

strated excellence in the classroom; (iii) host regular faculty meetings to discuss improved teaching techniques; (iv) have the faculty teach the laboratory sections of their classes; (v) divide single large classes into multiple small classes (this will increase the number of courses taught per year, perhaps bringing it more in line with what is typical at small liberal arts colleges); (vi) increase the amount of writing done by students in each class; (vii) be accessible to students who need additional help; and (viii) insist that departmental budgets allow for adequate laboratory and field courses so that undergraduates gain high-quality hands-on experience. These steps have had a far greater influence on the quality of instruction at small liberal arts schools than has the presence of students "carefully selected for their homogeneity."

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Cosmological Interpretations

As my paper (1) has been mentioned in an article by Govert Schilling (Research News, 22 Nov., p. 1305), I should like to make

some comments on remarks by theorists quoted there. First, I find it a bit misleading to talk about just "12 cases" of Seyfert galaxies with pairs of strong x-ray sources. The discussion is not about 12 cases out of a million, but 12 cases out of a sample of 26 Seyfert galaxies, a sample that is about 90% complete up to a magnitude of 10, 75% complete to a magnitude of 11, and 50% complete to a magnitude of 12, which makes the finding a robust and significant result. In addition, the pairs analyzed by Halton Arp are only those within a radius of less than 1 degree around the Seyfert galaxies, and only those with clearly identified x-ray blue stellar objects and quasars are counted, omitting even more unidentified pairs.

Concerning the redshift controversy, it is only fair to mention that Arp and others have collected many similar cases in the optical band over the last 30 years, so that the total number of known cases is high enough to be extremely significant. Observations of many other active galactic nuclei are available from the excellent data from the German x-ray satellite Rosat, and any interested astronomer should be encouraged to improve the statistics by working along the lines presented in our pair of papers (1, 2).

One last point: It is true—as Jim Peebles mentions—that observers disagree. Howev-

er, they do not disagree because the observations are ambiguous, but because they have contradicting theoretical preconceptions that lead to different interpretations. And that is what cosmology is based on: interpretations of interpretations of observations. We should not fall victim to cosmological hubris, but stay open for any surprise.

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References

1. H.-D. Radecke, *Astron. Astrophys.*, in press.
2. H. Arp, *ibid.* in press.

Letters to the Editor

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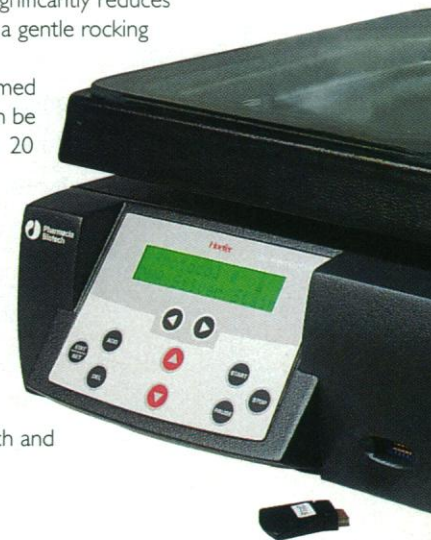
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