UV IMAGING SURVEY OF STAR FORMING REGIONS, CLUSTERS AND STARBURSTS
A Legacy Library for Stellar Evolution and Star Formation

Summary: NUV imaging atlas of massive star clusters and star-forming regions, consisting of (A) wide-field mapping of 2-3 resolved star-forming regions (e.g., 30 Doradus, NGC 604); (B) resolved stellar populations in 10 young massive clusters and 10 globular clusters; and (C) 30 starbursts and unresolved stellar populations (e.g., Blue Compact Dwarfs, Virgo ellipticals). Uniform imaging in F218W, F225W and/or F275W with possible SBC and/or optical supplements. Total 600 orbits.

(1) Overview:

Star clusters contain coeval stellar populations with homogeneous initial metallicity, thus offering empirical SEDs for single stellar populations. Beyond this, the cluster environment may affect stellar evolution, e.g. through binary/multiple star interactions or formation processes. These processes are essential for understanding relationships between young "super star clusters" and globular clusters. Cluster evolution itself is one of the foundations of stellar population studies, but has outstanding questions, e.g., the phenomenon of "Multiple Populations" (i.e., abundance anomalies) as well as the origin of the UV upturn in extragalactic clusters. Therefore, a compendium of cluster UV photometric data is essential for interpreting the stellar content and evolution of galaxies. This legacy data set will provide UV imaging of resolved star clusters covering a range of ages, and nearby, UV-bright galaxies which will test cluster formation efficiency in a variety of environments. The data will yield a library of UV SEDs for young massive clusters, along with data to support quantitative structural comparisons with distant young galaxies. In combination with existing archival observations of normal galaxies, this data set will yield a comprehensive HST photometric database on the properties of UV-bright stellar populations.

(2) **Key science goals:**

Spectral Templates: Provide UV photometry for massive and intermediate mass stars at all phases of stellar evolution for comparisons of model and observed spectral energy distributions (SEDs). In addition to supporting studies of cluster evolution, SED templates of cluster stellar populations will allow direct comparison with high-redshift galaxies and proto-globular clusters.

Stellar Populations: UV imaging will allow comprehensive studies of hot stellar population and stellar evolution across clusters and star-forming regions spanning the full range of possible ages. It will also facilitate studying the origins of hot stars in ancient stellar populations, thereby extending studies of globular clusters and the problem of UV upturns in early-type galaxies.

Multiple Populations. Ancient Galactic globular clusters are known to host abundance variations, or "multiple populations", of unknown origin. The cluster data set spanning a wide range of ages and masses can be used to investigate properties of multiple populations, e.g., as defined by spreads in main sequence turnoffs, relative to properties of their host clusters.

Dust Properties. SEDs from the near-IR to FUV in galaxies can be used to derive properties of dust obscuration in a variety of settings. Understanding how dust affects the emergent radiation in locations with intense UV radiation fields is essential for interpreting properties of young galaxies.

Starburst Clusters in Context. Images of UV-bright galaxies sample regions with high intensity star formation, for exploring variations of stellar properties and UV luminosity escape across a range of metallicities and host galaxy environments. These data also will provide a catalog of host galaxy morphologies in the rest frame UV. The maps can be used to determine properties of starburst clumps, star cluster luminosity functions and frequencies, and spatial correlation functions among young stellar components.