Professor_Bear_Image_Analysis_SLIC

March 14, 2017

1 Professor Bear :: Image Analysis :: SLIC (Simple Linear Iterative Clustering)

1.1 Professor Bear github

Code for Professor Bear YouTube videos at https://github.com/nikbearbrown

1.2 Download Anaconda 4 for Python 2.7

Download Anaconda 4 for Python 2.7 version https://www.continuum.io/downloads

Anaconda 4.3.0 includes an easy installation of Python (2.7.13, 3.4.5, 3.5.2, and/or 3.6.0) and updates of over 100 pre-built and tested scientific and analytic Python packages. These packages include NumPy, Pandas, SciPy, Matplotlib, and Jupyter. Over 620 more packages are available. https://docs.continuum.io/anaconda/pkg-docs

1.3 iPython

Go to the directory that has your iPython notebook

At the command line type

jupyter notebook notebookname

ipython notebook notebookname will also work

For example,

jupyter notebook Professor_Bear_Image_Analysis_Loading_Histograms.ipynb

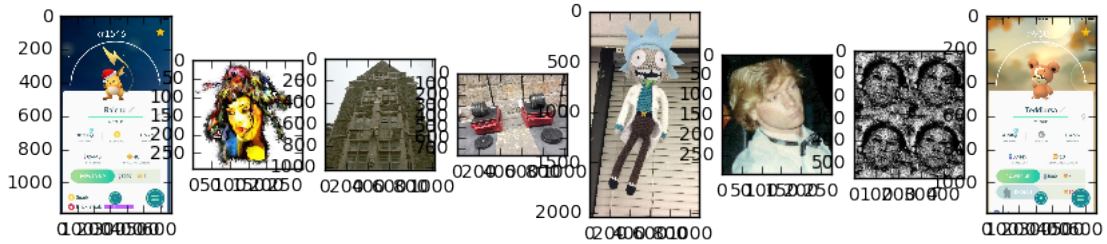
```
In [14]: # Bring in python image analysis libraries
         %matplotlib inline
         import matplotlib.pyplot as plt
         import matplotlib.image as mpimg
         import numpy as np
         from skimage import color
         import skimage.filters as filters
         from skimage.transform import hough_circle
         from skimage.feature import peak_local_max
         from skimage import feature
         from skimage import morphology
         from skimage.draw import circle_perimeter
         from skimage import img_as_float, img_as_ubyte
```

```
from skimage import segmentation as seg
from skimage.morphology import watershed
from scipy import ndimage as nd
from scipy.ndimage import convolve
from skimage import feature
import glob # for bulk file import

# Set defaults
plt.rcParams['image.cmap'] = 'gray' # Display grayscale images in... grays
plt.rcParams['image.interpolation'] = 'none' # Use nearest-neighbour
plt.rcParams['figure.figsize'] = 10, 10

# Import test images
imgpaths = glob.glob("./img/*.jpg") + glob.glob("./img/*.png")
# imgpaths = glob.glob("images/*.jpg") + glob.glob("images/*.png")  Windo
# Windows has different relative paths than Mac/Unix
imgset = [mpimg.imread(x) for x in imgpaths]

# Display thumbnails of the images to ensure loading
plt.figure()
for i,img in enumerate(imgset):
    plt.subplot(1, len(imgset), i+1)
    plt.imshow(img, cmap = 'gray')
```



1.4 SLIC (Simple Linear Iterative Clustering)

SLIC (Simple Linear Iterative Clustering) that clusters pixels in the combined five-dimensional color and image plane space to efficiently generate compact, nearly uniform superpixels. In other words, SLIC is a mapping from pixel grids to superpixels. A superpixel is an image patch which is better aligned with intensity edges than a rectangular patch. Superpixels can be extracted with any segmentation algorithm, however, most of them produce highly irregular superpixels, with widely varying sizes and shapes.

There are some key parameters:

The first is the is the n_segments argument which defines how many superpixel segments we want to generate. This value defaults to 100 segments.

The second is compactness , which balances the color-space proximity with image space-proximity compactness , which balances the color-space proximity with image space-proximity.

As the compactness increases, spatial distances to cluster centers are given more weight and colour distances to cluster centers are given less weight.

We can also supply a sigma , which is the smoothing Gaussian kernel applied prior to segmentation.

```
In [15]: # Calculate the mean color of slic regions, from the SciKit tutorial
         def mean_color(image, labels):
             out = np.zeros_like(image)
             for label in np.unique(labels):
                 indices = np.nonzero(labels == label)
                 out[indices] = np.mean(image[indices], axis=0)
             return out

         def plot_slic_segmentation(img, ns, c, s):
             labels = seg.slic(img, n_segments=ns, compactness=c, sigma=s, enforce_
             return mean_color(img, labels)

In [16]: ns=12
         compact=70
         sigma=2.0
         # Apply to the image set
         for i,img in enumerate(imgset):
             rgbimg = img_as_float(color.gray2rgb(img))
             plt.figure()
             plt.subplot(1, 2, 1)
             plt.imshow(img)
             plt.subplot(1, 2, 2)
             plt.imshow(plot_slic_segmentation(rgbimg,ns,compact,sigma))
```


CP1546
Raichu
94 / 94 HP
38.37kg
WEIGHT
ELECTRIC
0.92m
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PIKACHU CANDY
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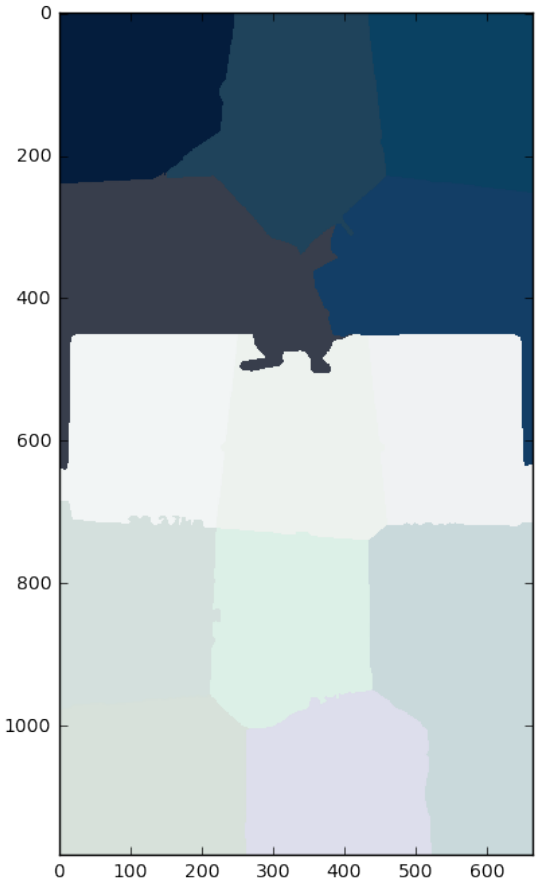

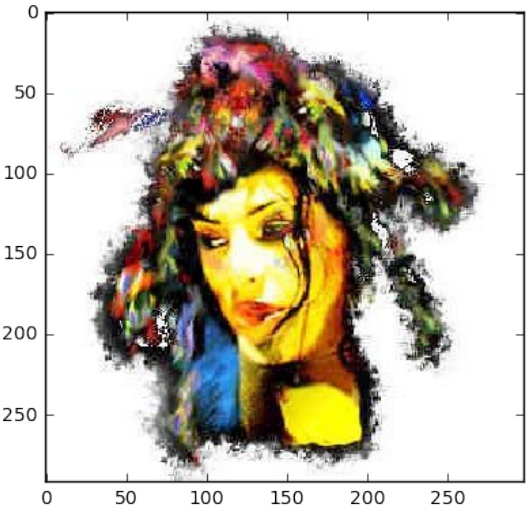

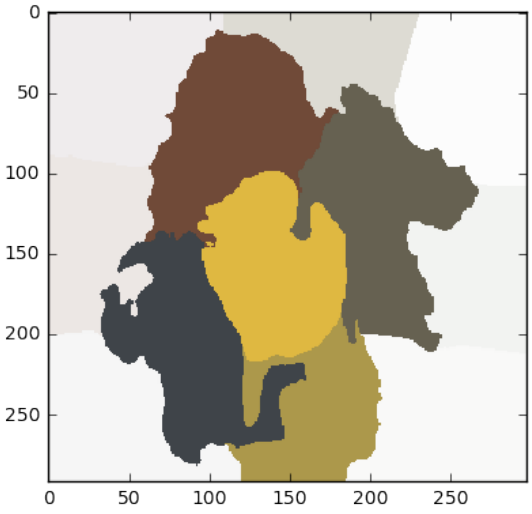

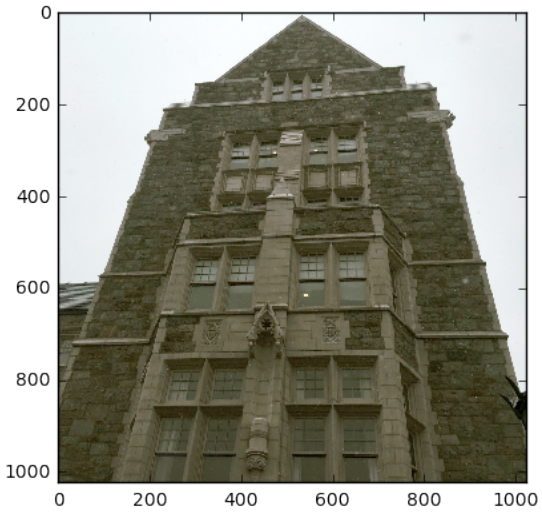
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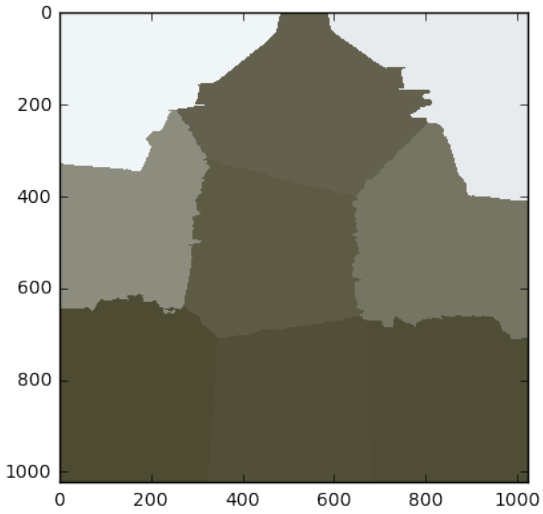
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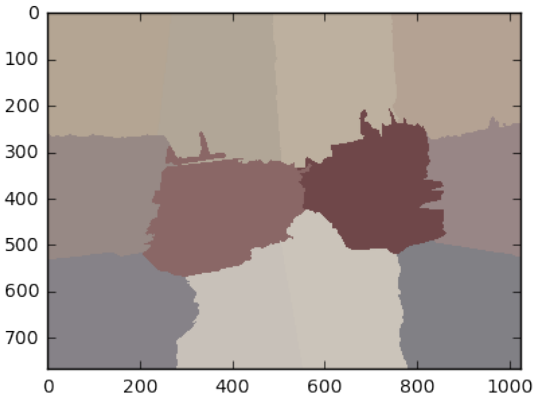
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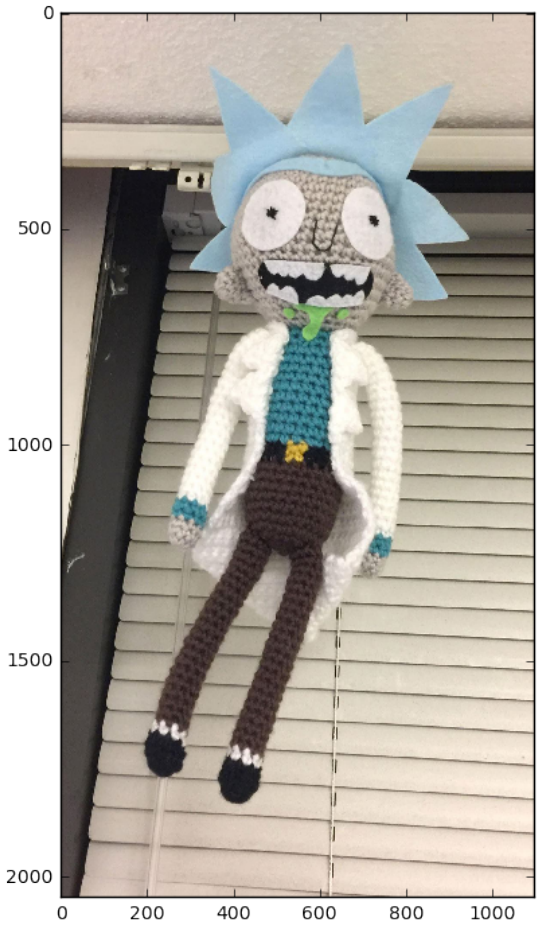
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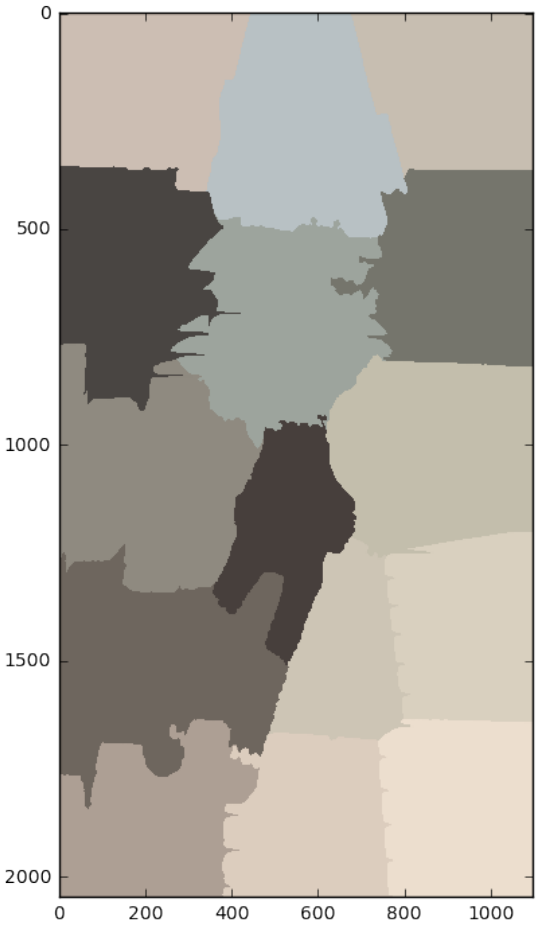
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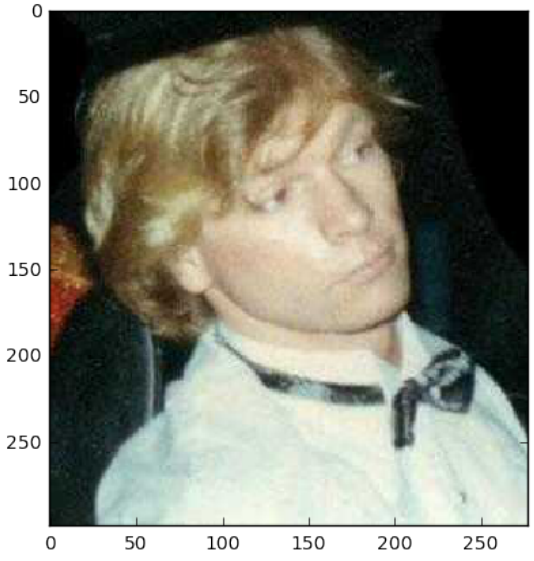
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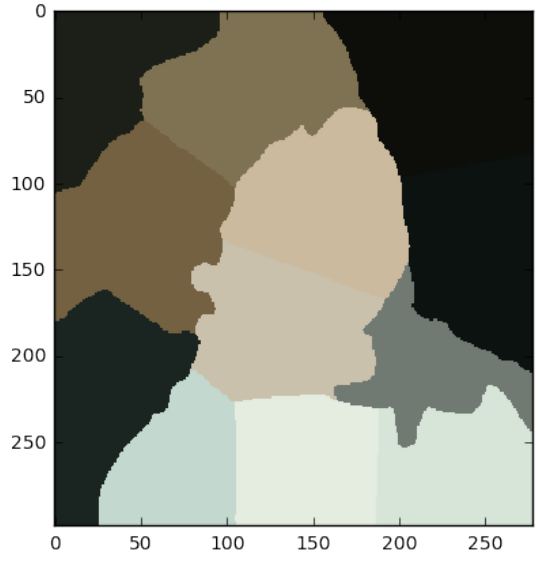
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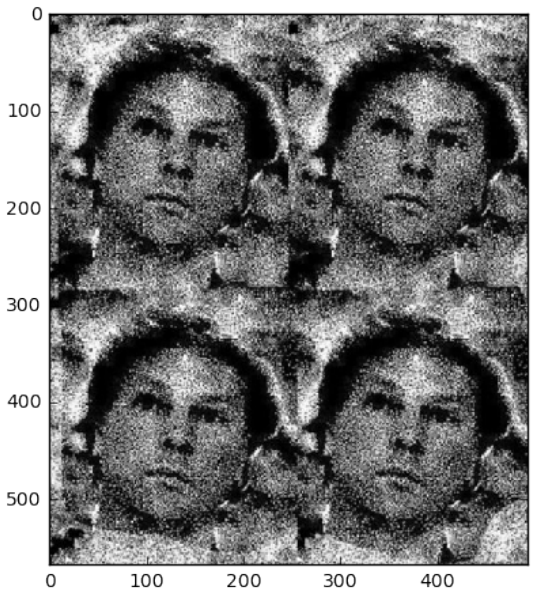
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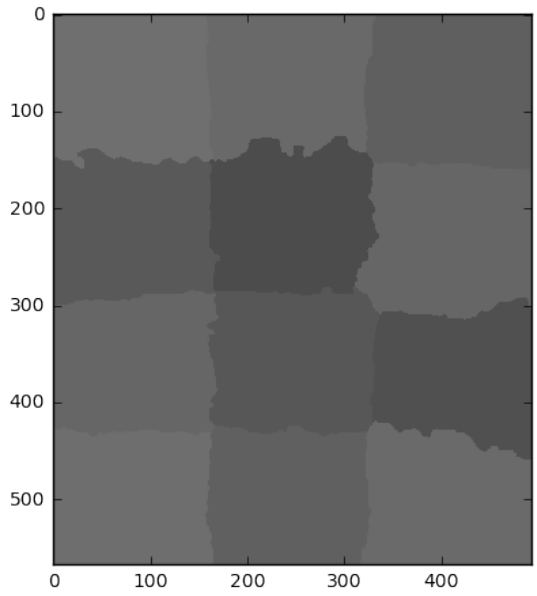
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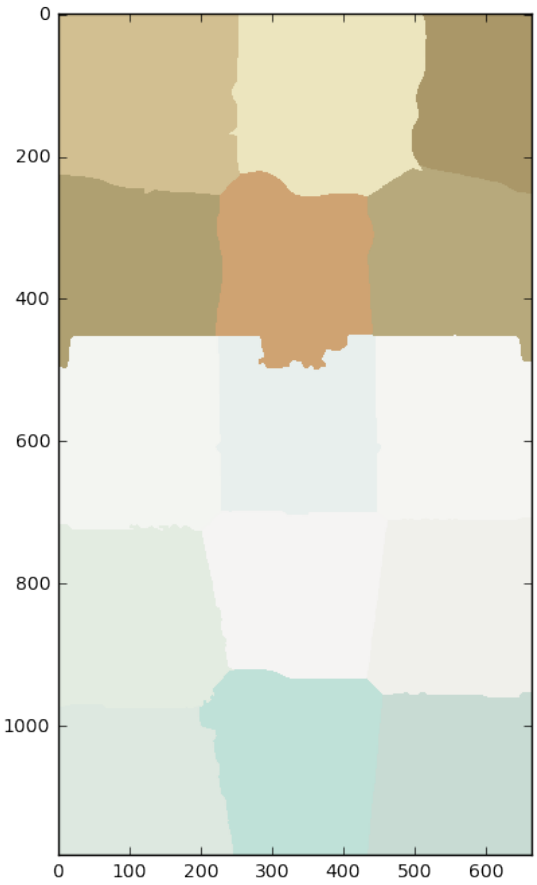
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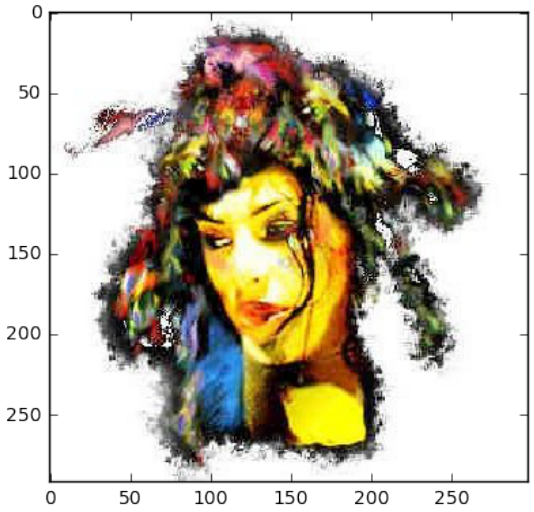
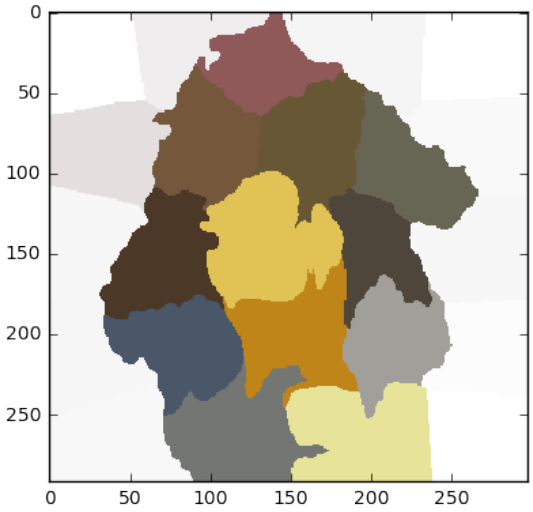
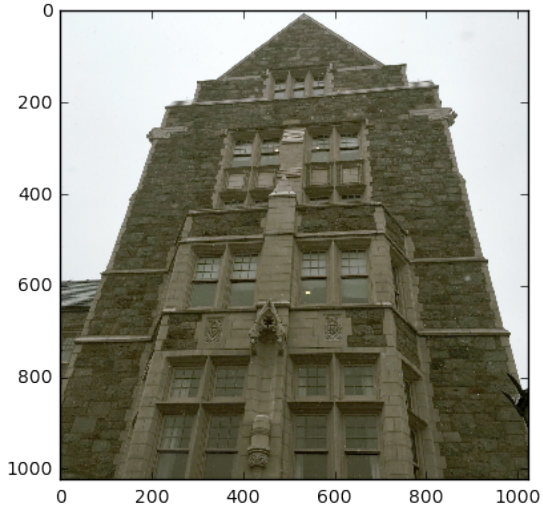
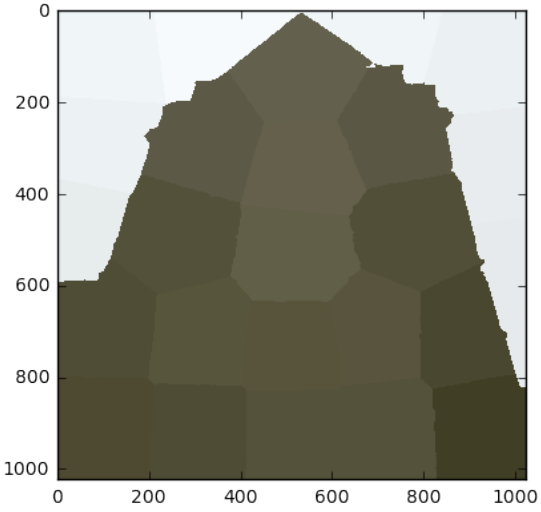
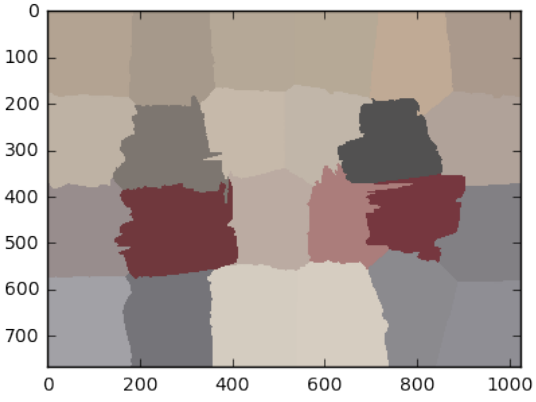
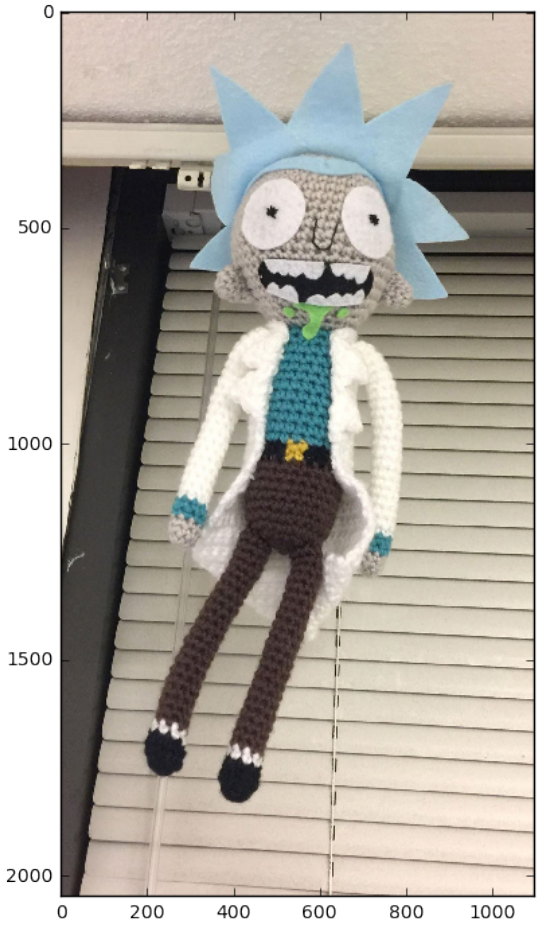
In [17]:
```
ns=24
compact=70
sigma=2.0
# Apply to the image set
for i,img in enumerate(imgset):
    rgbimg = img_as_float(color.gray2rgb(img))
    plt.figure()
    plt.subplot(1, 2, 1)
    plt.imshow(img)
    plt.subplot(1, 2, 2)
    plt.imshow(plot_slic_segmentation(rgbimg,ns,compact,sigma))
```

