

## Summer 2010 Quark Net links

One of the first things you will need to do for research this summer is download an application file named SpSpecToCSV.jar. The purpose of this file is to compile wavelength and flux information from the SDSS (Sloan Digital Sky Survey) and plot it on an Excel spreadsheet. This plot will give you necessary information as to the wavelengths that are being absorbed at the surface of a star and give us an idea as to what type of star that we are looking at.

So you will need to have Excel on your computer.

1. Open the flowing URL; <http://home.fnal.gov/~stoughto/quarknet/SpSpecToCSV.jar>

This file contains about 378 k bits of info, save it to a location that is easy to get to because you will access this file when we perform command prompts. You will need to write down the exact location of where this is saved for use in step 4. It is recommended that you (So) download the file and put it on your C drive. Here is an example of what it may look like - C:\Documents and Settings\jbrowne\Local Settings\Temporary Internet Files\Content.IE5\C9ST8HCF\SpSpecToCSV[1].zip

Yours will be different, the main thing is to copy where you have the file saved on your computer so you can find it later.

2. Next: Go to "Start" and click on "run"

3. Next (if the run box comes up and gives you a rectangular box with an open line then type in **cmd** and hit enter) then

4. Type in the following command. Insert the exact location you saved the downloaded file from in step 1 after `java -jar "` and then add the ending `" 51690 306 114 5`.

```
java -jar "write your C: exact file location SpSpecToCSV.jar here " 51690 306 114 5
```

and hit "enter."

Note that there is a space after "java" and after "jar". You need the double quotes if the directory where you put the file includes spaces. This is probably the case if you have a PC but NOT if you have a MAC.

For example, On my computer it looks like this. (I do the following)

```
java -jar "C:\Documents and Settings\jbrown\My Documents\SpSpecToCSV.jar" 51690 306 114  
5
```

Yours should look similar to mine, but unique to your particular saved program location from step one:

and hit "enter."

When the program runs, you will get some text on your screen that says this:

```
urlName=http://das.sdss.org/spectro/1d_26/0306/1d/SpSpec-51690-0306-114.fit
```

If you get an error then it is usually a misspelled word in the command line or a space in the wrong place. Go back to your command line and try to find the problem.

So, what did this program do? It created a file on your disk called spSpecText-51690-0306-114.csv in the directory where you ran the command.

5. Start excel and open this file.

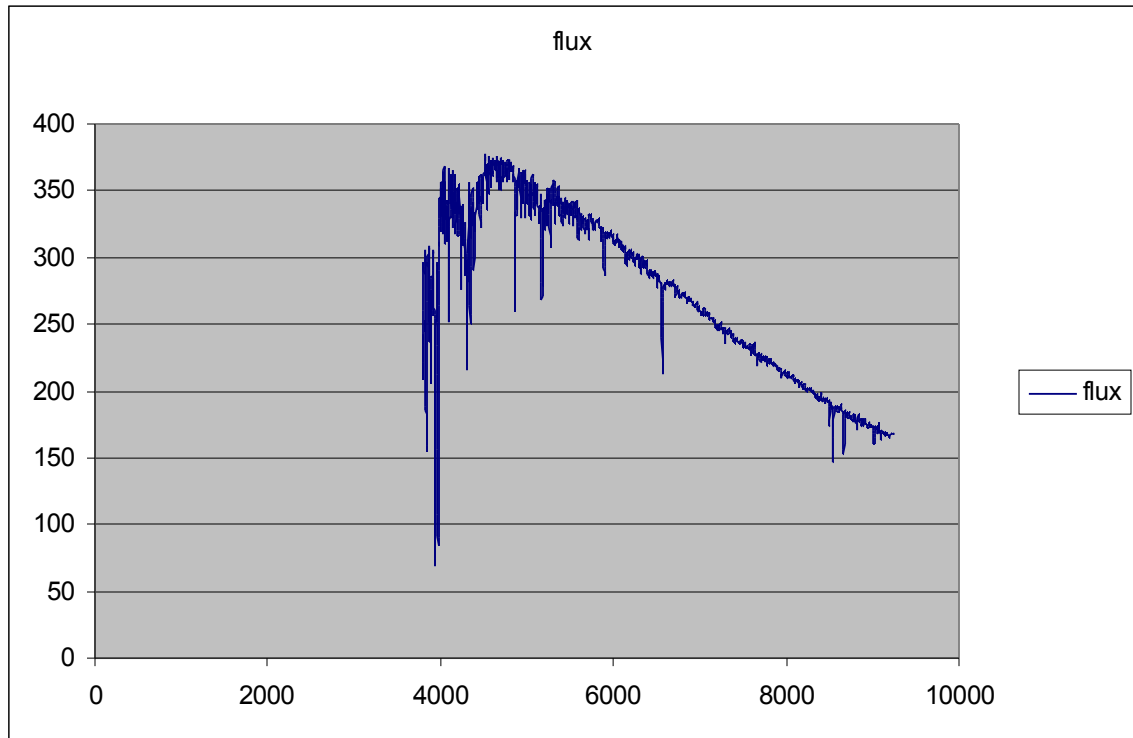
See my notes on getting to the SQL Search  
(for now skip all of this and go down to step 6)

