In this talk I will discuss high-resolution AFM investigations of biological filaments and particles associated with biological systems that have critical dimensions in the sub 100 nm range. The first case involves gene profiling of RNA using stretch immobilized molecules where we tag the molecules using restriction enzymes to create spatial markers to define specific sequences and the utility of the method for low copy number species. Next I will discuss the characterization of exosomes derived from human saliva where we explore the morphology using AFM at variable forces as well as FE SEM with nm resolution. Here we have explored specific surface receptors that are a marker of oral cancer with SMFS using tips coated with a secondary antibody. Vaults are a naturally occurring nanoparticle that are hollow protein assemblies with a length of ~70 nm. Our results compare particles that can be genetically modified as potential nano drug therapy agents. Finally we conclude with new work, which involves engineering the injection system of the T4 bacteriophage, and which has been assembled into 1, 2 and 3 D assemblies. The studies are part of a on going collaboration between the CNSI and the UCLA Medical and Dental schools.