to better understand the complex dynamics of living things. "Let's say you're interested in how animals behave," Resnick says. "With modeling clay, or sand, or Lego bricks, you could build a model of a bunny rabbit. But the bunny rabbit is just going to sit there. You can make it look like a bunny rabbit, but you can't make it *behave* like a bunny rabbit. If you watch two rabbits playing with each other, you'll see there's a type of dance between them. How is it that they come to that dance? How is it that animals behave?"

Both the Lego robots and the Virtual Fishtank enable kids to confront these questions through creative design, Resnick argues. To demonstrate, he puts a couple of Legobots on the floor between us, a few inches apart from each other. At first they're completely immobile. "They look like they're not doing very much, but in fact they're sending out signals, and if they happen to see each other, they go into a little dance." As he says this, the two Legobots do "recognize" each other and start to jig back and forth. "Now, I don't think it would be very interesting to give these to kids as

ready-made toys. That might be interesting for a few minutes, but it doesn't seem like a very deep play or learning experience. What's interesting is when kids can build up things like this. A child will say, 'I want the white one to tell the red one to start dancing.' He'll program that in, but then nothing will happen. So he'll say, 'Oh, the red one doesn't know *how* to dance, so I'll have to teach it.' When kids are going through that sort of activity, they're thinking about how to communicate. The hope here is that by building up their own communication models, kids start thinking about these ideas."

With his squinty smile, earnest intensity, and boyishly curly black hair, Resnick is both disarming and persuasive. He's so clearly trying to convince rather than sell that one is tempted to allow his sincerity to pass for proof. A similar feeling of indulgence follows a Media Lab visitor around on a tour, during which machines consistently seem to defy reality: coffee makers that recognize you by your magnetically encoded mug and customize your beverage accordingly; jean jackets with paper-thin music synthesizers sewn into the denim; wireless badges that communicate and keep track of social interactions; holograms that can be *felt* in three dimensions; bit-mapped lightbulbs that cast designer shadows on a room. From the Herman Miller office chairs to the Jell-O-filled cloth instrument balls that produce different rhythms and intonations depending on how they are pulled and squeezed (one of many child instruments in development), the Media Lab is a Willy Wonka factory for technophiles, where the only limitations are in the creators' imaginations. Here computing not only transcends number-crunching, it also makes inanimate objects "think." Intoxicated by the MIT fumes, one thinks: *How could this not be a boon to society?*

In between *Wows!*, though, I'm trying to remember that, like Wonka's sensational chocolate treats, these fantastic new devices for children can distract us from what ought to be our ultimate goal -- improving the quality of our kids' lives, not just injecting more fun into them. Sherry Turkle, a prominent techno-sociologist also at MIT, argues that technology is fast propelling us into an entirely new paradigm of child development. "Today's children are growing up with 'psychological machines,'" she told *The New York Times* last June. "They have become accustomed to the idea that objects that are not alive might nonetheless have a psychology and even consciousness." If Turkle is correct, the critical question

becomes: Do toys that think -- or pretend to think -- also spur our children to think?

Next page ... Stimulation or Captivation?

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Stimulation or Captivation?

Jean Piaget, the eminent Swiss psychologist who more or less invented modern developmental psychology earlier this century, defined intelligence as the ability to cope with the changing world through the organization and reorganization of experience. The two critical and complementary ingredients of that adaptation, he proposed, are *assimilation*, fitting new information into an old conception of the world, and *accommodation*, devising a new conception of the world to fit new information that doesn't gibe with the old model. MIT's Seymour Papert, a student and a colleague of Piaget's in the late fifties and early sixties, developed his faith in the educational potential of computers from his own successful experience of assimilation as a child. His infatuation with the mechanics of a car, he says, evoked an intense level of mathematical curiosity at a very early age. "Gears, serving as models, carried many otherwise abstract ideas into my head," Papert writes in *Mindstorms*. "I saw multiplication tables as gears, and my first brush with equations in two variables (e.g., 3x + 4y = 10) immediately evoked the differential." Since not everyone develops such a passion for car mechanics in particular, Papert reasons, children should have

When an electronic toy is substituted for an immobile or mechanical one, the critical issue is not *whether* but *how* kids will be stimulated. Is this stimulation or a form of neural *captivation*?

Riposte.

access to a machine that can adapt to their individual interests. "What the gears cannot do the computer might. The computer is the Proteus of machines. Its essence is its universality, its power to stimulate. Because it can take on a thousand forms and can serve a thousand functions, it can appeal to a thousand tastes."

