

# 2015 年臺灣國際科學展覽會 優勝作品專輯

作品編號	170007
參展科別	地球與行星科學
作品名稱	Lunar Tide Contribution to Thermosphere Weather
得獎獎項	一等獎 青少年科學獎
國家	United States
就讀學校	Fairview High School
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## Abstract

Internet search technology is a pervasively used utility that relies on techniques from the field of spectral graph theory. We present a novel spectral approach to investigate an existing problem: the critical group of the line graph has been characterized for regular nonbipartite graphs, but the general regular bipartite case remains open. Because of the ineffectiveness of previous techniques in regular bipartite graphs, our approach provides a new perspective and aims to obtain the relationship between the spectra of the Laplacians of the graph  $G$  and its line graph  $bG$ . We obtain a theorem for the spectra of all regular bipartite graphs and demonstrate its effectiveness by completely characterizing the previously unknown critical group for a particular class of regular bipartite graphs, the incidence graphs of finite projective planes with square order. This critical group is found to be  $Z_2 \times (Z_{2q+2})_{q^3-1} \times (Z_{q^2+q+1})_{q^2+q-1}$ ; where  $q$  is the order of the finite projective plane.

## 【評語】 170007

選題極佳，包含了地球科學跨領域的數據應用，idea 與邏輯分析能力亦佳，其討論結果有很新的持續進展的空間，甚至可說是提出重力衛星的加速度儀在太空天氣方面的具體方法。唯有一些分析方法的細節未盡善。