

Astronomy on the Internet

Lecture 8

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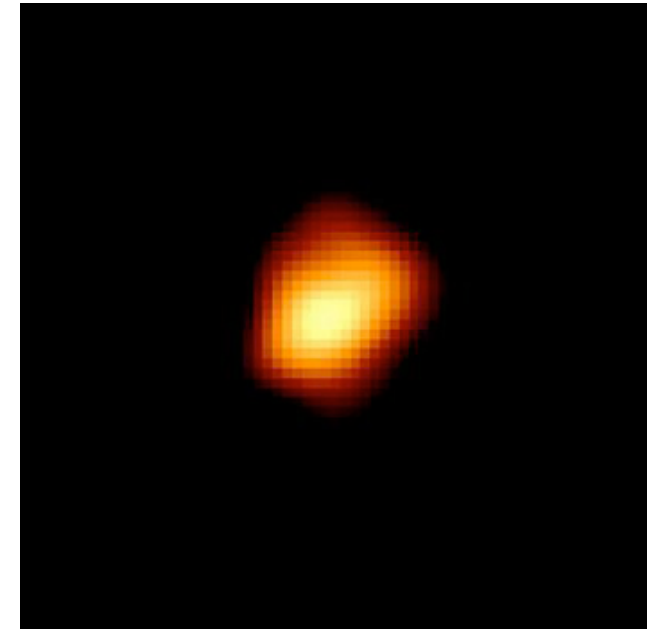
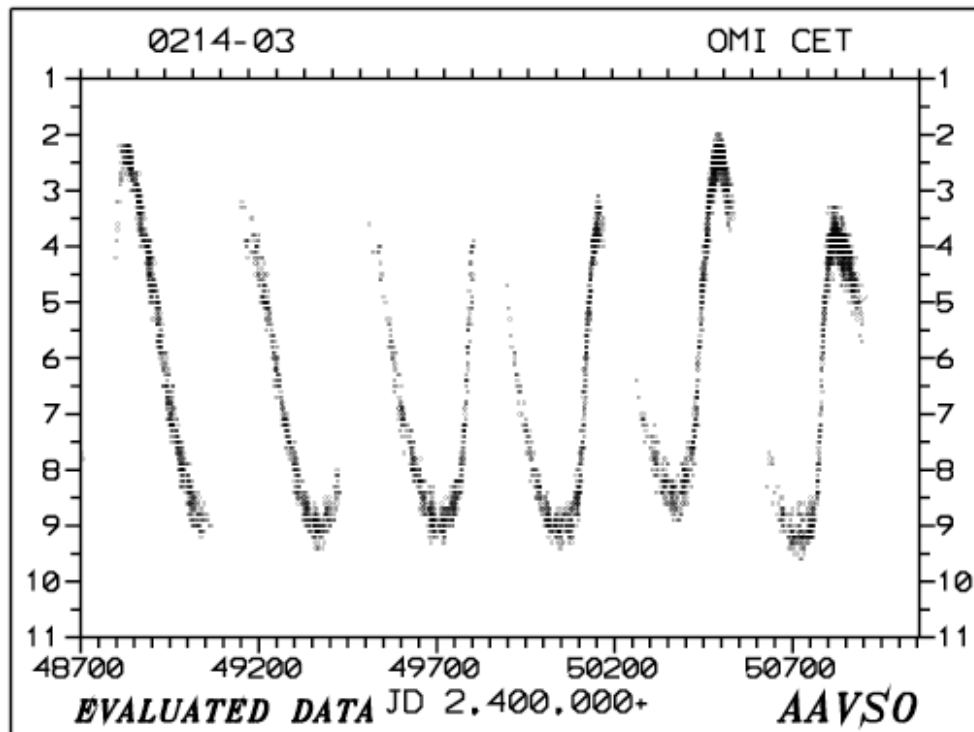
May 7

