Image processing starter kit

This is the starter kit for your images project. There are a number of image files we will use in this project so please download and unzip them. The files inside the zip look like this:

Make sure the unzipped image files are in the same directory as your `images.ipynb` file and that you are storing all files in the root of your repository. Do not create any subdirectories in your repository. (If you double-click on a zip file it tends to create a subdirectory so move the files afterwards). Only add the notebook file to the repository, not the image files.

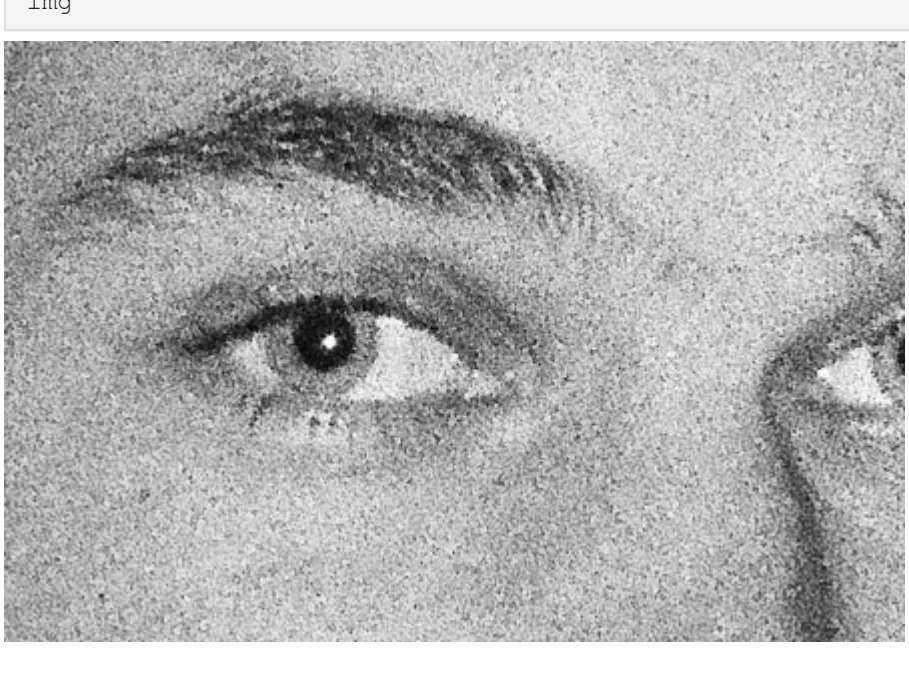
View

In [1]:
```
from PIL import Image
img=Image.open('eye.png')
img=img.convert('L')
img
```

Flip

In [2]:
```
def flip(img):
    #get the width height from image
    width,height=img.size
    #get the copy of the image
    copyimg=img.copy()
    #get the pixel of each image
    moriginal=img.load()
    mcopy=copyimg.load()
    #
    for i in range(width):
        for j in range(height):
            mcopy[i,j]=moriginal[width-i-1,j]

    return copyimg


img=flip(img)
img
```

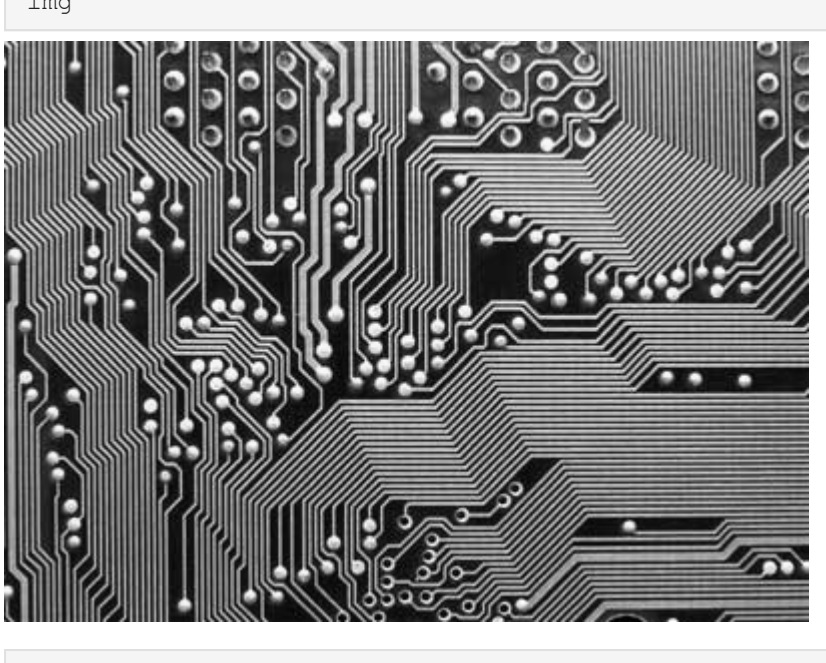
Out[2]:



