Kernel: SageMath 10.3

Experiment No. 06

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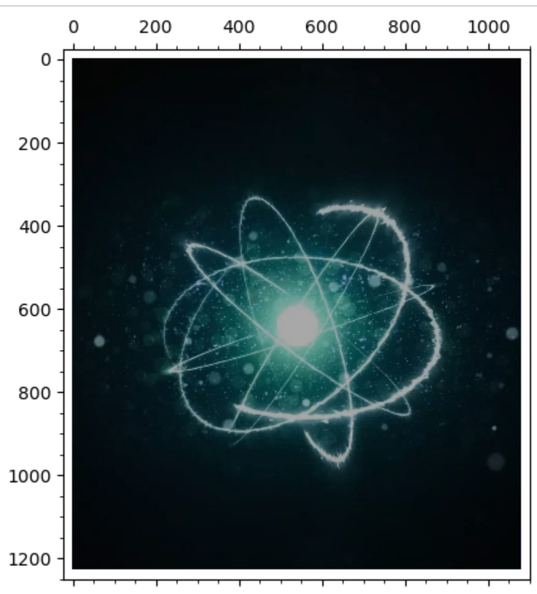
Aim: To perform Singular Value Decomposition with SageMath and it's application .

In [3]:
```
from matplotlib.pyplot import imread
import pylab
import numpy as np
img = pylab.imread('My_Profile_pic.png')
```

In [5]:
```
matrix_plot(img)
```

Out[5]:

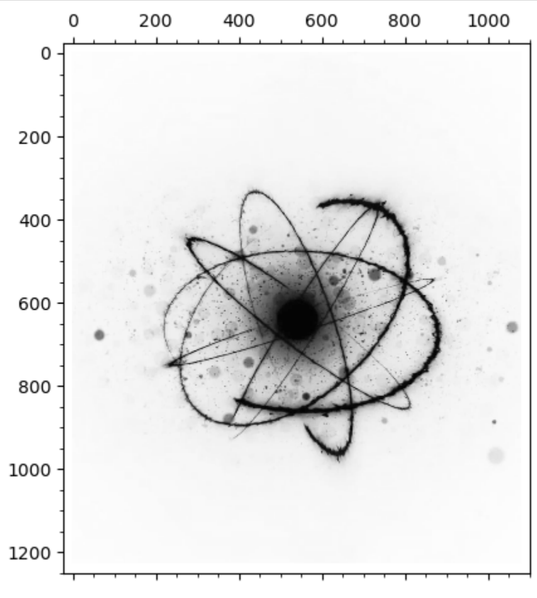


In [6]:
```
img.shape
```

Out[6]: (1227, 1080, 3)

In [7]:
```
gray = lambda rgb : np.dot(rgb[... , :3] , [0.299 , 0.587, 0.114])
gray_img = gray(img)
matrix_plot(gray_img)
```

Out[7]:



In [8]:
```
gray_img.shape
```

Out[8]: (1227, 1080)

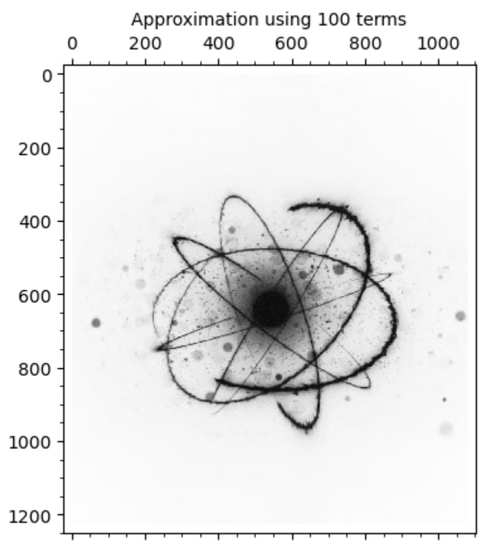
In [9]:
```
U,S,V = matrix(gray_img).SVD()
```

In [10]:
```
U.dimensions(),S.dimensions(),V.dimensions()
```

Out[10]: ((1227, 1227), (1227, 1080), (1080, 1080))

