

## Clock Of Ages

**A Legendary Computer Scientist Is Building A Monumental Timepiece Designed To Last 10,000 Years. Yes, He's Serious.**

By **Steven Levy** | NEWSWEEK

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TO DANNY HILLIS, THE POINT of building a millennium clock--a monumental device that ticks annually, chimes every thousand years and keeps accurate time for 10,000 years--is telling a story. As befits a Disney Fellow (one of the resident wizards in Uncle Walt's Imagineering R&D division), the 42-year-old computer scientist sees the story unfolding from an experience: an E-ticket ride for the intellect.

""The clock will be hard to visit," he says, stretching in an Aeron chair in a conference room at the unlabeled building in Glendale, Calif., where he works. ""Probably in the high desert. You have to go on foot. You see in the distance, at the top of a mountain, some little structure. You can't see how you'll get to it, but it's clear where the trail is. Then you find this little tunnel going into the cliff. You squeeze in and climb up through a sort of labyrinth. You can detect motion. Then you're in this big vertical building--inside a huge mechanism. You climb through it, and then you're into daylight. You look up, and at the dome of the structure, you see this piece of sky. It's the clock face."

The dial indicates the calendar date and year--and is designed to do so until the year 12000. (After that, it's no longer under warranty.) And the story that Hillis wants you to leave with is . . . our story. A species that's had civilization for 10,000 years, and if we're lucky, will hang on for a second 10K. But one that measures individual lives in, as the poet said, coffee spoons.

Will visiting a clock built to last a hundred centuries make us rethink the meaning of time? Could it be that even contemplating such an object will lead us to consider ""deep time," where entire generations are but noble drips on a multimillennial Jackson Pollock canvas? Those friends and supporters of Hillis who don't regard his idea as a cerebral midlife crisis think so. ""It's an insanely ambitious project," says author Stewart Brand. ""But if you put it out as this over-the-top crazy, but weirdly plausible adventurous thing to do, people want to be part of it."



Hillis's initial brainstorm for the clock came in the early '90s. Realize, now, that a brainstorm from Danny

Hillis is like a hurricane from Mitch. As a 12-year-old, Hillis built a tic-tac-toe machine out of wires and batteries. As an MIT student he constructed a working computer made out of Tinkertoys. Also at MIT, he devised the concept of massive parallelism, which organizes thousands of microprocessors to work at once, and then started a company, Thinking Machines, to make such supercomputers. He dreamed of designing conscious devices. "I'd like to build a computer," he once said, "that would be proud of me."

Oddly, "working on the fastest machine in the world got me thinking about the slowest," he says. Building a 64,000-processor supercomputer to outspeed the world's zippiest machines forced him to focus on nanoseconds. "Something in me was rejecting that," he says. "It wasn't clear that the world needed to go faster." He began to question whether sufficient attention was given to centuries, and millennia. For as long as Hillis could remember, people measured the future by the decreasing distance from the year 2000. Now that the date was almost here no one seemed to be dreaming of what came next. This alarmed Hillis, who finally came up with a way to balance his own values against the competitive race for silicon speed. Perhaps, he thought, a millennium clock could stretch our visions long past five-year plans and 30-year mortgages.

When Hillis spoke of the clock in public, he got a surprising reaction. "People would come up to me and want to write checks for its construction," he says, "and I would say, 'I'm not sure I'm really doing this'."

Then Stewart Brand--who in 1968 founded the Whole Earth Catalogue--started the Long Now Foundation, a non-profit group, to transform Hillis's deep-time koan into a glass, tungsten, sapphire and Invar alloy reality. (Disney does not fund the project, but benevolently tolerates Hillis's participation.) Board members are a mix of high-tech bigwigs, management gurus and freelance conceptualizers like musician Brian Eno, who named the foundation. (Latest addition: former National Park Service director Roger Kennedy.)

Hillis and the foundation have a wide range of connections. With donations from a list of personal benefactors and suggestions from kibitzers ranging from filmmaker David Lynch to musician Peter Gabriel, Hillis designed an eight-foot-tall prototype. It is a gleaming mix of Renaissance clockwork and high-tech machining: Galileo meets William Gibson. The half-million-dollar device is designed to be sufficiently transparent that a 90th-century anthropologist not only would know it is a clock, but could figure out how it works--and what kind of culture its creator came from.

One particularly innovative component is the "bit adder": a carefully machined piece of digital technology that calculates measures of time. This enables Hillis to program the unique characteristics of our Gregorian calendar into the clock. "It's the only computer in the world that's Y10K compliant," he says.

At first, Hillis wanted the clock to wind itself; he drafted a scheme whereby it would draw energy from a metal rod expanding from the temperature changes between day and night. Then he changed his mind, requiring that the clock be manually wound every year. "It's part of the story aspect," he says. "If it goes on without people, people won't care about it so much."

This week Hillis will bring pieces of the prototype to the World Economic Forum in Davos, Switzerland, urging global pooh-bahs to heed its story. In a low-key ceremony, the Long Now-it-alls plan to gather

around the finished prototype to greet the next new year. They'll hear it chime twice, then go home. One tick later--in 2001--Hillis hopes construction will begin on a giant Mountain Clock, at a site yet to be chosen.

In one sense, the clock's story is already having an effect. Some who hear it are building their own clocks, of their own design. For others, resetting their mental tickers has led them to consider our culture's long-term legacy. One project directly flowing from the clock idea is Long Now's effort to encourage a way to preserve the zillions of bits of digital information that seem otherwise doomed to decay on stacks of floppy disks and hard drives. Some reactions are more personal. After working with the clock, says Brian Eno, "I'm thinking more long-term about projects. I ask not only what fruits I'm getting, but what seeds I'm planting."

Others, of course, think that Hillis and friends are totally nuts. Or at least deluded. That's the view of even a friend like Gregory Benford, a science-fiction writer and physics professor whose book "Deep Time" wholeheartedly endorses an embrace of the far future. "The clock is doomed," says Benford, who believes that most likely traces of current humanity in the year 12000 will be nuclear waste and payloads shot into space. (Even that Christmas fruitcake is destined for the crumb heap.) Long before then, he predicts, the clock "will break, or will be vandalized."

That's his story. Danny Hillis's tale is more optimistic. It would be wonderful, he thinks, if thousands of years from now, someone winds his clock. But he will settle for this: people expanding their own temporal horizons, realizing perhaps that we have a claim on time even past our own allotted six score and 10. "I think we all want to see where we fit into the picture," says Hillis, who is dead serious about making his once whimsical idea into breathtaking reality. "It might take me the rest of my own life, and I might only start the process, but I'd say that the odds of a monumental-scale clock being built were very good." Reservations, anyone, for New Year's Eve, 3000?

**FACING THE TEST OF TIME** There may be many models of different sizes, but Hillis plans to build a giant clock to work like the prototype diagrammed here.

Weight

As it drops, it powers the clock by gravity. Every year a crew of caretakers will need to rewind it.

Chimes

The clock's "cuckoo" will chime every millennium with sound by Brian Eno

Pendulum

Consisting of three 22-pound tungsten bobs, it rotates once a minute

Solar sensor

On sunny days at high noon, it automatically corrects any deviation from exact time

Clock face

If the clock is neglected and stops at any time, later discoverers can reset the timepiece by matching its mapping of the night sky to the stars

Mechanical computer

Adjusts for leap years, etc.

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