The Lyman-alpha Solar Telescope (LST) is one of the three payloads of the Advanced Space-based Solar Observatory (ASO-S) and as scheduled it will be in phase C when the CESPM 2019 opens. The LST consist of a Solar Disk Imager (SDI), a Solar Coronal Imager (SCI), a White-light Solar Telescope (WST) and a Guide Telescope (GT). With all the instruments, LST is to observe solar flares, coronal mass ejections (CMEs) and other phenomena from disk center up to 2.5 solar radii in both the Lyman-alpha line and white-light wavebands with high tempo-spatial resolution. Due to its strong intensity and large temperature coverage of the Lyman-alpha line, LST can access both low- and high-temperature features on the Sun, such as filaments (prominences), jets, loops, coronal holes, CMEs, flares, etc. In this talk, I will review solar observations with the Lyman-alpha line done by various satellites and sounding rockets, introduce the up-to-date progress of LST and outline the possible LST contributions to study of the Sun.