

實驗目的: 對車輪星系的隨機5個點討論顏色的比例和亮度的比值

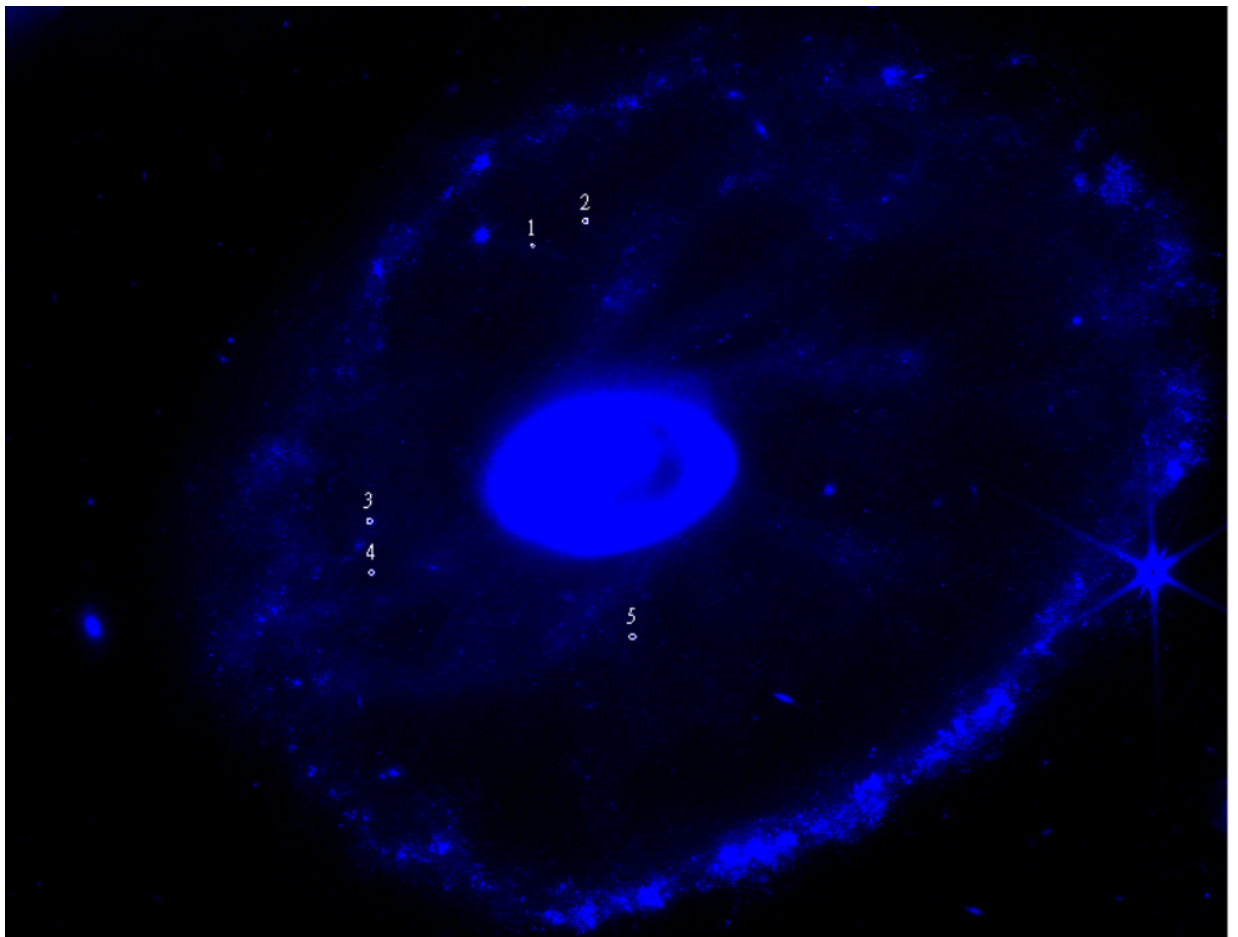
實驗方法: 對cartwheel galaxy三個不同的濾鏡下發射波長(藍150,綠200,紅356)的圖中標記隨機同樣的5個點

