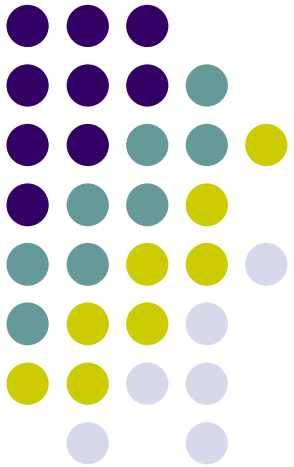
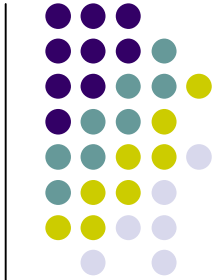
Procesamiento Digital de Imágenes

Pablo Roncagliolo B.

Nº 4

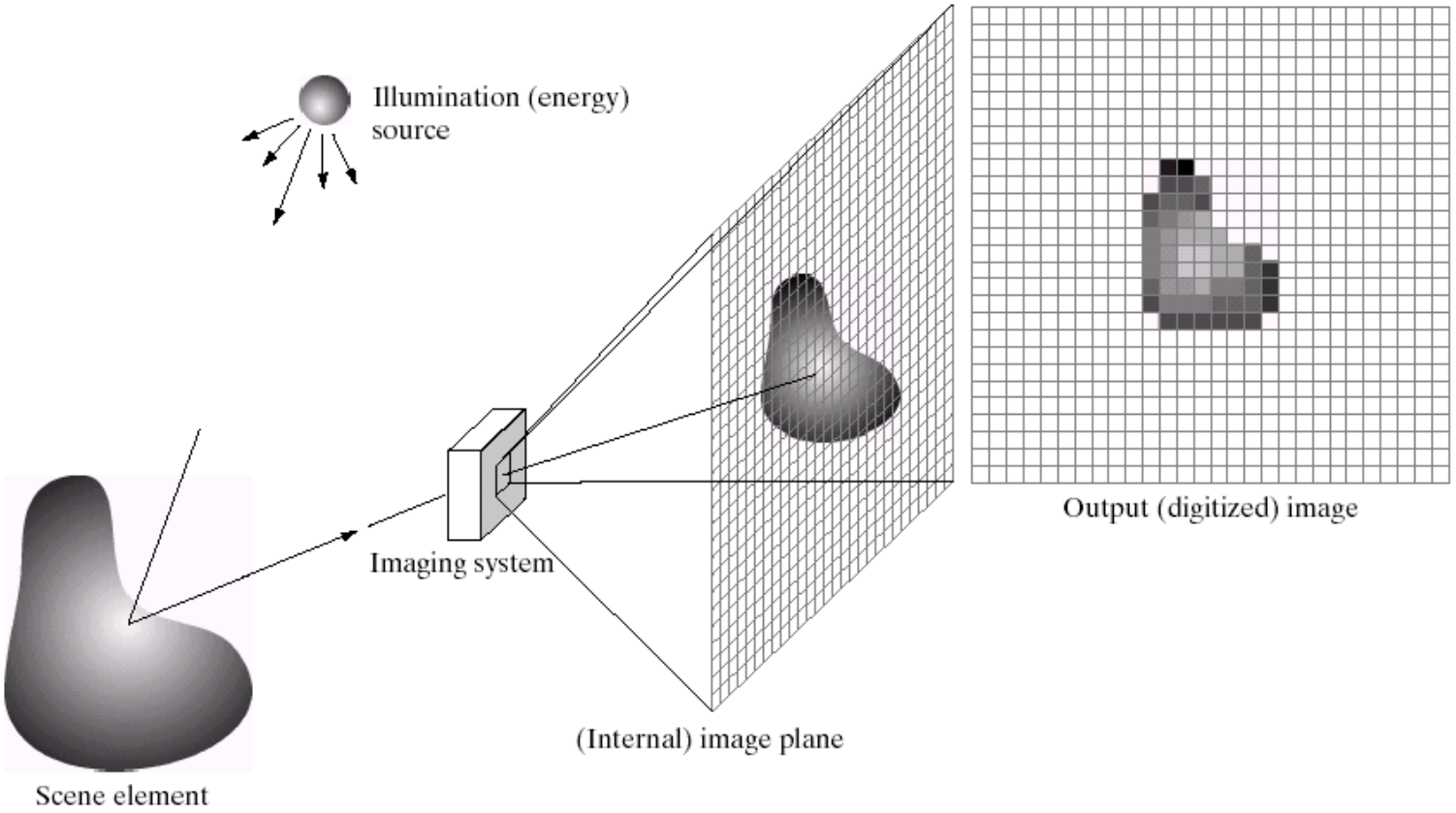


Orden de las clases...