Blur

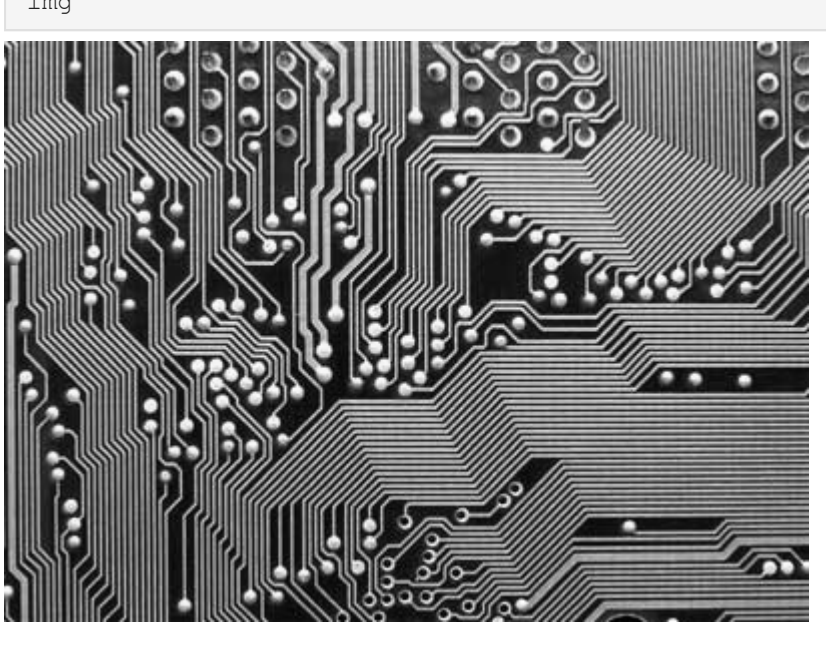
In [3]:
```
img=Image.open('pcb.png')
img=img.convert('L')
img
```

Out[3]:



In [4]:
```
#blur
def blur(img):
    #get the width of the image
    width,height=img.size
    copyimg=img.copy()
    mcopyimg=copyimg.load()

    for i in range(width):
        for j in range(height):
            r=region3x3(img,i,j)
            mcopyimg[i,j]=avg(r)

    return copyimg

def avg(data):
    return int(sum(data)/len(data))

def region3x3(img,x,y):
    center = getpixel(img, x, y)
    N = getpixel(img, x, y - 1)
    NE=getpixel(img, x+1, y - 1)
    NW=getpixel(img, x-1, y - 1)
    S = getpixel(img, x, y +1)
    SE=getpixel(img, x+1, y + 1)
    SW=getpixel(img, x-1, y + 1)
    W= getpixel(img, x-1, y)
    E= getpixel(img, x+1, y)

    return [center,N,NE,NW,S,SE,SW,W,E]

def getpixel(img,x,y):
    width,height=img.size
    pixel=img.load()

    if x<0:
        x=0
    elif x>=width:
        x=width-1

    if y<0:
        y=0
    elif y>=height:
        y=height-1

    return pixel[x,y]

img=Image.open('pcb.png')
img=img.convert('L')
img
```