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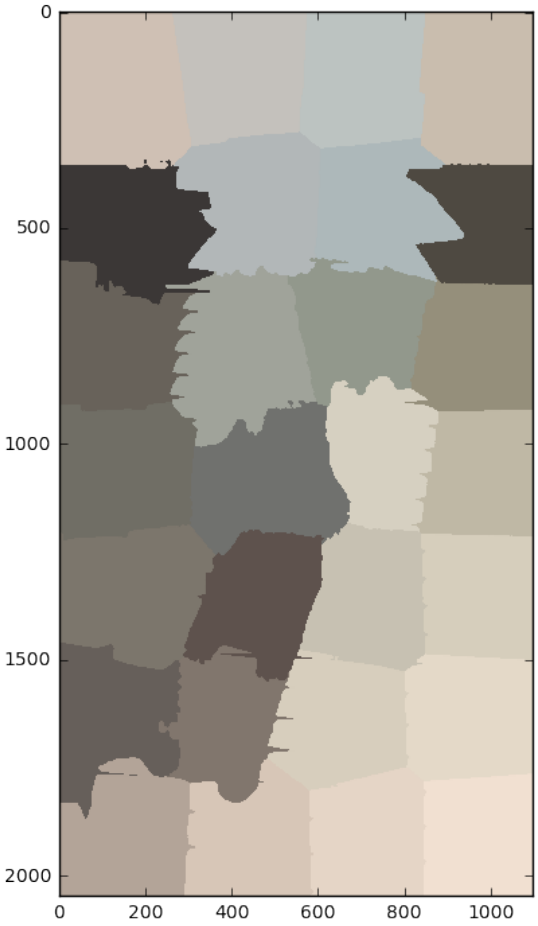
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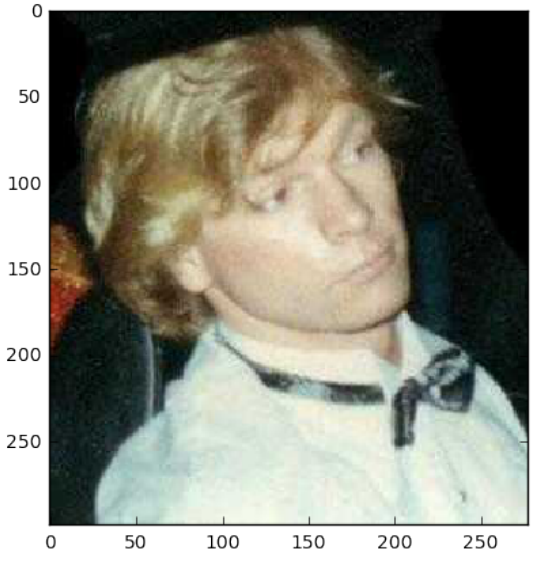
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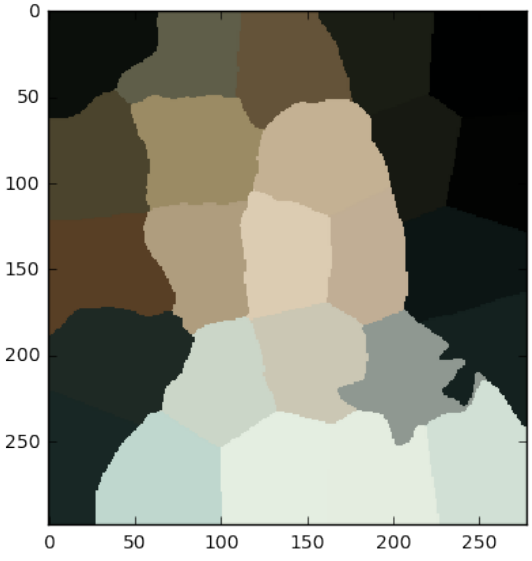
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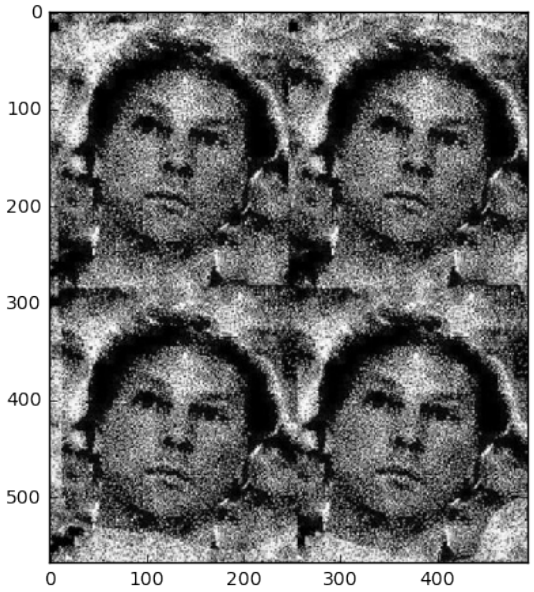

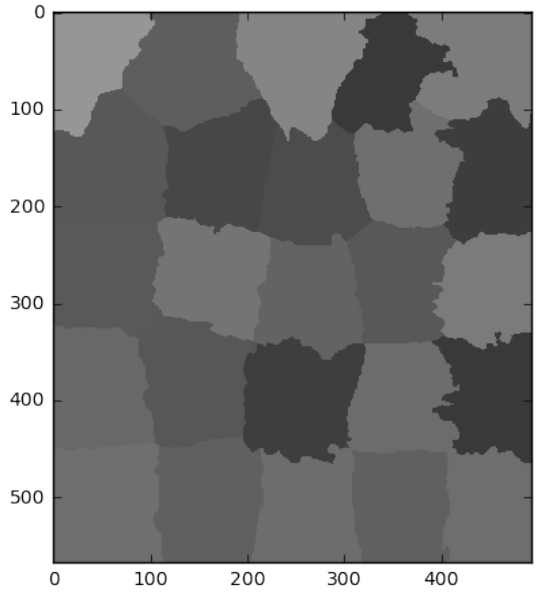


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CP910
Teddiursa
93 / 93 HP
4.24kg
WEIGHT
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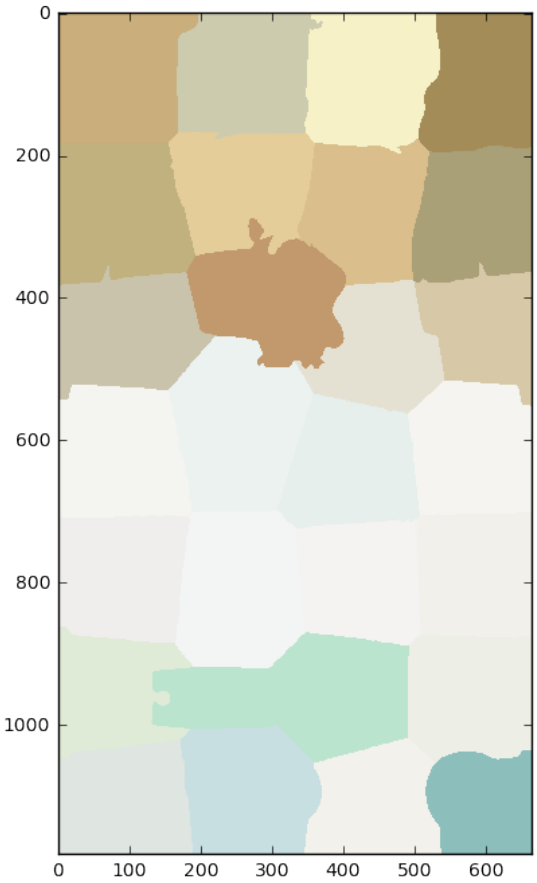
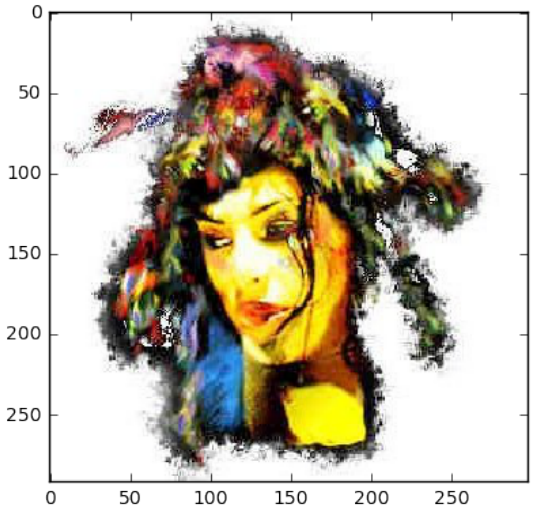
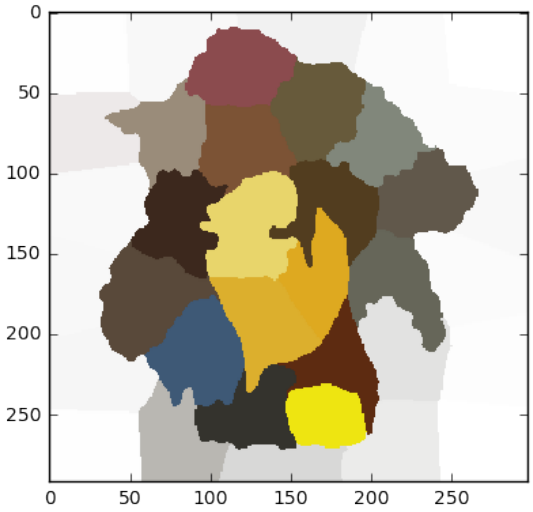
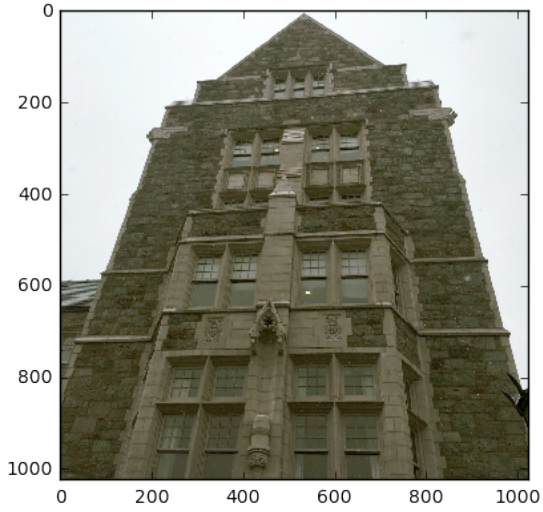
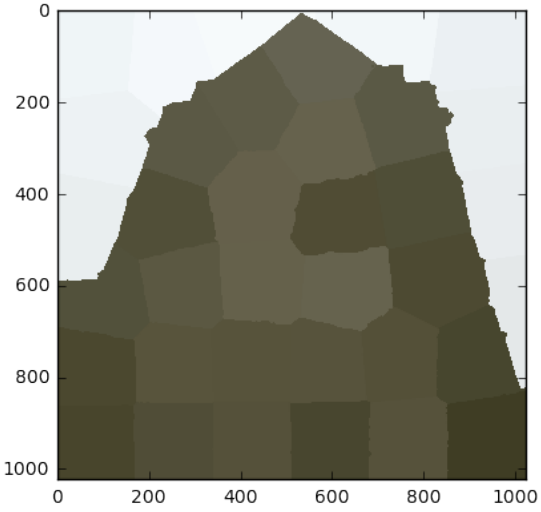
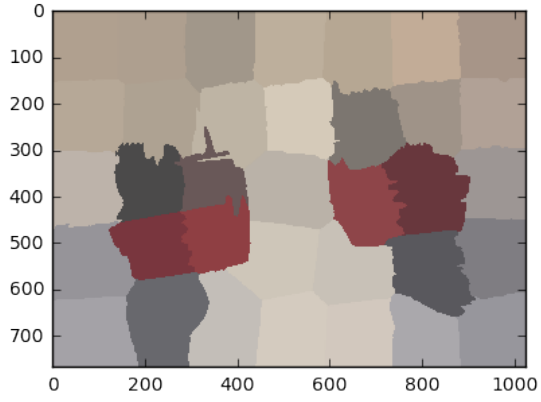
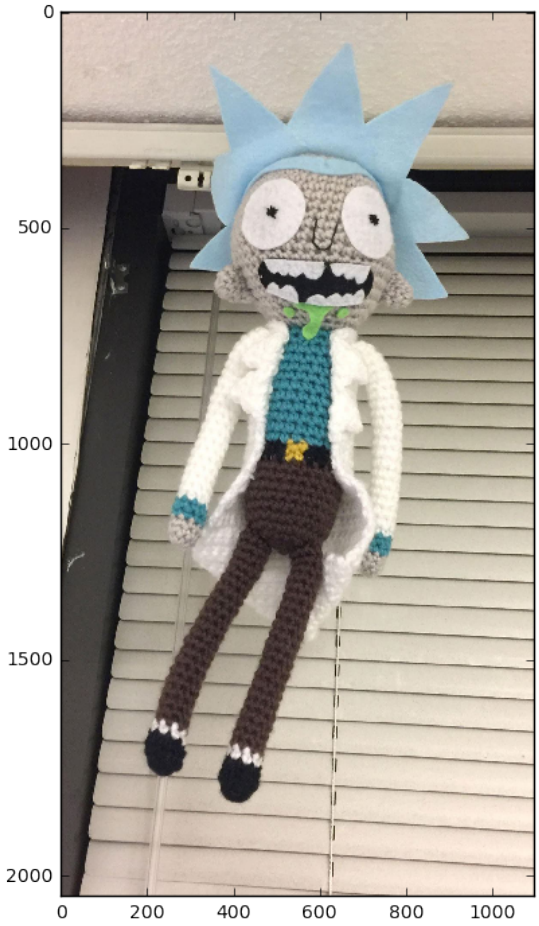


