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Abstract for an Invited Paper
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$p \times n$-Transverse Thermoelectrics: Single leg thermoelectrics with scalable integration and cryogenic promise[1]

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Under the $p \times n$type transverse thermoelectric paradigm electrons dominate conduction in one direction and holes dominate perpendicularly, allowing electrical current to drive transverse heat flow [1]. Bulk anisotropic crystals, superlattices, and nanowire arrays have all been previously proposed as viable $p \times n$ materials. This talk will describe the general philosophy behind $p \times n$-type transverse thermoelectrics as well as the tensor equations that define their anisotropic Seebeck effect. The advantages of single-leg thermoelectric devices – available only to transverse thermoelectrics – are detailed. Various device geometries are discussed which take advantage of the single-leg nature, in particular to provide advantages for cryogenic thermoelectric cooling and integrated thermal management.

[1] Chuanle Zhou, S. Birner, Yang Tang, K. Heinselman, and M. Grayson, Phys. Rev. Lett. 110, 227701 (2013).

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