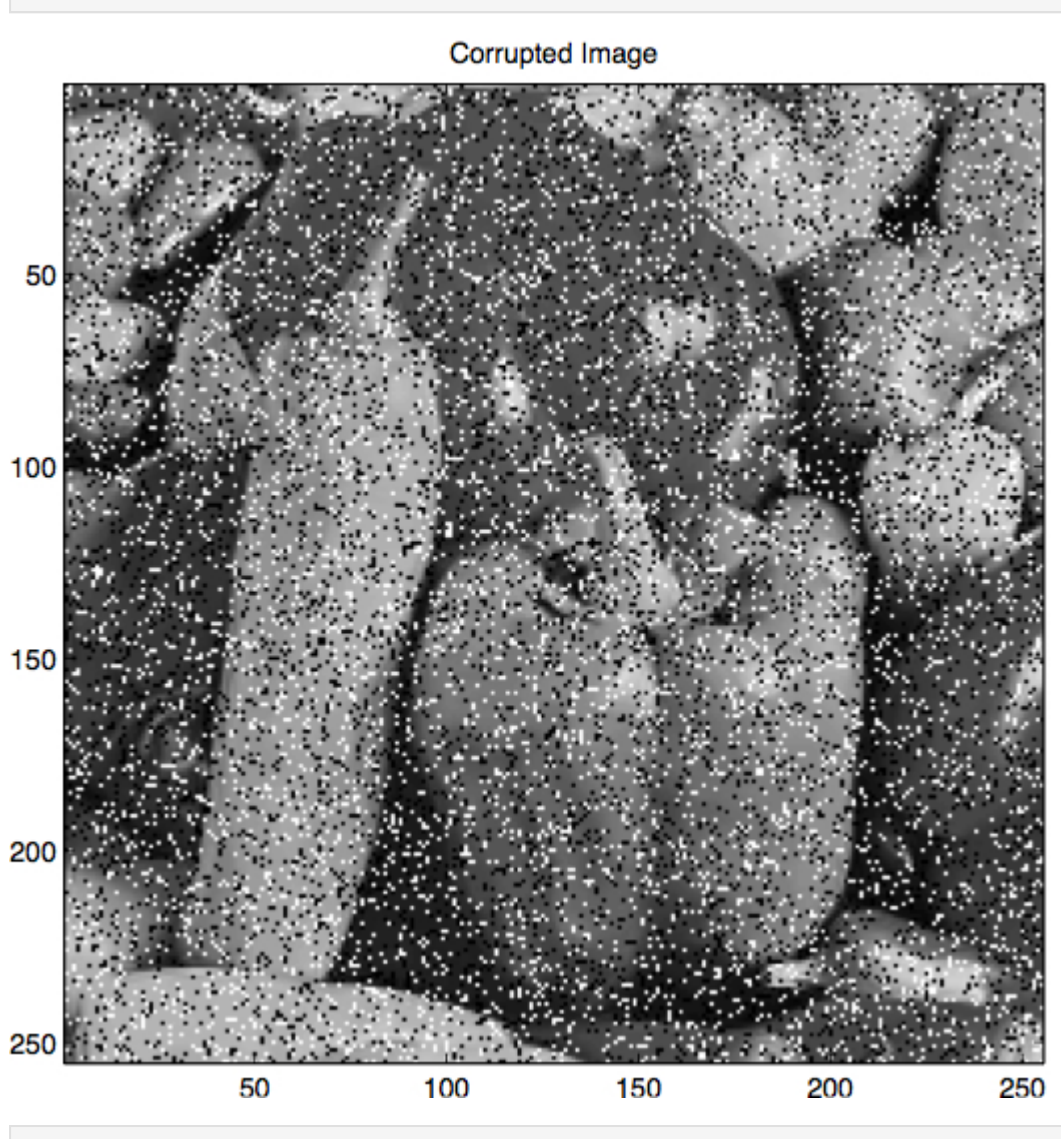
Out[4]:



Denoise

In [5]:
```
def denoise(img):
    #get the width of the image
    width,height=img.size
    copyimg=img.copy()
    mcopyimg=copyimg.load()

    for i in range(width):
        for j in range(height):
            r=region3x3(img,i,j)
            mcopyimg[i,j]=median(r)

    return copyimg

def median(data):
    data_sort=sorted(data)
    data_length=len(data)
    if data_length%2==1:
        middle=int(round(data_length/2))+1
    else:
        middle=int(round(data_length/2))

    return data_sort[middle-1]
img=Image.open('Veggies_noise.jpg')
img
```

Out[5]:



In [6]:
```
img=Image.open('Veggies_noise.jpg')
img=denoise(img)
img=denoise(img)
img
```

Out[6]:

In [7]:
```
img=Image.open('guesswho.png')
img
```

Out[7]:

In [8]:
```
img=Image.open('guesswho.png')
img=denoise(img)
img=denoise(img)
img
```

Out[8]:

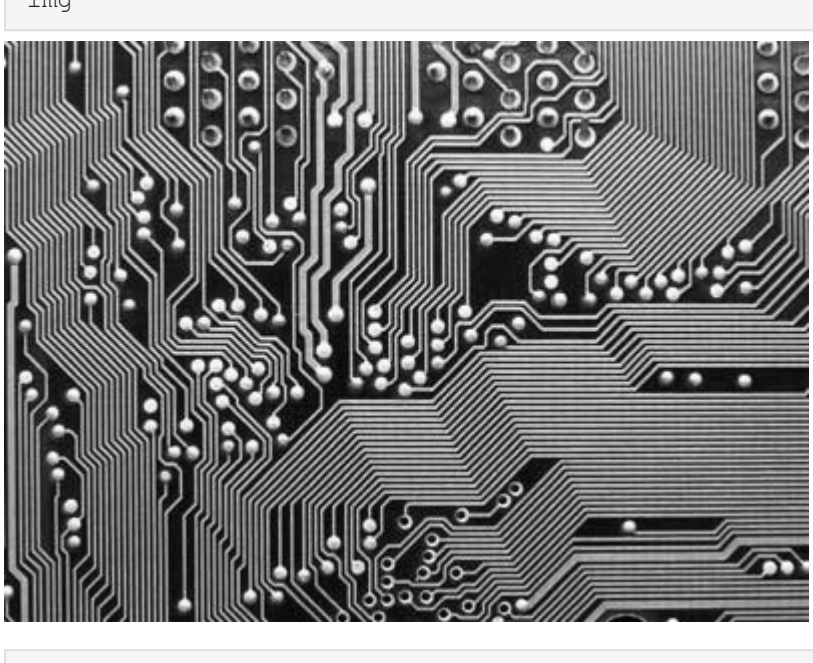
Generic Filter

In [9]:
```
def open(fname):
    img = Image.open(fname)
    img = img.convert("L")
    return img

def filter(image, f):

    #get the width of the image
    width,height=img.size
    copyimg=img.copy()
    mcopyimg=copyimg.load()

    for i in range(width):
        for j in range(height):
            r=region3x3(img,i,j)
            mcopyimg[i,j]=f(r)

    return copyimg
```

