1096-49-1754 **John Matthews*** (matt-matthews@utc.edu), Dept 6956, 615 McCallie Ave, Chattanooga, TN 37403, and **Boris Belinskiy** and **James W. Hiestand**, Dept 2452, 615 McCallie Ave, Chattanooga, TN 37403. *Effect of convection on optimal design of a bar with attached mass.* Preliminary report.

We minimize the mass of a bar with radial symmetry and a given rate of heat transfer. In engineering, such a construction serves as an extended surface for transfer of heat from an attached mass. Previously, similar work has considered only conduction of heat along the length of the bar. Here we include conduction along the bar as well as convection through the sides, and study bars consisting of multiple pieces with constant cross-sections. The given rate of cooling is defined by the first eigenvalue of the corresponding Sturm-Liouville problem. With convection, the problem is reduced to a set of transcendental equations for the cross-sectional areas. The minimal mass is found through the use of Lagrange multipliers and a Newton-like method. Exact expressions necessary for the optimization are obtained with Maple and the resulting equations are solved within Matlab. The effect of material parameters (including convection) on the optimal solution is studied. (Received September 16, 2013)