Here is the Proof:
Association of Quasars with Other Astronomical Objects

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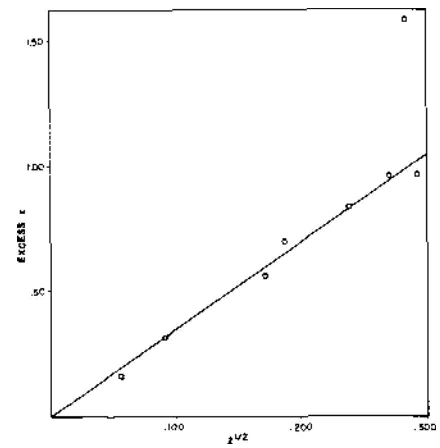
Here in this diagram, reproduced from D. B. Larson's book *Quasars and Pulsars*, is the evidence that confirms the reality of Halton Arp's "associations" of quasars with other astronomical objects, and thereby not only provides a conclusive answer to the hotly debated question as to where the quasars are located, but also opens the door to a solution of the whole "quasar mystery."



In the May 1967 issue of the *Astrophysical Journal,* Dr. Arp identified a number of instances in which the data available from observation indicated, in his opinion, that pairs of objects—radio galaxies or quasars—had been ejected in opposite directions as a result of explosive events taking place in large central galaxies. If these conclusions are correct, the quasars are not at the "cosmological" distances that correspond to their full redshifts, but are at ordinary galactic distances. Arp's findings have received widespread support, but the majority of his colleagues in the astronomical profession have preferred the "cosmological" hypothesis, largely because any departure from the standard redshift-distance relation raises a very awkward question as to the nature and origin of the excess redshift.

What Larson has done is to examine the relation between the redshifts of the quasars and those of the other objects with which Dr. Arp finds the quasars to be associated. No one else had attempted such a correlation, simply because there did not seem to be any object in so doing, inasmuch as there is no way, in the context of orthodox physical theory, whereby such a relation could exist. But Larson's results, portrayed graphically in the diagram, show that a specific mathematical relationship definitely does exist.

Of the associations for which sufficient redshift data are available, only four are close enough to enable checking the quasar redshift against that of the central galaxy. As the diagram shows, in every one of these cases the quasar redshift corresponding to a central galaxy redshift z is $z + 3.5z^{1/2}$, within the margin that can be attributed to known causes of minor deviation. At greater distances correlations can be made between the quasar redshifts and those of the radio galaxies, which should be close to those of the central galaxies if Arp's identifications are correct. Redshift data are available for four such comparisons, and in three of the four cases a radio galaxy with a redshift z has been found associated with a quasar having redshift $z + 3.5z^{1/2}$. In seven of the eight cases, therefore, the quasar redshift exceeds that of an identified associate by an amount $3.5z^{1/2}$, where z is the redshift of the associated object.

The existence of any specific relation between these redshifts obviously means that there is a corresponding relation between the objects from which the radiation originates. Larson's results thus clearly verify the reality of at least seven of Arp's associations, and thereby demonstrate that the quasars are spatially contiguous to the associates that Arp has identified. The redshift of the associate is thus the recession redshift of the quasar as well, and since the quasars participating in these associations can reasonably be regarded as representative of quasars in general, in the absence of any indication to the contrary, it follows that Larson's analysis has established the fact that where the recession redshift of a quasar is z, its total redshift is $z + 3.5z^{1/2}$.

You may not like this conclusion, because in the context of present-day physical and astronomical thought it raises more questions than it answers, but in the long run science must accommodate itself to the results of observation and measurement, not vice versa. The diagram reproduced on page one portrays a physical fact that both astronomy and physics will have to learn to live with, however painful the necessary readjustment of thinking may be. These data definitely show that the redshift of a quasar includes a component in addition to the normal recession redshift, and they further demonstrate that the additional component is not something of an independent nature, such as a gravitational effect, it is related to and a mathematical function of the normal recession redshift.

In view of the total inability of conventional physical theory to account for the existence of a redshift component of this character, or even to provide a consistent explanation of the more obvious features of the quasars, it is appropriate to call your attention to the fact that a new physical theory not subject to these limitations has been developed, one in which both the existence and the properties of the quasars (including the $3.5z^{1/2}$ excess redshift) are necessary consequences of the assumptions as to the nature of space and time that constitute the basic postulates of the theoretical system. The first half of *Quasars and Pulsars* traces the development of thought from these postulates to the quasars and associated phenomena. The remainder of the volume then develops the theoretical characteristics of these phenomena and shows that they are in full agreement with the observations. The close correspondence between the conclusions reached by Larson from purely theoretical premises and those reached by Arp from his observations with the world's most powerful telescope is particularly striking.

As Professor Fred Hoyle has emphasized on a number of occasions, conventional physical theory is "totally inadequate" to account for the behavior of many of the recently discovered astronomical phenomena. In this book we are presenting a theory that can deal with them, one in which the quasars and their associates are not freaks or accidents, but part of the great cycle of physical existence, a stage through which all matter must pass in due course. Here is the kind of a "revision of the laws of physics" that Hoyle has been asking for: one that meets the needs of present-day astronomy. In so doing it also supplies the answers to major problems in other areas of physical science; problems that are just as real, even though not as spectacular, as the current "mysteries" that perplex the astronomers.