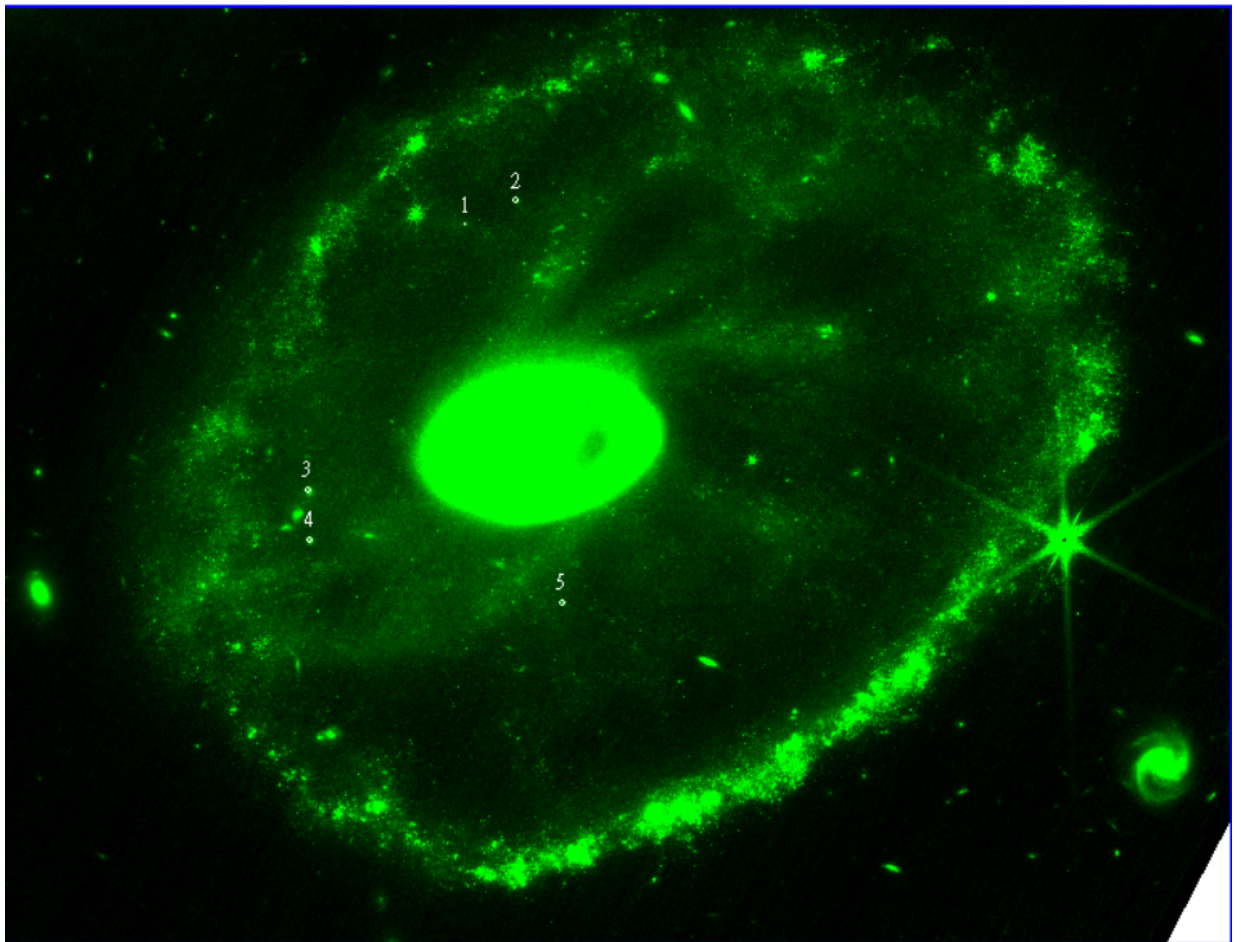
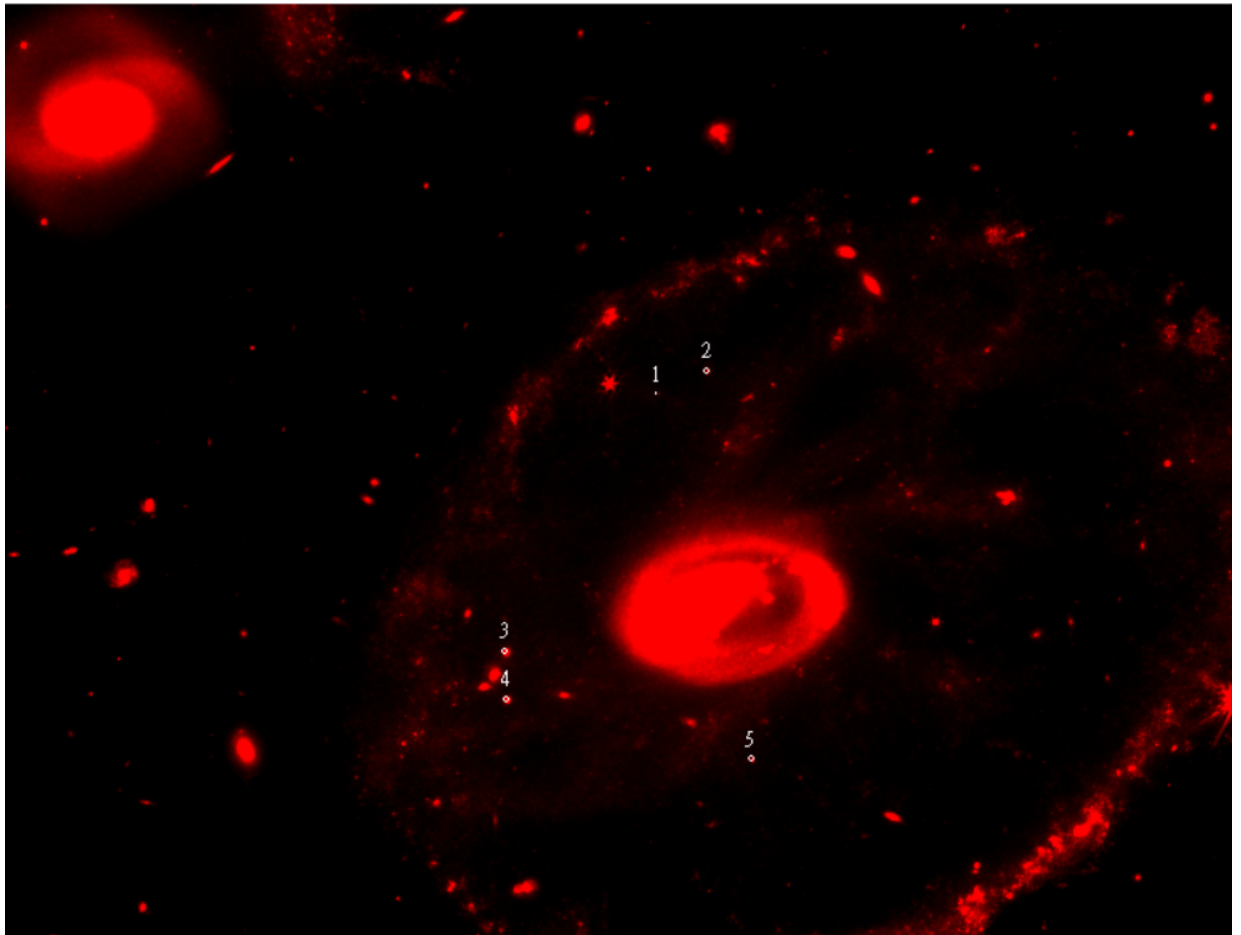
```
In [13]: import matplotlib.pyplot as plt
import numpy as np
from PIL import Image

%matplotlib inline

image_blue = "blue.png"
image_red = "red.png"
image_green = "green.png"
img_blue = Image.open(image_blue)
img_red = Image.open(image_red)
img_green = Image.open(image_green)

img_blue.show()
img_red.show()
img_green.show()
```





