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Are there Quasars at Non-Cosmological Distances?

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In Dravskikh & Dravskikh (1996) the results of a statistical analysis of quasar luminosity as a function of redshift, if it is assumed to be cosmological, are given (see Fig.1). Three quasar samples were analyzed separately:

- quasars with absorption lines;
- quasars associated with galaxies or association-quasars not having absorption lines (from Burbidge et al. 1996);
- other quasars not included in the first two groups.

The first thing to attract attention is that the curves for these samples differ sharply from one another. The difference is that galaxies with absorption lines have a higher luminosity than those of the other two types at any redshift. Association quasars at small redshifts also show an increased luminosity compared to quasars of the third sample, although they lose this feature with increasing z. The authors state that these results have fairly high statistical significance with a confidence level of over 0.99.

Let us consider these results assuming that some fraction of quasars have a local origin and were ejected from the nuclei of nearby galaxies. We designate as v_L the average quasar ejection velocity. Then it will be positive if the ejection occurred into the half-space "behind the galaxy" relative to the observer and it will have a negative sign, if the ejection occurred between the galaxy and observer.

Furthermore, it is easy to see that the radiation from quasars ejected into the half-space "behind the galaxy", other conditions being equal, will be more subject to absorption from the generating galaxy (as well as in the gaseous shelf that accompanies such an ejection), than the radiation from quasars ejected with a negative velocity. Burbidge (1996) notes on the similar physical assumption that absorption lines should be observed in the spectra of about 50% of ejected quasars, while there should be no such lines in the spectra of the remaining galaxies.

From this physical picture the following conclusion could be drawn. To the value of the redshift of the quasars that exhibit absorption is added some positive component due to the ejection velocity. On the other hand, for quasars ejected toward the observer and therefore free of absorption in the generating galaxy the redshift is decreased due to the negative velocity. The observable redshift z_Q for these objects will then be determined by the equation

$$1+z_Q = (1+z_c)(1+z_a)(1 \pm z_L) = 1+z_c+z_a(1+z_c) \pm z_L(1+z_c)(1+z_a), \quad (6)$$

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where z_c is the cosmolgical and z_a is the anomalous quasar redshift, and finally, z_L is the redshift due to ejection from the galaxy.

It thus becomes clear that if the observed redshift z_Q is treated as entirely cosmological, an error depending on the anomalous and local redshifts is thereby introduced. In this case the cosmological redshift differs from its true value by an amount

$$\Delta z = [z_a \pm z_L(1 + z_a)](1 + z_c), \tag{7}$$

where the "+" sign pertains to quasars that are more subject to absorption and the "-" sign to association quasars.

It is seen that if the expression $z_a \pm z_L(1 + z_a)$ is larger than zero, then the quasar's distance and luminosity are overestimated. Moreover, if at least one of the quantities z_a and z_L differs from zero, the luminosity of quasar with absorption is found to be larger than the true value. The overestimate for quasars with absorption is therefore more substantial than for association quasars. In converting to quasar luminosities, therefore, we find that quasars with absorption lines have a higher luminosity, on the average, than association quasars.

The model considered here is an extremely simplified one when all quasars are assumed to have been ejected from nearby galaxies and to have retained their initial anomalous redshift. Nevertheless, it would be more natural to assume that the anomalous redshift has some maximum value at the very onset of formation of a quasar, and subsequently it gradually decreases in the course of evolution and ultimately disappears. On the other hand naturally there should be quasars at cosmological distances which could be named "first generation" or "previous generation" quasars.

According to our current concepts, a quasar ultimately evolves to the stage of a galaxy, in the spectrum of which no anomalous redshift should be observed. This means that among quasars, including those ejected from galaxies, there are objects whose spectra are not distorted by an anomalous redshift. Such quasars obviously, with high probability, lie at large distances from the site of their formation and could not be included in the first two samples.

It is thus natural to assume that if one is calculating the luminosities of quasars that do not have absorption lines and are not in associations, then they will very likely include quasars whose anomalous redshift is close to zero. This means that their observed redshift consists mainly of two terms, which are the cosmological and the local redshifts, so we have

$$\Delta z = \pm z_L(1 + z_c) \tag{8}$$

and we no longer have to talk about the systematic overestimation of quasar redshift. We can therefore conclude that the overestimation of distances and luminosities is less in this case. It is then natural that the luminosities of these quasars calculated from their redshifts will be lower than for quasars associated in one way or another with neighboring galaxies. In other words, the redshifts of quasars with absorption lines and association quasars differ more from their cosmological values, on the average, than for other quasars.

Let us try to interpret now a feature at large redshifts mentioned at the very beginning. That is that at large redshifts the association quasars show a lower luminosity, on the average, than quasars of the third type. So, if we assume the

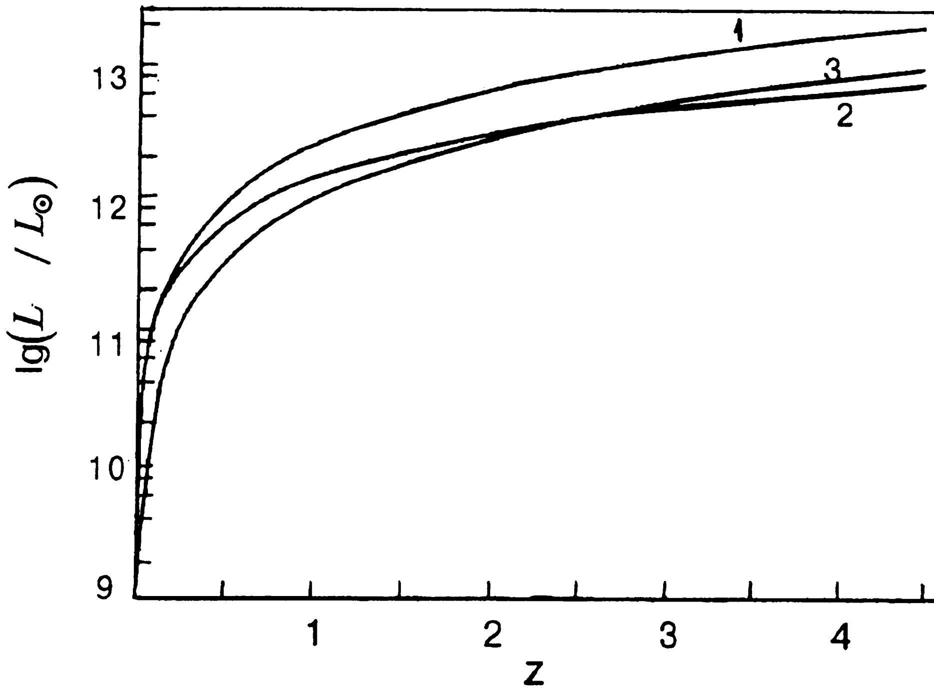

Figure 1. The distribution of average luminosities of quasars depending on z as given by Dravskikh & Dravskikh (1996).

existence of an anomalous component in quasar redshift, then this component should be manifested more often in quasars with large observed redshifts than in quasars with small redshifts. It is thus natural to expect the presence of an anomalous component in the spectrum of quasars in the third sample with large redshifts to be more likely than in the spectrum of quasars of the same sample but with small redshifts.

Thus it is understandable that if all three samples are under the same conditions from the standpoint of the presence of an anomalous redshift component, then the luminosities of quasars in the third sample should be closer to the average of the luminosities of the other two types. And in this case we can actually say that the luminosities of quasars in the first sample, which include quasars with "positive" velocities, are overestimated the most, that the luminosities of quasars in the second sample, having "negative" velocities, are overestimated the least, and that the luminosities of quasars in the last sample, for which averaging over all velocities occurs, should be overestimated less than the former and more than the latter. Just such a picture is observed.

So, the assumption about the existence of the quasars ejected from nearby galaxies with an anomalous redshift allows interpretation of some observational data unexplained till now. We believe this is an argument speaking in support of existence of "local" quasars. This is a very important fact in favour of Ambartsumian's concept. Briefly, it appears that some part of the matter existing in the nuclei of galaxies (ejecting as "local" quasars) has identical properties with the matter generated at the very beginning of the Universe ("first generation" quasars).

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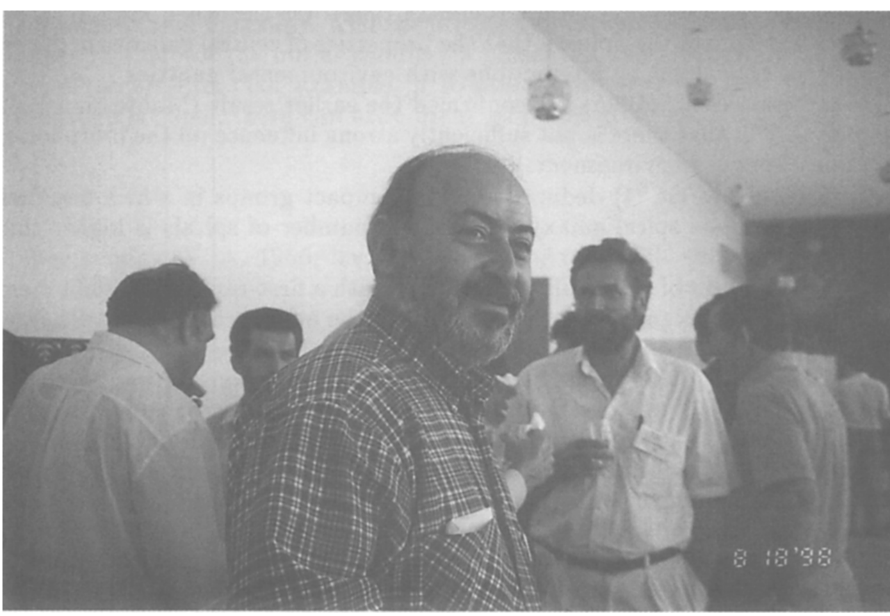

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