Astronomical online resources

- Astronomical institutes and observatories
 - Harvard Astronomy Department: <http://astronomy.fas.harvard.edu>
 - European Southern Observatory: <http://www.eso.org>
- Public outreach
 - Hubble images: <http://hubblesite.org> <http://www.spacetelescope.org>
 - APOD: <http://apod.nasa.gov/apod/archivepix.html>
 - Full sky maps: <http://sky.esa.int> <http://www.worldwidetelescope.org/>
- Professional resources
 - Data archives
 - Catalogues and bibliography
 - Virtual Observatory

The need for archiving in astronomy

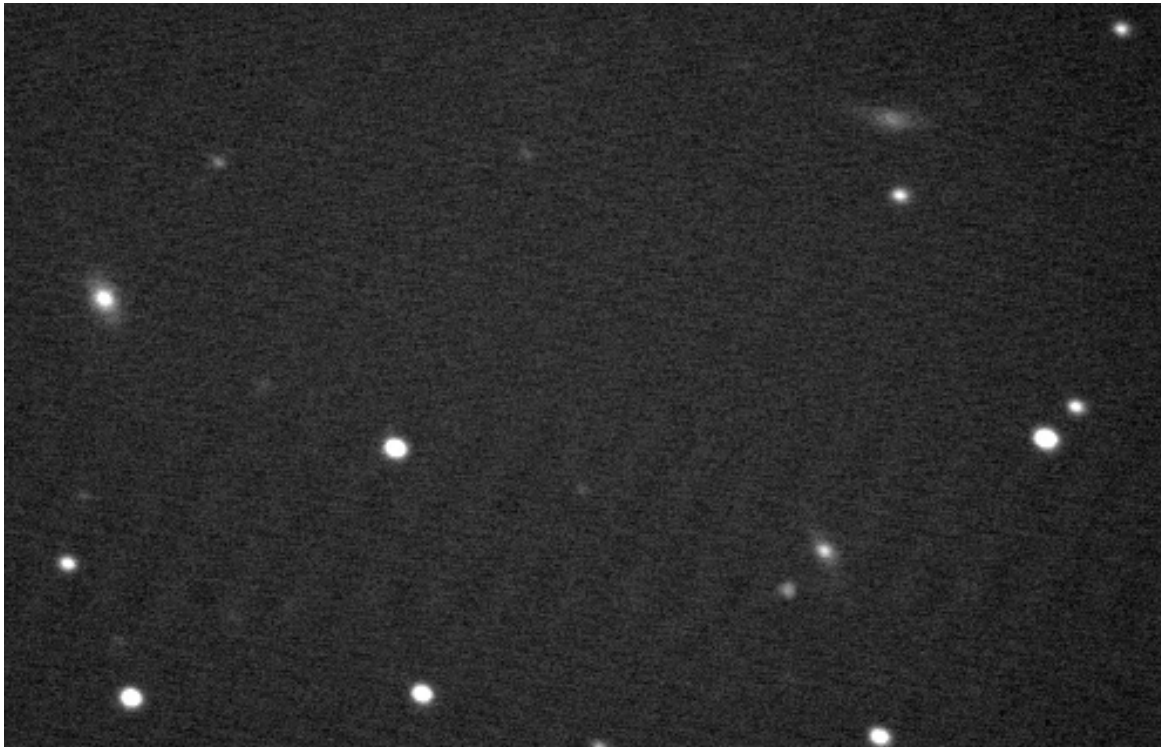
- Observations of time-dependent phenomena
 - variable, binary, high proper motion stars



