

Weekly Seminar: Fall 2010

Date: Friday October 15

Time: 11:00 AM

Location: Maryland Hall 110

Speaker: Patrick Weidman (University of Colorado)

Title: *"Mathematical Models for the Shape of the Eiffel Tower: Historical Perspective and New Results"*

Abstract

Equations modeling the shape of the Eiffel Tower are investigated. One model, based on equilibrium of moments, gives the wrong tower curvature. A second model, based on constancy of vertical axial stress, does provide a fair approximation to the tower's skyline profile of twenty-nine contiguous panels. However, neither model can be traced back to Eiffel's writings. Reported here is a new model embodying Eiffel's concern for wind loads on the tower, as documented in his communication to the French Civil Engineering Society on March 30, 1885. The result is a nonlinear, integro-differential equation which may be solved to yield an exponential profile. An analysis of actual panel coordinates reveals a profile closely approximated by two piecewise continuous exponentials with different growth rates. This is explained by specific safety factors for wind loading that Eiffel & Company incorporated in the design and construction of the free-standing tower.