Click on A and B and highlight the 2 columns.

Make a scatter plot

The LINES in this plot that are going downward, look like spikes, are the wavelengths that are being absorbed at the surface of the star. This info tells us something about the star.

Your plot should look like this:



Go ahead now and do this example on your computer. You should get the same plot as above.

### **What is with all the numbers?**

The Sloan Digital Sky Survey took spectra of over one million objects. We are not going to have time to look at all of them. In a bunch of different ways, we are going to select just a few to look at.

We identify a specific spectrum with three numbers: MJD, Plate, and Fiberid.

MJD stands for Modified Julian Date - it tells you which day we measured the spectrum. Plate is what we call the big round piece of Aluminum we use in the telescope. Each plate is drilled with a pattern of holes that matches the location of stars and galaxies on the sky in one general direction. Into these holes, we plug a fiber, which we identify with - you guessed it - Fiberid. So, the combination of mjd, plate, and fiberid uniquely identifies one spectrum in the SDSS. AND we can find these spectra by writing a SQL Query.

6. Enter the following URL onto your search engine:

<http://cas.sdss.org/dr7/en/tools/search/sql.asp>

then click on the URL link

This link will allow you to write a query and get information about spectra and images from the SDSS.

So let's write a simple query and get some numbers to try in our SpSpecToCVS command.

(Click on the URL link)

7. A box with white background will open with some text already written in it.

Use the tab "clear query" to clean out the text.

8. Now write the following and then click on the "submit" tab:

```
Select top 5  
mjd,plate, fiberid  
from sppParams
```

you should get

**Your SQL command was:**

```
Select top 5  
mjd,plate, fiberid  
from sppParams
```

Mjd	plate	fiberid
51602	266	1
51602	266	2
51602	266	3
51602	266	4
51602	266	5

9. Now you want to locate your saved file.

Click on "start" tab and find "Search" tab and click on "For Files or Folders"  
In the "Search for Results" bar write the drive location where you saved the file from Step 1. For example, I saved mine on the C: Drive, so I would put C: in the "Search for Results" bar. Once you have done this hit enter.

10. This will show you what is on your C: drive. Look for an Excel document labeled spSpecText... and open it.  
This is the SLOAN data you requested.

