Re High-Energy Rays, Local Supercluster Is a Major Source Spot

It is nice to see that new evidence is convincing some researchers that the ultrahigh-energy cosmic rays are coming from compact "radio-loud quasars," as reported in your October 1998 story (page 19). But just where are the brightest such quasars? I am one of those who believe they lie in the direction of the Local Supercluster, and particularly its center, the Virgo Cluster. That is only 16 megaparsecs distant, so it is no trouble for the rays to travel through the 3K microwave background to reach us.

Evidently, though, information about the rays does have trouble in reaching and convincing the leaders of the astrophysics establishment. They cling to the idea that the quasars are much farther away (due to the redshifts). They prefer explanations calling for "new particles" that do not interact with the 3K background. They are not receptive to the ten different proofs that have accumulated over the past three decades showing that bright quasars really are concentrated in the Local Supercluster.[1]

I am somewhat concerned about this whole matter because of the history of one particular paper that I coauthored. Written in 1996, that paper outlined the observational evidence for all the various forms of high-energy radiation coming from the center of the Local Supercluster, and made a sound case for there being no other source within 30 Mpc that could account for it.

Eventually, the paper appeared in *Astroparticle Physics*[2]—but only after it was emphatically rejected by *Physical Review Letters*. Being rebuffed like that left me and my coauthors with the impression that *Physical Review Letters* will publish rather loopy papers that speculate about "corkscrew space" and freely invent new particles to explain observations, but it doesn't want to publish the empirical facts that bear on the observations. I suspect that there is a real crisis here.

References

1. See, for example, H. Arp, *Seeing Red: Redshifts, Cosmology and Academic Science*, Apeiron, Montreal (1998).
2. H. Arp, J. Narlikar, H.-D. Radecke, Astroparticle Physics **6**, 387 (1997).

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[Editor's Note: See also the articles on page 38 and page 44 of this issue.]

Teachers Groups, APS Debate New California Science Standards

On behalf of the Los Angeles Physics Teachers Alliance Group (LAPTAG), a group of both high school and college physics teachers, we wish to comment on Toni Feder's "California's Science Standards Slammed for Demanding Too Much, Too Early" (PHYSICS TODAY, November 1998, page 54).

The members of LAPTAG first became aware of the California science standards long after much of the political fighting between various factions had taken place, and so our initial reaction was only to the final document, without reference to the debate. Most of us had read the national standards prepared by the National Academy of Sciences, and although we completely agreed with the NAS position that science in all grades is best taught by using the method of inquiry, we were dismayed by the lack of specificity in the actual standards set down by the NAS. The NAS document states how science should be taught and gives excellent advice on the general attitudes and teaching methods that should be employed to ensure that all students can learn science. However, its guidance on the specific content that should be attempted at each grade level is quite vague. Those of us who teach need more than generalities when we face the daily task of determining what to teach. In this regard, the California standards complement the national standards by providing specific topics at each grade level for grades K–8, and specific subtopics under four major divisions of science for grades 9–12.

The California standards are not perfect, but LAPTAG views them as a refreshing first step toward ending the need for endless repetition at each grade level by teachers who often do not know what their students were taught in previous courses. Such repetition results in some college teachers concluding that students in their introductory classes have had no standard background in physics and that it is best to assume the students know nothing about the subject.

We feel it is unfair of Andrew Sessler, then the president of the American Physical Society, to have described the California standards as being "terrible" and "overstuffed," as Feder reports. His assessment that "Kids will be turned off science" underestimates the talent of our students and the ability of good teachers to make almost any science topic interesting by using appropriate teaching methods. The key to success, as always, is having well-trained and motivated teachers with a supportive administration and involved parents.

A specific example of what's wrong with the California standards that is mentioned by Feder and has been cited frequently elsewhere is the criticism that introducing the periodic table in elementary school is inappropriate. But why is having elementary school students see a chart of all the elements of the universe in elementary school any less appropriate than having them see a map of the world? The charge that teachers will simply require their students to memorize the periodic chart is shortsighted. Just as a good teacher knows how to teach geography in a meaningful way with a variety of activities, including memorization, so a good teacher knows how to develop activities, including memorization, to help students come to an appreciation of the meaning and beauty of the periodic chart.

As experienced teachers, the members of LAPTAG do understand the need to teach science using methods of inquiry and activities involving hands-on experience. Our group has initiated a number of its own experiments with this end in view. Nevertheless, to help students come to an understanding of the great general principles of science, we must attend to specific details in the early years in an agreed-upon sequence so that teachers will be able to build upon previously learned material. We know that learning is complex and that great strides have been made recently on the subject of how children learn. However, studies of the performance of students in other industrialized nations suggest that rather than the new California science standards demanding too much too early, for too long they have demanded too little too late.

We feel strongly that the California science standards, for physics at least, are far from being "overstuffed" and that they give a real promise that our state finally has the basis for a sequential approach that will make it possible to build upon a student's previous science experience. We are dismayed that, through Sessler, APS has spoken so strongly against the California science standards.

This letter, prepared primarily by the undersigned, is strongly endorsed by 34 of the 36 members of LAPTAG, with one dissenter believing that the California science standards are too