從imformation 中得知濾鏡下各星點的亮度

```
In [51]: image_path_data1 = "s1 red.png"
         img_data1 = Image.open(image_path_data1)
```

```
img_data1.show()

center=9.422605 -33.711696
fk5
1 pixel = 0.063005684 arcsec

reg      sum      error      area      surf_bri      surf_err
      (arcsec**2)      (sum/arcsec**2) (sum/arcsec**2)
---      ---      ---      ---      ---      ---
1      2.3426745      1.53058 0.0317577      73.7671      48.1955

reg      sum      npix      mean      median      min      max      var      stddev      rms
---      ---      ---      ---      ---      ---      ---      ---      ---      ---
1      2.3426745 8      0.292834 0.311971 0.221881 0.399815 0.00311995 0.0558565
```

輸入csv檔行成表格

```
In [14]: image_path_data = "data.png"

img_data = Image.open(image_path_data)

img_data.show()
```

sum	R	G	B
star1	2.3426	25.2038	28.9678
star2	18.1619	80.7003	90.3363
star3	43.3804	149.8182	117.6284
star4	70.93418	143.232	104.8002
star5	18.7823	98.4493	93.8857

1.顏色比較得到各點的不同波段的光密度並計算出各星星的RGB三波段相對三波段總和的百分比
擷取csv檔數據形成分割成五個星星的各個數據

```
In [30]: filename = "file.csv"
star1=[]
star2=[]
star3=[]
star4=[]
star5=[]
c=1
with open(filename, encoding='latin-1') as f:
    lines = f.readlines()[1:]

    for line in lines:
        print(line)
        if c == 1:
            star1 = line.split(',')
        elif c == 2:
            star2 = line.split(',')
```

```

elif c == 3:
    star3 = line.split(',')
elif c == 4:
    star4 = line.split(',')
else:
    star5 = line.split(',')
    c+=1
print(star1)
print(star2)
print(star3)
print(star4)
print(star5)

```

star1,2.3426,25.2038,28.9678

star2,18.1619,80.7003,90.3363

star3,43.3804,149.8182,117.62842

star4,70.934184,143.23196,104.8002

star5,18.7823,98.4493,93.8857

```

['star1', '2.3426', '25.2038', '28.9678\n']
['star2', '18.1619', '80.7003', '90.3363\n']
['star3', '43.3804', '149.8182', '117.62842\n']
['star4', '70.934184', '143.23196', '104.8002\n']
['star5', '18.7823', '98.4493', '93.8857\n']

```

將個個星星手動轉換成程式集的形式形成橫向的各星星的RGB三色亮度值,將星星中RGB三色比總亮度得到三色所占的比例

In [35]:

```

star1=[2.3426,25.2038,28.9678]
star2=[18.1619,80.7003,90.3363]
star3=[43.3804,149.8182,117.62842]
star4=[70.934184,143.23196,104.8002]
star5=[18.7823,98.4493,93.8857]
ratios1 = [value / sum(star1) for value in star1]
ratios2= [value / sum(star2) for value in star2]
ratios3 = [value / sum(star3) for value in star3]
ratios4 = [value / sum(star4) for value in star4]
ratios5 = [value / sum(star5) for value in star5]
print("star1的RGB的比值:", ratios1)
print("star2的RGB的比值:", ratios2)
print("star3的RGB的比值:", ratios3)
print("star4的RGB的比值:", ratios4)
print("star5的RGB的比值:", ratios5)

