Jerome replies: I thank Richard Camilli and M. David Egan for their factual additions. The letter from G. Stanley Brown merits a more complete response.

The African American postdoc in my article who was ignored when he went for his job interview was far removed from the disruptive classrooms that preoccupy Brown; yet the postdoc's skin color made him invisible to the interviewer. My main point, which Brown ignores, is that scientists need to follow Einstein's example and, to paraphrase Hamlet, take up arms against a sea of social troubles, especially racism.

Now, to Brown's point: Children who disrupt classes and children who see no hope for their futures are real and related problems. Both are clearly linked not to race but to economic status, which raises serious questions about economics. According to the US Bureau of Labor Statistics, unemployment among African Americans is at least double the rate among whites; obviously, parents who cannot get jobs can rarely provide the stability at home needed to focus on study skills. Nonetheless, some people, like Brown, persist in seeing such problems as racial and perhaps inherent or genetic, a view that can lead only to race-based actions rather than to a real solution based on economic restructuring.

Despite Brown's denial, a plethora of reports document that educational tracking in America—race- *and* class-based—is rampant.[1] Not only does it widen the former gap—now chasm—between the haves and have-nots, but the majority of students whose grades fall below the top one-tenth end up in the worst classrooms in the worst schools, with some of the worst teachers. It makes those students essentially passengers on an express train to Hell, which bypasses what Brown calls "the opportunity that tax money affords them" and ends abruptly at the junction of Despair and Anger in US cities that increasingly resemble the New Orleans we saw explode in 2005.

If the American media were surprised by that explosion, it could be because so little media attention was focused on the root problems. Perhaps a word from Einstein's 1946 message to the Urban League would be useful—for Brown, other physics teachers, and not a few media moguls:

> First, the taboo, the let's-not-talk-about-it, must be broken. It must be pointed out time and again that the exclusion of a large part of the colored population from active civil rights by the common practices is a slap in the face of the Constitution of the nation.

I hope this discussion continues, in the pages of PHYSICS TODAY and elsewhere.

Reference

1. See, for example, http://www.stanford.edu/dept/news/pr/94/940302Arc4396.html; J. Hill, http://www.msteuiuc.edu/hill/papers/tracking.html.

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Da Vinci Could Have Used a Publicist

I was surprised to note some of Alan Shapiro's comments in his review of the book *Math and the Mona Lisa: The Art and Science of Leonardo da Vinci* by Bülent Atalay (PHYSICS TODAY, July 2005, page 63). Shapiro wrote, "I believe [Atalay] overemphasizes da Vinci's significance and originality as a scientist and engineer—as many do." This may be true, if we evaluate da Vinci's direct impact on science and engineering in the centuries after his death. It is certainly not his fault that nobody bothered to read his notebooks. I suggest da Vinci's significance and originality as a scientist and engineer—not to mention his other multifarious talents and abilities—make him perhaps the most outstanding intellect and talent of recorded history. *Webster's Biographical Dictionary* devotes three full lines to listing fields in which he made contributions; it finishes with the dreaded "etc."

Reading da Vinci's own writings (*The Notebooks of Leonardo da Vinci*, translated by Edward MacCurdy, Garden City, 1941), one can scarcely grasp the breadth of his interests, or of his abilities in deductive and inductive logic. As a practicing geophysicist, I found the following observations in the first hundred or so pages da Vinci wrote around 1510. "A falling body will take the shortest route towards the Earth's center." And "two bodies of water equidistant from the Earth's center, will not move towards each other." No mean deductions regarding Earth's gravitation and equipotential surfaces. More than 30 years before Copernicus, da Vinci wrote, "The Sun does not move." I found hundreds of other observations about every scientific subject under the Sun—light, geology, aerodynamics, anatomy, flight, and more.

Perhaps da Vinci's lack of serious mathematical training hindered his making deeper contributions in some fields. However, he knew the importance of that purest of all sciences: "Therefore, O students, study mathematics, and do not build without foundations." What comes across clearly from his notebooks was his complete lack of interest in public acclaim. He carried out his activities and research for his own interest and moved on from them once completed.

Shakespeare was correct when he wrote "Here was a [man] Caesar! When comes such another?" But the Bard applied it to the wrong son of Italy.

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Shapiro replies: My intention was not to deny Leonardo da Vinci's significance or originality, but rather to draw attention to the tendency to overestimate those qualities. To properly evaluate his—or anyone's—originality and significance, simply citing passages from his work is insufficient. One must also study the work of his contemporaries and predecessors to appreciate when he was borrowing from others, extending earlier work, or taking a truly innovative direction. That is a difficult task involving the study of long-forgotten Renaissance writings. For more than a century, historians have been attempting to evaluate Leonardo in his historical context, and before assessments can be made, those historical works must be consulted.[1]

Leonardo's work *is* full of brilliant insights, observations, and designs, but, as Baksi recognizes, if they are to become part of the scientific enterprise, they must be made publicly available. It is in fact Leonardo's "fault" that he never composed and published coherent scientific or technological treatises on his investigations or allowed his manuscripts to circulate widely. Surely, one cannot blame people for not reading Leonardo when he did not publish his work.

Reference

1. See, for example, D. C. Lindberg, *Theories of Vision from al-Kindi to Kepler,* U. of Chicago Press, Chicago (1976); P. Galluzzi, *Mechanical Marvels: Invention in the Age of Leonardo,* Giunti, Florence, Italy (1997).

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