In [18]:
```
ns=36
compact=70
sigma=2.0
# Apply to the image set
for i,img in enumerate(imgset):
    rgbimg = img_as_float(color.gray2rgb(img))
    plt.figure()
    plt.subplot(1, 2, 1)
    plt.imshow(img)
    plt.subplot(1, 2, 2)
    plt.imshow(plot_slic_segmentation(rgbimg,ns,compact,sigma))
```

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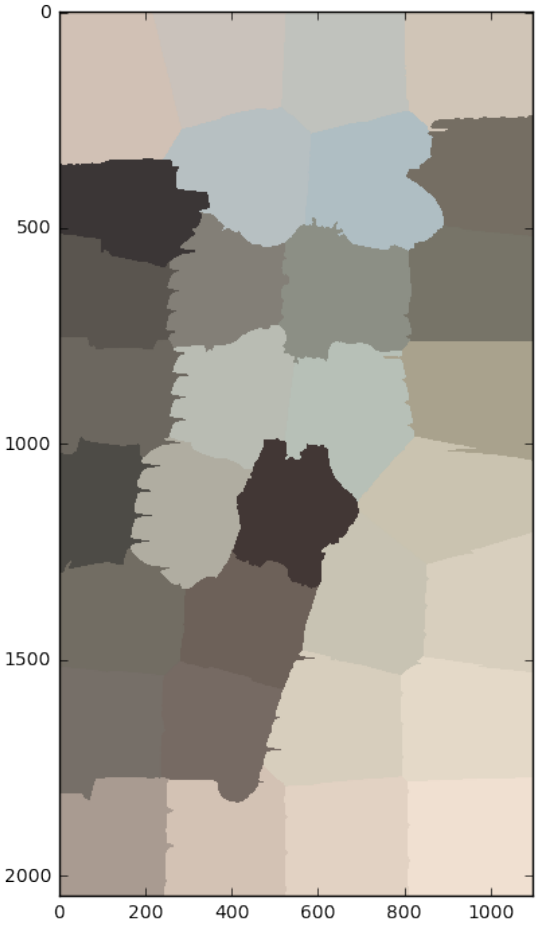
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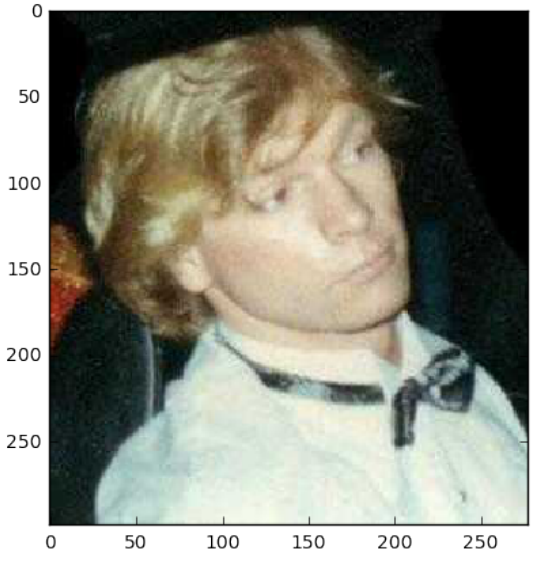
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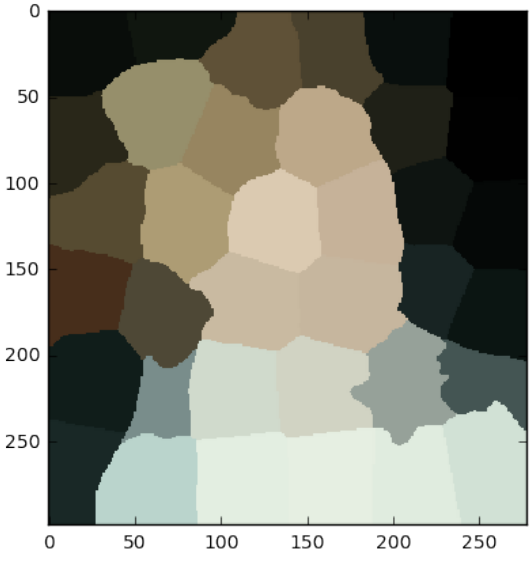
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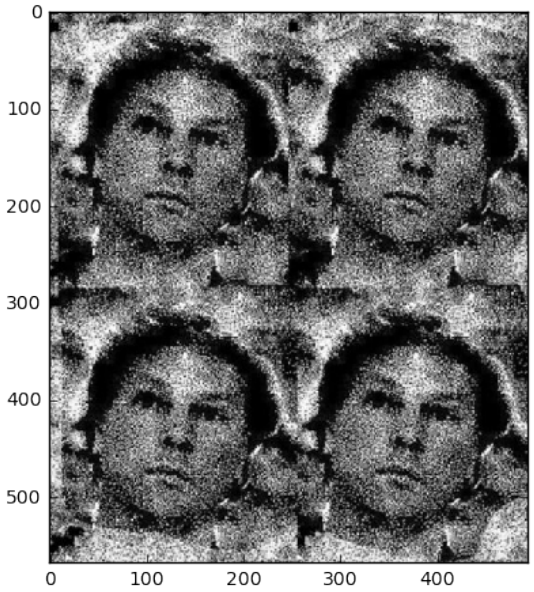

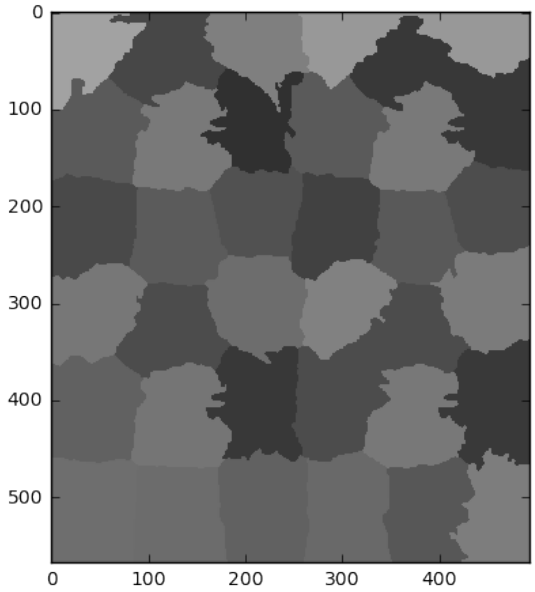


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CP910
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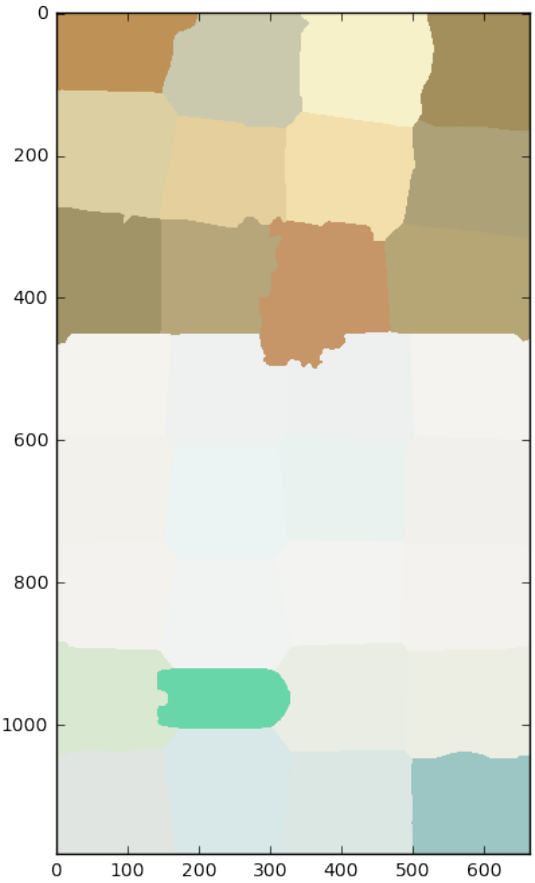

```
In [19]: ns=72
         compact=70
         sigma=2.0
         # Apply to the image set
         for i,img in enumerate(imgset):
             rgbimg = img_as_float(color.gray2rgb(img))
             plt.figure()
             plt.subplot(1, 2, 1)
             plt.imshow(img)
             plt.subplot(1, 2, 2)
             plt.imshow(plot_slic_segmentation(rgbimg,ns,compact,sigma))
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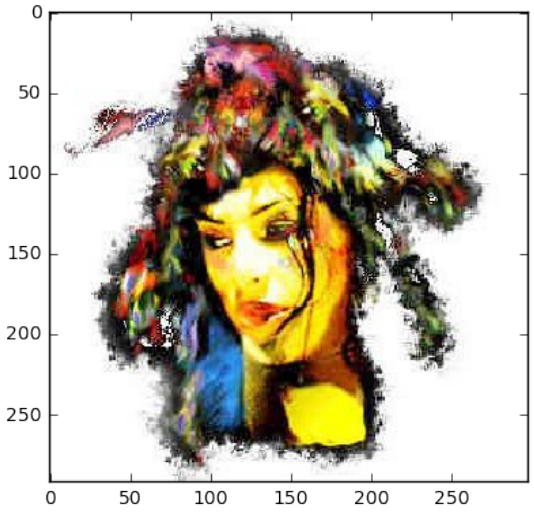
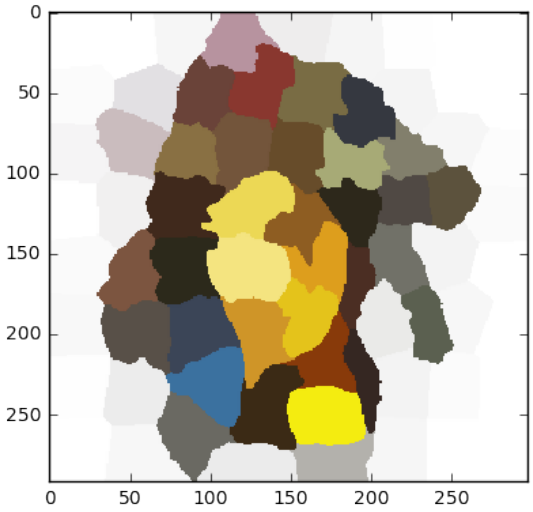
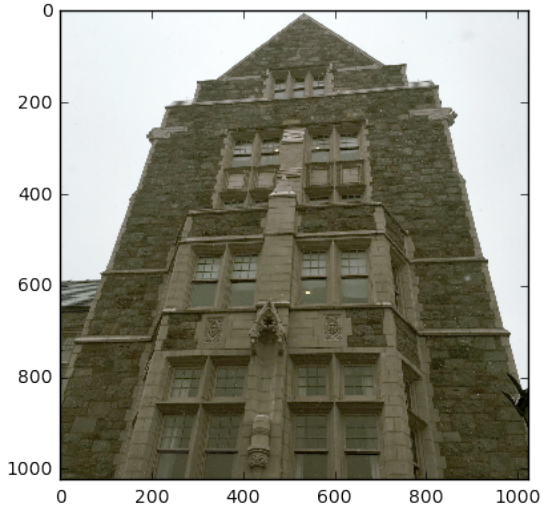
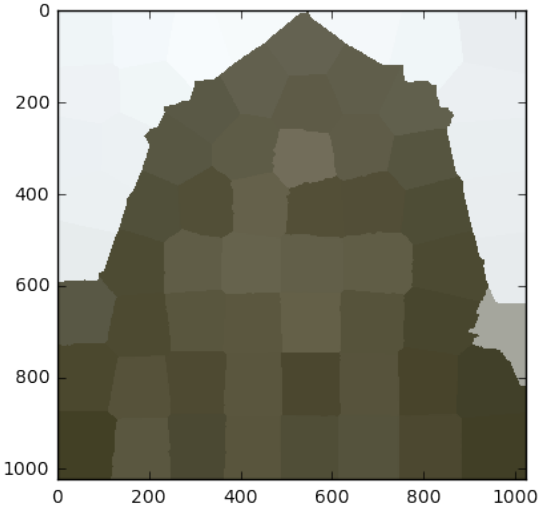

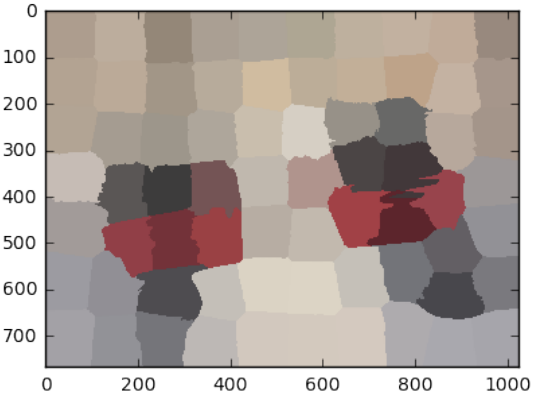

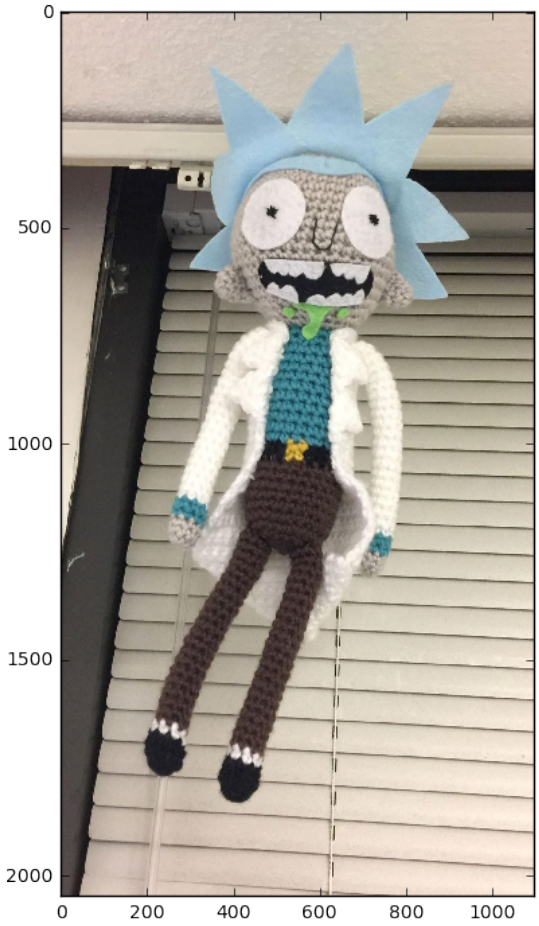
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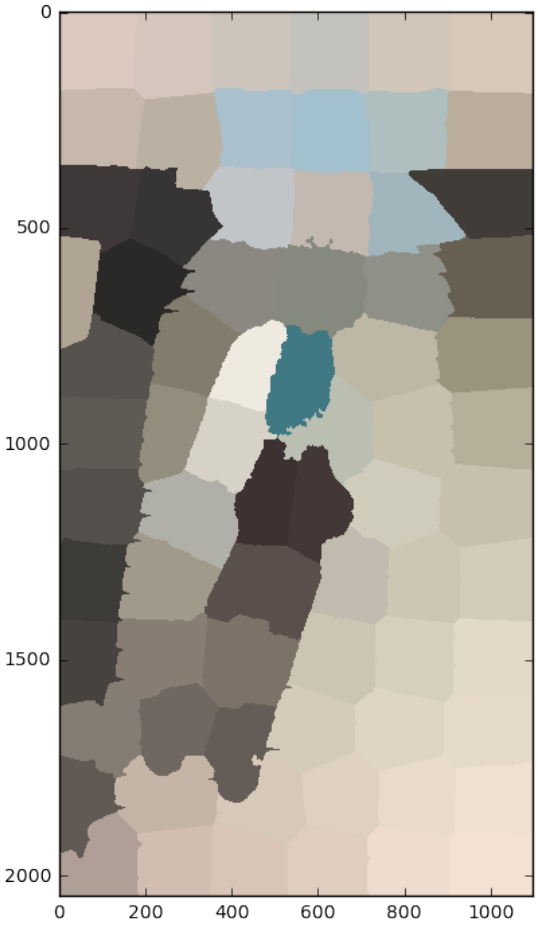
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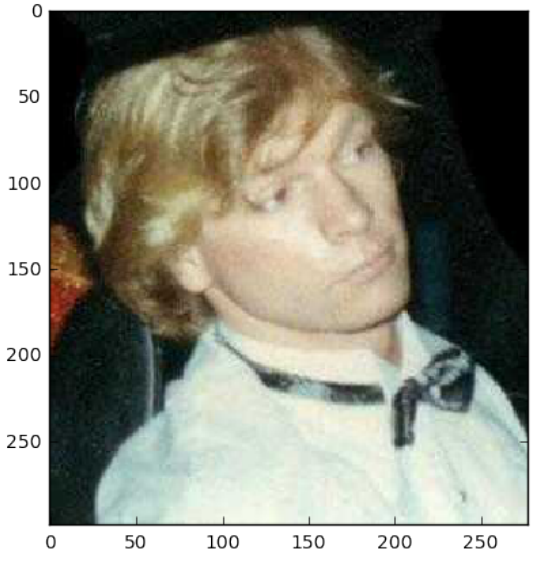
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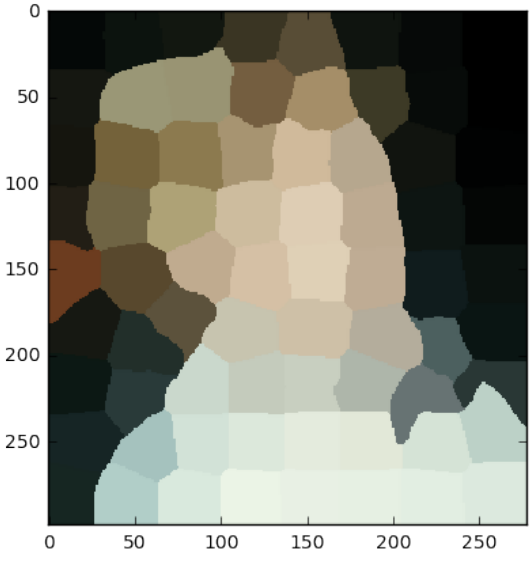
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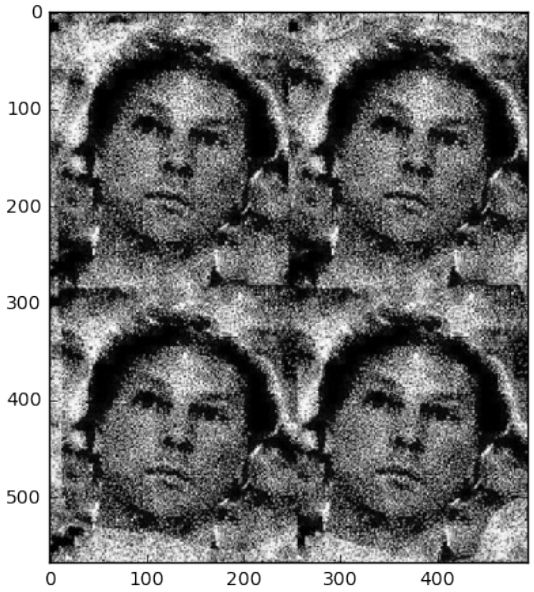
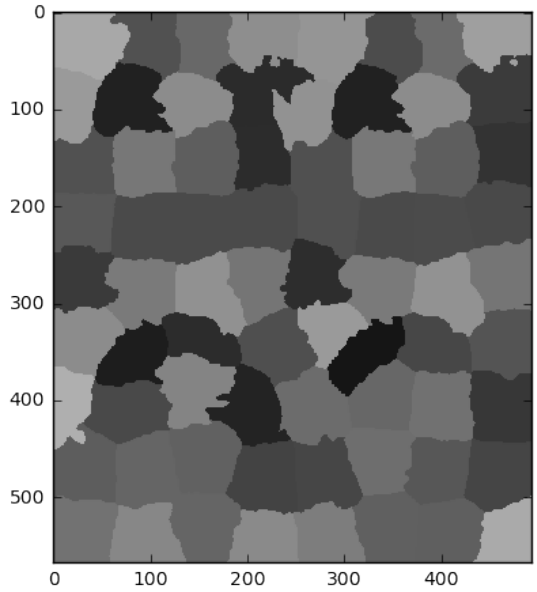
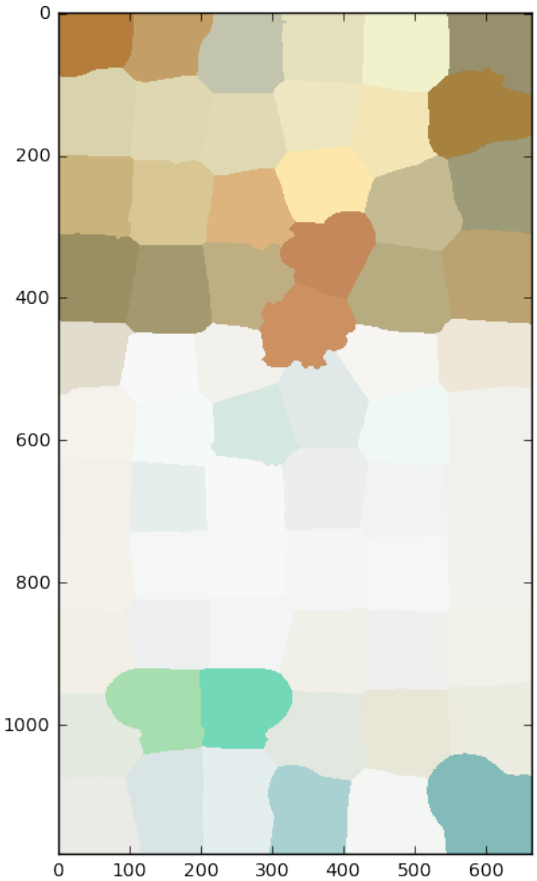
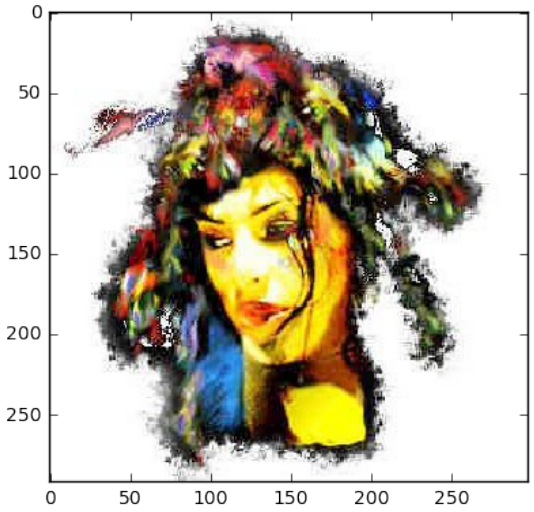
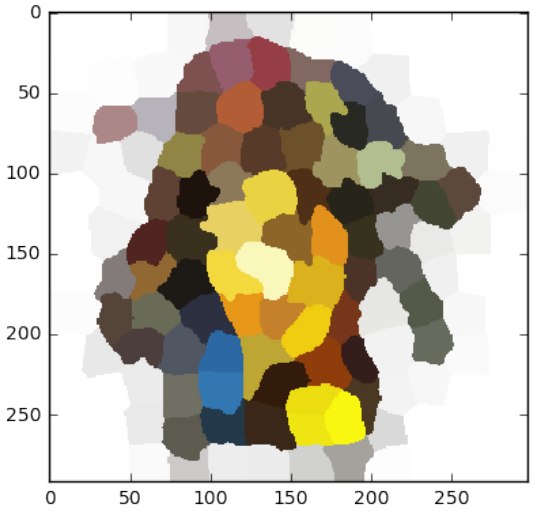
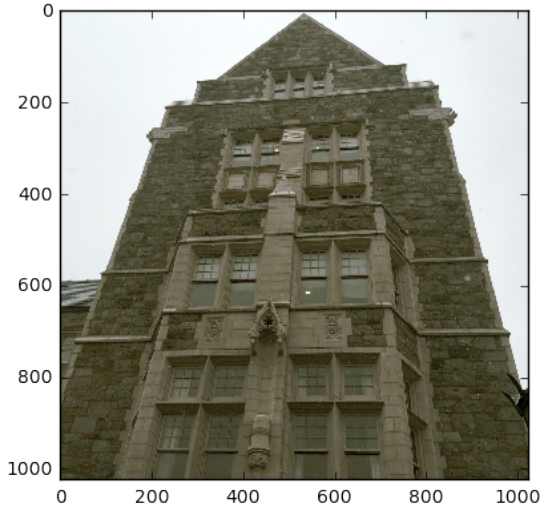
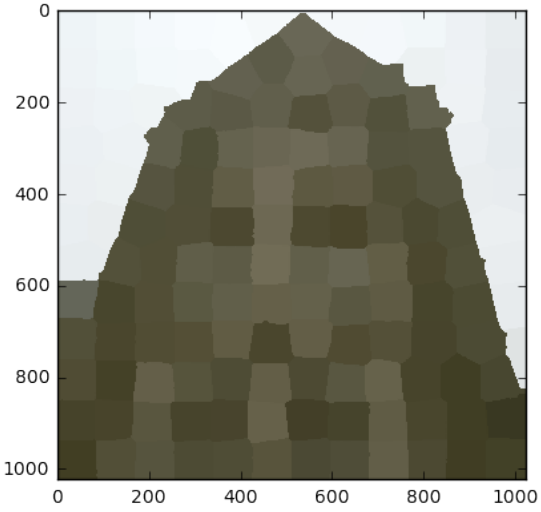


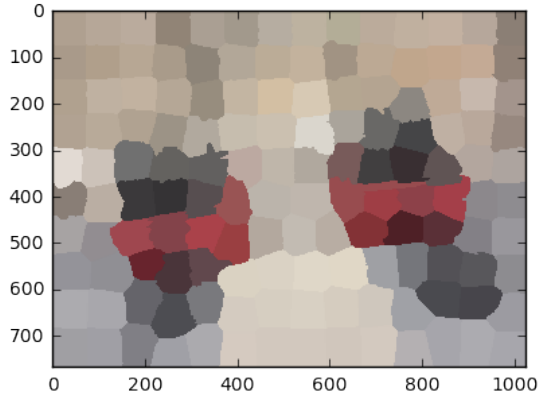


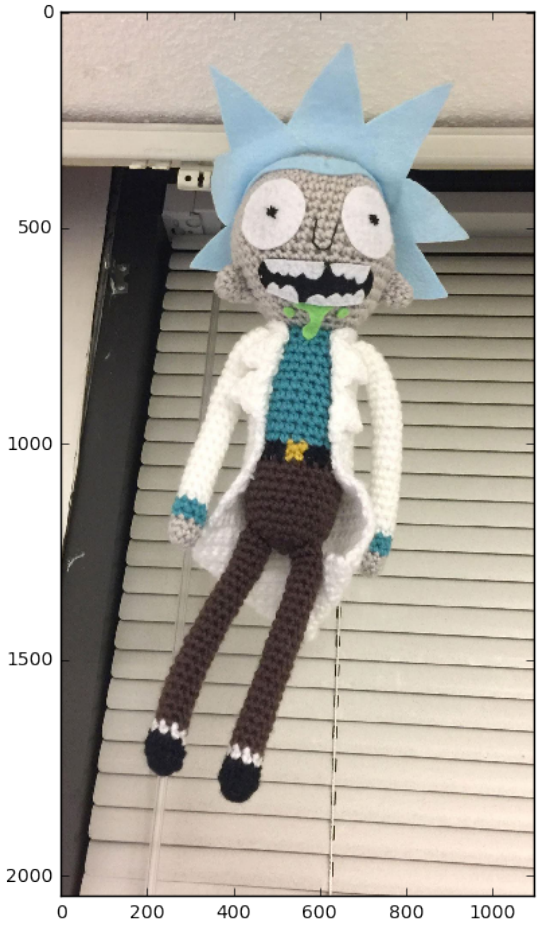

8:15 PM
CP910
Teddiursa
93 / 93 HP
4.24kg
WEIGHT
NORMAL
0.46m
HEIGHT
89445
STARDUST
13
TEDDIURSA CANDY
POWER UP
5000
4
EVOLVE



