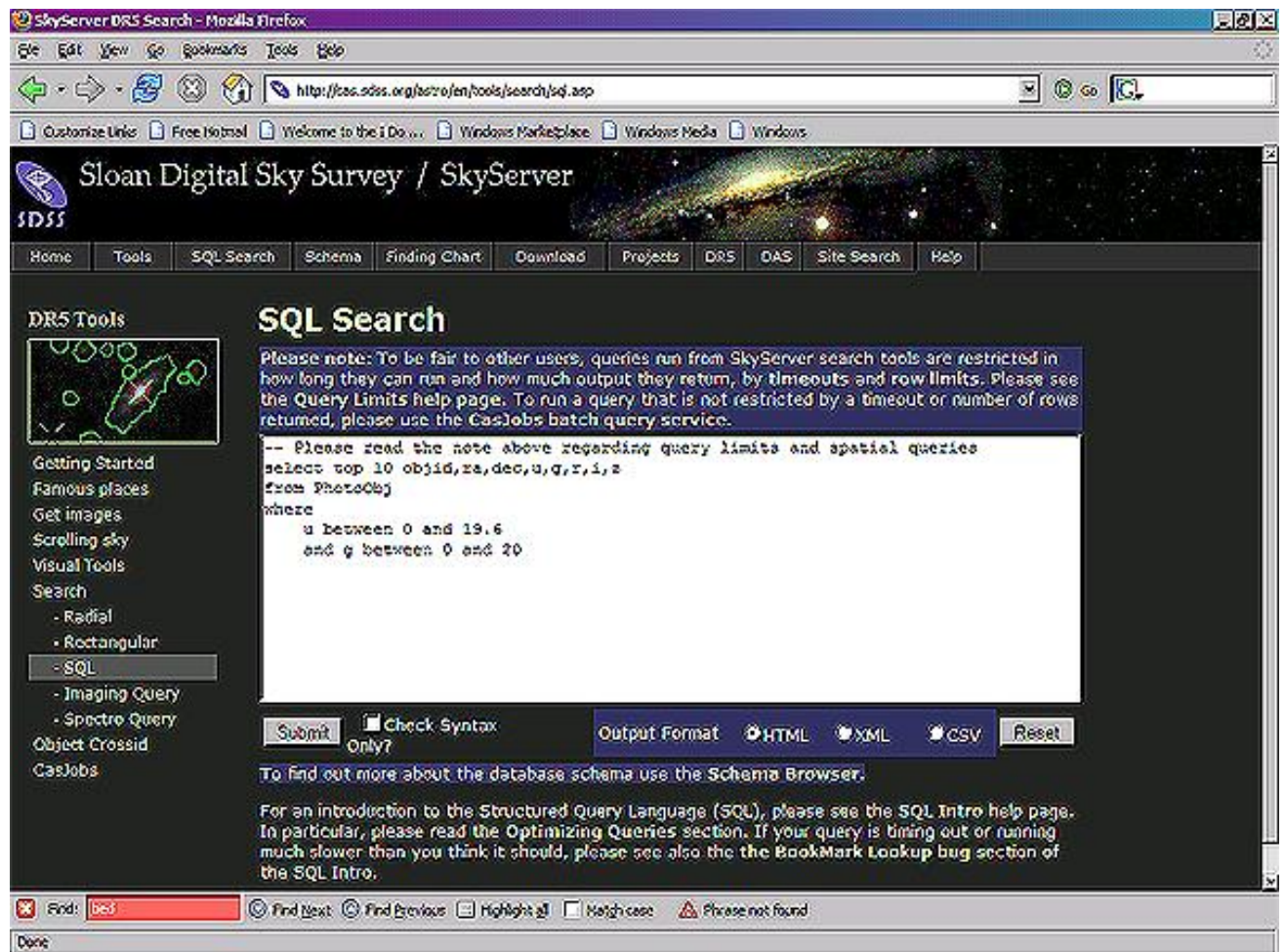


How Do I...

Find stars that have been seen more than once?

Most of the sky area seen by the SDSS has been observed only once over the course of the survey. However, there are many areas that have been observed more than once, so there are many objects that have been observed at different times. Finding these objects could give more measurements for light curves of variable stars.

