Galaxies are not closed systems but are constantly interacting with their environment via mechanisms that could remove baryonic matter (stars, gas and dust) from the host galaxy and re-deposit those removed baryons into the space between the galaxies. Depending on the mass of the host galaxy, this removed baryonic debris may or may not still be retained by the gravitational potential of the host galaxy. Because most galaxies are highly clustered and therefore are subject to various tidal encounters with other members of the cluster over a Hubble time, there is indeed a natural mechanism for tidal stripping of the outermost layers of the galaxy, perhaps repeatedly in certain cluster environments. Currently, these interactions generally remove more gas than stars. However, during the galaxy formation process, if those forming galaxies are highly clustered, then these interactions may well liberate stars from the gravitational potential of individual galaxies thereby creating a population of “intergalactic” stars which will tend to congregate at the cluster center. Such a population in the Virgo cluster was discovered decades and work since then has shown a similar population in the Coma cluster.

In addition to tidal stripping, galaxies that are physical moving through a warm or hot intergalactic medium (IGM) may experience a type of hydrodynamic ram pressure that is very effective at moving gas and is less effective at moving stars, although some objects in clusters with known IGM exhibit peculiar morphologies as if the stellar orbits are also be greatly disrupted (e.g. IC 1183 in Hercules). For the case of the Coma cluster, Bothun and Dressler (1986) identified a number of cases where disk galaxies, moving at about 1000 km/s with respect to the Coma IGM, were experiencing both baryonic mass loss and induced, enhanced, star formation. The eventual supernovae/stellar winds from this newly formed stellar population could serve to drive out even more baryonic material at later times.

Currently there is a well-documented “missing baryon” problem in Cosmology as known galaxies do not contain enough baryons to be consistent with Big Bang Cosmology. This implies a substantial amount of Baryons must exist in the IGM, but most of this remains undetected. While this component has been assumed to take the form of the so-called IGM (a few hundred thousand K and therefore not detectable in X-ray surveys), progress to date has not detected this warm IGM with strong enough signal to claim, well, that’s where all the missing baryons are. For example, the recent (and first) discovery of a filamentary gas connection between many pairs of galaxies (REF) shows that while the suspected IGM gas does exist it is extremely diffuse and unlikely to contain a significant mass, relative to the baryonic mass of the host galaxies. This implies there is likely a cold component to the missing baryons. While low surface brightness galaxies (now called extremely diffuse galaxies) are being detected in increasing numbers, its not year clear if that population is where such cold missing baryons are located. Another alternative at detection of IGM baryonic material is in the extended cluster environment. For example, The Hubble Telescope Spectroscopic Legacy Archive (HSLA) now contains a large amount of QSOs that are shining through various kinds of foreground structures. This provides an excellent opportunity for obtaining a relatively large-scale accounting of various kinds of chemical elements that might inhabit the IGM as well as providing measurements of the column densities of absorbing clouds. We are in the process (results presented in proposal body) of an extensive detection campaign via QSO absorption lines of the Northern Galactic Cap centered on the Coma cluster. To date we have found at least 300 absorption line systems which have probable velocities similar to those for the galaxies in the region and the Coma supercluster in particular. We now wish to combine that survey data with various available X-ray data at the same coordinates to search for the presence of diffuse X-ray emission. The presence of absence of local X-ray emission is important to help determine possible heating sources for these cold, diffuse clouds in the Coma are which can then help determine their ionization state. Combining our absorption line data, with X-ray data would greatly aid in the physical understanding of these IGM clouds.