Objectives and Key Challenges:
- Develop high-reflectivity coatings to increase system throughput, particularly in the far-UV (FUV) spectral range
- Study other dielectric fluoride coatings and other deposition technologies, such as Ion Beam Sputtering (IBS), expected to produce the nearest-to-ideal-morphology optical-thin-film coatings and thus low scatter

Significance of Work:
- High reflectivity (> 90-95%) in the 90 to 250 nm range will enhance throughput in UV telescopes
- Scaling coatings up to large diameter (1+ m) mirror substrates will enable large-aperture UV and/or UVOIR missions

Approach:
- Retrofit a 2-m coating chamber with heaters/thermal shroud to perform Physical Vapor Depositions at high temperatures (200-300 C) to further improve performance of Al mirrors protected with either MgF$_2$ or LiF overcoats.
- Optimize deposition process of lanthanide trifluorides as high-index materials that when paired with either MgF$_2$ or LiF will enhance reflectance of Al mirrors at Lyman-alpha
- Establish the IBS coating process to optimize deposition of MgF$_2$ and LiF with extremely low absorptions at FUV wavelengths

Key Collaborators:
- Javier del Hoyo, Steve Rice, and Felix Threat (GSFC Code 551)
- Jeff Kruk and Charles Bowers (GSFC Code 665)

Recent Accomplishments:
- Performed end-to-end testing of the three-step Physical Vapor Deposition (PVD) coating process in 2-m chamber to enable 1+ m class mirrors with either Al+MgF$_2$ or Al+LiF coatings for FUV applications
- Completed characterization of lanthanide trifluorides (GdF$_3$ and LuF$_3$) to pair them with low-index MgF$_2$ layers to produce narrow-band dielectric reflectors at FUV wavelengths
- Produced mirrors with reflectance over 90% in FUV for ICON and GOLD projects

Application:
- Application of these enhanced mirror coating technology will enable FUV missions to investigate the formation and history of planets, stars, galaxies, and cosmic structure; and how the elements of life in the universe arose