Time and Radiation Domain in Star-Like Objects: Relating Intrinsic Colors of Quasars to Redshifts

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As the redshift of a quasi-stellar object (QSO) increases, the velocity and distance of the QSO increases. Based on this fact, it was hypothesized that when plotting the intrinsic colors of QSOs as a function of their redshifts, the intrinsic colors would either decrease, indicating that distant QSOs are more blue, or increase, indicating that distant QSOs are more red. I wrote a program in Python that used public data from the Sloan Digital Sky Survey with the necessary information on over eighty thousand QSOs. The program separated out sections of data with four increasing redshift ranges that would approximate the rest frame color u-g intrinsically. The program then calculated the error-weighted average of the u-g magnitude in each range. When I plotted this data, I discovered that the rest frame u-g magnitude generally decreased as redshift increased, confirming the first part of my hypothesis. The data therefore indicate that QSOs are more blue at higher redshifts. This information helps us to understand more about the universe as it was when it was younger. In conclusion, the data are consistent with the idea that earlier in the universe, there were more collisions between galaxies, causing QSO formation. For this reason, the QSOs from earlier epochs have more energy and are more blue. As the universe expands, there are less frequent collisions, so the QSOs produced are more red. This study contributes to models of the younger universe and how an expanding universe has affected the formation of QSOs.

Awards Won:
European Organization for Nuclear Research-CERN: All expense paid trip to tour CERN