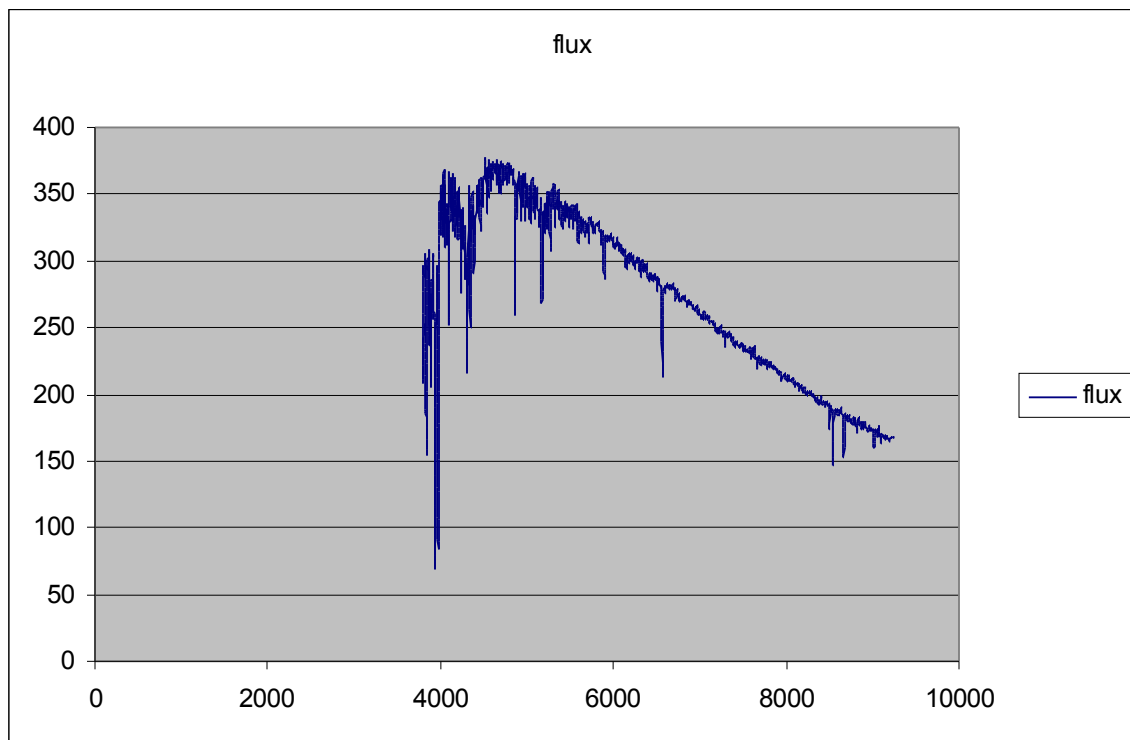
To make a scatter plot.

11. Click on A and B and highlight the 2 columns.

12. To Make a scatter plot graph find the "Insert" tab and click open the "Chart" tab. A prompt should appear. Find the heading "Chart type" and click on "XY(Scatter)", then select the "Scatter with data points connected by lines without markers" and hit "Finish". You should have a graph similar to the one below.

The LINES in this plot that are going downward, look like spikes, are the wavelengths that are being absorbed at the surface of the star. This info tells us something about the star.

(Your plot should look like this:)



(Go ahead now and do this example on your computer. You should get the same plot as above.)

## What is with all the numbers?

The Sloan Digital Sky Survey took spectra of over one million objects. We are not going to have time to look at all of them. In a bunch of different ways, we are going to select just a few to look at.

We identify a specific spectrum with three numbers: MJD, Plate, and Fiberid.

