lowed Lipton with the description of a hypothetical molecular computer which, if constructable, would solve hard instances of the satisfiability problem substantially faster than the fastest current super computer (*2*).

But it is too early for either great optimism or pessimism. Today's electronic computers are marvels of speed and efficiency. They are the product of a half century of extraordinary development. Molecular computers are less than a year old. Perhaps they will mature well—perhaps not.

In any case, molecular computers can contribute to our understanding of the nature of computation. They can cause us to revisit the question of what a computer is. In the end computers are simply physical devices obeying physical laws. Devices become "computers" when we learn to interpret their behavior appropriately. Molecular computers make it clear that such an interpretation can be imposed on devices very different from those to which we have grown accustomed. What other devices will become "computers" in the future?

Building a practical molecular computer is an exciting prospect, but it is not the only goal. We should not lose sight of the fact that the primary reason for research in this area is to elucidate fundamental aspects of computation and biology. In this regard there is reason for optimism.

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References

1. R. Lipton, *Science* **268**, 542 (1995).
2. L. Adleman, "On constructing a molecular computer, Draft," 11 January 1994 (by anonymous ftp: /pub/csinfo/papers/adleman/molecular_computer.ps on usc.edu).

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Gravitational Theory

Faye Flam's Research News article "Theorists make a bid to eliminate black holes" (23 Dec., p. 1945) could not have appeared at a more opportune time. Within weeks of its publication, astronomers announced two important findings. One is evidence for a supermassive object with mass of 36 million suns that is a candidate for a black hole (*1*). The other is the nonexistence in Hubble Space Telescope images of material supposed to surround quasars, characterized by John Bahcall as "a giant leap backwards in our understanding of quasars" (*2*).

In the theory we advocate (*3*, *4*), a large amount of matter can collapse, but does not form an event horizon. Radially directed light can always escape, although the red shift is great. The concept of horizon in Einstein's theory is misleading. Einstein's theory actually gives two spherically symmetric, nonisotropic solutions, one of which is the standard Schwarzschild metric. The other does not have an event horizon (*4*). These two solutions are structurally the same as the slab solutions in general relativity, where the unphysical features are attributed to "peculiar matter" (*5*). If one says the slabs are "peculiar matter," one also has to say that mass in the Schwarzschild solution is "peculiar matter." The theory we advocate gives a unique solution that corresponds to normal matter without any unphysical features. This solution does not have an event horizon, nor does it exhibit a curvature singularity at the origin. We urge the astronomical community

to look for evidence for or against an event horizon after collapse of a heavy star or group of stars is ascertained. Although the concept of an event horizon is problematic in general relativity, as is the theory itself, its absence would be consistent with the new theory.

As for the discovery of quasars without the expected surrounding matter, the possibility exists that quasars may be local objects, which seems also compatible with the new theory. Twenty-two years ago, the late Roger E. Clapp (6) presented arguments in favor of this theory and of the position of Halton Arp, Geoffrey Burbidge, and Adelaide Hewitt (7) on the locality of quasars. Clapp studied 151 quasars and called the quasar problem the *fifth test* of gravitational theory. His ideas should be reinvestigated.

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References and Notes

1. M. Miyoshi *et al.*, "Evidence for a black hole from high rotation velocities in a sub-parsec region of NGC 4258," *Nature* **373**, 127 (1995).
2. J. Bahcall, talk presented at the 185th Meeting of the American Astronomical Society, Tucson, AZ, 8 to 12 January 1995; quoted by K. Sawyer, *Washington Post*, 13 January 1995, p. A2.
3. H. Yılmaz, *Il Nuovo Cimento* **107B**, 941 (1992).
4. C. Alley, in *Frontiers of Fundamental Physics*, M. Barone and F. Selleri, Eds. (Plenum, New York, 1994), pp. 125–137; H. Yılmaz, in *ibid.*, pp. 115–124.
5. Term used by C. W. Misner, quoted by I. Peterson, *Sci. News* **146**, 376 (1994), and paraphrased by Flam.
6. R. E. Clapp, "Preliminary quasar model based on the Yılmaz exponential metric" *Phys. Rev. D.* **7**, 345 (1973).
7. G. Burbidge and A. Hewitt, *Sky Tel.* (December 1994), p. 32.

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Rosetta: An ESA Mission

Jon Cohen, in his interesting article "Getting all turned around over the origins of life on Earth" (News, 3 Mar., p. 1265), states

In 2003, the National Aeronautics and Space Administration [NASA] will launch its Rosetta mission, a spacecraft that will orbit the comet Wirtanen . . . .

I would like to stress that the International Rosetta Mission is not a NASA mission. It is one of the four Cornerstones of the Horizon 2000 long-term plan of the Scientific Programme of the European Space Agency. NASA participates in this mission by providing, in cooperation with the French Space Agency, CNES (Centre National d'Etudes Spatiales), one of the two Surface Science Packages, and through the use of its Deep Space Network.

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Corrections and Clarifications

In the report "Evidence from 18S ribosomal DNA that the lophophorates are protostome animals" by K. M. Halanych *et al.* (17 Mar., p. 1641), the third sentence in the second paragraph should have read, "Earlier researchers often allied lophophorates with protostome taxa on the basis of the presence of chitin, the lack of sialic acids, and several embryological features. . . ."

In the Random Samples item about the Dial of Ahaz (17 Mar., p. 1599), the miracle referred to concerned the sickness, not of King Ahaz, but of his son Hezekiah.