Papert is correct to say that computers are pliable enough that they can be adapted to stimulate almost every child. But the transition from gears to computers invokes far more than the issue of customization. When an electronic toy is substituted for an immobile or mechanical one, the critical issue is not *whether* but *how* kids will be stimulated. A lifeless toy that doesn't speak or bleat or flash for attention may not reflexively draw every child's attention every time, but if it does, it will probably be for the right reasons -- the child is curious, the child wants to explore. But what is the nature of the stimulation aroused by a set of squeezeable balls that play exotic, electronic sounds? Or a playpen whose floor and walls are tripwired for different sounds? Is this stimulation or a form of neural *captivation*? Is the thinking toy sparking curiosity or mere amusement? "Up until recently," says Monty Stambler, a psychiatrist at Harvard Medical School and Boston's Children's Hospital and a toy developer himself, "toys have been animated by the imagination of their users. These toys turn that on its head. The electronic toy animates the user, instead of the other way around. That has to have an impact on creativity." The great danger with high-tech toys, then, is not that they won't excite children, but that the provocation will be of an unwanted -- or unquantifiable -- sort.

I voiced this concern with Resnick during my MIT visit. He is very sensitive to the idea that too much visceral stimulation can kill the creative impulse by subverting curiosity. One simply absorbs the flash of sound or light, is entertained and even hypnotized by it. There is an essential balance to be struck, Resnick agrees, wherein the tools are exciting enough to stimulate interest but are challenging enough to draw the user into a genuine intellectual pursuit. "We sometimes use a phrase around here -- 'hard fun' -- that we've heard kids use when they're working with our products," he says. "We like to hear them use that term, because it's not meant to be easy. If it's too easy, if it's cotton candy, that's not what we want. At after-school workshops that we sponsor, a lot of the kids are working really hard, though no one is forcing them to. Kids who are seen as having attention problems in school will work for three straight hours on a project. Time and

again we see that kids are willing to work hard at things that capture their imagination. So that's what we aim for, fun that is engaging but that has a type of depth to it."

From my own experience growing up with computers, I know that Resnick is speaking the truth. The notion of hard fun is real and meaningful, and is the basis for the most hopeful aspect of computer games, and of the Internet. The Net's ability to compel so many people to spend so much time forging personalized, electronic pathways of hyperlinks from subject to intriguing subject makes it the apotheosis of Papert's "Proteus of machines." Howard Gardner, the Harvard philosopher of education and the proponent of the theory of multiple intelligences, proposes that the key ingredient to a truly successful educational culture is the ability to appeal to and inspire the wide variety of abilities and combinations of intelligences that different people possess. This is the best argument I can think of for introducing computers and other thinking machines to children: to motivate kids by giving them the ability to design their own educational destinies.

Whether this new paradigm will present more opportunities than hazards, though, is another matter. Sherry Turkle has characterized the introduction of a machine consciousness into children's lives as a fundamentally social, fulfilling enterprise. As these psychological machines begin to pervade our culture, she says, kids "will be more likely to take the machines 'at interface value' -- that is, to accept them as dialogue partners, even as companions of a sort." This echoes what Microsoft's Erik Strommen explained to me back at Toy Fair about the radical new role his toys will play in kids' lives. "These dolls are treated by children as if they are another person," he said. "They talk back to them, they laugh at their jokes. The dolls respond in a way that a good friend and a good learning partner would respond -- they praise their successes, offer hints when you want them, that kind of thing." After our meeting, Strommen e-mailed me a paper elaborating on the nature of the companionship provided by his ActiMates dolls, which he equates with the bedrock developmental process of *scaffolding*. From his paper:

> Scaffolding is the process whereby an adult or more mature peer supports a child's acquisition of a new skill by providing assistance at key points during the execution of the skill itself, in a form of collaborative effort. An example of scaffolding might be helping a

> child learn to count by filling in numbers in the count sequence when the child is unable to remember them, or manually guiding the child's finger to each object being counted while counting along, to structure the task as it is executed. The metaphor of the scaffold is meant to capture the temporary and transitional nature of the learning intervention. Just as a scaffold is gradually removed from a new building as it is completed and can stand on its own, support of the child is gradually reduced as repeated effort leads to mastery of the new skill....
>
> The goal of ActiMates Barney's design was to use the social mimicry of pretend play, combined with the differential responsiveness of interactive technologies, to provide scaffolded learning experiences for young children, both during toy play and in combination with other learning media.

I showed this to Harvard's Monty Stambler, who was horrified. Strommen's claim "does violence to the concept of what a scaffolding experience would be like," Stambler says. "All the sophistication of the adult is completely missing. He gives this example [elsewhere in the paper]: the child is supposed to pick the triangle and he gets the wrong one, and then Barney says to the child, 'A triangle has three sides.' He's calling that scaffolding -- but that's not really what scaffolding is. That's *correcting.* Scaffolding is where you, the adult, start with what the child's perceptions are and work in a sort of Socratic method to help the child advance their understanding from where they are, individualized for them. What he's got here is formularized. It *always* says 'A triangle has three sides.' There's no individualization, no calibration to where the child is at." (Other psychologists, including some cited in Strommen's paper, agree that his scaffolding claim is a wild stretch. It's "highly exaggerated," says Inge Bretherton, a psychologist at the University of Wisconsin. "I feel sad that he is citing my article in support of his claims.")

