

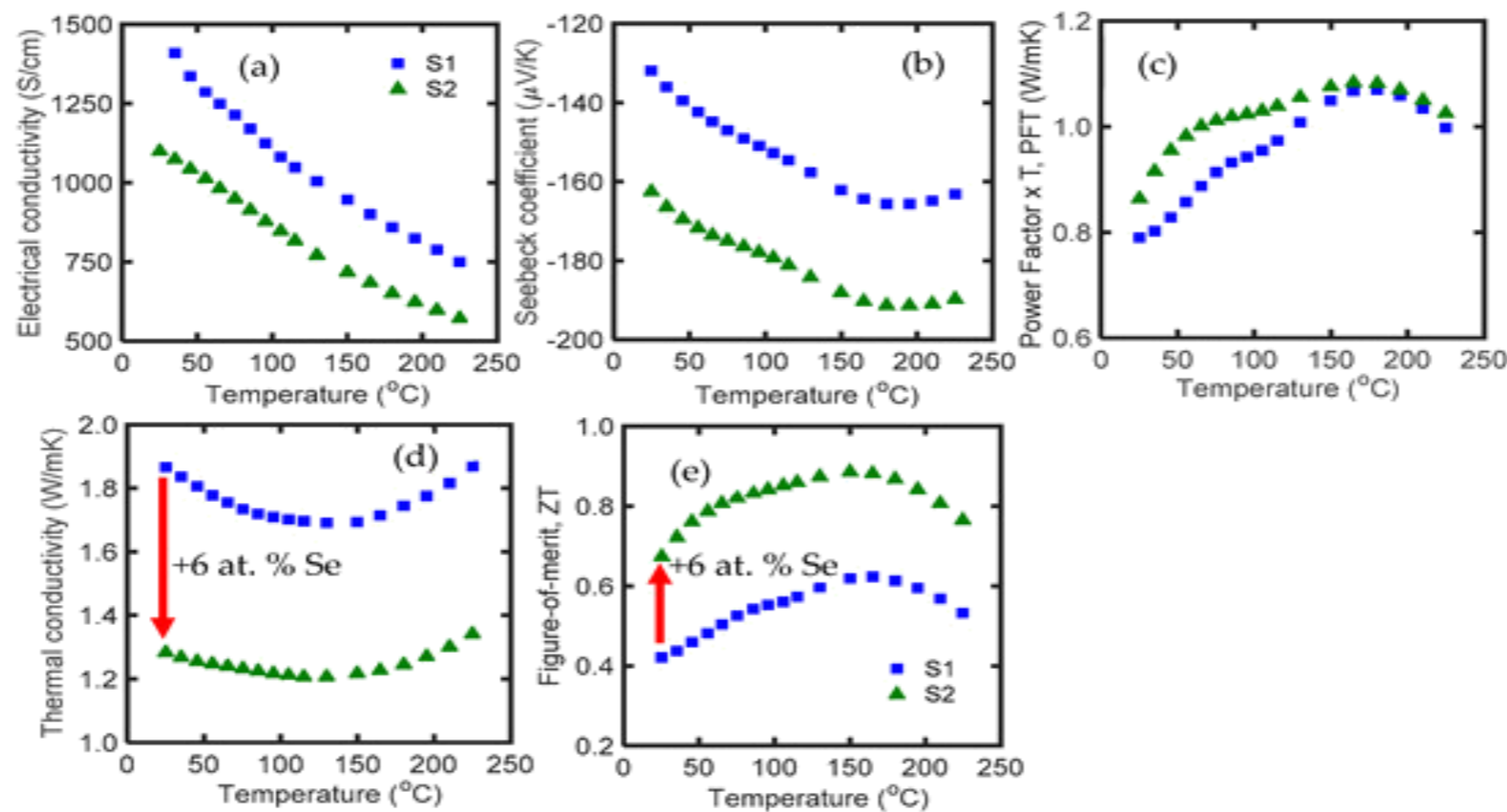
## Monthly Colloquium

### Recent Advances in Thermal Energy Harvesting – Conventional and Nanostructured Thermoelectrics

Invited Speaker:

**Prof. Daryoosh Vashaee**

Monteith Research Center, North Carolina State University



#### Abstract:

A thermoelectric generator is a solid-state device that converts heat directly into electricity. Thermoelectric technology has made significant progress in recent years, and its potential to reduce the environmental impact of electrical power generation is retaking worldwide attention. With the new stimulations of the research community in this area, thermoelectric research has been continued in two general directions: (1) theoretical models that predict the properties and offer superior materials and structural designs, and (2) experimental efforts in finding new materials or structures that show enhanced electronic and thermal properties. These efforts have also been followed in two main directions. One has been finding new bulk materials and their further engineering to achieve higher efficiency. Some examples of this direction are the filled skutterudites, half-Heusler, and clathrates. Another direction has been the use of nanostructures that improve or maintain thermoelectric power factor through quantum size effects or interface energy filtering, while their thermal conductivity is reduced through the scattering of phonons at interfaces. Some examples of these groups are BiTe/SbTe superlattices (SL) and PbTe/PbSeTe quantum dot superlattices (QDSL). After a brief overview of the science and technology of thermoelectric energy conversion, we will discuss the prospects for waste heat recovery in automobiles, industrial processes, and environmental heat harvesting for powering integrated sensors and health monitoring technologies. In particular, the role of nanotechnology for making efficient generators will be highlighted, and recent advances will be reviewed and compared with the existing commercial devices.

**Wednesday, 17 Mehr 98 (09 October, 2019), 4 - 5 pm**  
**Farmaniyeh Building, Conference Hall.**