```
In [20]: ns=144
         compact=70
         sigma=2.0
         # Apply to the image set
         for i,img in enumerate(imgset):
             rgbimg = img_as_float(color.gray2rgb(img))
             plt.figure()
             plt.subplot(1, 2, 1)
             plt.imshow(img)
             plt.subplot(1, 2, 2)
             plt.imshow(plot_slic_segmentation(rgbimg,ns,compact,sigma))
```

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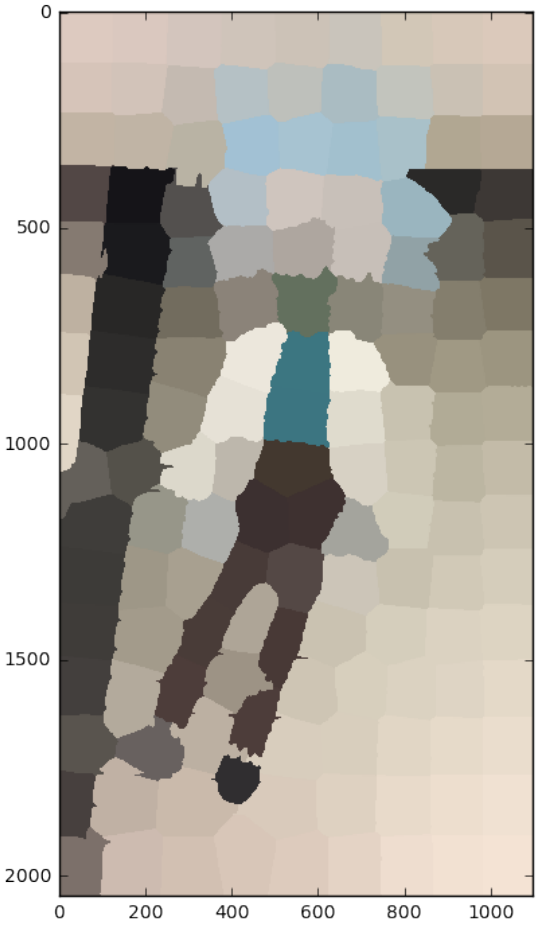
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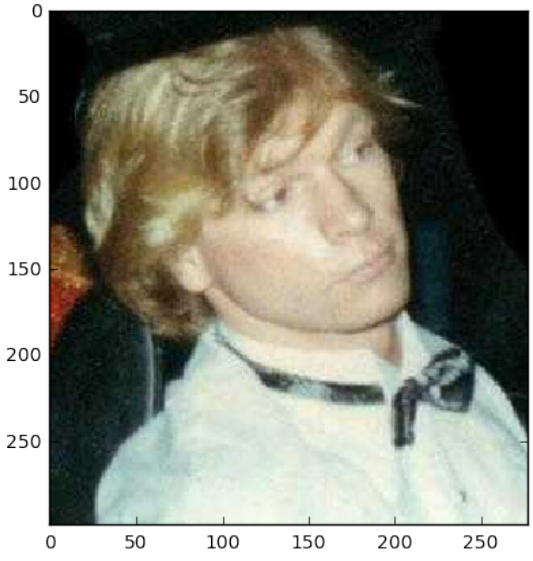
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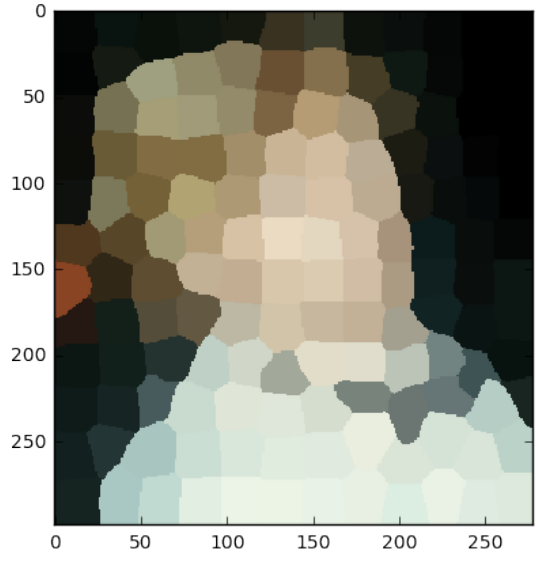
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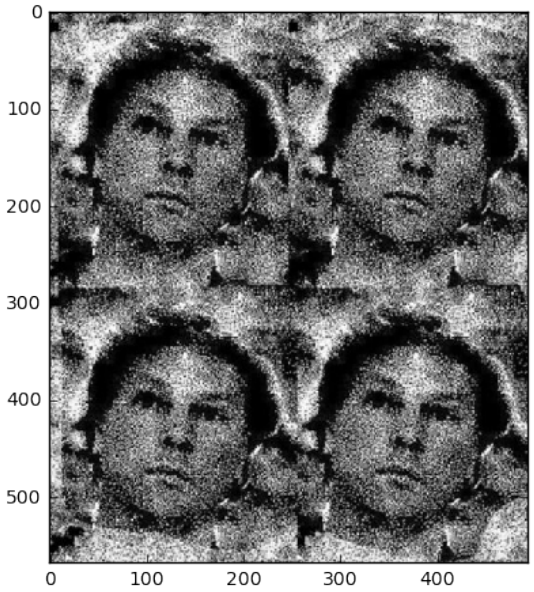

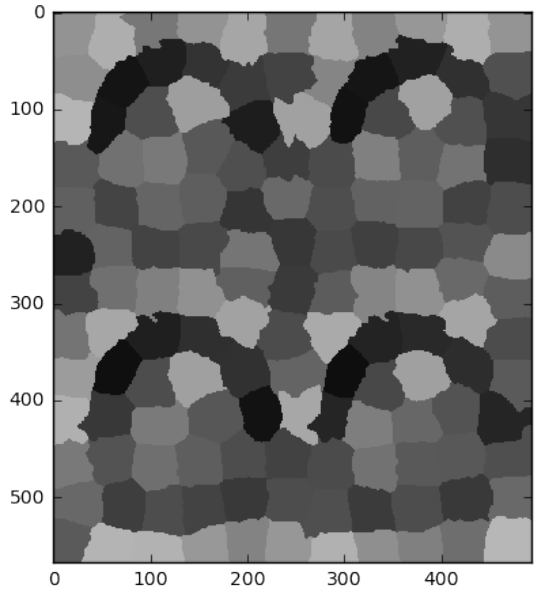


8:15 PM
CP910
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4.24kg
WEIGHT
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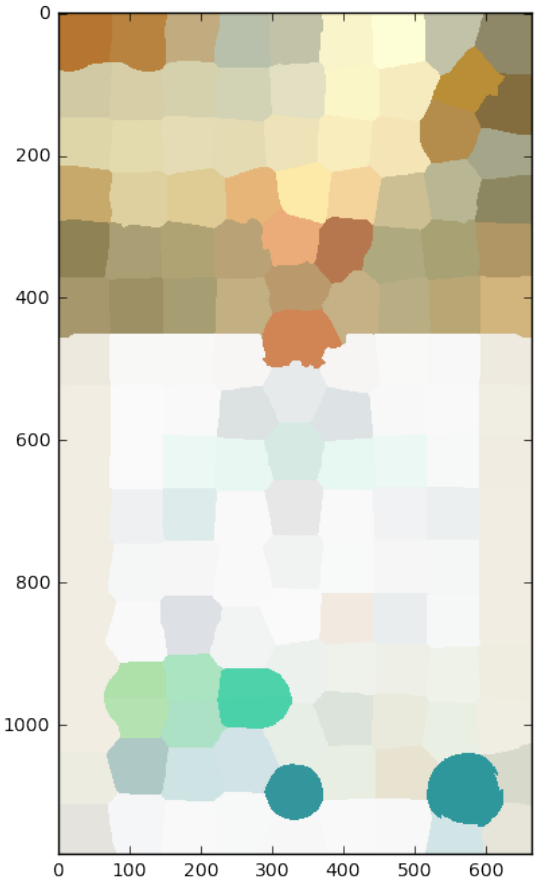
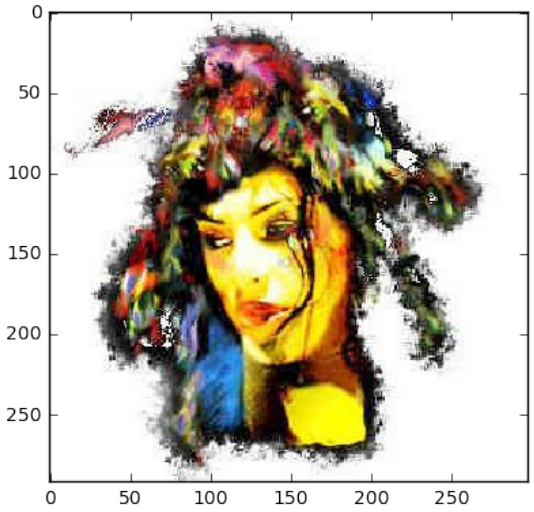
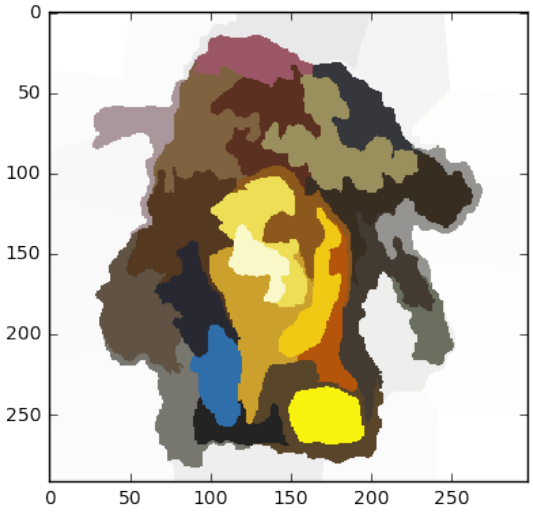
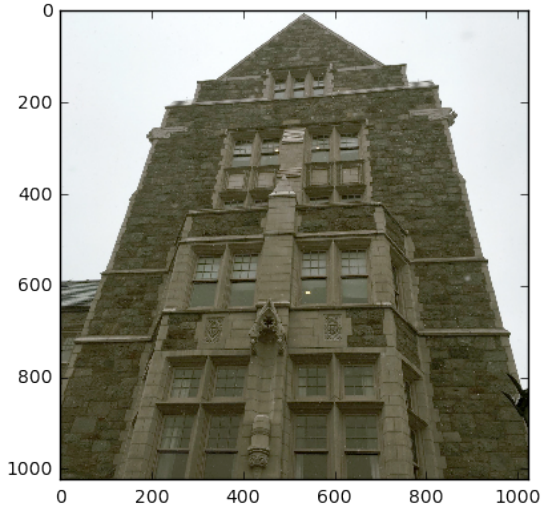
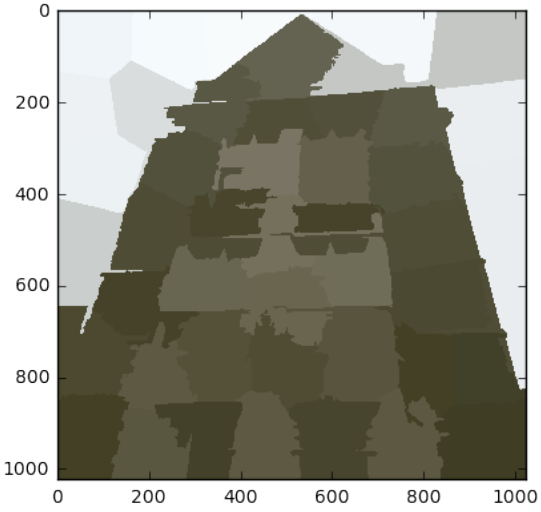
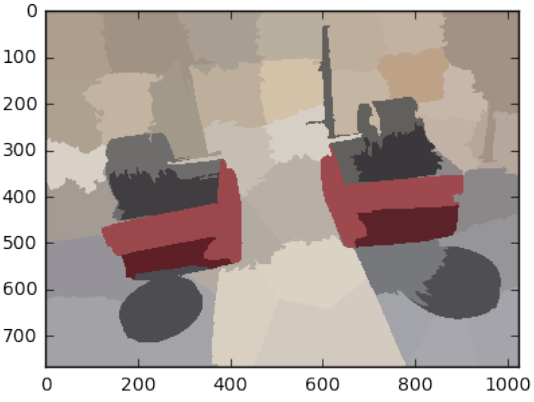
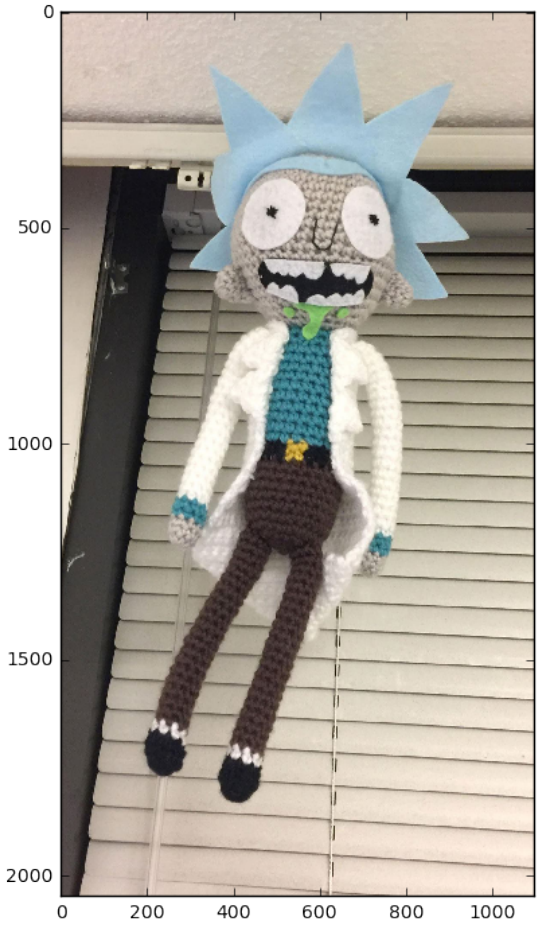
0.46m
HEIGHT
89445
STARDUST
13
TEDDIURSA CANDY
POWER UP
5000
4
EVOLVE



```
In [21]: ns=55
         compact=20
         sigma=2.0
         # Apply to the image set
         for i,img in enumerate(imgset):
             rgbimg = img_as_float(color.gray2rgb(img))
             plt.figure()
             plt.subplot(1, 2, 1)
             plt.imshow(img)
             plt.subplot(1, 2, 2)
             plt.imshow(plot_slic_segmentation(rgbimg,ns,compact,sigma))
```

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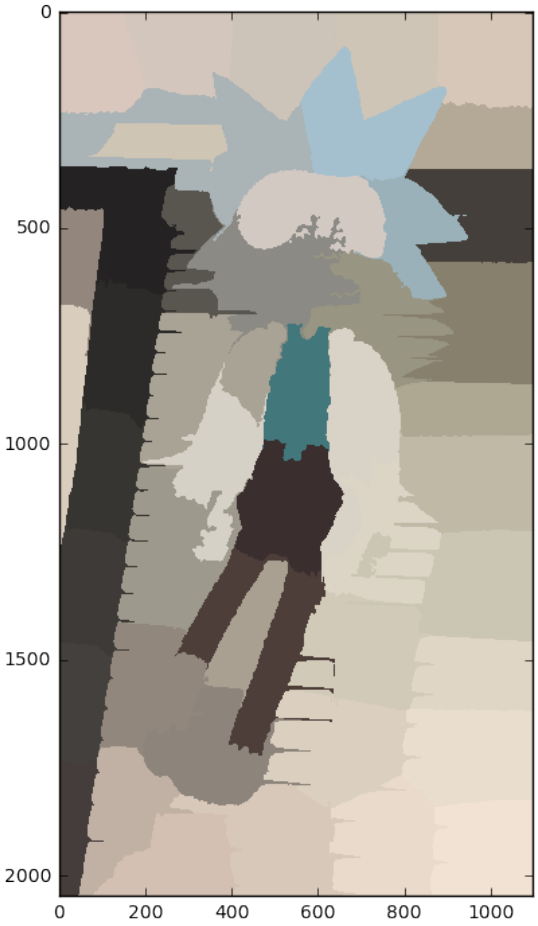
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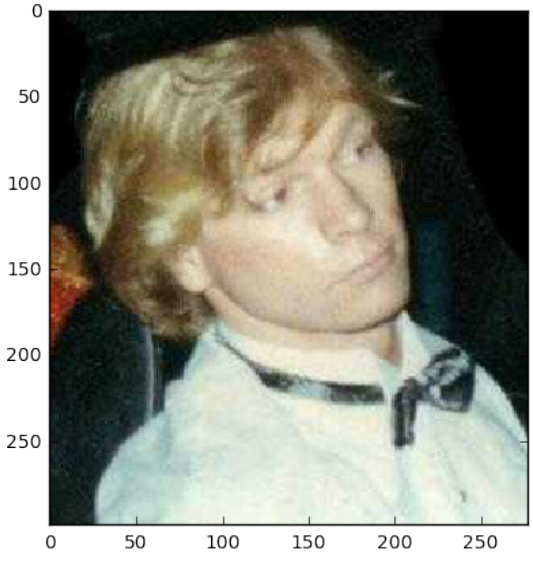
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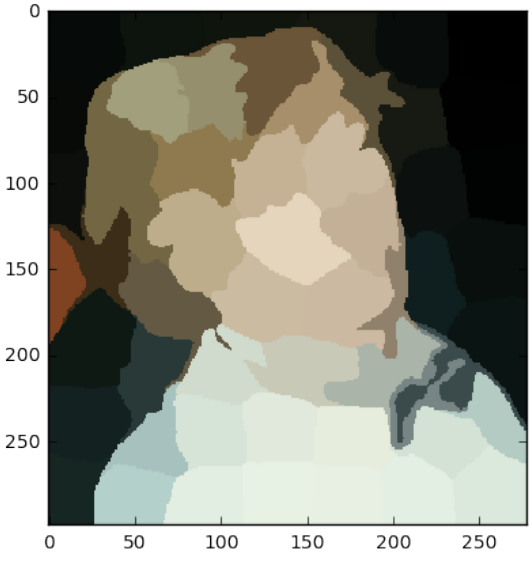
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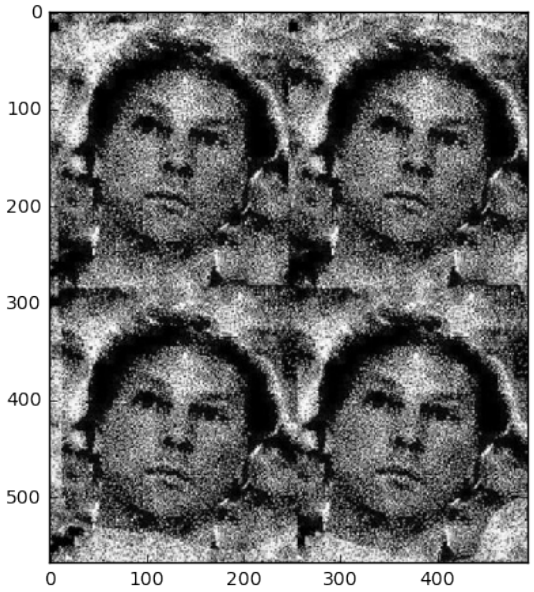
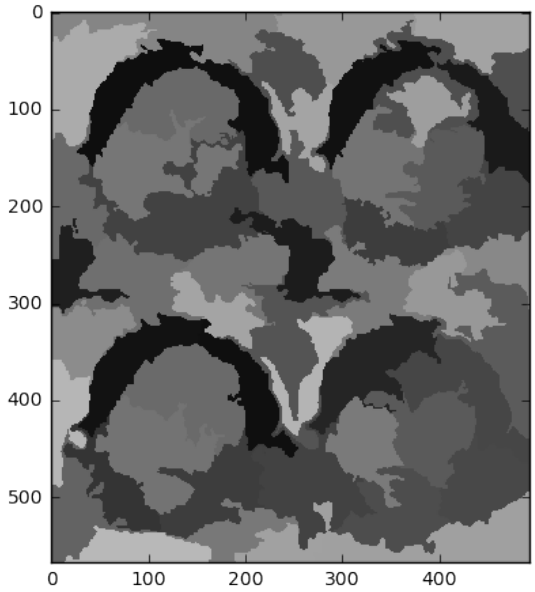
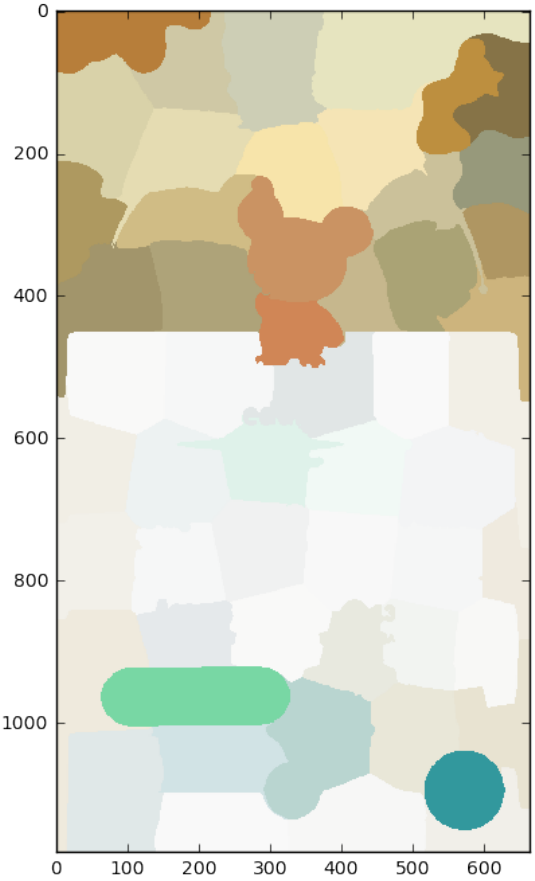
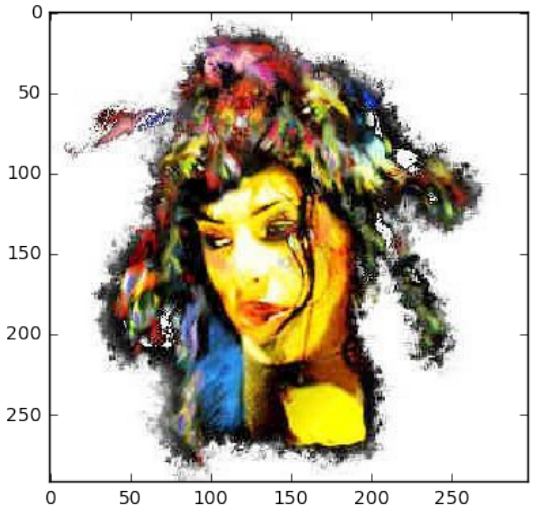
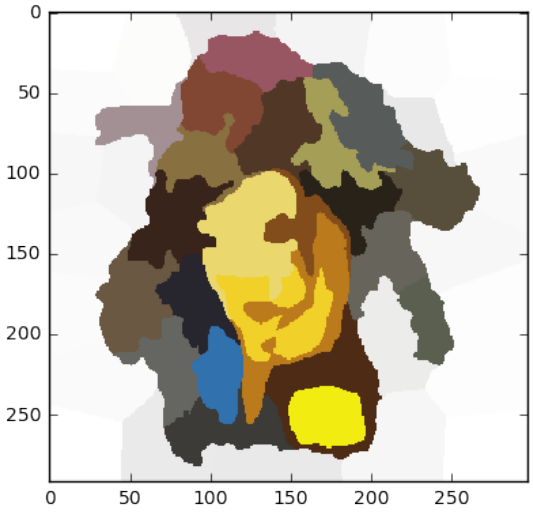
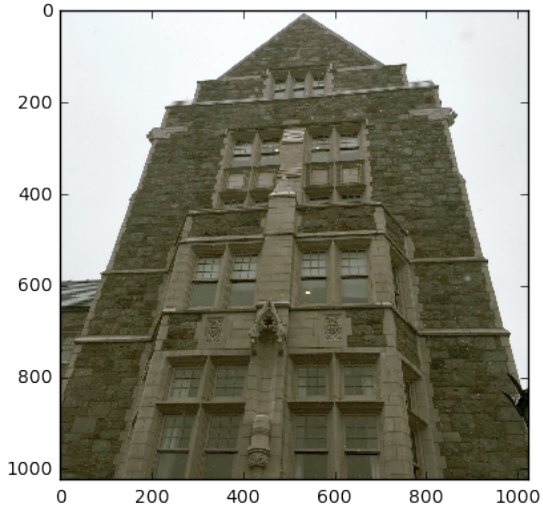
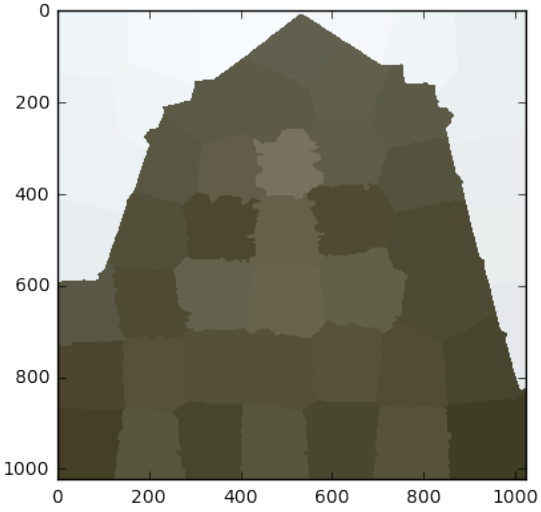


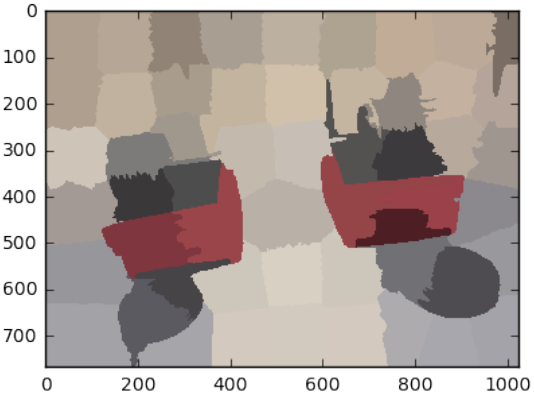


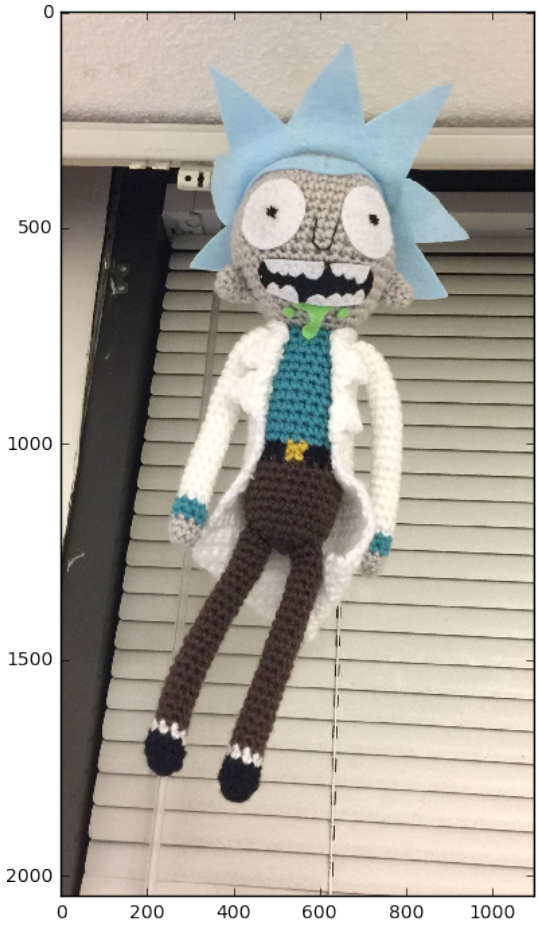

8:15 PM
CP910
Teddiursa
93 / 93 HP
4.24kg
WEIGHT
NORMAL
0.46m
HEIGHT
89445
STARDUST
13
TEDDIURSA CANDY
POWER UP
5000
4
EVOLVE



```
In [22]: ns=55
         compact=40
         sigma=2.0
         # Apply to the image set
         for i,img in enumerate(imgset):
             rgbimg = img_as_float(color.gray2rgb(img))
             plt.figure()
             plt.subplot(1, 2, 1)
             plt.imshow(img)
             plt.subplot(1, 2, 2)
             plt.imshow(plot_slic_segmentation(rgbimg,ns,compact,sigma))
```

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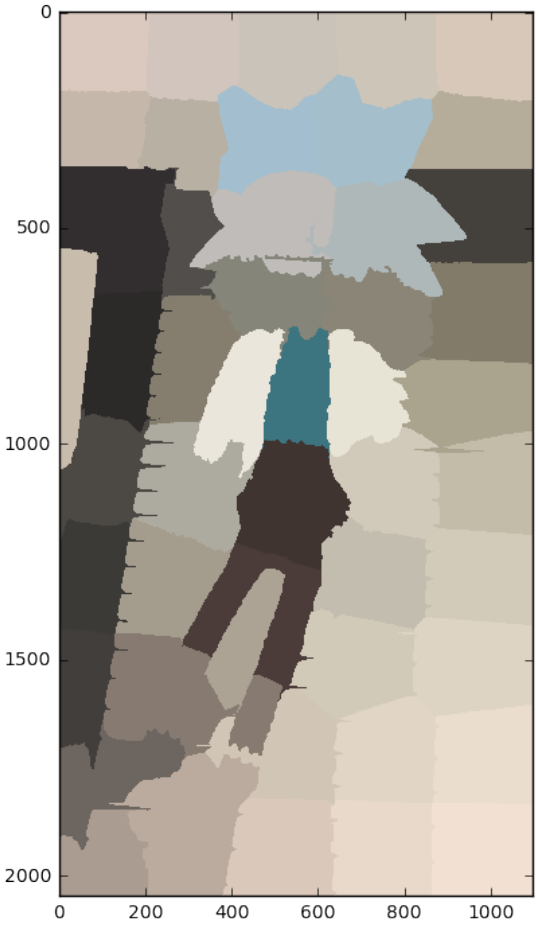
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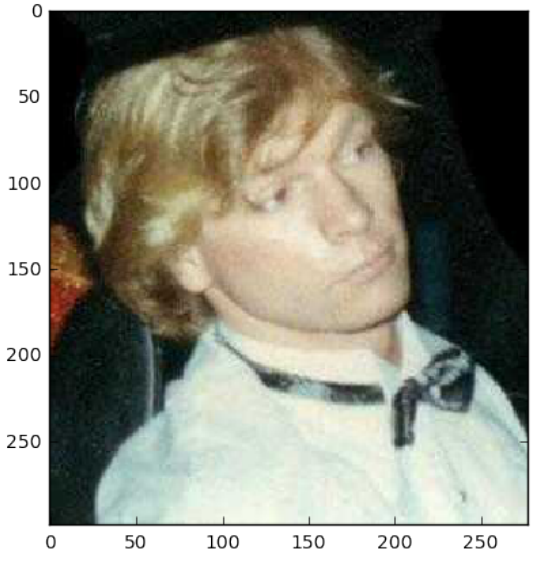
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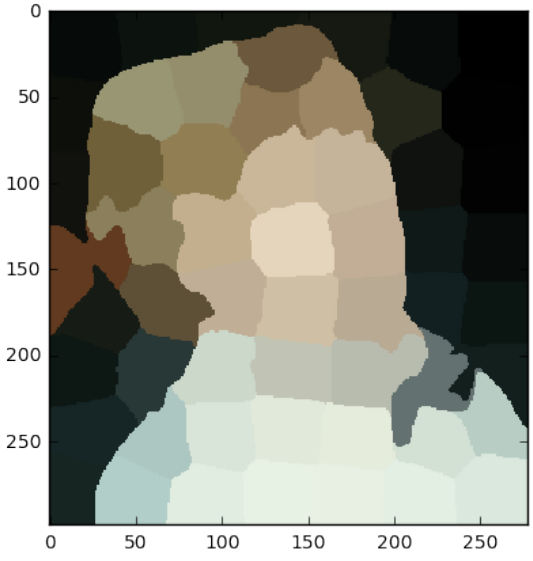
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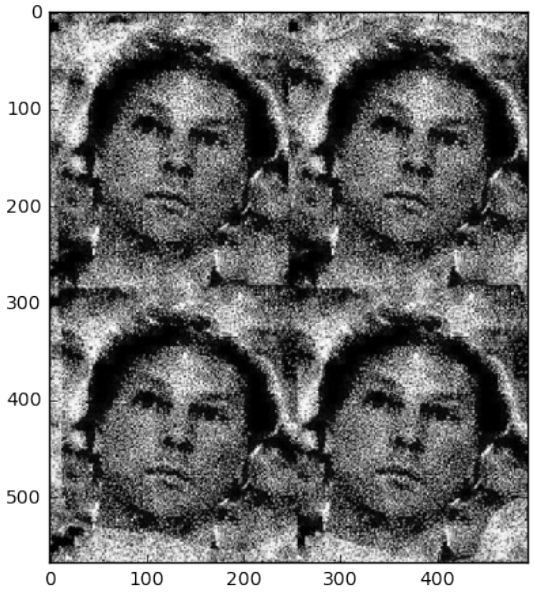

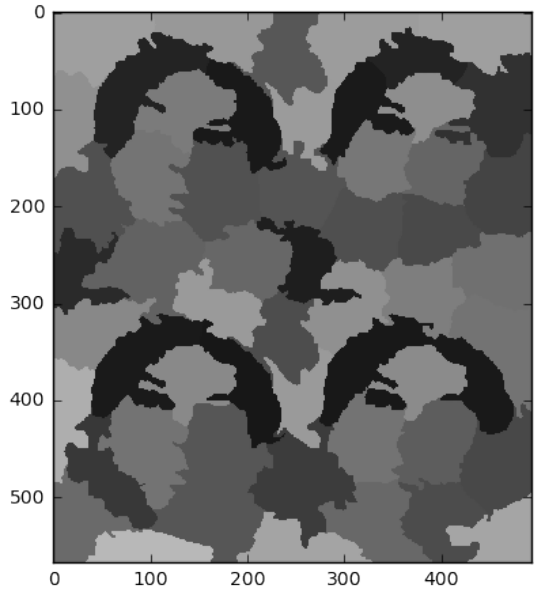


8:15 PM
CP910
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WEIGHT
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89445
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TEDDIURSA CANDY
POWER UP
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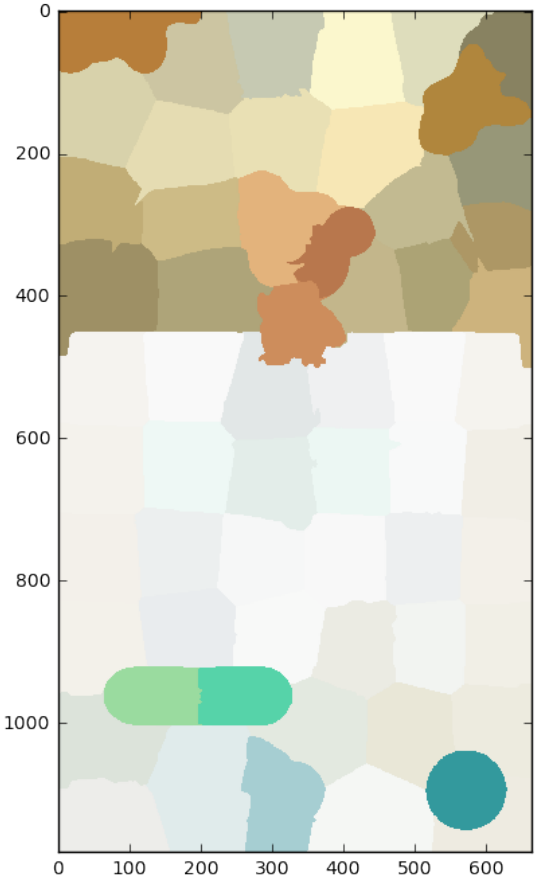
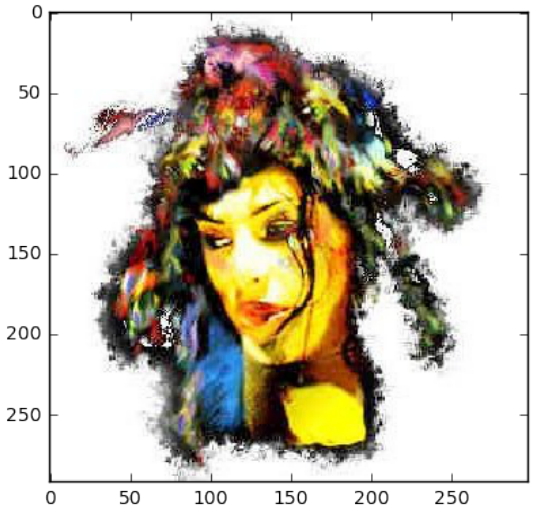
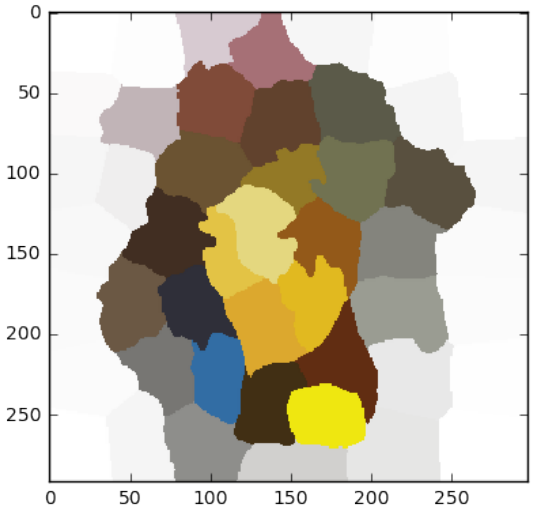
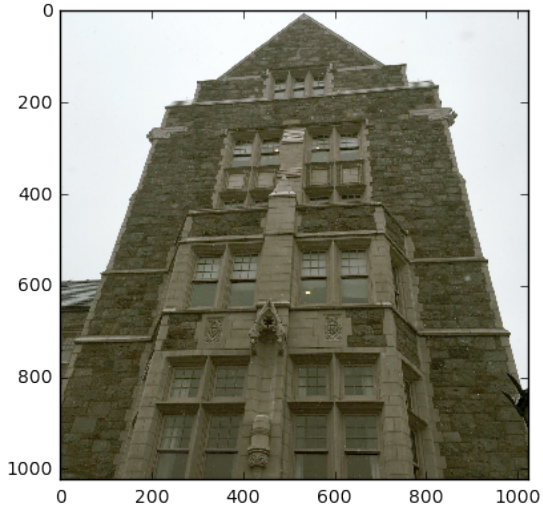
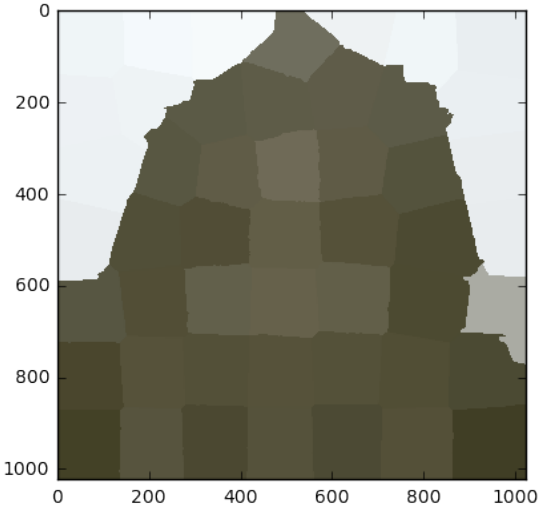
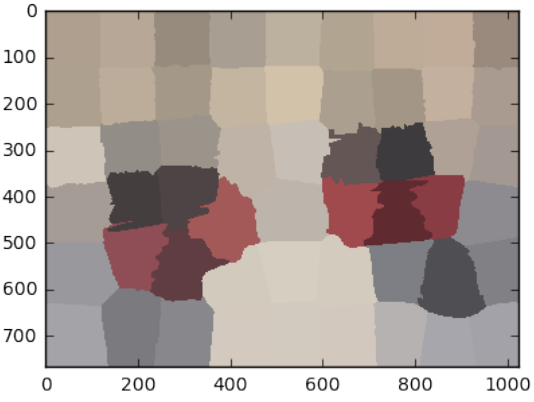
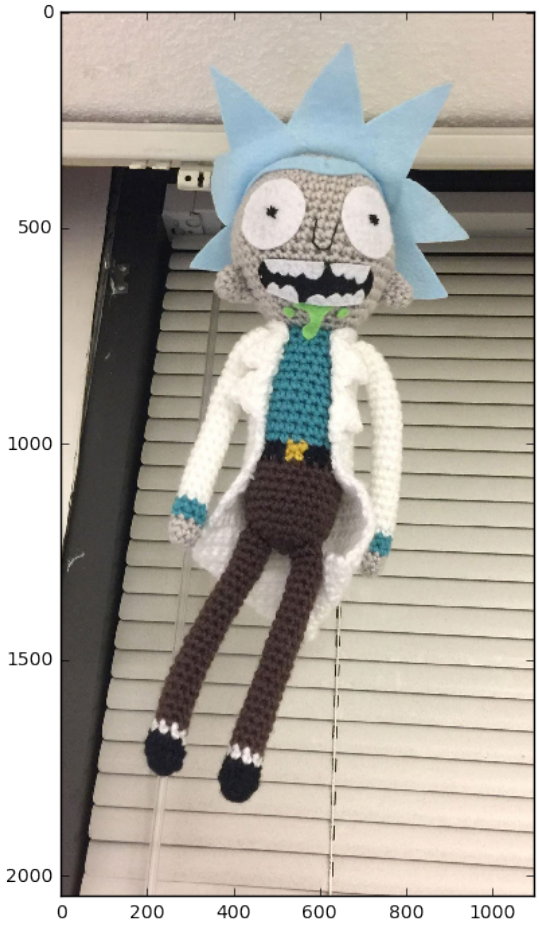
4
EVOLVE



```
In [23]: ns=55
         compact=80
         sigma=2.0
         # Apply to the image set
         for i,img in enumerate(imgset):
             rgbimg = img_as_float(color.gray2rgb(img))
             plt.figure()
             plt.subplot(1, 2, 1)
             plt.imshow(img)
             plt.subplot(1, 2, 2)
             plt.imshow(plot_slic_segmentation(rgbimg,ns,compact,sigma))
```

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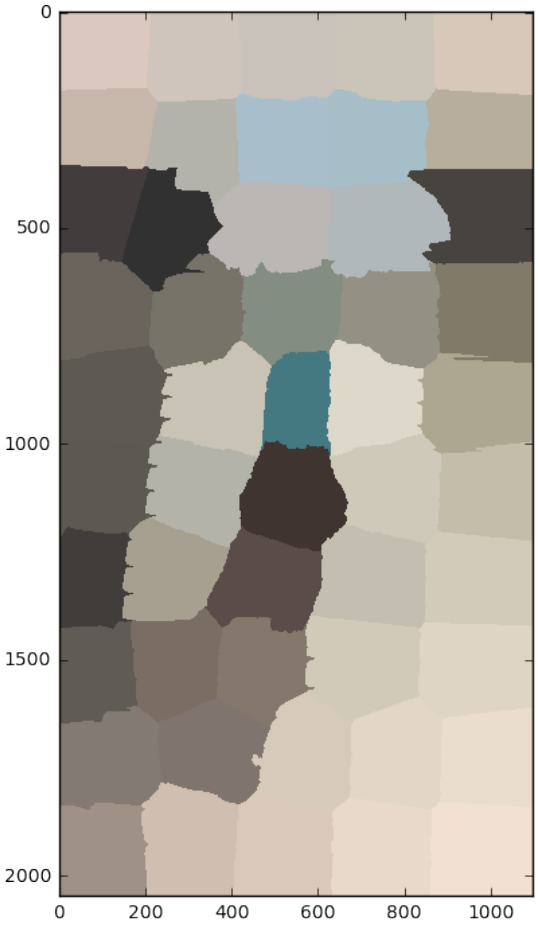
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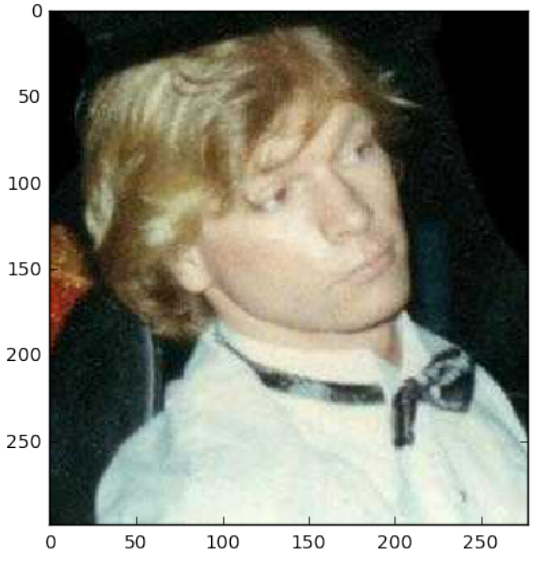
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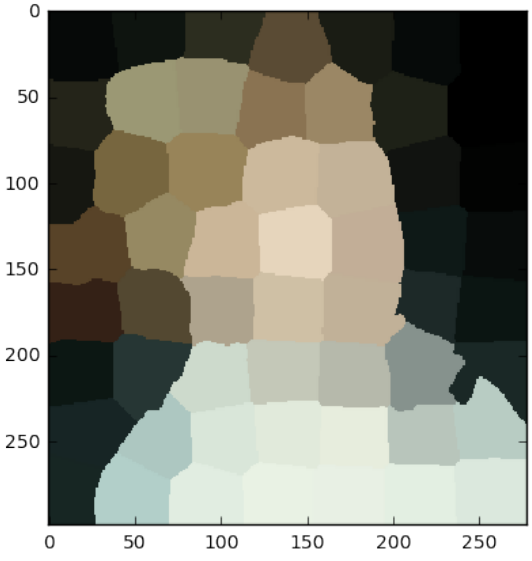
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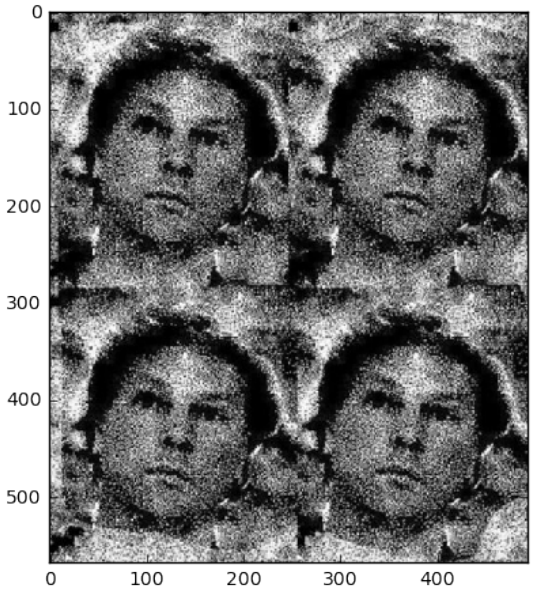
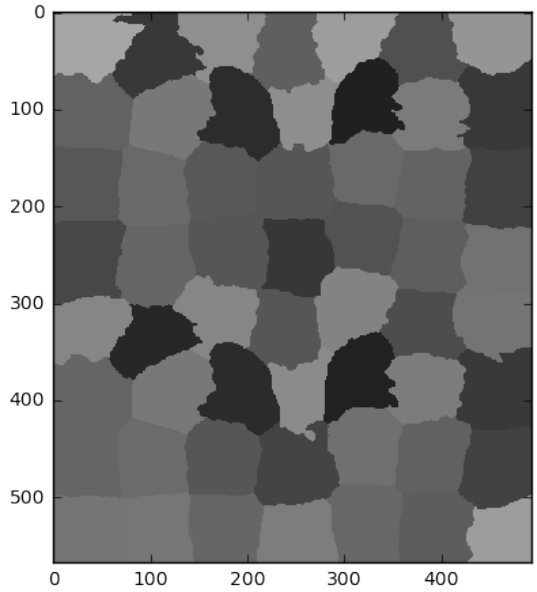
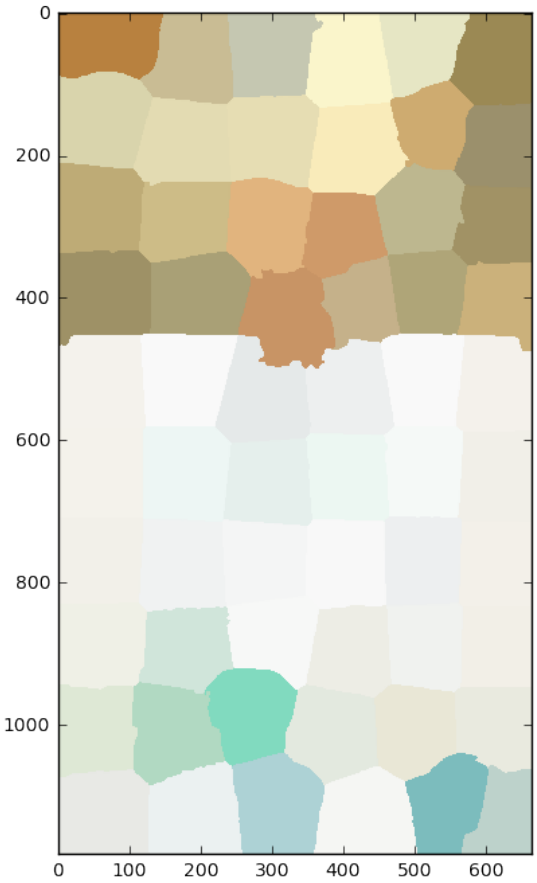
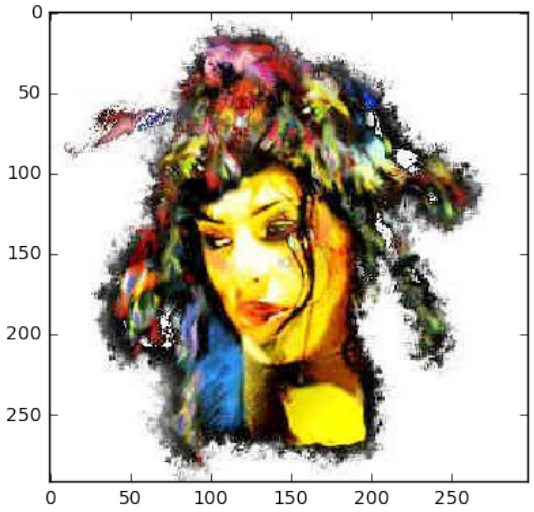
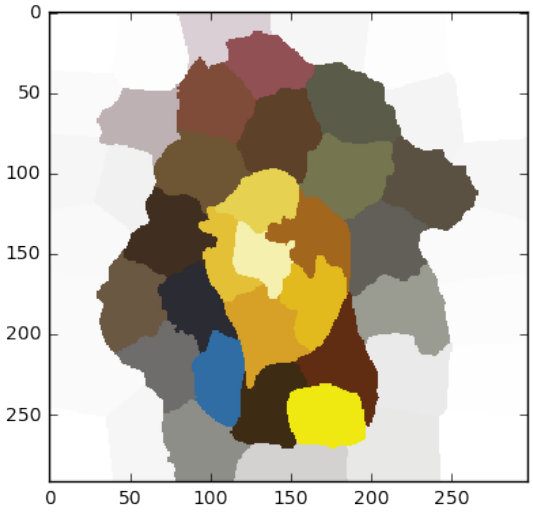
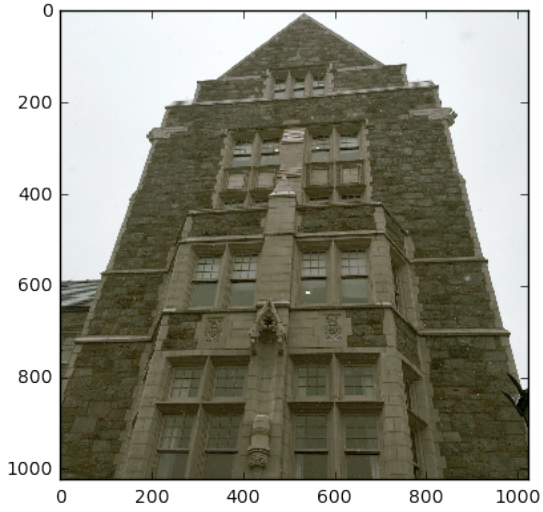
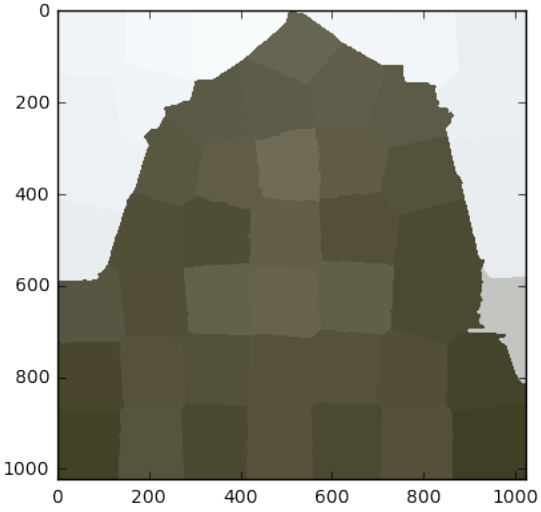


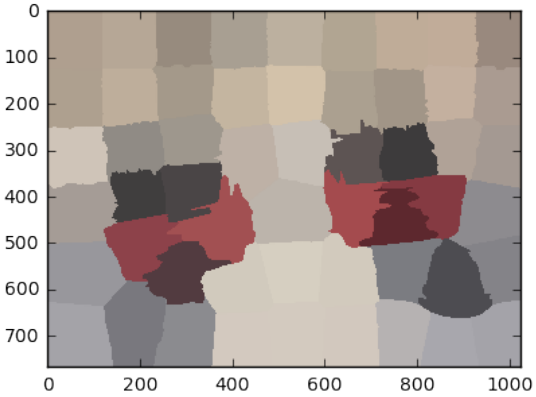


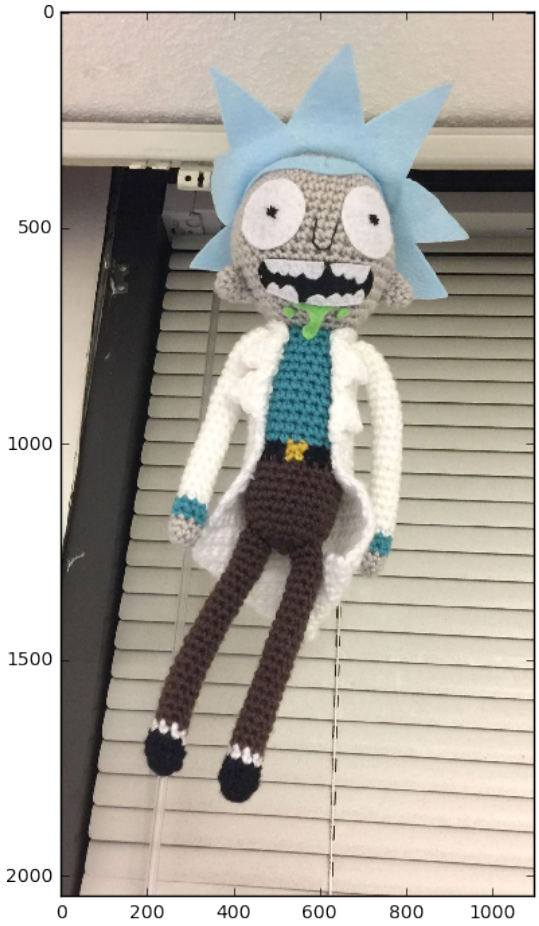

8:15 PM
CP910
Teddiursa
93 / 93 HP
4.24kg
WEIGHT
NORMAL
0.46m
HEIGHT
89445
STARDUST
13
TEDDIURSA CANDY
POWER UP
5000
4
EVOLVE



