Lambda Arietis = WDS 01579+2336

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Abstract: Measurements made of the double star Lambda Arietis with a CCD are compared with those made with a web-cam.

Lambda Arietis (λ Ari) is a pretty double star system for binoculars at 1h 57.9m +23°36' (2000.0). At a distance of 37 arcseconds from the 4.8 magnitude bright primary there is a companion of magnitude 6.7 (values taken from the WDS). This is definitely visible in steadily mounted 10x50 binoculars. Lambda Ari is catalogued in the Washington Double Star Catalog (WDS) under the discoverer designation of H 5 12 which is a code for William Herschel's distance class V, entry number 12 = H V 12. This double star was discovered before Herschel by Christian Mayer of Mannheim (Schlimmer, 2006).

Using a telescope, one can see two more faint wide companions: the WDS contains companion C with mag 9.7 at 188 arcsecond distance and D with mag 9.9 at 270 arcsecond distance. While looking at the system using my 130 mm refractor at 35x, it is obvious that companions C and D are not approximately equally bright, but C is about a magnitude fainter than D.

Lambda Arietis imaged by Peter Wienerroither, http://homepage.univie.ac.at/peter.wienerroither/pwafods/01579+2336.htm North is up and east to the left, as in a pair of binoculars. The letters identify the companions in the WDS.

Peter Wienerroither (2006) has a project underway of imaging wide double stars with his 106 mm refractor. He takes short exposures of 1 to 10 seconds with a CCD camera (SXV-H9) at a focal length of 1100 mm. He takes R(ed), G(reen) and (B)lue images and combines them to form color im-

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ages. On Peters images, companion C is clearly fainter than D. I measured his G(reen) images by differential photometry and got a magnitude difference between C and D of 1.5. The value is exact to around 0.1 mag and should be very near the visual magnitude difference. When looking up C in the Hubble Guide Star Catalog (GSC), I find a magnitude of 11.41 (these magnitudes are not very exact but usually in the right ballpark). D has an entry in the Tycho-2 catalogue and is given a V magnitude of 9.75 there. My measured magnitude difference is near this value.

I used Lambda Arietis as a test to compare Peter's CCD-images with my own Webcam Images. We use a very similar focal length of slightly more than one meter and Peter uses a 4-inch and I a 5-inch refractor. So I tried to take several Webcam videos. The resulting images are not as pretty as the CCD images and they do not reach to a magnitude limit as deep as the CCD due to the short exposure times possible with my off-the-shelf webcam (ToUCam Pro II). But the measures are almost exactly the same as the CCD measures! (See Table 1.) I trust the results even more since I used two different procedures to make them: the CCD images have a larger field of view and I did a classical astrometry with 6 reference stars from the Tycho-2 catalogue to determine the exact focal length and field orientation. Since the webcam has a much smaller field of view I used my own "drift astrometry" procedure: I let the stars drift across the field with the motor drive switched off and determine the field orientation this way. The focal length I calibrated with several dozen other observations. To reduce the images I use the software "Astronomical Image Processing" by Berry and Burnell in both cases. The only drawback of the cheap webcam was that I could not measure C due to its faintness.

components	webcam distance	webcam PA	CCD distance	CCD PA
A-B	37.4"	47.5°	37.5"	47.5°
A-C	---	---	188.7"	75.8°
A-D	270.7"	84.8°	270.5"	84.7°

Table 1: Comparison of measurements made with webcam to measurements made with CCD. PA = position angle. Webcam images taken at f = 1040 mm on 11 Jan 2006, CCD images taken at f = 1100mm on 14 Oct 2005. I am quite happy since the results agree so well!

The bright components A and B are apparently physically related: they show a common proper motion and did not change their distance and PA measurably in the more than 200 years since they have been measured for the first time. C and D seem to be unrelated stars showing a small or no proper motion so they change their distance to A over the years: see the following tables.

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Date	Distance	PA	Source
1779	36.6″	48°	WDS as of Jan. 2006
2003	36.7″	47°	WDS as of Jan. 2006
2005.79	37.5″	47.5°	CCD measure

Lambda Ari A-B = H V 12AB

Date	Distance	PA	Source
1892	175.3″	74°	WDS as of Jan. 2006
1998	187.7″	76°	WDS as of Jan. 2006
2005.79	188.7″	75.8°	CCD measure

Lambda Ari A-C = H V 12AC

Date	Distance	PA	Source
1892	258.1″	84°	WDS as of Jan.2006
2001	269.6″	85°	WDS as of Jan.2006
2005.79	270.5″	84.7°	CCD measure

Lambda Ari A-D = H V 12AD

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References:

Schlimmer, 2006:
http://www.epsilon-lyrae.de/Doppelsterne/Galerie/GalerieDoppelsterne1.html#Aries
Wienerroither, 2006:
http://homepage.univie.ac.at/peter.wienerroither/pwafodse.htm
Double star astrometry with a webcam:
http://members.eunet.at/vollmann/ds/dsawc1e.htm
Hubble Space Telescope Guide Star Catalogue (GSC):
http://vizier.u-strasbg.fr/viz-bin/Cat?I/254
Tycho-2 Catalogue:
http://vizier.u-strasbg.fr/viz-bin/Cat?I/259
Washington Double Star Catalog (WDS):
http://ad.usno.navy.mil/proj/WDS/wds.html

Mr. Vollman tells us, "Mostly I admire beautiful and rare sights, naked eye or at the eyepiece of my telescope." Like so many of us, he became interested in astronomy as a child when being shown Orion. During the day he works as an IT instructor and lives in the suburbs of Vienna with his wife and two children.