```

star1的RGB的比值: [0.04145152899625227, 0.4459728705351929, 0.5125756004685548]

star2的RGB的比值: [0.09599389001498426, 0.42653773682138074, 0.477468373163635]

star3的RGB的比值: [0.13956444327137327, 0.4819986370554271, 0.3784369196731996]

star4的RGB的比值: [0.22238767611168406, 0.4490503863316689, 0.3285619375566471]

star5的RGB的比值: [0.08896618135984119, 0.4663251187846756, 0.44470869985548317]

2.亮度比較 以star1為基準做不同濾鏡下光強度的比較

直向擷取各星星的RGB的亮度數值形成在濾鏡下各星星的亮度值

In [44]:

```

red=[]
green=[]
blue=[]

data=[]
c=1
with open(filename, encoding='latin-1') as f:

```

```

lines = f.readlines()[1:]

for line in lines:
    print(line)
    cols = line.split(',')
    red.append(float(cols[1]))
    green.append(float(cols[2]))
    blue.append(float(cols[3]))

print(red)
print(green)
print(blue)

```

star1,2.3426,25.2038,28.9678

star2,18.1619,80.7003,90.3363

star3,43.3804,149.8182,117.62842

star4,70.934184,143.23196,104.8002

star5,18.7823,98.4493,93.8857

```

[2.3426, 18.1619, 43.3804, 70.934184, 18.7823]
[25.2038, 80.7003, 149.8182, 143.23196, 98.4493]
[28.9678, 90.3363, 117.62842, 104.8002, 93.8857]

```

讓各個星星以star1的值為基準得到濾鏡下各星星的比值

In [54]:

```

ratios_red = [value / red[0] for value in red]
ratios_green = [value / green[0] for value in green]
ratios_blue = [value / blue[0] for value in blue]

print("在356濾鏡下與star1亮度的比值:", ratios_red)
print("每在200濾鏡下與star1亮度的比值:", ratios_green)
print("在150濾鏡下與star1亮度的比值:", ratios_blue)

```

在356濾鏡下與star1亮度的比值: [1.0, 7.752881413813711, 18.518056859899257, 30.28010928028686, 8.017715359002818]

每在200濾鏡下與star1亮度的比值: [1.0, 3.201910029440005, 5.944270308445551, 5.68295098358184, 3.9061292344805145]

在150濾鏡下與star1亮度的比值: [1.0, 3.118507446198883, 4.0606611478952495, 3.6178170244202184, 3.241036599258487]

三色疊合的圖

In [47]:

```

image_path_all = "last.png"

img_all = Image.open(image_path_all)

img_all.show()

```




356 200 150 三個波長濾鏡下所疊合出來的全景圖

```
In [48]: image_path_last = "123.png"
img_last = Image.open(image_path_last)
img_last.show()
```



結論: 這份報告我主要是想探討在不同濾鏡下橫向對比同個星星顏色所占的總亮度的比例和縱向對比相同濾鏡下相對於star1的亮度比值

在第一個分析中

- star1 藍色占51.2%綠色占44.6%紅色占4.1%
- star2 藍色占47.7%綠色占42.6%紅色占9.6%%
- star3 藍色占37.8%綠色占48.2%紅色占13.9%
- star4 藍色占32.8%綠色占44.9%紅色占22.2%
- star5 藍色占44.4%綠色占46.6%紅色占8.8%

在第二個分析中

- 在356濾鏡下與star1的亮度相比 star2是6.7倍 star3是17.5倍 **star4是29.2倍** star5是7倍
- 在200濾鏡下與star1的亮度相比 star2是2.2倍 **star3是4.9倍** star4是4.6倍 star5是2.9倍
- 在150濾鏡下與star1的亮度相比 star2是2.1倍 **star3是3倍** star4是2.6倍 star5是2.2倍

In []: