An empirical perspective of climate and complex responses of ecosystems

I have spent 35 years of my professional career observing different ecological systems and how they respond to environmental change. In the beginning, it was obvious that stochastic climate played a crucial role in driving primary productivity and how this association pervaded into the entire ecosystem. It was not until several years later that I found out the importance of temporal and spatial scales for a better understanding of climate stochasticity and its effects on ecological processes. This included a necessary look at the geological time and evolutionary life histories involved in the complex responses of organisms to climate variability. I have ended up with the feeling of gathering a limited empirical knowledge of a range of organisms and ecosystems, and I struggle now to find out if there are good questions that remain unanswered. For instance, is there an evolutionary memory selected to tune the response of organisms to climate stochasticity? How has climate cyclicity over the recent Quaternary affected life histories and the responses of organisms to this new climate regime? How the evolutionary pace of life has shaped the response of different organisms to climate stochasticity? I will summarise here my field experience over the years and how I deal with what remains between the trivial evidence (i.e. climate influences ecological processes) and the challenges of the unanswered (i.e. copying with the responses of complex ecosystems).