- CAPTURA, DIGITALIZACION Y ADQUISICION DE IMAGENES
- TRATAMIENTO ESPACIAL DE IMAGENES
- TRATAMIENTO EN FRECUENCIA DE IMAGENES
- RESTAURACION DE IMAGENES
- OPERACIONES MORFOLOGICAS
- PROCESAMIENTO DE IMÁGENES EN COLORES
- COMPRESION DE IMAGENES
- REPRESENTACION Y DESCRIPCION
- SEGMENTACION DE IMAGENES
- TOPICOS AVANZADOS

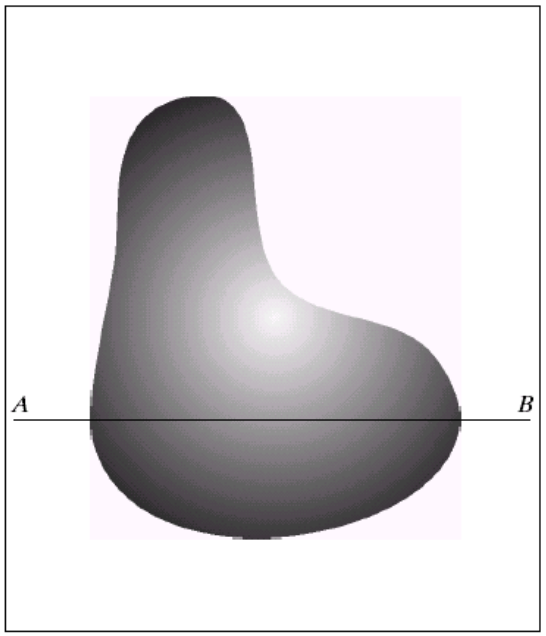
ADQUISICION & DIGITALIZACION

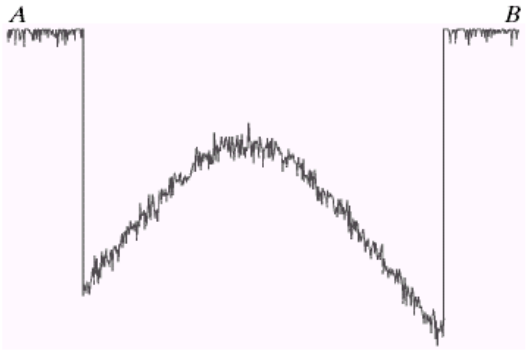


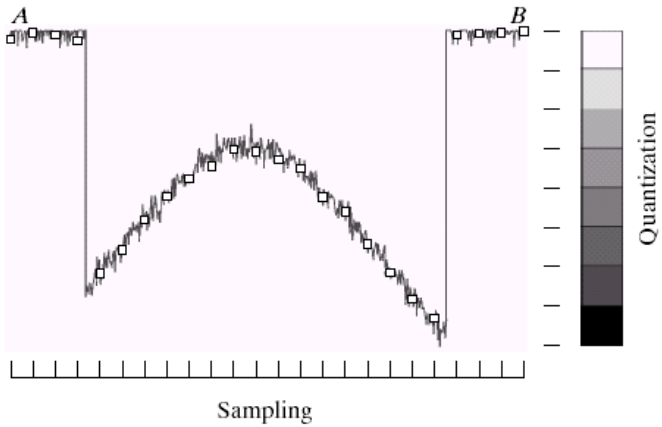
a
b c d e

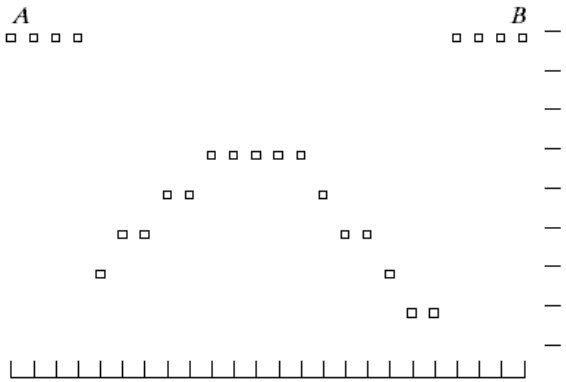
FIGURE 2.15 An example of the digital image acquisition process. (a) Energy ("illumination") source. (b) An element of a scene. (c) Imaging system. (d) Projection of the scene onto the image plane. (e) Digitized image.

