Dear Colleagues,

In the last two decades, there has been significant progress in using entropy generation for damage and fracture mechanics and in-situ structural health monitoring of systems, ranging from infrastructures to mechanical and biological systems. Compared to phenomenological damage and fracture mechanics models based on empirical curve fitting a polynomial to a degradation and fracture data, using entropy provides a physics and mathematics-based alternative. Using either thermodynamic entropy or information theory entropy has been shown to be extremely successful in predicting the degradation, fracture, fatigue, and in-situ prognosis of all systems. It was proven by Jaynes [1957] that thermodynamic entropy is identical to the information theory entropy of the probability distribution, except for the presence of Boltzmann's constant. The following are some examples of some of the most beneficial uses of entropy in the last two decades: thermodynamics entropy has been used as a bridge to unify the laws of Newtonian mechanics and thermodynamics to establish the unified mechanics theory. Information-theory entropy has been used successfully for fault diagnostics and prognostics of systems for in-situ structural health monitoring using various real-time signal feed-back cycles and computations. There is even a new pyroelectric sensor entropy detector to monitor energy conversion process in real time. There is a strong worldwide consensus among leading researchers that using entropy is scientifically the most accurate and reliable method for predicting degradation, fatigue, fracture, failure mechanics, and in-situ structural health monitoring of all systems. This Special Issue of the *Entropy* is devoted to covering the most recent advances in using entropy damage mechanics, and the structural health monitoring [fault diagnostics] of all systems.

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Guest Editor