Pulsations of Omicron Ceti (Mira) 1992-1998, $P \approx 330$ d

The need for archiving in astronomy

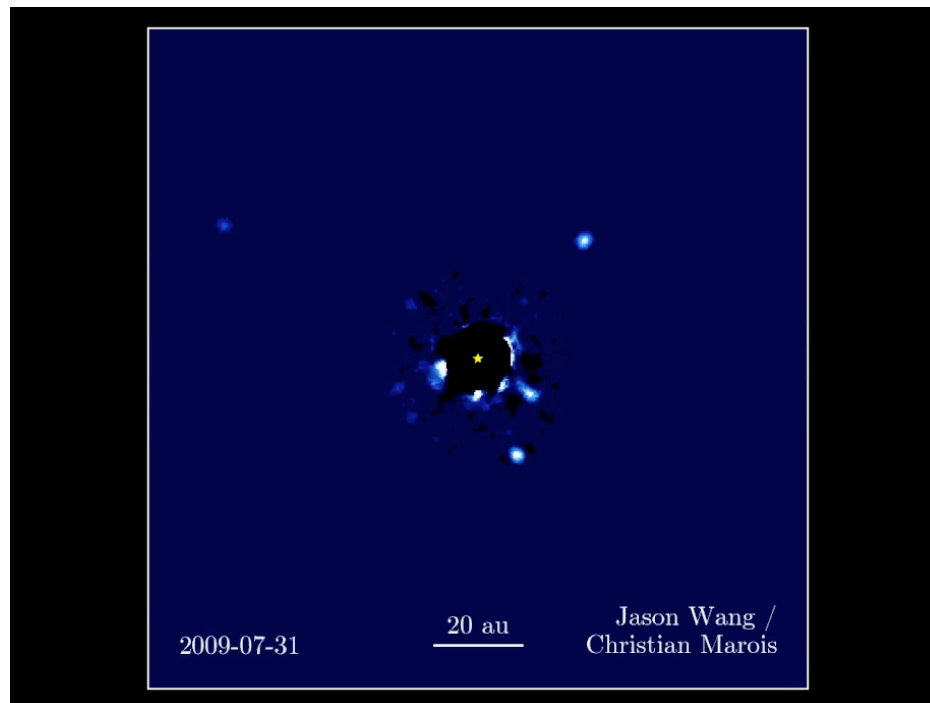
- Observations of time-dependent phenomena
 - variable, binary, high proper motion stars
 - asteroids and dwarf planets



Asteroid
1997 XN207

The need for archiving in astronomy

- Observations of time-dependent phenomena
 - variable, binary, high proper motion stars
 - asteroids and dwarf planets
 - long-period exosolar planets



Planets around
HR 8799.

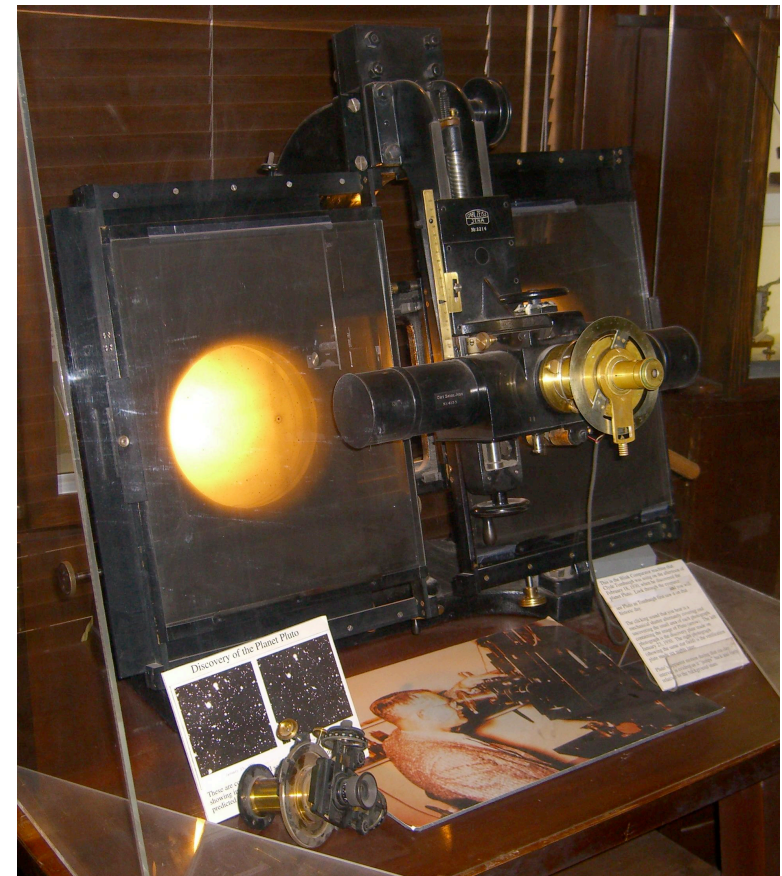
$P_{\text{orb}} = 100\text{-}400 \text{ yr}$

