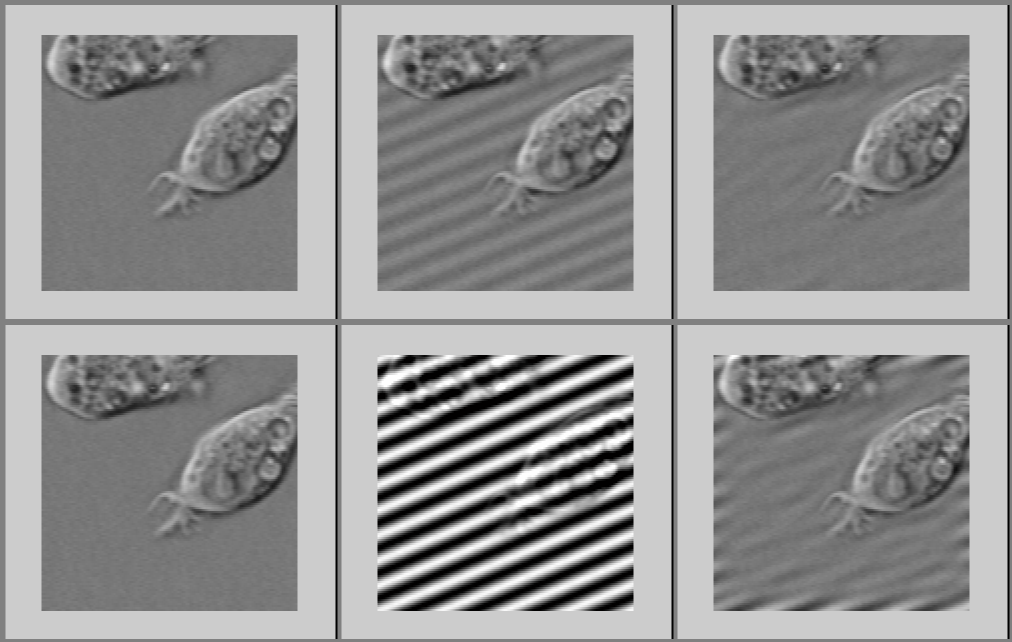
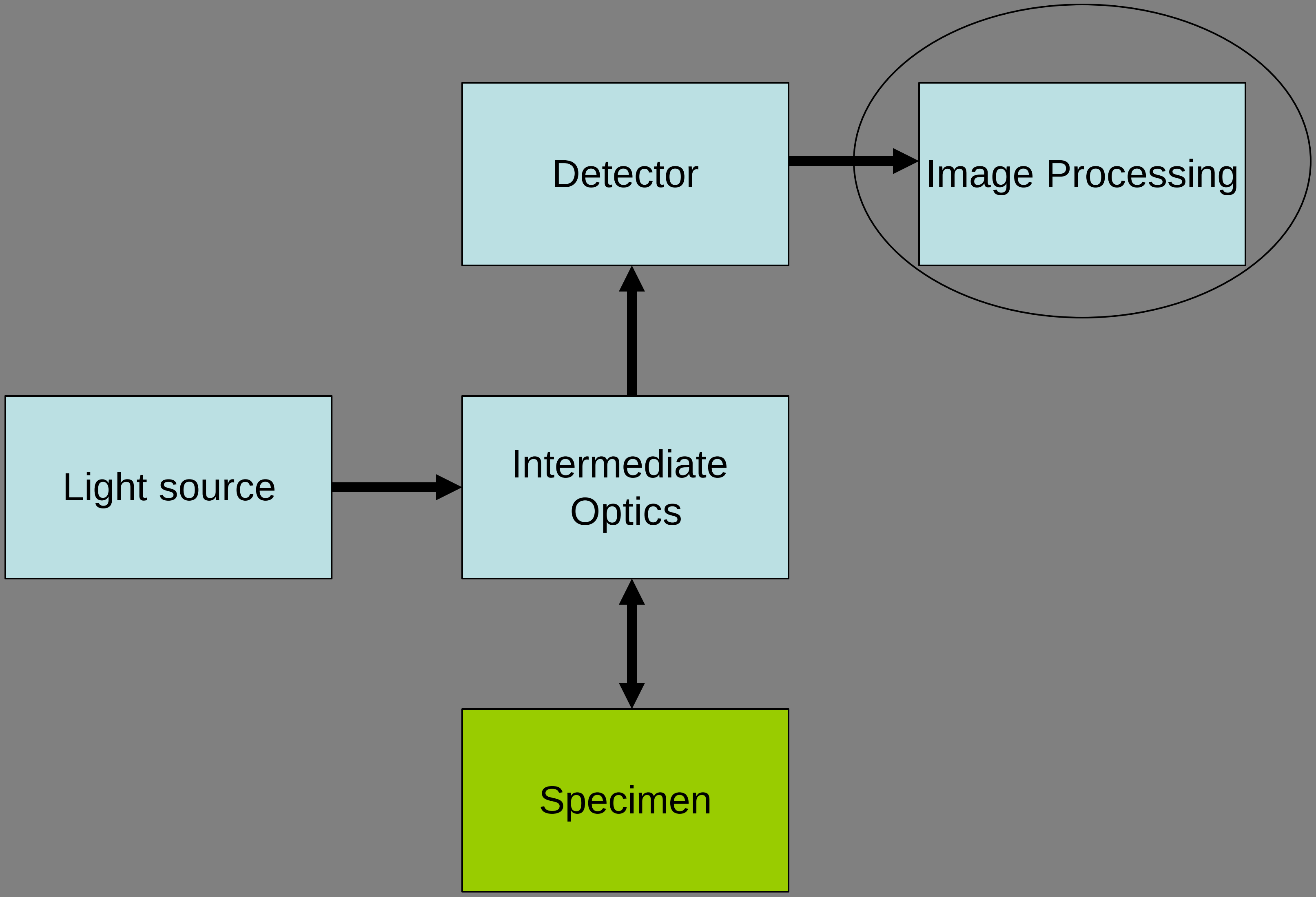
Image Processing and Analysis I



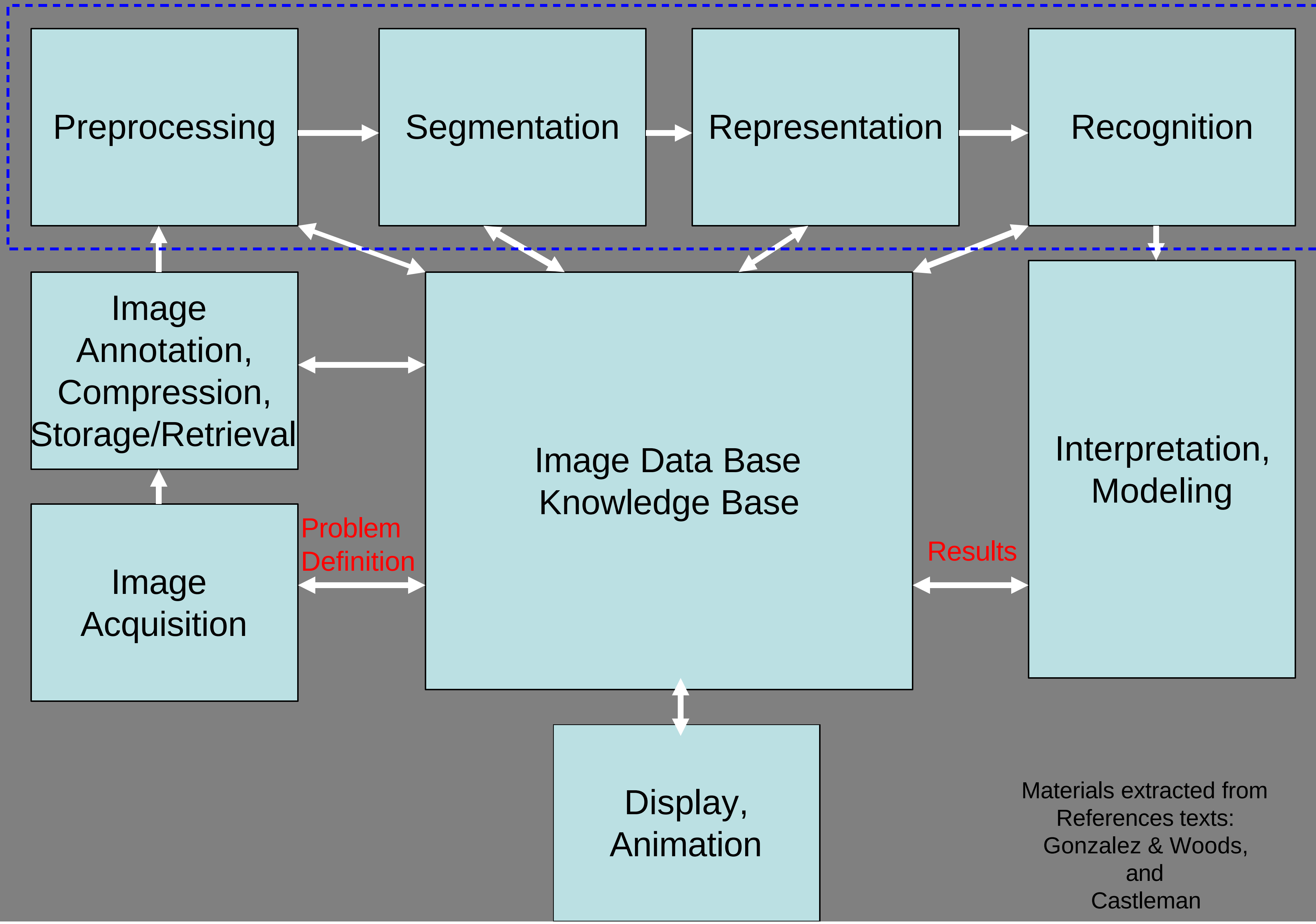
Materials extracted from Gonzalez & Wood
and Castleman

A typical biomedical optics experiment



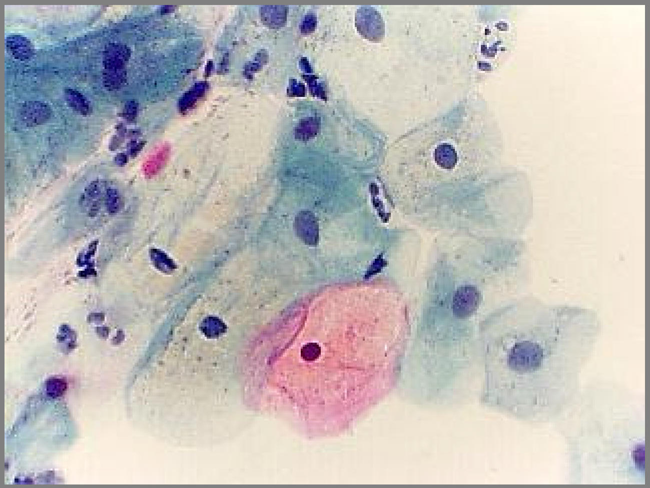
Digital Image Processing

A process to extract information from image data



Materials extracted from References texts: Gonzalez & Woods, and Castleman

Image Processing Example 1 – Pap Smear

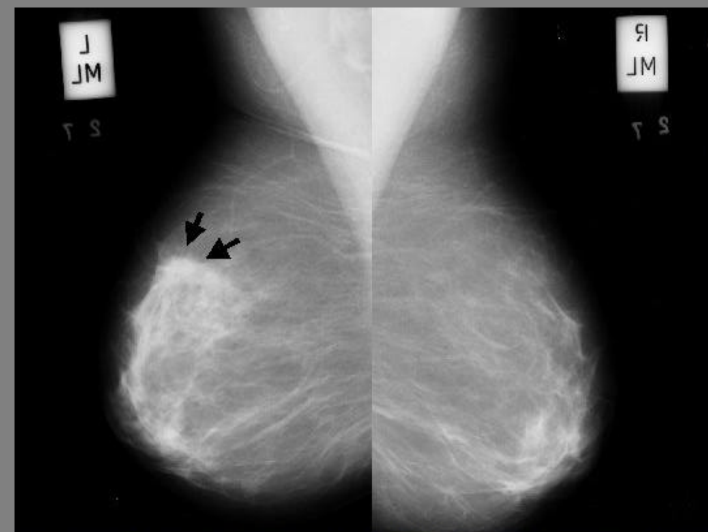


Benign Squamous Cells

Squamous Cell Carcinoma

One of the few histopathological tasks
where image recognition system is becoming commercial

Image Processing Example 2 – Breast X-Ray



The distinction between benign and malignant can be difficult for breast x-ray
Radiologist are highly trained in image recognition

Most biomedical imaging today does not address underlying
molecular and cellular based mechanisms

Image Data Base – Format and Data Base

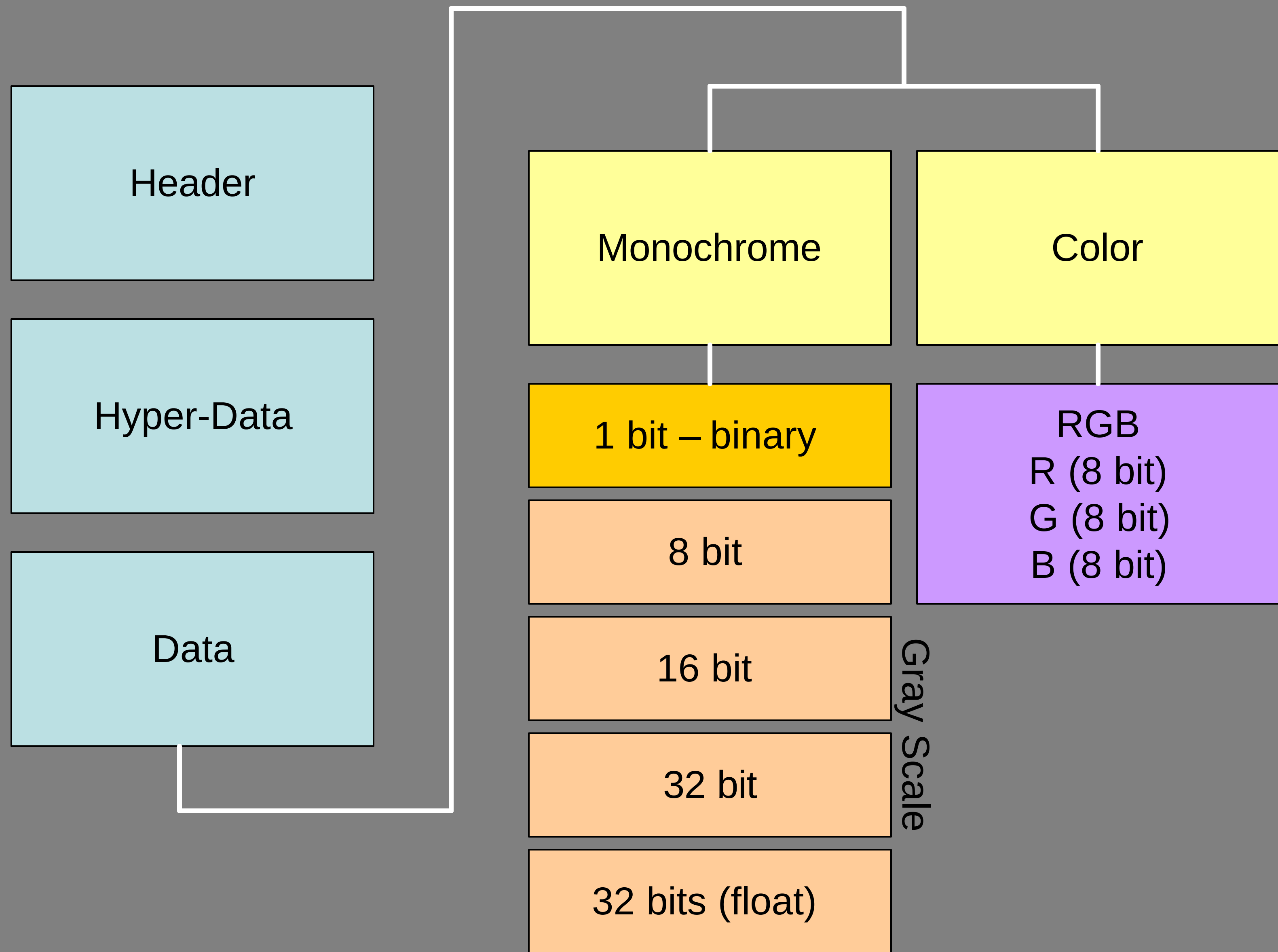
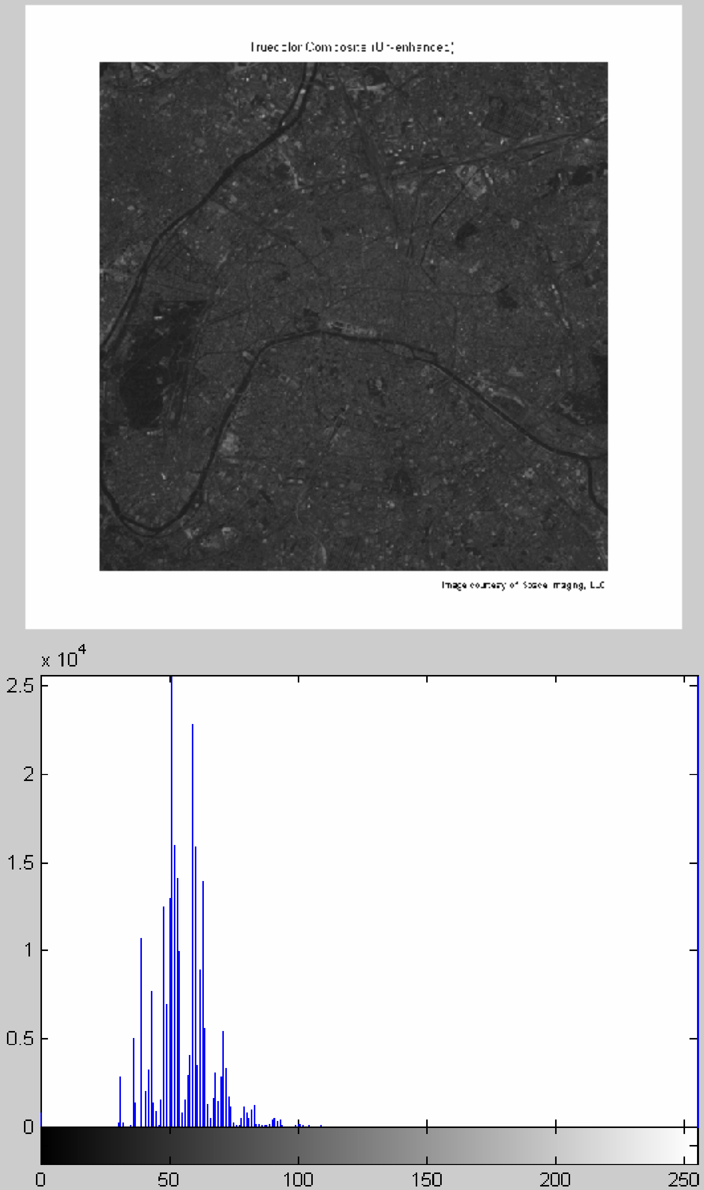