```
In [24]: ns=55
         compact=70
         sigma=2.0
         # Apply to the image set
         for i,img in enumerate(imgset):
             rgbimg = img_as_float(color.gray2rgb(img))
             plt.figure()
             plt.subplot(1, 2, 1)
             plt.imshow(img)
             plt.subplot(1, 2, 2)
             plt.imshow(plot_slic_segmentation(rgbimg,ns,compact,sigma))
```

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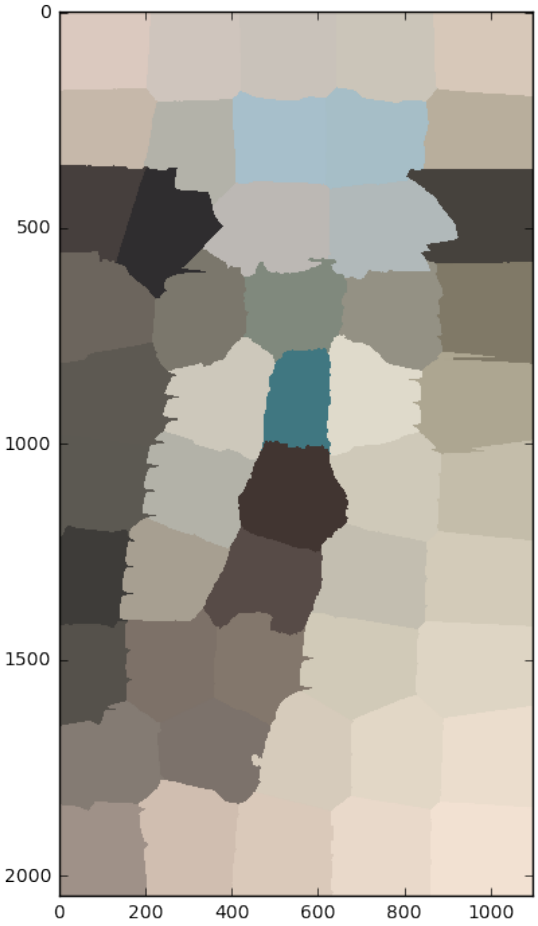
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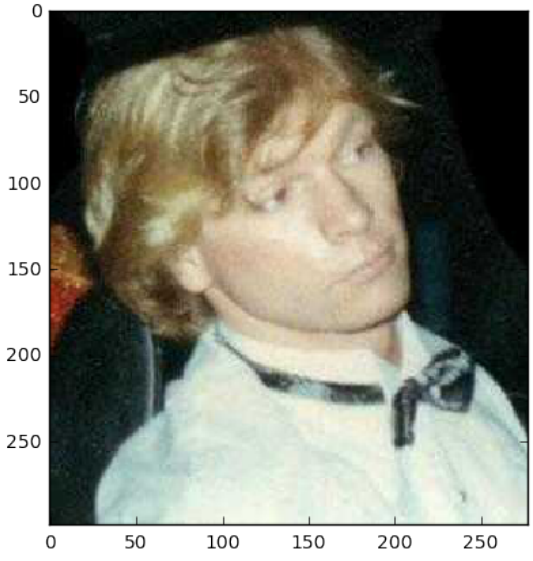
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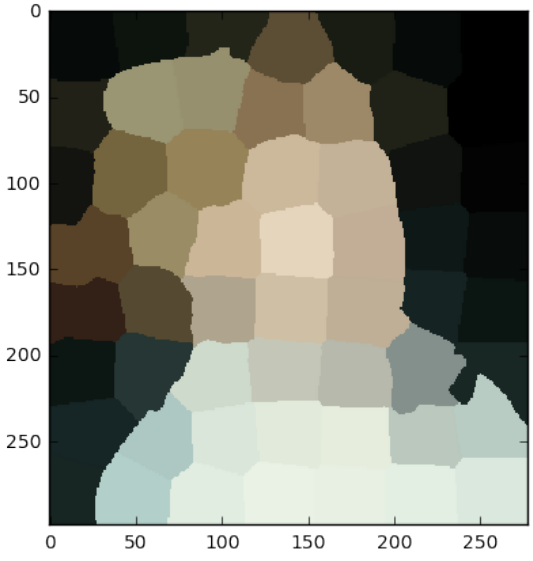
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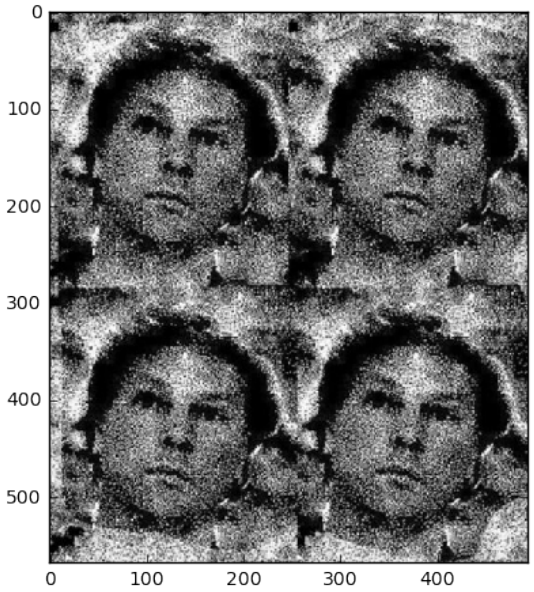
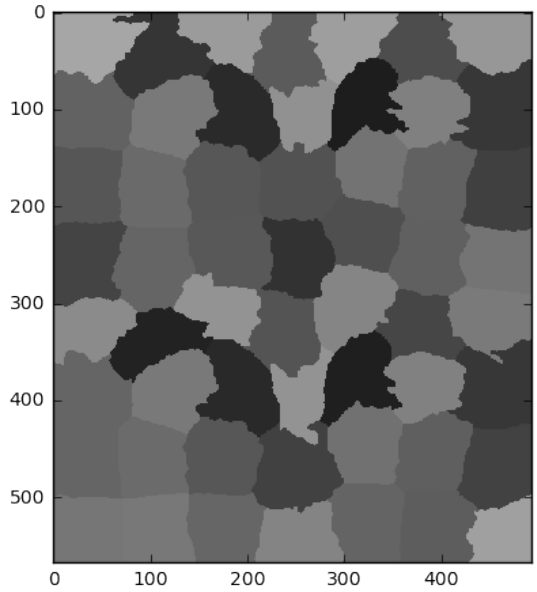
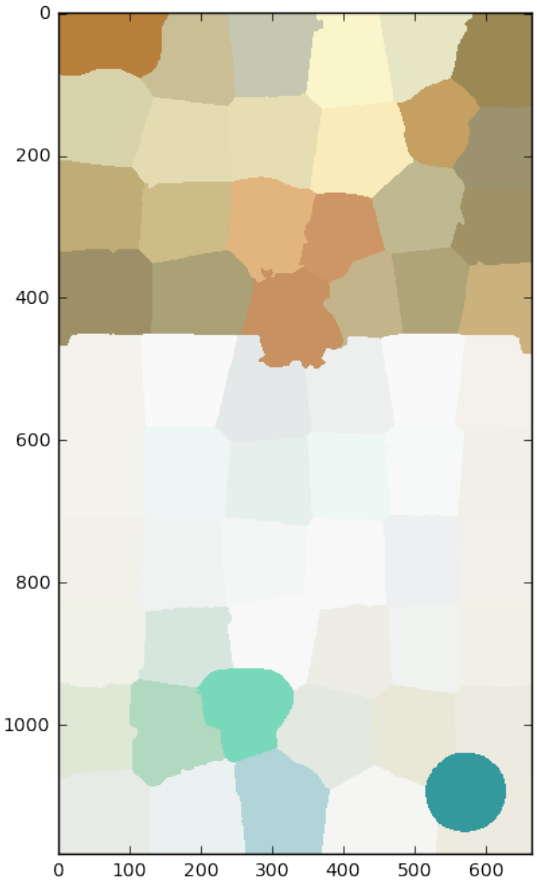
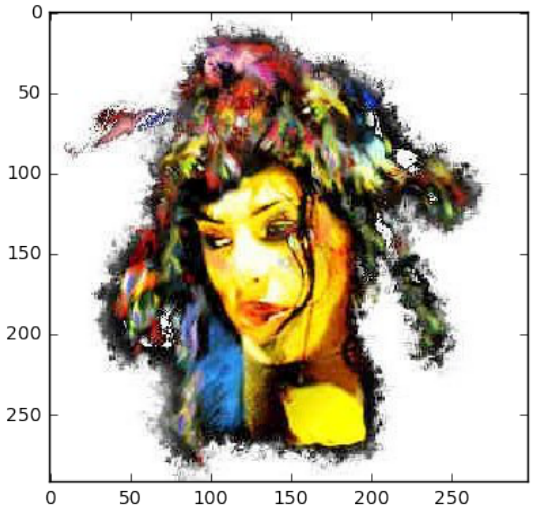
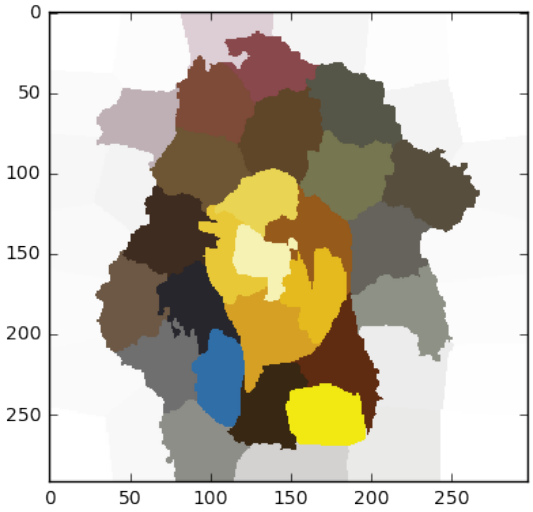
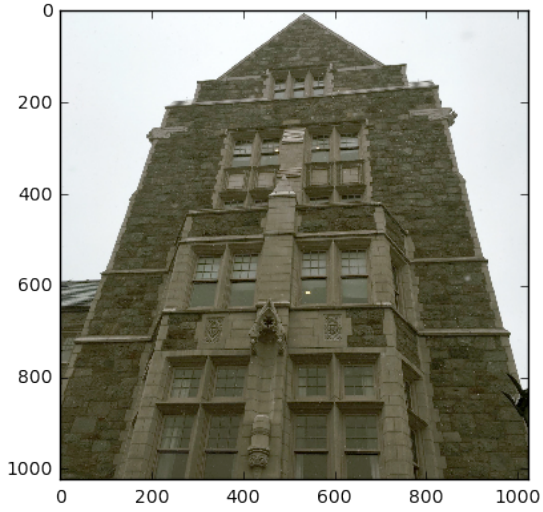
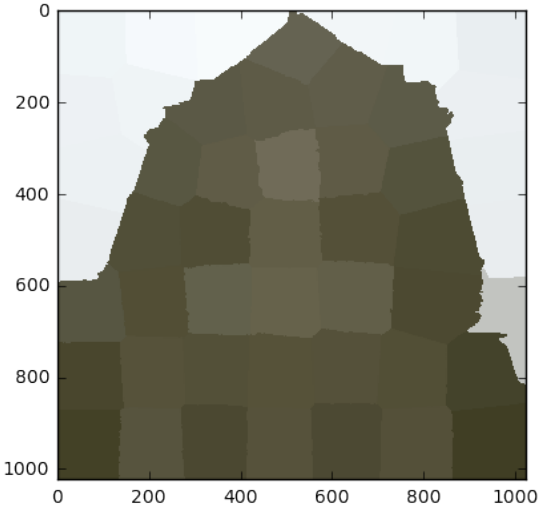


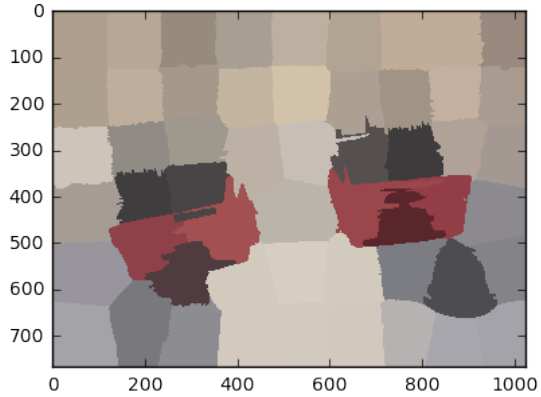


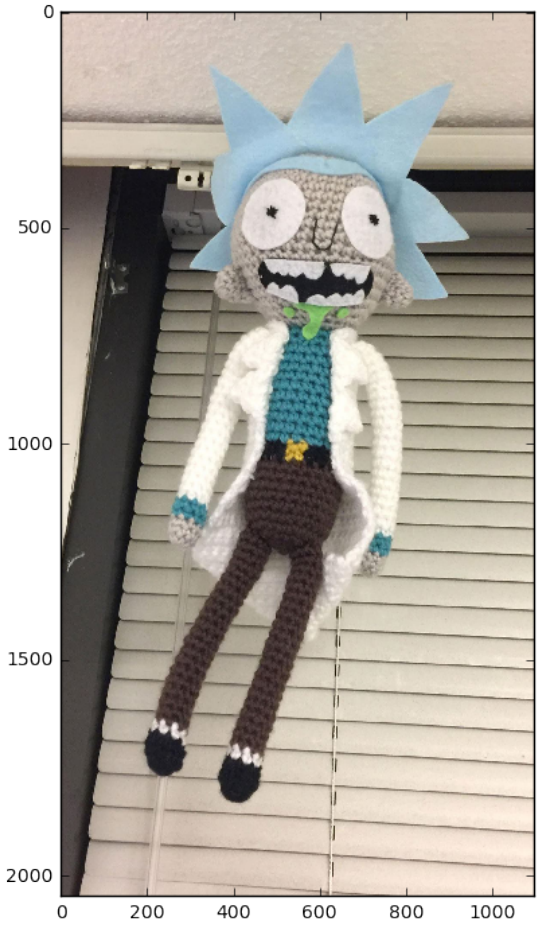

8:15 PM
CP910
Teddiursa
93 / 93 HP
4.24kg
WEIGHT
NORMAL
0.46m
HEIGHT
89445
STARDUST
13
TEDDIURSA CANDY
POWER UP
5000
4
EVOLVE



In [25]:
```
ns=55
compact=70
sigma=1.0
# Apply to the image set
for i,img in enumerate(imgset):
    rgbimg = img_as_float(color.gray2rgb(img))
    plt.figure()
    plt.subplot(1, 2, 1)
    plt.imshow(img)
    plt.subplot(1, 2, 2)
    plt.imshow(plot_slic_segmentation(rgbimg,ns,compact,sigma))
```

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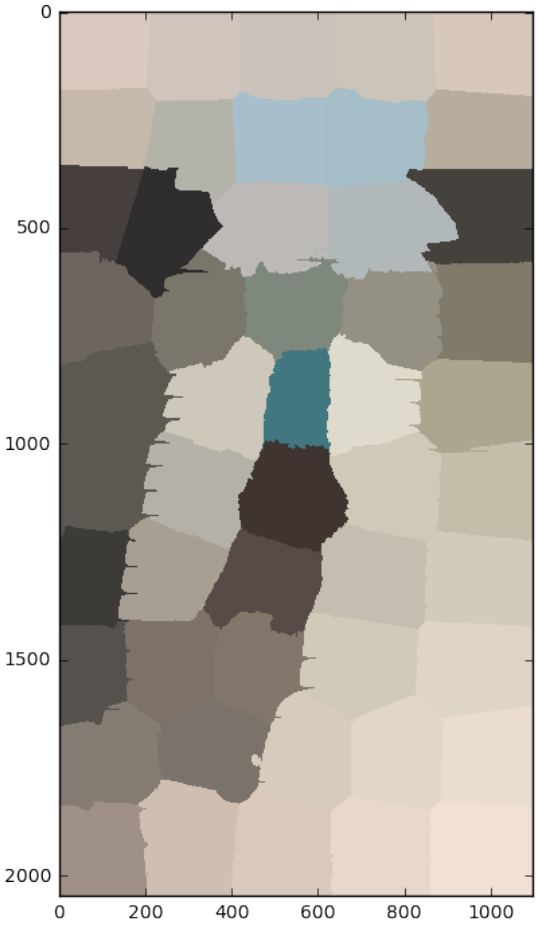
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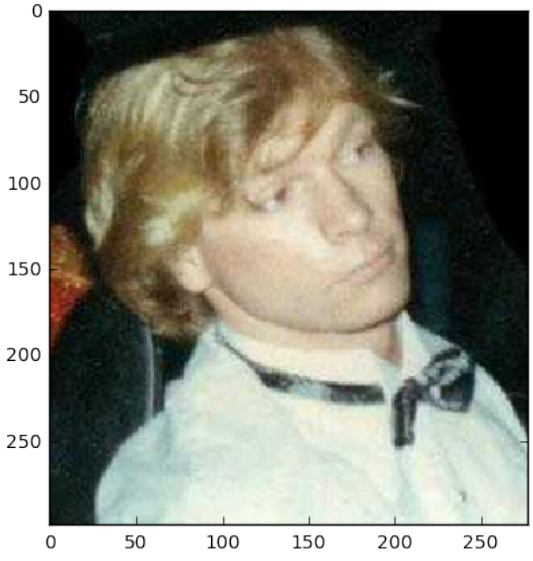
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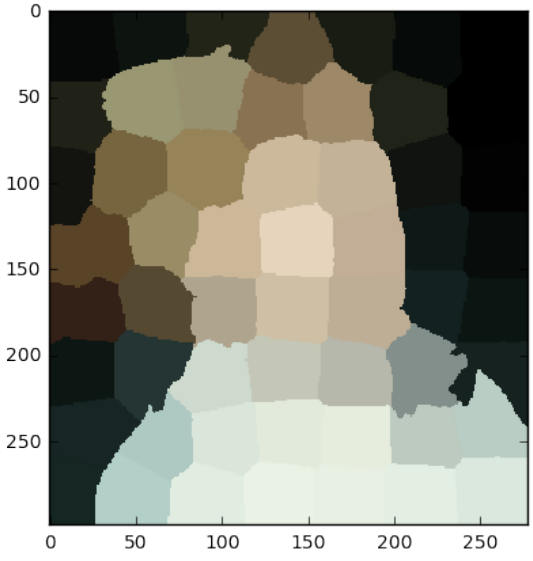
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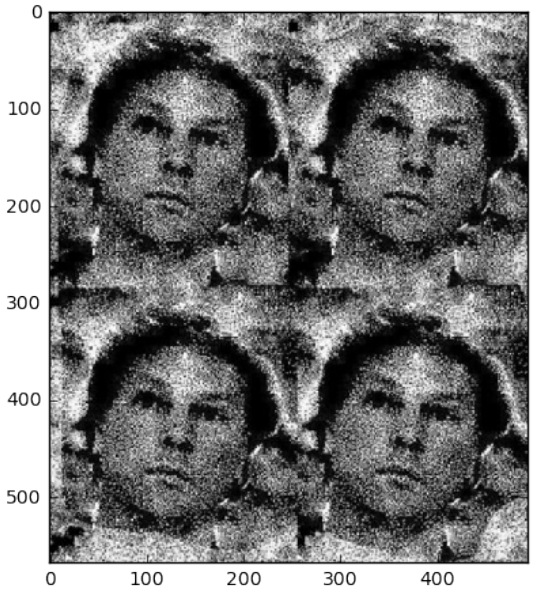

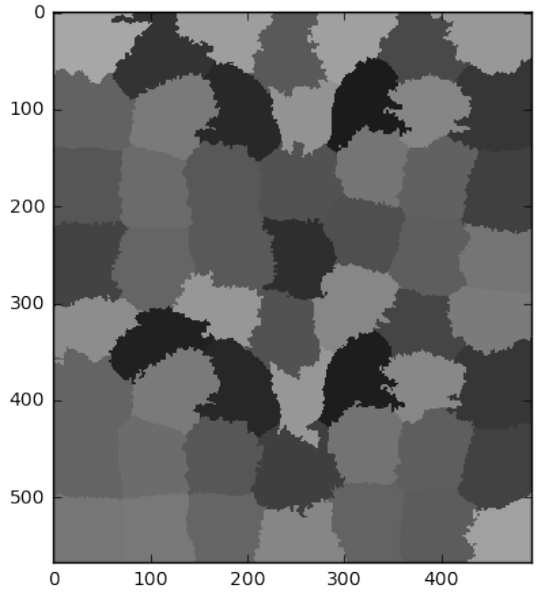


8:15 PM
CP910
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4.24kg
WEIGHT
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89445
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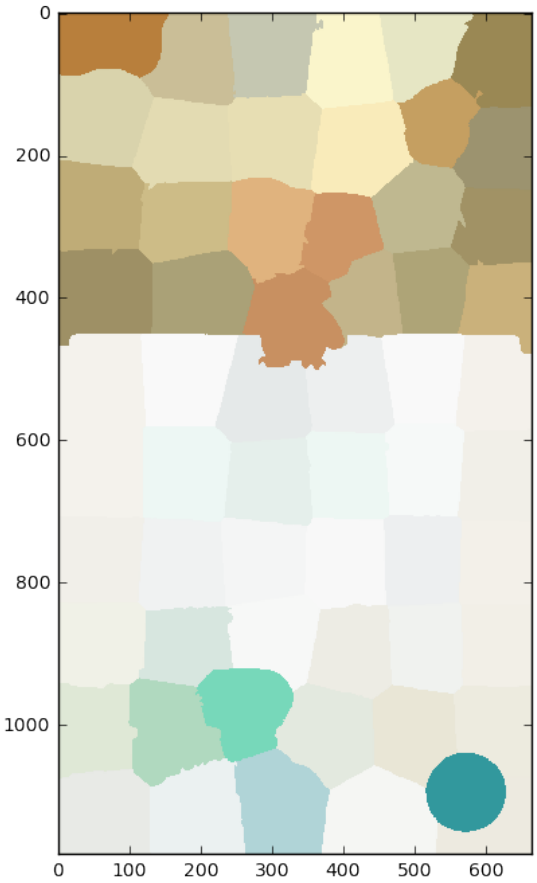
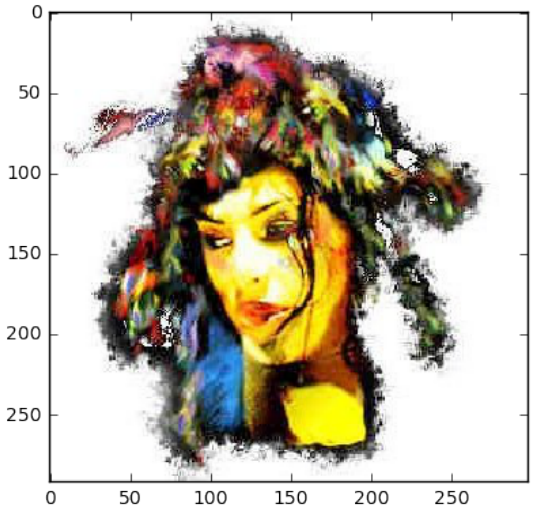
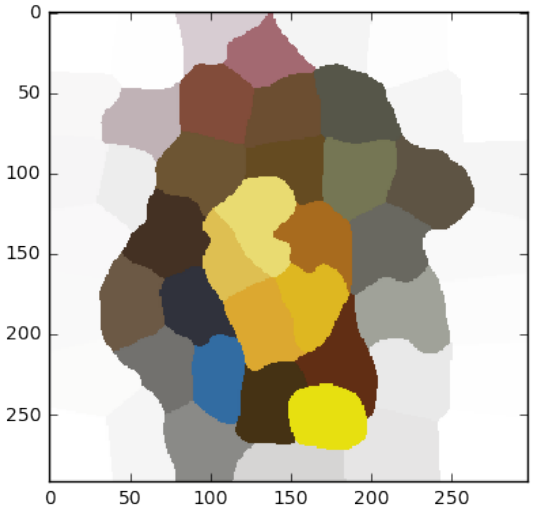
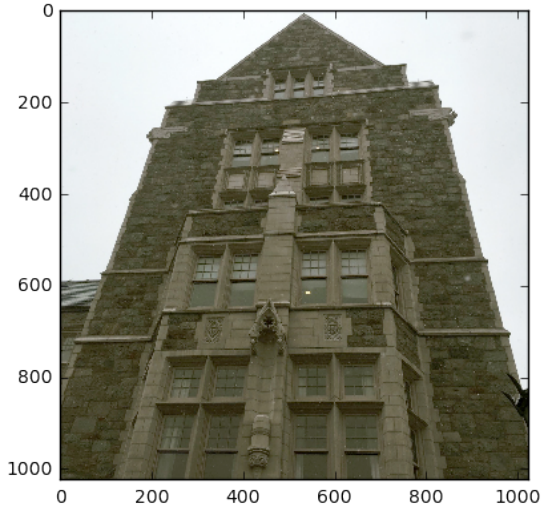
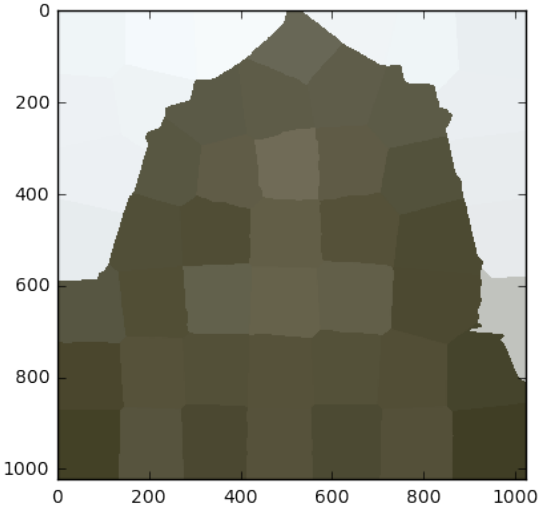
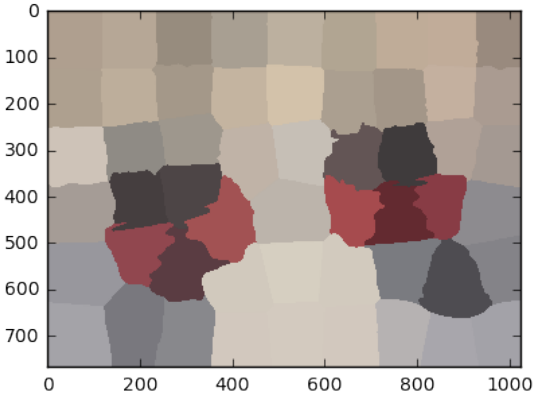
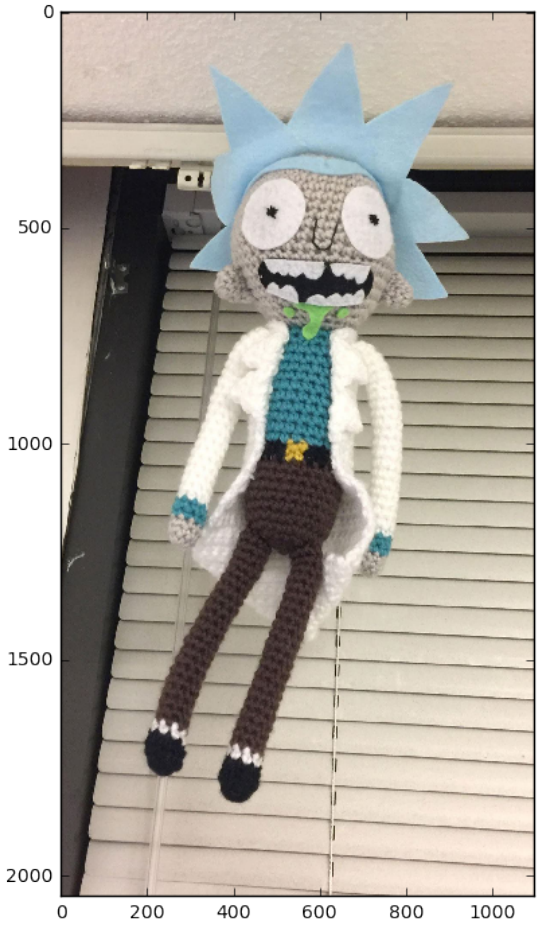
TEDDIURSA CANDY
POWER UP
5000
4
EVOLVE