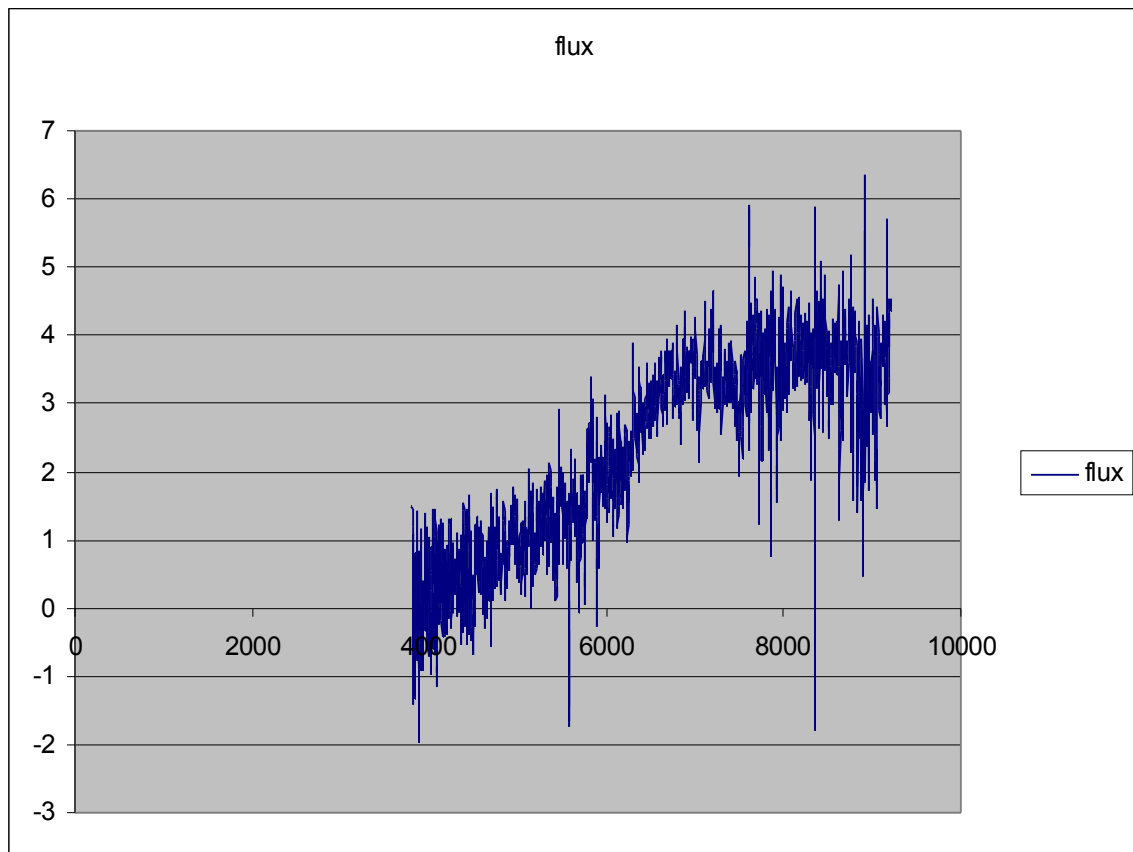
MJD stands for Modified Julian Date - it tells you which day we measured the spectrum.

Plate is what we call the big round piece of Aluminum we use in the telescope. Each plate is drilled with a pattern of holes that matches the location of stars and galaxies on the sky in one general direction. Into these holes, we plug a fiber, which we identify with - you guessed it - Fiberid. So, the combination of mjd, plate, and fiberid uniquely identifies one spectrum in the SDSS. AND we can find these spectra by writing a SQL Query.

So now we can take these numbers and insert them into the SpSpecToCVS command and plot the flux and wavelength of one. So pick one and see what the graph looks like.

\*NOTE\* whichever number you choose let say you use 51602 266 5 you must add a 5 on the end so that the number looks like this 51602 266 5 5 then hit enter.

My plot looks like this



The problem with this is that we don't know if it is a star and if we hadn't specified the top 5 we would have received about a million returns and still not known if it were a star or not.

Let's specify in our next query that we want a star

Here we have specified a G2 star and we want 10 of them, we could get more but 10 is good for now.

13. Let's rewrite our query in SQL.

```
Select top 10  
Mjd,plate, fiberid, sptypea  
From sppParams  
Where sptypea="g2"
```

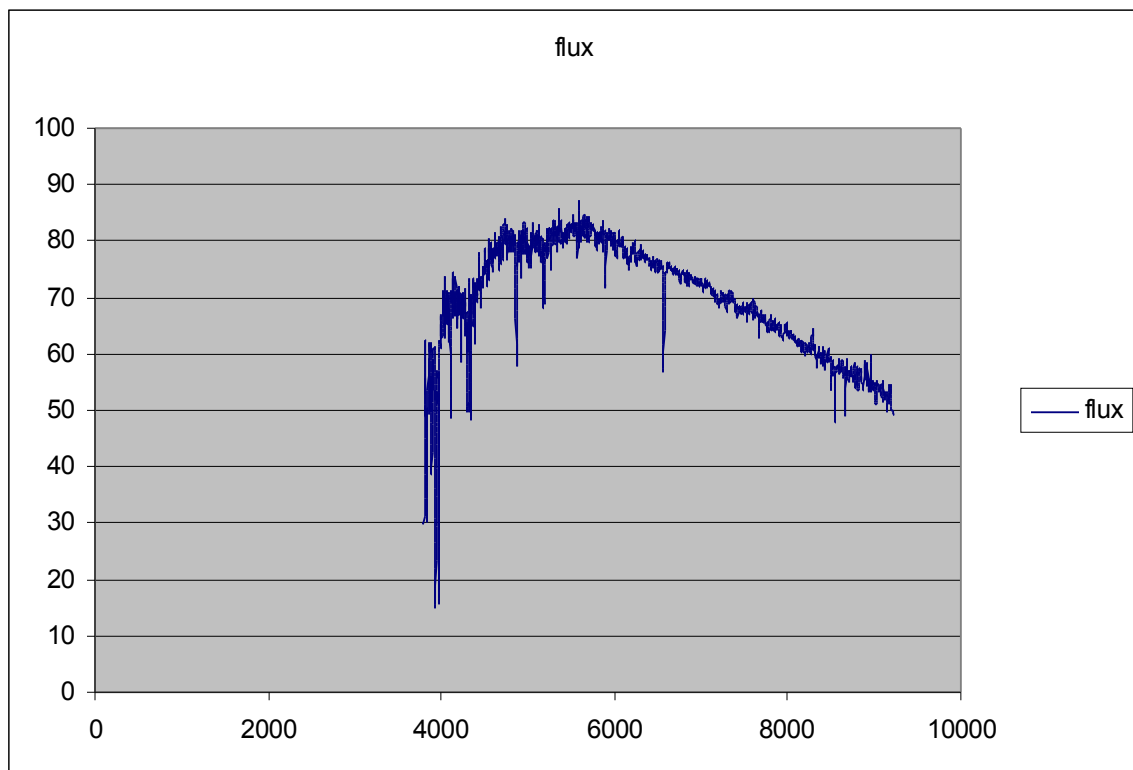
You will get this returned.

**Your SQL command was:**

```
Select top 10  
Mjd,plate, fiberid, sptypea  
From sppParams  
where sptypea="g2"
```

Mjd	plate	Fiberid	sptypea
51602	266	32	G2
51602	266	365	G2
51602	266	599	G2
51630	266	38	G2
51630	266	364	G2
51630	266	591	G2
51630	266	620	G2
51608	267	75	G2
51608	267	128	G2
51608	267	150	G2

And the graph of 51602 266 32 5



You can pick one of the others on the top ten list and graph it. It should be close to this one.



14. (a) Try to calculate the temperature of this G2 star by taking the max flux value and find the corresponding wavelength ( $\lambda$ ).

(b) Use the equation  $\lambda = b / T$ . Where  $b = 2.9877685 \times 10^{-3}$

(Remember  $\lambda$  is measured in Angstroms,  $10^{-10}$  m)

(c) Rearrange to solve for T

(After doing the math you Should get an answer of around 5000 K.)

15. Now Let's try an A0 star

So type into the SQL query

```
Select top 10
Mjd,plate, fiberid, sptypea
From sppParams
where sptypea="a0"
```

