**PHYS 354 Project 4: Calibrating the M23 Field**

Due: Jan. 15

We have been collecting data from the field of the sky containing open star cluster M23 since 2003. We use as a single reference image to normalize our data each night. That reference image is image #71 from August 4, 2003. An Excel file (M23refdata.xlsx) has been [shared](https://drive.google.com/file/d/1Dh5Ioi1Sit1p1Qc07vByKNG03qWmBTeu/view?usp=sharing) with you that has two sheets. The first tab lists the x-y pixel position of each of 2508 stars (some are artefacts) found in the field. The second tab uses data taken from [WebDA](https://webda.physics.muni.cz/cgi-bin/ocl_page.cgi?cluster=m23) that provides all the previously published celestial coordinates and V magnitudes for stars in the field. You can find images of the field (FITS format and jpeg) in the same shared folder. Visualizations of the WebDA data can be found on the M23 cluster page on the WebDA site. Your task here is to:

(i) Build a coordinate transformation script in Kaleidagraph, MatLab, Excel, IDL, Python or all of the above that turns any pixel coordinate data into celestial coordinates. Pages 251-253 of *Astronomy on the Personal Computer* by Montenbruck and Pfleger might be particularly helpful here.

(ii) Perform a regression to V magnitude as a function of measured signal (ADU) for the WebDA stars of known magnitude to derive a general formula for converting measured signal to V magnitude.

These expressions will be valuable components of future project work.