```
In [26]: ns=55
         compact=70
         sigma=4.0
         # Apply to the image set
         for i,img in enumerate(imgset):
             rgbimg = img_as_float(color.gray2rgb(img))
             plt.figure()
             plt.subplot(1, 2, 1)
             plt.imshow(img)
             plt.subplot(1, 2, 2)
             plt.imshow(plot_slic_segmentation(rgbimg,ns,compact,sigma))
```

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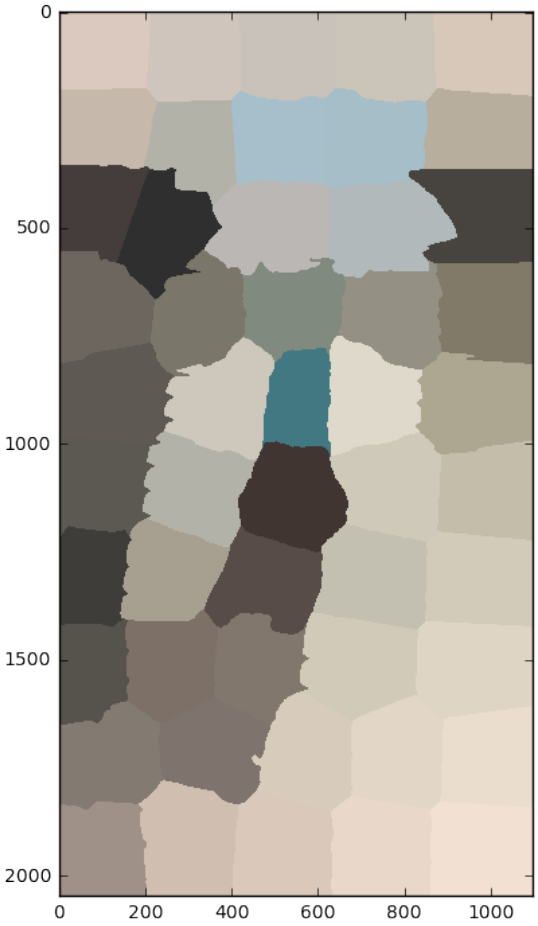
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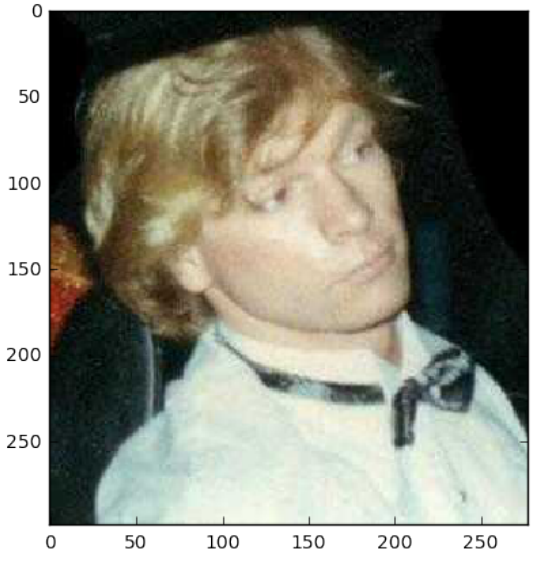
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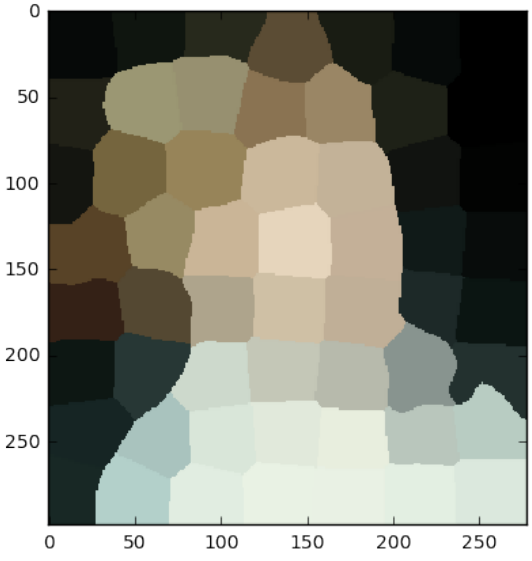
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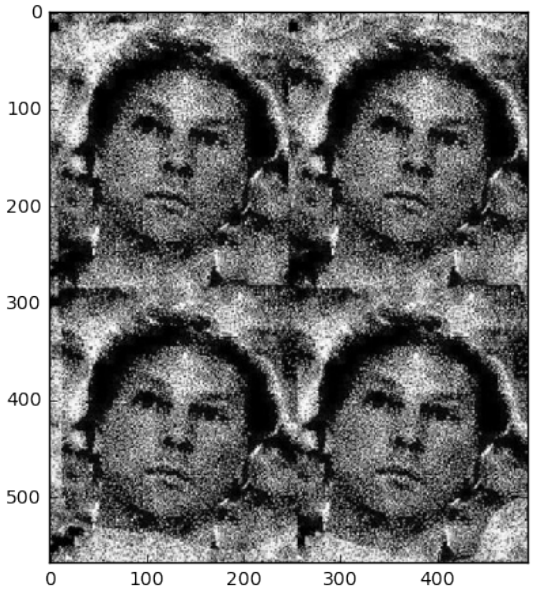

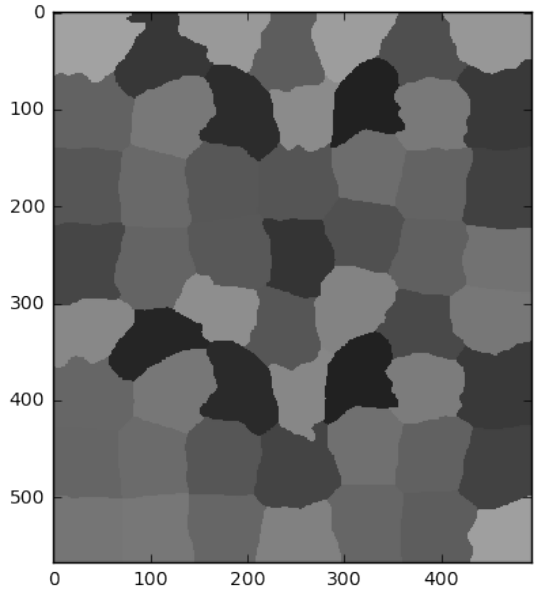


8:15 PM
CP910
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4.24kg
WEIGHT
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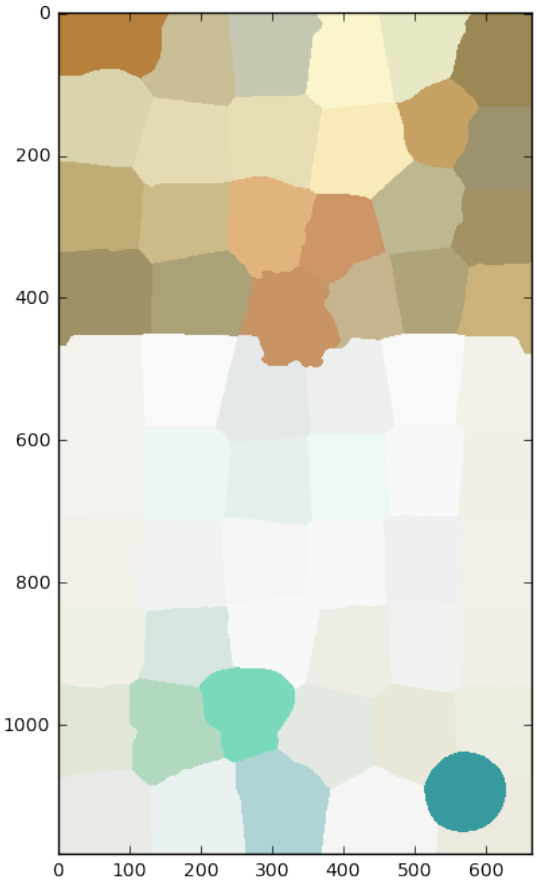
5000
4
EVOLVE



2 Python Tutorials

Python 101 Beginning Python http://www.rexx.com/~dkuhlman/python_101/python_101.html
The Official Python Tutorial - [http://www.python.org/doc/current/tut/tut.html](http://www.python.org/
The Python Quick Reference -http://rgruet.free.fr/PQR2.3.html
YouTube Python Tutorials
Google Python Class - http://www.youtube.com/watch?v=tKTZoB2Vjuk
Python Fundamentals Training – Classes http://www.youtube.com/watch?v=rKzZEtxIX14
Python 2.7 Tutorial Derek Banas - http://www.youtube.com/watch?v=UQi-L-_chcc
Python Programming Tutorial thenewboston - http://www.youtube.com/watch?v=4Mf0h3HphEA

3 Evaluation

Install Anaconda 4 for Python 2.7 and get this notebook to run with a set of your images.