How thunderstorms generate antimatter –
an excursion through the known and unknown physics of lightning

Thunderstorms belong to the most energetic processes in the atmosphere, in particular, in tropical regions. Though they are familiar phenomena, they are far from being understood. Furthermore recent observations have revealed that there is a zoo of transient luminous events above thunderstorms as well as unexpected energetic radiation like terrestrial gamma-ray flashes and electron-positron beams. I will discuss the state of observations and theoretical understanding as well as some laboratory experiments that allow a more systematic study of similar events. For this reason there is also cross-fertilization of research in high-voltage engineering, plasma technology and thunderstorm physics.