ASTRONOMY 383C

ASSIGNMENT #1   Due Sep 22, 2006

1. Barnes & Evans (1976, MNRAS, 174, 489) begin their paper by stating that from the standard relation L $\sim$ D^{2}T$_e^4$, where D is the stellar diameter, and folding in the appropriate quantities for the Sun, "it is easy to derive the equation"
$$\log T_e + 0.01BC = 4.2207 - 0.1V_0 - 0.5\log\phi'$$
Here, ϕ' is the stellar angular diameter in milli-arc-seconds, V_0 is the un-reddened V magnitude, and BC is the bolometric correction. Derive this formula.

2. Investigate one of the photometric systems below, and address the following considerations about it:
   - (1) the original publication, with its underlying rationale
   - (2) definitions of pass bands
   - (3) how are pass bands achieved (filters, detectors)
   - (4) why was system developed?
   - (5) what is the relationship to UBV?
   - (6) for what spectral types is it ideal?
   - (7) for what spectral types is it not useful?
   - (8) what useful astronomical result has come from it?
   - (9) how are reddening effects handled?

   Photometric systems to be considered: uvby$H\beta$; SloanDSS; Geneva; Vilnius; DDO; Washington; IRAS; WFPC2; GSC; RI (Eggen, Johnson, Kron, Cousins); IRAC (SPitzer); 2MASS; JHK (Johnson, SAAO, CTIO, 2MASS, Tenerife, ...).

   Limitation: you may not choose a photometric system in your area of research, and your system must not be identical to that of another class member. So "register" your chosen system with me. Please document your answer with relevant citations to publications.

3. Handy sets of stellar photometric indices *predicted* from stellar model atmospheric computations are given by R. L. Kurucz at his web site http://kurucz.harvard.edu/ . From these data, estimate simple formulas for the response of $B - V$ and $U - B$ colors to variations in [Fe/H] metallicity and luminosity (use its surrogate surface gravity log g) for stars with T_{eff} 10,000, 7,500, and 5,000 K. In doing so, develop a numerical description of $\delta(U - B)$ that can separate warm metal-rich and metal-poor stars via UBV photometry. Describe clearly what you have done. Comment!