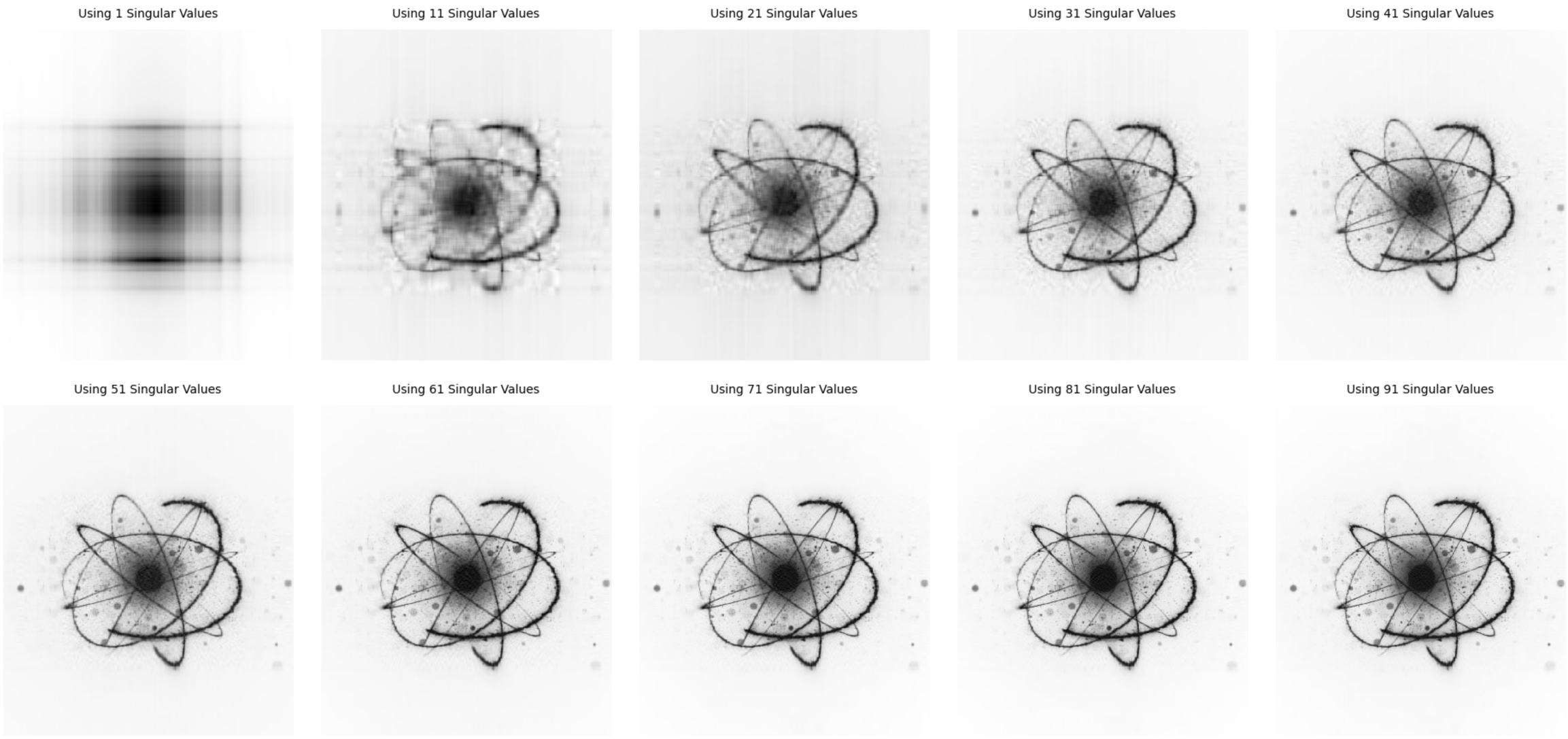
In [11]:
```
n=100
A_approx = U[:,:n]*S[:n,:n]*V.T[:n,:]
#print('Approximation using '+str(n)+ ' terms')
svd_img1=matrix_plot(A_approx,figsize=6,title='Approximation using '+str(n)+' terms')
svd_img1
```

Out[11]:



In [13]:
```
appx =[]
for i in range(1,100,10):
    A_approx = U[:,:i]*S[:i,:i]*V.T[:i,:]
    appx_img = matrix_plot(A_approx, title="Using "+str(i)+' Singular Values', frame=False)
    show(appx_img, figsize=6)
```

Out[13]:



Conclusion: Singular Value Decomposition is successfully performed by means of its application namely dimensionality reduction.