The need for archiving in astronomy

- Observations of time-dependent phenomena
 - variable, binary, high proper motion stars
 - asteroids and dwarf planets
 - long-period exosolar planets
- Service mode observations
 - modern multi-purpose telescopes
 - space telescopes
- Open access policy
 - free access to publicly-funded research

Glass plate archives

- pre-digital era



Electronic archives

- Modern astronomical data archives



Electronic archives

- Modern astronomical data archives
 - Flexible Image Transport System (FITS)

ascii header

binary table

```
SIMPLE =          T / FITS STANDARD
BITPIX =         -32 / FITS BITS/PIXEL
NAXIS =           1 / NUMBER OF AXES
NAXIS1 =        379656 /
OBJECT = 'ThAr' /
ORIGIN = 'KPNO-IRAF' /
DATE = '17-02-99' /
IRAFNAME= 'tharspec' / NAME OF IRAF IMAGE FILE
IRAF-MAX=      8.474217E4 / DATA MAX
IRAF-MIN=     -1.267378E3 / DATA MIN
IRAF-BPX=          32 / DATA BITS/PIXEL
IRAF-TYPE= 'REAL' / PIXEL TYPE
OBSERVAT= 'KPNO' / observatory
OBSERVER= 'willmarth, carder' / observers
EXPTIME =         600. / actual integration time, seconds
DARKTIME=         600. / total elapsed time, seconds
IMAGETYP= 'comp' / object, flat, bias, etc.
DATE-OBS= '15/07/96' / UT date (dd/mm/yy) of observation
UT = '21:52:00.00' / universal time (start of exposure)
ST = '10:01:42.00' / sidereal time
RA = '21:15:07.00' / right ascension (hh:mm:ss)
DEC = '48:52:35.00' / declination (dd:mm:ss)
EQUINOX =        1996.5 / equinox of RA and Dec
EPOCH =         1996.5 / same as EQUINOX (for back compat.)
```


Electronic archives

- Modern astronomical data archives
 - Connection to the Internet
 - Advanced search, preview and download options
 - ESO Science Archive Facility:
http://archive.eso.org/eso/eso_archive_main.html
 - ESA missions:
<http://sky.esa.int/>
 - IUE satellite spectra:
<http://sdc.cab.inta-csic.es/ines/index2.html>
 - NASA's MAST:
<https://mast.stsci.edu/portal/Mashup/Clients/Mast/Portal.html>

Catalogues and bibliography

- CDS overview:

<http://cdsweb.u-strasbg.fr>



- Simbad - astronomical objects:

<http://simbad.u-strasbg.fr/simbad>



- VizieR - catalogue browser:

<http://webviz.u-strasbg.fr/viz-bin/VizieR>



- ADS - access to astronomical publications:

http://adsabs.harvard.edu/abstract_service.html



Observing tools

- Description and user manuals for specific instruments:

UVES@VLT:

<http://www.eso.org/sci/facilities/paranal/instruments/uves/>

FIES@NOT

<http://www.not.iac.es/instruments/fies/>

- Exposure time calculations (ETC):

