In this presentation, I will first give a brief overview of the recent development of high-entropy alloys and, then, discuss and summarize different traditional strengthening mechanisms that have been observed in high-entropy alloys. Some of these mechanisms are useful for low-temperature and some for high-temperature applications. Special emphasis is placed on the perspective of developing precipitation-hardened alloys for both low and high temperature applications. Examples of coherent precipitates strengthened fcc-base alloys, such as Al and Ti-modified NiFeCoCr, will be given. Microstructure-wise, these precipitation-hardened alloys, in fact, bear great resemblance to the well-known γ-γ’ Ni-base superalloys. Aging response as well as strengthening of this alloy will be presented. Finally, if time permits, I will discuss the intrinsic strength (or frictional stress) resulting from lattice distortion induced by the uniform distribution of concentrated constituent elements. The measurements of intrinsic strength will correct the misuse of traditional solid-solution theory for the explanation of the apparent high strength in high-entropy alloys.

Biography: Dr. T.G. Nieh is currently a professor in Department of Materials Science and Engineering at The University of Tennessee. From 1980 to 1992, he worked at Lockheed Missiles and Space Co. (now Lockheed-Martin Corporation) as a Senior Fellow of Research Laboratory. He subsequently worked at Lawrence Livermore National Laboratory as a Senior Research Fellow until he joined UT in 2004. Nieh is a world leader in superplasticity and superplastic forming. He is also widely recognized for his work in several material science disciplines, including multicomponent complex alloys (including high entropy alloys and bulk metallic glasses), nanocrystalline materials, lightweight alloys, metal-matrix composites, intermetallics, refractory metals and nanolaminates. He published over 400 papers and a textbook on “Superplasticity of metals and ceramics”. He is now serving as Editor-in-Chief, Journal of Intermetallics., has served as Editor, Materials Letters, 2008-2013. Nieh received the Ph.D. degree in Materials Science and Engineering from Stanford University, the M.S. degree in Physics from University of Washington, Seattle, and the B.S. degree in Physics from National Cheng-Kung University in Taiwan.