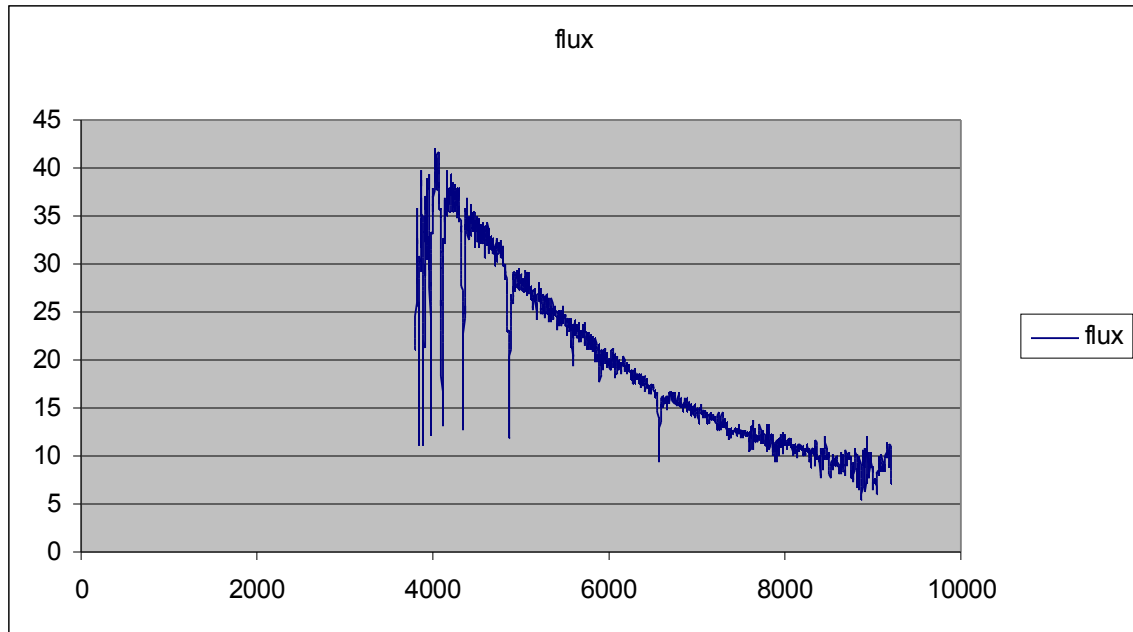
You get

Your SQL command was:

```
Select top 10
Mjd,plate, fiberid, sptypea
From sppParams
where sptypea="a0"
```

Mjd	Plate	fiberid	sptypea
51602	266	14	A0
51602	266	84	A0
51602	266	125	A0
51602	266	182	A0
51602	266	225	A0
51602	266	397	A0
51602	266	498	A0
51602	266	500	A0
51602	266	513	A0
51602	266	576	A0

I put 51602 266 14 5 into the SpSpecToCSV command line, and got the following.



The peak of the flux is around 4100 for  $\lambda$ , plugging that into your equation for T and you should get around 7300 K  
Remember  $\lambda$  is measured in Angstroms,  $10^{-10}$  m.

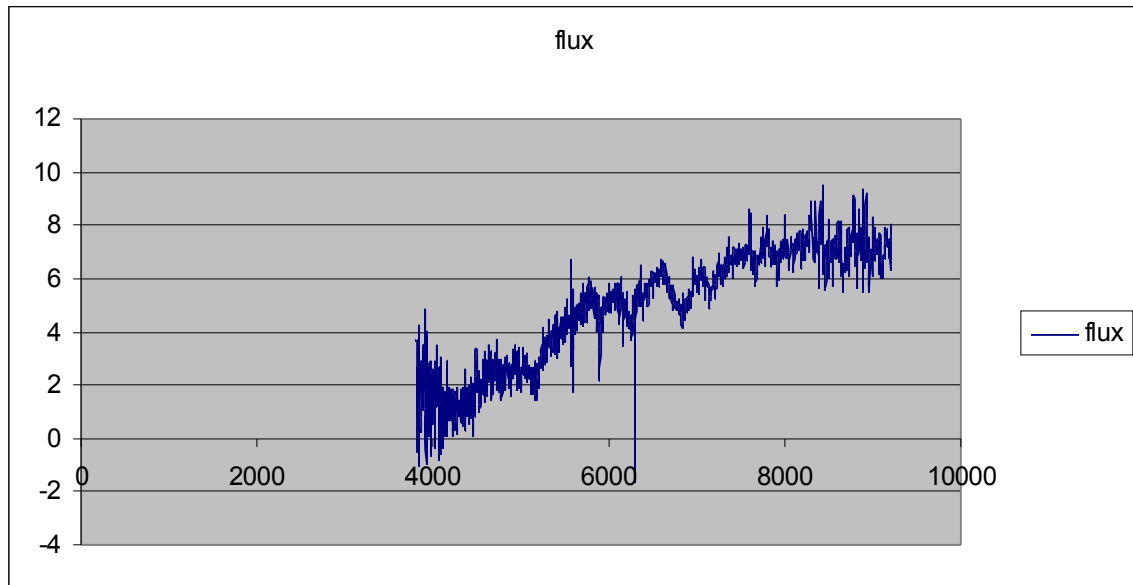
You should be able to pick one from the top ten list and plot it as well.

