

Time to reflect.

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Just what is time all about? An American foundation aims to make people think about its scale by building a simple clock that will last for 10,000 years. Neil Wilks explains.

Engineers worried about the Year 2000 problem may like to spare a thought for their successors who will have to deal with the Year 10000 issue - changing from 9999 to 10000. Long-term thinking is one of the morals of the Y2K saga, but just how long should we be thinking?

The people behind the Long Now Foundation believe incredibly long term.

They have already begun to advocate the use of five digits to express a year to stave off the **Y10K** bug.

Formed in the US in "01996", the group aims to encourage the notion of responsibility for the future and is building a clock that will last 10,000 years.

The idea behind the project has come from scientist and computer designer Danny Hillis, co-founder of Thinking Machines Corporation and pioneer of the concept of parallel computers, now the basis for most supercomputers.

By opposing what he describes as "the culture of greater demands" and celebrating a "slower/better" attitude, Hillis has come up with the idea of the Clock of the Long Now. This will use mechanical science in its most primal form.

Electricity is being ignored in favour of bronze age technology. This will keep maintenance to a minimum and, if any disasters do occur, the clock can be repaired using commonplace materials and simple theory.

The idea is to make successive generations think about time within the context of a much longer scale. "We hope to achieve something that is easily maintainable and can have context to the next 400 generations," says Alexander Rose, executive director of the Long Now Foundation.

A mechanical Stonehenge perhaps? "Stonehenge is an interesting example because of its age and clock-like alignments, but we want our clock's context to remain throughout its life," says Rose.

Clock starts ticking

An prototype nearly 2.5m high is due to start on 1 January 02000, while the final clock, which will be between 9m and 18m high, should be ready a year later.

It will be installed underground in a desert area in order to minimise human contact, deliberate or accidental, and to protect it from corrosion.

Land in eastern Nevada has been purchased for the full-size clock, selected for its good geological stability. The site is high-altitude desert and is very dry, a vital factor in preservation.

"The area has evidence of Bristlecone pines living there over 9,000 years ago. We feel this bodes well for the site," says Rose.

Power for the clock will come from a weight falling down a threaded shaft which, as it falls, turns the shaft. The weight will need to be cranked back to the top of the clock at periods yet to be decided. A privately funded institution, planned to span the 10,000 years, will be responsible for this as well as maintenance and the admission of tourists.

Accuracy maintained

Two-phase locking systems will operate the timing device, designed to be accurate to between five and 15 minutes in every 10,000 years. The first system is a torsional pendulum, rotating for a period of one minute.

This will be corrected by the second system, which uses noontime sunlight to amend any error. This synchronisation mechanism is made of metal, placed at the bottom of a shaft which allows sunlight to penetrate only at noon.

This metal will expand in the sunlight and cause a mechanical trigger to correct the clock.

The clock will have two dials. The outer one will display "human constructs of time", reading to the year 12000. The inner dial has day/night display, sun and moon phases and the current night sky, which repeats every 25,800 years.

The dials are connected to the moving parts by a Bit Serial Adder, a patented device designed by Hillis specifically for the clock. This uses the movement of the pendulum to move each dial through a series of gears and levers.

The prototype is using materials such as tungsten, monel 400 and quartz-plated brass, but the full-size version will use more commonplace materials.

British musician and writer Brian Eno is working on a new type of chime and striking system that will make unique sounds for the clock's chimes.

The shortest period the chimes will mark will probably be 12 hours.

Whether the clock ticks for the rest of time or not, we will never know, but the thought behind it is provocative and original. Hillis himself admits that it is almost enough just to suggest this idea to a wider audience, and if it never comes into being, making people think about this will be an achievement in itself. But the engineering behind the clock will turn his theory into reality.

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