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# PROPER MOTION EVIDENCE AGAINST A GALACTIC ORIGIN FOR QUASARS

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DISCUSSION

G. BURBIDGE: There is at least one BL Lac object, CL4, which Ryle and Webster have argued is in our own Galaxy. Can you observe it. Here you might expect to see some proper motion.

J.J. WITTELS: The only criteria necessary to observe CL4 with the differenced fringe phase VLBI technique are that the source have a sufficiently strong compact component at 8 GHz to be above our detection level and that there exists a sufficiently close-by radio source to complete the pair. We have been contemplating pairing BL Lac itself with another source like 3C 454.3 to try to measure proper motion of BL Lac since its redshift is quite controversial.

B. TINSLEY: Could Dr. Burbidge or another astronomer please remind us of the evidence used to support the claim that CL 4 is a BL Lac object within the Galaxy?

D.B. SHAFFER: The galactic nature of the source CL 4 is claimed on the basis of lack of neutral hydrogen absorption in front of the source.

J. TERRELL: A time of ejection (from the center of our Galaxy) of about $4 \times 10^6$ years ago, consistent with the data of Dr. Wittels, also agrees very well with the very local quasar model. I have considered similar times in a number of papers, for example in Astrophys. J. 147, 827, 1967, and Phys. Rev. Letters 21, 637, 1968.

As to further investigations, it may be very difficult to obtain proof that differential proper motions are much less than the reported figure of 0.0005 " /yr, since internal separation speeds not much less than this are being found for a number of quasars, as we heard from Kellermann this morning. In effect, some proper motions have already been observed.

Finally, we should keep in mind that very local quasars, if several thousand times closer than Hubble distances, should be similar to type O stars in brightness and might be difficult to see in other galaxies. As a matter of fact, some very faint blue objects have been found recently (Blanco, Graham, Lasker, and Osmer, Astrophys. J. 198, L63, 1975.) in the radio field of Centaurus A (NGC 5128) and have the proper brightness to correspond to local quasars ejected by that galaxy (Terrell, Nature 258,

132, 1975).

J.J. WITTELS: With respect to Dr. Terrell's comment on the ejection time, our present value of t is only a lower limit, and, in fact, is only $5 \times 10^6$ years because the QSOs observed have quite large redshifts (Z = 0.695 and 1.67). Similar proper motion limits on a QSO like 3C 273 would place that source at well over 1 Mpc, based on Terrell's local model.

As to the confusion of proper motion with asymmetric expansions of the brightness distributions of some QSOs, I commented in my paper that clearly the path of future measurements should turn to sources which are either unresolved by long baseline interferometers or do not have variable brightness distributions, or both. On the other hand, for sources which do appear to expand, assuming that no proper motion should be observed, the differential fringe phase VLBI technique can be used to distinguish between symmetric and asymmetric apparent motions of the brightness distributions of the sources.

B.F. BURKE: With respect to the ballistic hypothesis of Dr. Terrell, I would like to point out that two quasars (4C32.33 and 1749 + 701) are known to be at least as distant as the external galaxies near which they happen to lie. 21-cm absorption lines in the quasar spectra appear at or near the radial velocity of the nearby galaxy (NGC 3067 and NGC 6503, respectively). The lines are very narrow. The narrow profiles are much like those seen at much larger redshift by Brown and Roberts in the spectrum of the quasar 3C 286. Although we cannot prove from these observations that the quasars be at cosmological distances beyond the galaxies, the observations suggest that this would be the simplest most consistent interpretation.

A comment is also in order on the other consequences of a local quasar hypothesis, at least as far as the radio quasars are concerned. Two weeks ago, at the Cambridge Symposium, Ryle reminded us of the need to keep the background brightness below the observed value. If the average luminosity of quasars is much lower than the cosmological value, the total contribution to the average sky brightness, by Olbers paradox, becomes very large. Perhaps one could move the quasars closer by a factor of 10, but not by a factor of 100 or 1000.