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1/92

'The Starry Night' Illuminated

I was pleased to see Scott Tremaine's apt use of Vincent van Gogh's "The Starry Night" to illustrate his article on dark matter in the universe (February, page 28). Van Gogh painted it while in a sanitarium in Saint-Rémy, France, and Tremaine says it "suggests how the night sky might look if all the mass in the universe were luminous."

As a footnote, it may interest your readers to know that Albert Boime¹ (working with the late George Abell) and I² independently concluded that this is one of several sky views based on van Gogh's own observations. In one case, "Starry Night on the Rhône"—not the painting used by Tremaine, but an earlier one that includes the Big Dipper—it is clear that van Gogh conflated a southwest view of the Rhône landscape with a northern view of the sky. In fact, the orientation of the Dipper and its height above the horizon are consistent with the known place and approximate time of the painting. Another painting, "Road with Men Walking, Carriage, Cypress, Star and Crescent Moon," has been analyzed by Donald Olson and Russell Doescher,³ who used a computer "planetarium" to conclude that it accurately depicts the new Moon, Venus and Mercury in the evening sky in mid-May 1890, several months before van Gogh's death.

The Saint-Rémy "Starry Night" is a conflation of views, I believe. Van Gogh's letters⁴ and contemporary weather records let us date the painting to 15–18 June 1889. The brightest object near the horizon, just to the right of the tree, is Venus, seen as a morning star in the eastern sky and mentioned in a letter to his brother, Théo. The Moon would also have been seen in the pre-dawn sky, although van Gogh appears to have taken some liberties with the shape of the crescent. The stars and the swirling nebulous pattern may have been patterned on the southeastern evening sky at that time. In a letter from the previous summer, van Gogh de-

scribes the "blue-whiteness" of the Milky Way, which he would have seen in June through the window of his east-facing room on the second floor of the sanitarium. The village in the foreground of the painting is pulled in from a view to the south, which was not visible from his window but could be seen from the garden of the sanitarium.

In trying to account for the spiral pattern—which, of course, needs no such explanation, but who can resist the temptation?—it is interesting to note that Camille Flammarion's popular book⁵ (and a variety of articles) had reproduced the drawing of the Whirlpool nebula by Lord Rosse (William Parsons). Flammarion wrote: "This structure recalls so well that of our Milky Way, which surrounds us on all sides, that we can see in it an image of our universe resembling those that are often shown in astronomical treatises. If we suppose ourselves to inhabit the central regions of this distant universe, we would no doubt see a Milky Way surrounding our sky and reproducing the sidereal effects that we see from our floating island." Van Gogh's painting is remarkably similar to Lord Rosse's drawing, and although we have no evidence that van Gogh (who was a voracious reader) actually saw Flammarion's book, I like to think that he is giving us a double view of our galaxy.

Van Gogh's letters are a fascinating record of an artist in search of "truth." He expresses a fear of letting his imagination run wild, and yet he insisted on seeing beyond the surface. To me, they reflect a tension similar to the attitude of the research scientist, who must use imagination to clarify vision and yet cannot afford to be carried away.

In any case, van Gogh was an avid amateur of the sky. To his brother he wrote: "Looking at the stars always makes me dream, as simply as I dream over black dots representing towns and villages on a map. Why, I ask myself, shouldn't the shiny dots of the sky be as accessible as the black dots on the map of France? Just as we take a train to reach Tarascon or Rouen, we take death to reach a star."

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2/92

Is Science Made Too 'Magical' to Children?

Thank you for organizing the special issue on pre-college education (September 1991). The issue makes the point very well: This subject is *not* beneath the dignity of practicing physicists.

However, the cover photo (and several others accompanying the corresponding article) illustrates well one of the primary shortcomings of our attempts to educate children in science: Too often we misjudge our targets, and our message gets badly mangled. The cover shows a friendly young physicist (good so far), dressed casually (no tie, no lab coat—still good), in a laboratory crammed with electronics (maybe intimidating to kids, but let's see . . .), doing an experiment with a bunch of third-graders, using a plastic wading pool, a toy boat and some balloons (good). Obviously he is going to attach the balloons to the boat in a simple way and propel the boat with balloon power, thus demonstrating conservation of momentum, conversion of energy from air compression (via the lungs) to kinetic energy of the boat, and so on, all using familiar materials from the children's macroscopic world. He is going to show them that their world can be understood in terms of simple concepts that they can handle, even as children.

But *no!* We learn from the caption that instead he is teaching them about energy conservation by using a "shape-memory wire" affected by thermal differences between ice and water. The balloons were for another experiment, using liquid nitrogen. These kids are not familiar with such esoteric concepts as "shape memory" or such esoteric materials as liquid nitrogen. They surely came away from this demonstration with the idea that science is something that goes on in laboratories only, not in the real world. They surely thought that it involves magic: something incomprehensible (see how this wire uncoils as it warms!) that happens when somebody in the "priesthood" (the physicist) does something. They surely thought: "Gee whiz! That's neat! Show us another trick!" They might well have thought: "Who cares! Real boats don't run like that."