Blur refactored

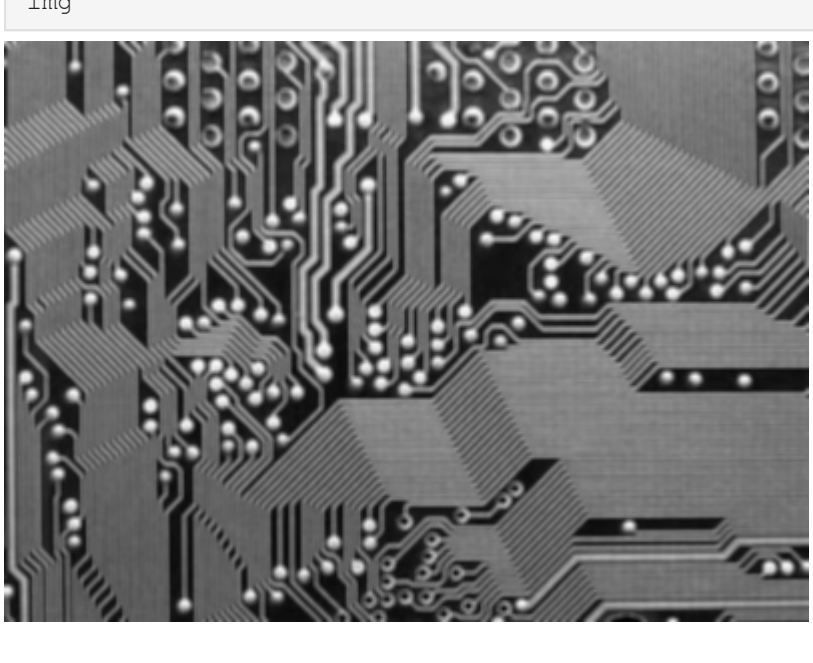
In [10]:
```
img=open('pcb.png')
img
```

Out[10]:



In [11]:
```
img=filter(img,avg)
img
```

Out[11]:



Denoise refactored

In [12]:
```
img=open('guesswho.png')
img
```

Out[12]:

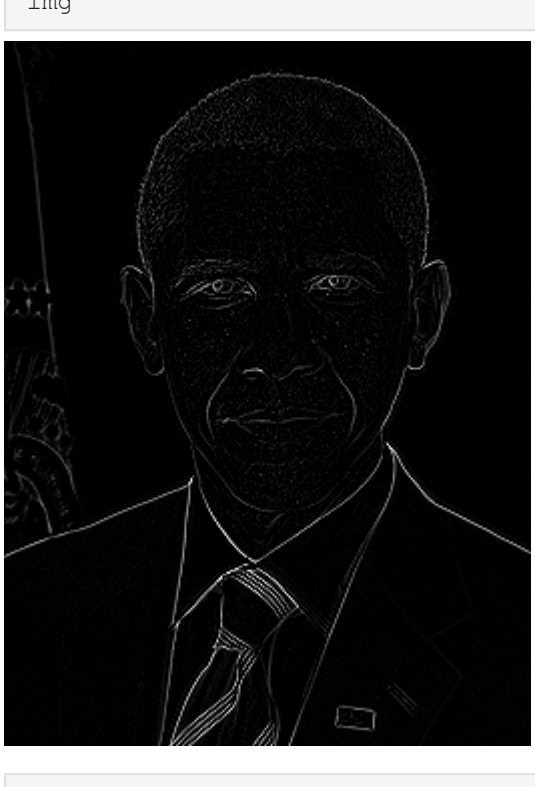
In [13]:
```
img=filter(img,median)
img
```

Out[13]:

Edges

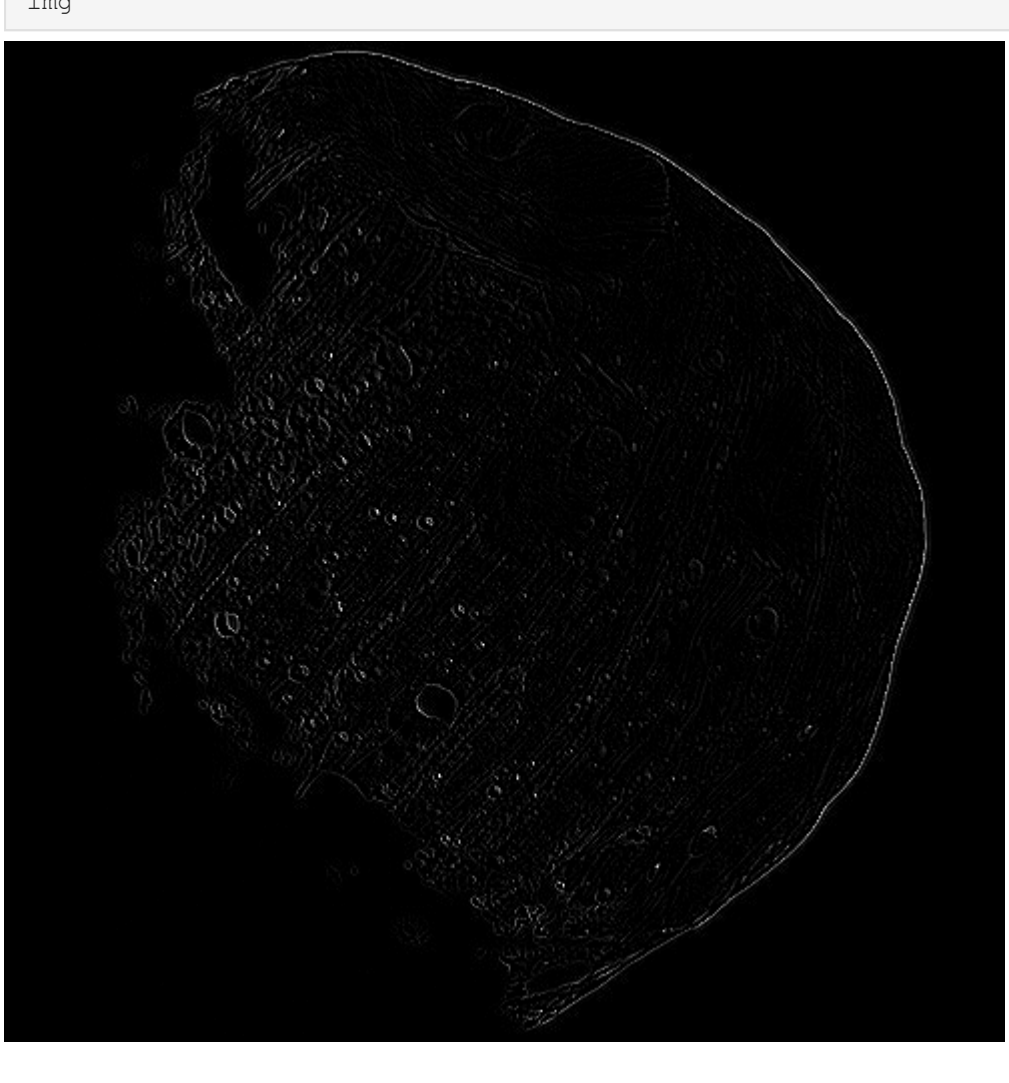
In [14]:
```
def laplace(data):
    return (data[1]+data[4]+data[7]+data[8])-4*data[0]

img=open('obama.png')
img=filter(img,laplace)
img
```

Out[14]:



In [15]:
```
img=open('phobos2.jpg')
img=filter(img,laplace)
img
```

Out[15]:



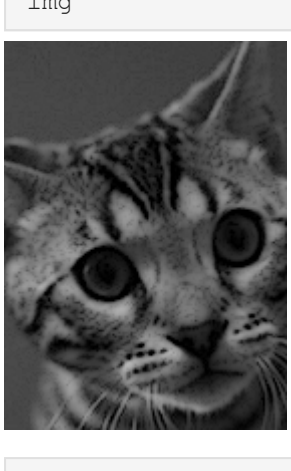
Sharpen

In [16]:
```
def minus(A,B):
    pixelA=A.load()
    pixelB=B.load()
    copyA=A.copy()
    pixelcopy=copyA.load()
    width,height=A.size

    for i in range(width):
        for j in range(height):
            pixelcopy[i,j]=pixelA[i,j]-pixelB[i,j]

    return copyA


img=open('bonkers.png')
img
```

Out[16]:

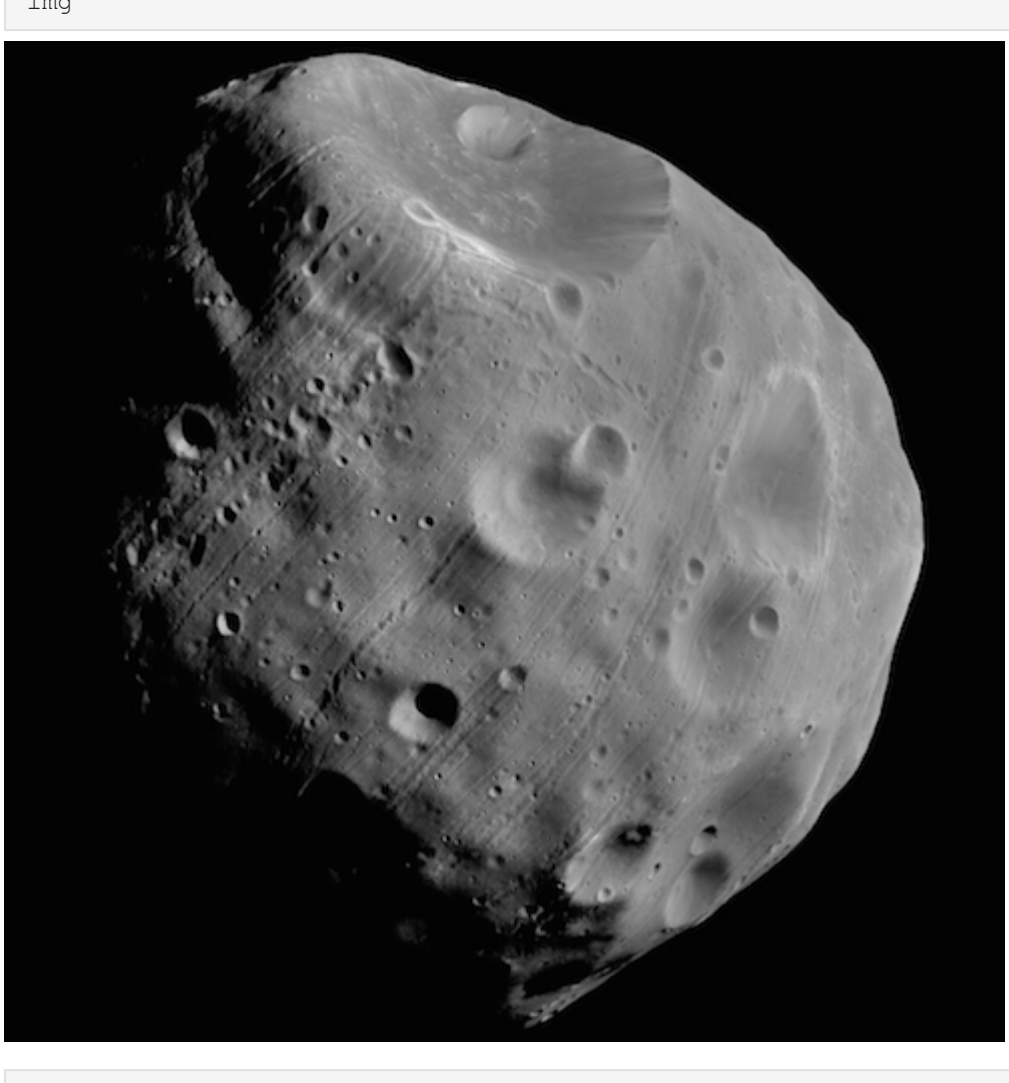
In [17]:
```
edges = filter(img, laplace)
img=minus(img,edges)
img
```

Out[17]:



In [18]:
```
img=open('phobos2.jpg')
img
```

Out[18]:



In [19]:
```
edges = filter(img, laplace)
img=minus(img,edges)
img
```

Out[19]: