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Letters

The unsolved problem

"Games Mathematicians Play" (SN: 9/20/86, p.186) was generally excellent. However, there is one inaccuracy that I wish to correct. It is in fact relatively easy to find a non-periodic tiling of the plane that uses copies of only a single tile, though in various orientations. The unsolved problem is whether there is a single tiling figure that *can* tile the plane in a nonperiodic way but *cannot* tile the plane periodically. (What Penrose discovered was a pair of tile shapes that can tile the plane non-periodically but not periodically.)

Solomon W. Golomb
Los Angeles, Calif.

Seeing redshift

Regarding "Spectral variations on a universal theme" (SN: 9/13/86, p. 166), I was not sur-

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Cover: Reputedly the last traditional steam locomotive in revenue service in the United States, the Crab Orchard and Egyptian Railroad's No. 17 blasts her way out of the woods. Planners and developers now propose a return to coal-fueled locomotives, in both modern and somewhat traditional forms. (Photo: Christopher D'Amato)



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prised to see that this possible mechanism for a non-Doppler redshift emerged from outside of the astronomy community. The vast majority of extragalactic astronomers have made up their minds on this project. They have decided that the conventional picture is the correct one, irrespective of evidence to the contrary. In fact, they have decided that we should not have access to telescopes capable of making the observations!

Will Wolf's suggestion actually explain our experimental results? It is impossible to tell from what he has published so far. It is encouraging to see that the proposed effect is intrinsic to the source. The "tired light" approach, which involves an extrinsic origin for the redshift, does not correspond with what is observed. I think we would require an effect that varies with the compactness of the source (this probably means with age as well). Thus the quasars would show the largest intrinsic

redshift and various classes of peculiar galaxies would show a lesser effect.

We have begun to make detailed spectroscopic measures of some of the discordant redshift systems. Previous work rested, to a large extent, upon analysis of direct images. With the new generation of telescopes and electronic detectors, we can probe these objects in much more detail. What we see suggests that objects with difficult redshifts are associated.

The best is yet to come. We have submitted to *ASTROPHYSICAL JOURNAL* an extensive spectroscopic analysis of NGC4319 and Markarian 205. This is the best-known example of a galaxy and quasar that appear to be connected. The results there provide impressive evidence that the objects are at a common distance.

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