In Stambler's view, then, the so-called machine consciousness is bound to be nothing more than a thin facsimile of humanity. "It puts so much stress on learning *fact* and so little on *feeling* that it worries me," he says of ActiMates. "Do we want this Barney modeling our kids' involvement with television? I would find it objectionable to have a plush being unreservedly positive about a

television program, because that's not how I am when I watch television. It's one thing when you're an adult and you know that it's just a feeling state that can be evoked and that it's not for real. It's another thing when you're a kid who's having this relationship with this talking plush. Emotional intelligence has certain components. One of them is a certain capacity to understand what someone else feels -- the ability to link certain feeling states together, to know how to cope with a bad mood, and so on. These toys have no moods. Like Pinocchio, they're animated but they can't cry."

Of course, someday, Stambler allows, perhaps in time for our children's children, these toys may actually exhibit and read moods. Will they then place enough emphasis on real feeling to help kids navigate emotional terrain, or will the eery proximity to humanity be all the more creepy and objectionable? Stambler's instinct is that there might be something beneficial there. I'm less sanguine.

Conclusion ... Shaped by Our Toys

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Shaped by Our Toys

What can we expect from the Toys-R-Us shelves of tomorrow? The fact that Stambler's harsh critique applies to some of the most well-intentioned technologists in the toy business may ultimately be the most unnerving observation of all. Most of the toys of tomorrow, of course, will be as mindless and developmentally useless as most of the toys of today. A survey of Toy Fair's other high-tech entrants last year, though, raises the prospect that, because of the inherently captivating qualities of electronics, tomorrow's bad toys will be much, much worse. Exhibits A, B, and C: Toymax's "Mighty Mo" X-Treme Force S-10 Pick Up, whose wireless key ring revs the engine and activates the car alarm; YES! Entertainment's hand-held "Yak" sound-effects machines, which spit out an endless stream of distorted snarls, howls, and screams; and Play-Tech's "IQ Builders" series Professor Giggles, "the talking electronic toy that makes sentence structure (subject, object, verb) fun."

I'm afraid, even as an avid computer user, that if quasi-conscious electronic toys do begin to pervade our social space, something dear may be lost to us all.

Erik Erikson, in his landmark 1950 book *Childhood and Society*, proposed that every culture socializes its children to uphold that culture's core values. What premier social value are we promoting with today's orgy of licensed character toys and electronic gizmos? In a word, Stambler says, *consumerism.* "Toys like these stunt creativity, make people

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dependent on animated objects to bring meaning into their lives, and make them constantly dependent on upgrades."

If we are already awash in consumerism, how bad could the future of toys really be? There is always a danger of gratuitous romanticism when we contemplate our future infrastructure -- of reminiscing about the good old days that never were, instinctively fearing the richer, more complex world ahead simply because it is unknown. On the other hand, there is also the corresponding danger of pining for a world that can never be, cavalierly trading in the enormous achievements of the past and present for a look behind curtain number two. Our consumer culture may suffer from a confusion over life's priorities, but the good news is that, by and large, we already know as a society how to raise highly verbal, curious, and intelligent children. The ingredients for doing this turn out to be surprisingly low-tech -- parents and their surrogates spending lots of individual time with kids, speaking to them very early on, playing music for them, providing a measure of security while allowing a measure of independence. There are many pitfalls, of course, and many children receive far from an ideal upbringing. But today's developmental deficits have little to do with the inability of children to master abstract mathematical thinking at a very early age.

As a first-time parent I have been struck repeatedly by the degree to which child-rearing is not, as I once thought, about raising the brainiest or most-athletic or most-musical children. Now that I actually have to make these choices, I find instead that I want to raise a confident, curious, patient, personable, humble, ambitious, generous, adaptable human being. Throughout the research of this piece I found my parental intuition regularly confirming Monty Stambler's wariness of the high-tech, pre-packaged entertainment units. Some of the more thoughtful toys of tomorrow will no doubt help to enlighten and provoke young minds into ways of thinking that are largely unavailable to my generation. But I'm confident that they will do nothing to advance the causes of child development that I now find myself passionately, paternalistically concerned with. And I'm afraid, even as an avid computer user, that if quasi-conscious electronic toys do begin to pervade our social space, something dear may be lost to us all. The great challenge of our age is to enjoy the benefits of technological advance without getting caught up in all of its tangles. As old toys become smarter, new toys become possible, and all toys become

connected, we may discover that children adapt all too well to the souls of their new machines.

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David Shenk, the author of *Data Smog* (1997), lives in Brooklyn. A collection of his essays on science and technology will be published next fall.
