What is the nature of the mysterious Dark Energy that permeates and accelerates the expansion of the Universe? How enigmatic Cold Dark Matter particles affect the formation of clusters of galaxies? Is General Relativity correct..? In the last few years it has become clear that in order to properly address the most fundamental questions on the cosmic structure and evolution, a new class of instrumental facilities has to be developed, capable of taking deep spectra of hundred of millions of faint astronomical sources. Possibly the most interesting enabling technology is based on the use of MEMS devices, both on ground telescopes and on space satellites. This approach, pioneered by institutions like NASA and RIT, benefits from the enormous advances in reliability and performance of nanotechnology for commercial applications.

In my talk I will focus on the Digital Micromirror Devices (DMDs) produced by Texas Instruments, which can be used as slit selection mechanism for astronomical multi-object spectrographs. I will describe the potential and limitations of DMD-based spectrographs, together with the constrains they impose on the instrument design. I will illustrate different type of instruments, either existing, under construction, or proposed for the next generations of space missions.