

LETTERS

Einstein, Picasso, and Cubism: 'Seeing' the Fourth Dimension

The review by Stephen G. Brush of Arthur I. Miller's book *Einstein, Picasso: Space, Time, and the Beauty That Causes Havoc* (PHYSICS TODAY, December 2001, page 49), prompts me to add some comments.

Pablo Picasso did not invent cubism. Paul Cezanne was painting cubist paintings, in all but name, by the mid-1880s. Objects were analyzed and reduced to basic geometric forms, often to aggregations of flat planes, and were seen from more than one angle of perspective in many of Cezanne's works. Picasso himself did not turn to cubism before seeing the great Cezanne show of 1906, shortly after Cezanne's death, and often spoke of his reverence for the older artist.

Les Femmes d'Alger was painted in 1907, as is stated in the article, but was not publicly exhibited until years later. If not the first cubist picture, it was certainly the most shocking one at the time. Even Picasso was a little afraid of it; for 15 years after he'd painted it, he showed it only to friends.

While the review states that both Picasso and Albert Einstein held that "thinking, not seeing, leads to the truth," Einstein reported differently: While still a teenager, he imagined himself riding on a beam of light and wondering about the consequences of it. This implies that the vision, albeit an internal one, preceded the thought. Einstein often emphasized that the idea preceded the thought. Thus his perception of nature, or his "seeing" of nature in a deep sense, was the necessary forerunner of all the thinking that followed.

And Cezanne's finely wrought cubism came from seeing, which he always stressed as paramount when painting from nature. He suggested

that truly seeing could give birth to a closer re-creation of what the eye and mind actually perceive than could a classical Renaissance perspective.

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The review of Miller's book propagates a misconception by referring to the fourth dimension as "time, not space," repeating a comment from H. G. Wells. The fourth dimension appears explicitly as part of a displacement in spacetime, and has the form of not simply t , but rather ict , which is orthogonal to the other three classical spatial dimensions. The factor c puts all four dimensions on the same footing in the algebra of relativity.

The book's purported correlation between relativity and modern art is reminiscent of the old saying about the correlation between the price of rum and the salaries of Presbyterian ministers. Almost any two things can be correlated by selecting some specious reasoning to make the correlation plausible, or by invoking faith. Astrology is a familiar example.

Lastly, the illustration printed with the review looks flat to me, lacking the perspective to suggest a third dimension, much less a fourth. If someone sees a fourth dimension here, perhaps others may see five, six, or more. Picasso painted many fine portraits with lifelike proportions and normal perspective. He knew what he was doing when he flattened the human subjects in his cubist paintings, but the results must be interpreted in our imaginations, not in the objective analysis of science.

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BRUSH REPLIES: These two letters illustrate how, in the century since Einstein and Picasso made their startling discoveries, physics and art have grown further apart. Richard Tourin gives a critique of four-dimensional representations of the world, while Charles Zigmund

wants to award Cezanne the credit for inventing cubism.

Arthur Miller has something important to say to both correspondents: Einstein and Picasso lived in a culture that was fascinated by the concept of a fourth dimension and how it might offer a clue to the nature of a world that is not completely or directly visible to us. Miller offers documented personal connections, not just statistical correlations; and he shows in detail how the two geniuses developed their ideas, following similar though separate paths. If you want to argue about whether Picasso could "see a fourth dimension" as he worked on *Demoiselles* or whether "truly seeing" a beam of light requires some kind of thinking (not just collecting the raw visual sensations available to everyone), you will find Miller's book useful.

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Acoustic Surgery Devices in Clinical Trials

Gail ter Haar's article "Acoustic Surgery" (PHYSICS TODAY, December 2001, page 29) is admirable in describing bloodless, nonincisional surgery, a goal long desired by medical technology workers. Her description of magnetic resonance-guided focused ultrasound surgery (MRGFUS), however, understates the accomplishments of this approach. With MRGFUS, the focused beam is seen directly at lower power (magnetic resonance imaging can be sensitive to temperature changes of 1–2°C), thus permitting the surgeon to position the treatment beam accurately. MRI is also the most sensitive method for defining the target so that the surgeon can see, for example, tumor margins. Precise closed-loop control of the treatment, without damage to healthy tissue, is thereby obtained. These systems are

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