Image Preprocessing – histogram and contrast



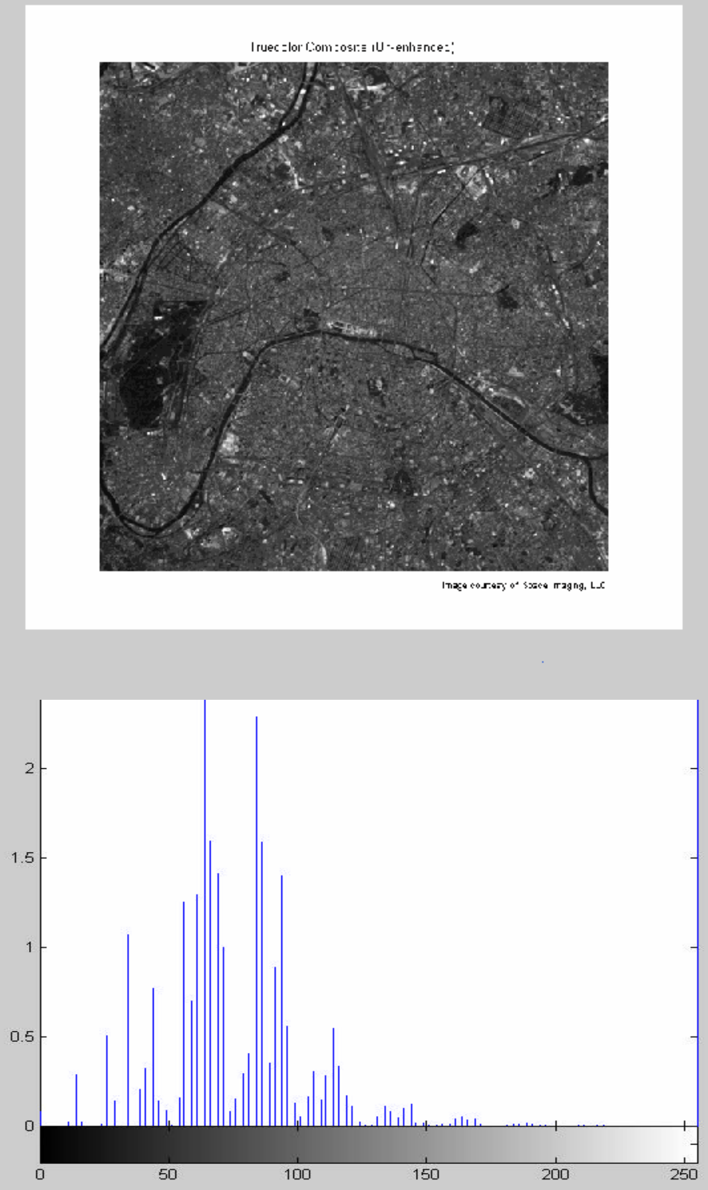


Image Preprocessing – histogram equalization

Let r be the gray level value of a pixel in the image.

$r \in [0,1]$; Map each gray level value r to a new value s: $s = T(r)$

The histogram distribution of the original image is: $P_r(r)$
The histogram distribution of the new image is: $P_s(s)$

In general: $P_s(s) = [p_r(r)\frac{dr}{ds}]_{r=T^{-1}(s)}$

Histogram equalization is defined as the transform: $s = T(r) = \int_0^r p_r(w)dw$

Since $\frac{ds}{dr} = P_r(r)$, $P_s(s) = 1$ for histogram equalization

Image Preprocessing – histogram and contrast