

Time Crystals considered as ultra-long-term binary data memory storage.

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The recent experimental demonstration of time crystals by leading technology labs has led to flurry of research and proposed applications. The concept of using time crystals as an ultra-long-term data memory storage mechanism is suggested in principle only.



LEIBNIZ'S IMAGO CREATIONIS.

*"2, 3, 4, 5, etc. 0. Omnibus ex nihilo ducendis sufficit unum."*  
(To make all things from nothing, unity suffices.)  
-- Gottfried Wilhelm Leibniz's imago creationis [1]

*"In a hundred years, sand dunes will bury the ruins. In five hundred years, Audoghast will survive only as a few dozen lines of narrative in the travel books of Arab scholars. ...Such is the truth, regrettable as it may be. You, and all you love, will leave no trace in this world, except a few lines in the writing of strangers. ...But delightful Audoghast, said the poet, weeping. All our loveliness, lost to the sands."*  
-- Bruce Sterling, Dinner in Audoghast

*"From the height of these pyramids, forty centuries look down upon you."*  
-- Napoleon Bonaparte

*"Time is the cruelest force of all."*  
-- Cixin Liu, Death's End

*"Teach them to do all the things I have told you to do. I am with you always, even to the end of time."*  
-- Matthew 28:19-20, Worldwide English (New Testament)

The experimental demonstration of time crystals at various major laboratories has recently been achieved in a remarkable technological leap from theory to reality.[2] This has led to speculations about their application in the booming and competitive Quantum Computing space. However, perhaps, another application is not only more obvious, but more essential to the future of mankind.

Time crystals are "a novel phase of matter that physicists have strived to realize for many years, a time crystal is an object whose parts move in a regular, repeating cycle, sustaining this constant change without burning any energy." [3] "Time crystals are also the first objects to spontaneously break time-translation symmetry, the usual rule that a stable object will remain the same throughout time. A time crystal

is both stable and ever-changing, with special moments that come at periodic intervals in time.”<sup>[3]</sup> In addition, a research group claimed earlier this month to have created a time crystal in a diamond.<sup>[4]</sup>

Looking upon the length of one's life (or the average human's lifespan) and at the amount of time needed to learn, verify, educate, and teach critical theories, discoveries, and concepts, one despairs at the thought of future generations wasting eons repeating lessons that might be lost "in the sands of time." Or perhaps one realizes that eons in the future the majesty of one's iTunes music song playlist may never be heard or experienced again. If only there were a way to store that data for the deep future?

If we recall that binary digits (bits), used in computing for code and data storage, can be represented as zeroes and ones - or electrical impulses and the lack thereof - then it is not difficult to imagine a large number of time crystals at a low vibration frequency and another set at a higher frequency level also representing zero and one bit value. If these time crystals, or the entire assembly of them, are then encapsulated in diamonds, and perhaps even in outer space, then one can envision a scenario where the entire encyclopedia-scale or Internet-scale knowledge of human understanding is stored in a near-eternal high fidelity binary data storage mechanism. Granted, billions of years in the future a device or computer will still be needed to decode or run the encyclopedia program, but the fact that the data could be preserved is the potential miracle.

Obvious threats from gravity wells of stars and black holes to the distant future Dark Energy "big rip" expansion of the Universe, or the accidental destruction by comets or even intelligent life, would necessitate redundancy requiring various copies of our earth or "humanity encyclopedia," but its value would still be priceless beyond just a statement in an eternal war against time and the laws of thermodynamics. The pharaoh's pyramids would pale compared to a civilization that could retrieve high fidelity data tens of billions of years or more in the future far eclipsing modern technology like 5D storage "based on tiny quartz discs, each one offering some 360 terabytes of data, along with resistances to heat up to 1000 degrees Celsius and data retention on the order of several billion years.”<sup>[5]</sup>

## References

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