1. From the astronomers' main page, click on the SQL Search link – the second link in the first column. The page looks like this:



The screenshot shows the SkyServer DRS Search interface in Mozilla Firefox. The browser's address bar displays the URL `http://www.sdss.org/astro/en/tools/search/sql.asp`. The page features a navigation menu with links for Home, Tools, SQL Search, Schema, Finding Chart, Download, Projects, DRS, DAS, Site Search, and Help. The main content area is titled "SQL Search" and includes a "DRS Tools" sidebar with options like Getting Started, Famous places, Get images, Scrolling sky, Visual Tools, Search (with sub-options: Radial, Rectangular, SQL, Imaging Query, Spectro Query), Object Crossid, and CasJobs. The central area contains a "Please note" box regarding query restrictions, a text input field with a sample SQL query:

```
-- Please read the note above regarding query limits and spatial queries
select top 10 objid,ra,dec,u,g,r,i,z
from PhotoObj
where
  u between 0 and 19.6
  and g between 0 and 20
```

, and buttons for Submit, Check Syntax Only?, Output Format (HTML, XML, CSV), and Reset. Below the query field, there are instructions to use the Schema Browser and a link to the SQL Intro help page. The browser's search bar at the bottom shows the word "test" entered.

2. In the main window, type the following query:

```
SELECT top 100 h.objid, m.objid2      -- return object IDs of both observations
FROM matchhead h, match m            -- from "match" tables
WHERE h.objid = m.objid1             -- observations match between tables
    AND h.matchcount > 1             -- more than one observation
    AND m.type1 = 6                  -- observation 1 is of a star
    AND m.type2 = 6                  -- observation 2 is of a star
```

The query returns the object ID of each observation of the star, for 100 stars.

To learn more about each observation of the star, you will need to go to another tool called the **Explore** tool. Save the object ID of each observation; you will need it to find the observation in the Explore tool. One way to save the object IDs is to request the query results as *CSV*, then save the resulting CSV file to your machine.

- From the astronomers' main page, click on **Explore** – it's in the second column. Then, click on the link that says **Click here to Explore!** A new page will load; it will look like this:

SDSS J001817.82-101855.1
STAR ra=4.574268, dec=-10.315307, ObjId = 587727178988322845

mode	PRIMARY
status	TARGET PRIMARY OK_STRIPE OK_SCANLINE PSEGMENT RESOLVED OK_RUN GOOD SET
flags	BINNED1 MANYPETRO
PrimTarget	TARGET_STAR_BHB TARGET_QSO_CAP
SecTarget	

run	rerun	camcol	field	obj	rowc	colc
1729	40	3	113	29	456.0	1024.2
u	g	r	i	z		
17.80	16.70	16.65	16.68	16.75		
fiberMag_r	petroMag_r	devMag_r	expMag_r	psfMag_r	modelMag_r	
17.01	16.69	16.65	16.65	16.65	16.65	
extinction_r	petroRad_r	parentId	nChild			
0.10	1.465	587727178988322844	0			

SpecObjID = 184027122128388096

plate	mjd	fiberid	z	zErr	zConf	specClass	ra	dec	fiberMag_r	objid
653	52145	302	-0.001	0.00012	1	STAR	4.57421	-10.31533	16.86	587727178988322845

zStatus	XCORR_EMLINE
zWarning	
PrimTarget	TARGET_STAR_BHB
SecTarget	
eClass	0.353
emZ	0.000
emConf	
xcZ	-0.001
xcConf	1

Cross-identifications

catalog	delta	propermotion	angle	blue	red
USNO	0.262	0.734	90.697	16.47	16.55

- Click on **ObjID** under the *Search* label in the top left corner of the tool. A small window will pop up:



- Enter the object ID of the first observation of the object you want to see, which is labeled *objid* in your search results. Click **OK**.
- A new window will pop up with the Explore tool entry for the first observation of the star. Its magnitudes are labeled as *u*, *g*, *r*, *i*, and *z*.
- To see more observations of the star, click on **More Observations**, under the *PhotoObj* label in the left-hand column. The tool now shows other observations of the same object:

Other observations (matches) of

SDSS J154452.99-010322.2

(**objid=587722951693303810,run=745,rerun=40,camcol=1,field=518,obj=2**)

objid	run	rerun	camcol	field	obj	ra	dec	distance	type	mode
587722981764694094	752	40	1	619	78	236.22080	-1.05620	0.001	STAR	2
587729971795263510	2379	40	5	181	22	236.22079	-1.05620	0.001	STAR	1

- Each of the links listed under **objId** is a link to another observation of the same star. Click on the link to go to the Explore page for the new observation of the object. The best observation of the star is known as the *primary* observation; the others are known as the *secondary* observations.
- If you want to know when the observation was made, look for its Modified Julian Date (MJD) in the SDSS data. Click on **Field**, then look for *mjd_u*, *mjd_g*, and the *mjd* for the other wavelengths. You can use a web-based tool

(<http://www.csgnetwork.com/julianmodifdateconv.html>) to convert from MJD to a real date.

10. Note that when you run this query in the SQL search tool (as you did in step 2), the query may sometimes time out. To get all results you will probably need to use **CasJobs**. See the **CasJobs Help page** for more information.