<http://www.not.iac.es/observing/forms/signal/v2.2/index.php>

- Visibility and airmass tools:

<http://www.briancasey.org/artifacts/astro/>

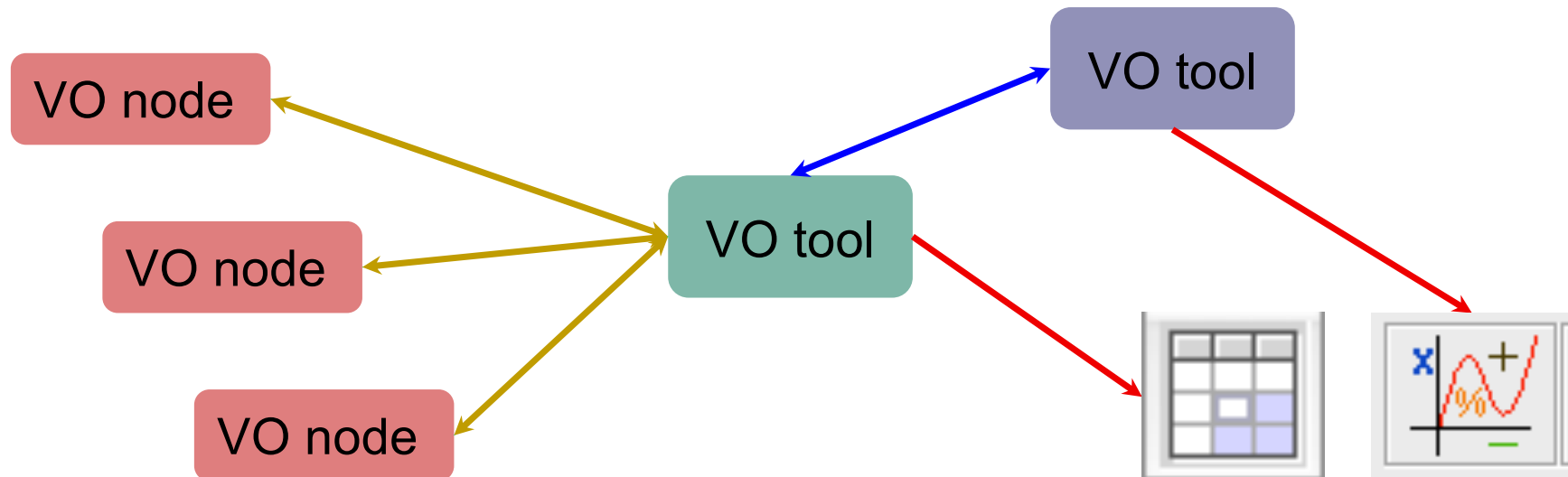
<http://www.not.iac.es/observing/tools.php>

Virtual observatory

- Uniform access to astronomical data archives
- Develop and implement common standards for
 - data storage
 - data access
 - basic analysis
- Change in astronomical research methodology:
focus on data mining and exploration of digital
archives
- VO websites: <http://www.ivoa.net>, <http://www.euro-vo.org>

Practical implementation of VO

- **VO nodes:**
on-line services registered as VO-compliant
- **VO tools:**
programs that query VO nodes, display and analyze obtained information



Selected VO tools

- Aladin - an interactive sky atlas:

<http://aladin.u-strasbg.fr/aladin.gml>

- VOspect - explore collection of spectra:

<https://www.cosmos.esa.int/web/esdc/vospec>

Exercise with VO tools

- Download and install Aladin tool from <http://aladin.u-strasbg.fr/java/nph-aladin.pl?frame=downloading>
- Display in Aladin the sky around the target galaxy that you observed with the Westerlund telescope.
- Adjust the image to match FOV of your observations with Westerlund telescope.
- Overplot information from Simbad
- Identify several foreground stars and retrieve their BVR magnitudes from Simbad. Use this information to calibrate your Westerlund telescope images.