The Amateur Virtual Observatory

Exercise 5: Find all the supernovae in NGC 6946. Then find information on the most recent using Simbad

In this exercise we will practice using the Aladin interface and extend this to include identifying items of a particular type in the image. We will also explore the interface to another VO component Simbad that will enable us to find more information on selected objects. This exercise will explore the features of the measurement area below the image window.

This exercise is based on the nearby Galaxy NGC 6946 often described as a Supernova factory due to the number of supernova that have been observed.

1) First you need to open a new Aladin window and detach it or clear the window you already have open. (see exercise 4 if you have forgotten)

2) To start the exercise we can just load the default image plus the Simbad and NED catalogues by typing NGC 6946 in the command box.

3) After a few seconds a DSS image together with the NED and SIMBAD catalogue data should load. Turn off the NED plane by un-ticking the box.

4) Have a look at the image and catalogue. Some of the obvious things are how many of the stars have a high proper motion as shown by the arrows on the star images. Also note there are a number of quite bright stars near the centre of the Galaxy that Simbad (and NED) if you check have not identified. These are more likely to be stars that the automated routine could not identify than unidentified supernova ! (see the additional exercises at the end)

5) There are also a number of supernova remnants marked by squares and supernova locations marked by 'SN'. Of course the supernova will not be visible unless they were visible on the day the plate was taken

6) Just for practice check the date of the original plate using the properties as you did in exercise 3. It might be worth noting this down when we come to examine the supernova in this galaxy.

7) It's not easy to see all the SN in this galaxy so we will use one of Aladin's tools to help. First select all the Simbad objects by double clicking on the title of the plane 'Simbad' in the stack. This should select all the objects and the measurement list should show them. There should be around 970 objects shown as selected if you leave the cursor over the plane title.

8) If you then move your cursor over the OTYPE (Object Type) of the first object in the measurement lit the Zoom box will show a histogram of the number of objects of each type.

9) Then move the cursor across to the histogram. As you move across each bar it should show the number of each type of object and the percentage of the total. The most common will probably be stars. Also note that as you move the cursor across the bars all the sources of that type are highlighted in the main window.

10)   At the right hand end is should show 9 Supernovae (assuming no more have been discovered when you try this !). To select them and transfer just the supernova to the measurement window double click on the bar in the histogram.

11)   The measurement window should now show just the supernova but in random order. To see if there were any supernova visible when the plate was taken click on the header of the column 'Main ID'. This will sort the column in name order and as the date is part of the name also in date order.

12)   Now scroll down the list to see if there was a supernova identified just before the date the plate was taken. Unfortunately there is not in the case of the plate I used but you may be lucky. You could try loading other plates later to see if you can catch one when it was visible.

13)   Lets have a look at the data on the oldest recorded SN – 1917A. There is some basic data on the page including that it was a Type II. To get more information double click on the main ID with the blue text – 1917A.

14)   This should cause your browser to open the Simbad page for 1917A. The Simbad page has some more detailed information and also includes a link to the 32 references to this SN in astronomical journals.

15)   Click on the display reference summary and a list should appear of all the references. These are in reverse date order so scroll to the bottom to see what is available about the discovery.

16)   Explore some of these references to see if you can discover who found this SN and where. (I could not !)

17)   Go back to Aladin and click on the most recent SN – 2008S, to open the Simbad page in your browser. You should be able to identify the discoverers from the oldest (lowest Number) Central Bureau Electronic Telegrams.

18)   At the start of the exercise we saw a number of stars that were quite bright but near the centre of the galaxy. One exercise for you to try is to identify if these stars are in other star catalogues. There are a number of catalogues available such as the USNO that contain many more stars. Try loading this or one of the other catalogues that contain lots of stars

19)   While many more stars appear in these catalogues you may notice that some of the stars near the centre of the Galaxy have not been identified.

20)   Finally lets have a quick look at Aladin Filters. Turn off the Aladin & NED planes and leave the star catalogue & DSS image planes on. Then select this plane so the blue bar is on it. Then click on the filter button on the vertical toolbar.

21)   A pop-up box will appear with several options, in the beginners tab click the option *Draw Circles Proportional to the Object Luminosity* . A circle should appear round each star – the brighter the star the larger the circle.

22)   Before you leave the properties window click on the advanced tab – go on it will not bite ! This will then show you the actual filter that you have asked Aladin to use – it should show '{ draw circle(-$[phot.mag*]) }' . All this does is say for every star draw a circle where the size is proportional to the star brightness in the *phot.mag* column.

23)   Now return to the main Aladin window – have a look at the size of the circles against the brightness of the stars. (You might need to click on the filter properties and adjust the colour if the circles are not clear – I found black or blue best) . Can you find ones that appear brighter ? Can you find any that appear dimmer ? Why might the brightness have changed ?

This exercise has introduced you to some more facilities of Aladin, in particular you can select objects by type, you can examine associated data in Simbad and have put your toe in the magic world of filters.

The next exercise will allow you to identify new supernovae in a galaxy.