Understanding hadrons in terms of their partonic structure is essential for and hence an important goal of the JLab 12 GeV physics program. Within the framework of Generalized Parton Distributions (GPDs), deep exclusive reactions such as Deeply Virtual Compton Scattering (DVCS) provide a unique tool for probing the transverse spatial structure of the nucleon, and could, for instance, also shed light on $q\bar{q}$-correlations. While DVCS, $\gamma* p \to \gamma p$, is the simplest and cleanest of the exclusive processes, its timelike equivalent, $\gamma p \to \gamma* p \to e^+ e^- p$, also known as Timelike Compton Scattering (TCS), offers a unique opportunity for studying the universality of GPD factorization in a way analogous to that of Parton Distribution Functions (PDFs), which appear both in the (spacelike) DIS and the (timelike) Drell-Yan reactions.

TCS is also complementary to DVCS in another important way. The most easily accessible observables in DVCS are the beam or target asymmetries, which measure the imaginary part of the Compton Form Factors (CFFs), probing the GPDs along the $x = \xi$ line, where $x$ is the momentum fraction of the struck quark and $\xi$ is the skewness (\textit{i.e.}, the change in the momentum fraction carried by the struck quark). At low $x$, where real part of the CFFs is small, the entire $x$-$\xi$ plane can in principle be reconstructed from dispersion relations. However, in JLab 12 kinematics, mapping primarily the valence region, a good handle on the real part is highly desirable, and could also have a significant impact on global fits of CFFs. In DVCS, the real part can be measured through the beam charge asymmetry (constructed by comparing data taken with electron and positron beams) and a direct measurement of the cross section (in kinematics where this is possible), both of which offer a number of challenges. In TCS, due to symmetry arguments, the real part of the Compton and Bethe-Heitler interference can be extracted in a model independent way from the azimuthal angular distribution of the lepton pair.

With CLAS12 and an $11$ GeV electron beam, TCS can be studied with high luminosity in a resonance-free window between the $\rho^\prime$ and the $J/\Psi$ ($4 < M^2_{e^+e^-} < 9$ GeV$^2$), where $M^2_{e^+e^-} = Q^{\prime 2}$ is the timelike virtuality of the outgoing photon, and $x \sim Q^{\prime 2} / s$, over a wide range in $-t$. While the focus of this proposal is on TCS, the $J/\Psi$ photoproduction cross section near threshold will also be measured with high statistics. The studies of the gluonic structure of the nucleon using $J/\Psi$ photo- and electroproduction will, however, be the subject of separate proposals.