1097-35-492 **John V Matthews*** (matt-matthews@utc.edu), 615 Mccallie Avenue, Chattanooga, TN 37403-2598, and **Boris P Belinskiy** and **James W Hiestand**. *Heat equation; first eigenvalue of a Sturm-Liouville problem; and optimal design of a bar.* Preliminary report.

We minimize, with respect to the cross sectional area, the mass of a bar given the rate of heat transfer. The bar serves as an extended surface to enhance the heat transfer surface of a larger heated known mass to which the bar is attached. This paper is an extension of the previous authors' paper where heat transfer from the sides of the bar was neglected and only conduction through its length was considered. The rate of cooling is defined by the first eigenvalue of the corresponding Sturm-Liouville problem. We compare the mass of the bar with the mass for the bar of the same rate of heat transfer but of a constant cross-section area. (Received January 28, 2014)