16. Now let's try to find an M0 star.

```
Select top 10
Mjd,plate,fiberid,sptypea
From sppParams
where sptypea="m0"
```

Mjd	plate	fiberid	sptypea
51602	266	450	M0
51630	266	445	M0
51608	267	290	M0
51633	268	613	M0
51910	269	46	M0
51910	269	85	M0
51910	269	123	M0
51909	270	221	M0
51883	271	408	M0
51957	273	167	M0

It Looks like this:



Now you have three different star types, warm, hot, and cold.

17. Now let's take a look at Metallicity.

```
Select top 25  
Mjd,plate, fiberid, feha, sptypea  
From sppParams  
Where feha between -0.1 and 0.1
```

This query allows us to specify a range of Metallicity and with the star type (sptypea) we will see the range of stars with these Metallicities. We will retrieve 25 stars in this search.

Are all of these stars the same type?

Suppose we want to find stars of the same type and we know the temperature range that they exist in. We could use that....right?

## 18. Let's try

```
Select top 50  
Mjd,plate,fiberid,feha,sptypea,teffa  
From sppParams  
where teffa between 7260 and 9160
```

What type of star did you find?

## 19. Another type

```
Select top 50  
Mjd,plate,fiberid,feha,sptypea,teffa  
From sppParams  
where teffa between 4900 and 5480
```

Again what type of star did you find?

## 20. Another type

```
Select top 50  
Mjd,plate,fiberid,feha,sptypea,teffa  
From sppParams  
where teffa between 4000 and 4250
```

What did you find here?

Ok, now let's try something a bit more powerful.

This query is analogous to a query that asks for a name and a SSN# and a query that asks for an address and a SSN#. We have to set them equal so that the same SSN# will give us the name and then the address.

## 20. Let's try

```
select top 25 p.plate,p.mjd,p.fiberid,p.feha,l.H8w12,sptypea,teffa  
from sppParams as P, sppLines as l  
where sptypea="g2"  
and l.specobjid=p.specobjid and l.H8w12 between 1 and 2
```

You should get this:

### Your SQL command was:

```
select top 25 p.plate,p.mjd,p.fiberid,p.feha,l.H8w12,sptypea,teffa
```

```

from sppParams as P, sppLines as l
where sptypea="g2"
and l.specobjid=p.specobjid and l.H8w12 between 1 and 2

```

plate	mjd	fiberid	feha	H8w12	sptypea	teffa
266	51602	365	-0.75	1.713	G2	5899
266	51630	620	-1.349	1.573	G2	5695
267	51608	128	-0.293	1.374	G2	5849
267	51608	293	-1.137	1.717	G2	5630
268	51633	18	-0.858	1.658	G2	5773
268	51633	344	-0.401	1.722	G2	5859
270	51909	21	-0.474	1.36	G2	5972
270	51909	174	-1.136	1.946	G2	5722
270	51909	443	-0.307	1.307	G2	5987
271	51883	320	-0.578	1.823	G2	5920
271	51883	639	-0.46	1.746	G2	5957
272	51941	620	-0.616	1.55	G2	6031
274	51913	236	-0.651	1.224	G2	5932
274	51913	356	-0.7	1.783	G2	5986
274	51913	422	-0.58	1.435	G2	5798
275	51910	35	-1.496	1.744	G2	5524
276	51909	212	-1.325	1.789	G2	5520
276	51909	452	-0.508	1.651	G2	5825
277	51908	626	-0.731	1.587	G2	6039
278	51900	307	-0.626	1.164	G2	5817
279	51608	289	-1.094	1.634	G2	5620
279	51984	211	-0.747	1.735	G2	5868
279	51984	296	-1.221	1.796	G2	5654
279	51984	312	-1.053	1.817	G2	5707
279	51984	367	-0.874	1.815	G2	5886

Ok, you've been blitzed through the procedures, now is the time for any additional questions.