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Loops, strings, and time

Referring to "Loops of Gravity" (SN: 6/13/98, p. 376), since space, matter, gravity, electric charge, magnetic dipoles (or unipoles), and energy are quantized, one would also expect time to come in quanta. Has anyone estimated the duration of a time quantum?

*Lawrence Shapiro
Sebastopol, Calif.*

The suggestion of a model of reality where space-time is quantum in nature is intriguing but not entirely original; some of the early mystics had a similar conception of space and time.

This approach could account for some paradoxes of quantum physics, for example, an electron being in only one of a discrete

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number of energy shells and crossing from one shell to another in zero time.

This may also illuminate one of the fundamental constants of nature, the speed of light (approximately 3×10^8 meters per second). In this model, it would represent the ratio of the space quanta to the time quanta. Light would travel across the smallest unit of distance in the smallest unit of time. Any greater speed would be impossible because it would imply that a photon has crossed a space particle in less than an indivisible unit of time.

If loop theory asserts that the space-quanta is only 10^{-35} meter wide, one could then calculate the time-quanta as approximately 0.3×10^{-43} second.

*Simcha Z. Pollack
Jamaica, N.Y.*

Could there be a connection between string theory and loop quantum gravity analogous to the connection between wave and particle physics? As Baez mused, "Maybe we are just seeing two faces of the same theory."

*Patti Batchelder
Georgetown, Mass.*

Physicists searching for a quantum theory of gravity are looking for something they should not expect to find.

If we consider a particle in a gravitational field, there is essentially only one variable: the local gravitational field. If we consider a particle in an electromagnetic field, however, these new variables are introduced: the mass of the particle, its electric charge, and its magnetic moment.

A "20/20 hindsight" mathematical analysis of this situation reveals that we would expect these new constants to arise: the quantum of action, the quantum of electric charge, and the quantum of magnetic moment.

Physicists searching for a quantum theory of gravity have not offered a justification for why gravity should be quantized.

*Peter Wilson
Phoenix, Ariz.*

CORRECTION

In "Planets are candidates, not finds" (SN: 7/25/98, p. 57), the nearby star with strong evidence of an orbiting planet is HR7875, not HR785.

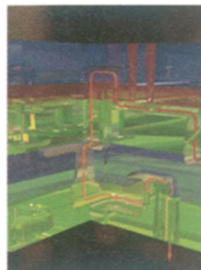
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Cover: The rooms and corridors of this laboratory could fit in the palm of your hand. Scientists designed the glass microchip—shown in this computer-generated image—to do chemistry. It uses electrodes to direct fluid (red arrow) through its channels and reaction chambers. Such microchips could speed diagnostic tests and drug development.
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