ADQUISICION & DIGITALIZACION





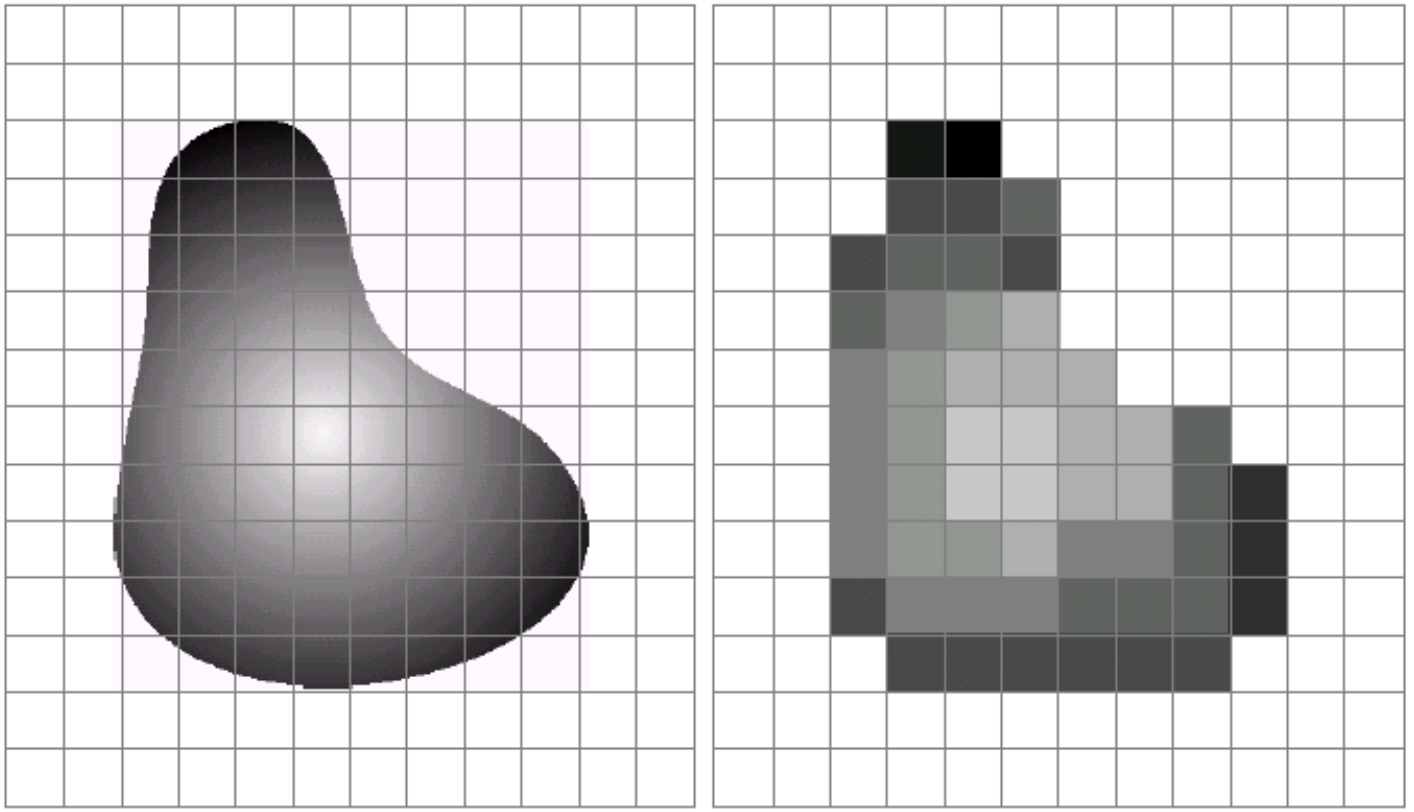




a b
c d

FIGURE 2.16 Generating a digital image. (a) Continuous image. (b) A scan line from *A* to *B* in the continuous image, used to illustrate the concepts of sampling and quantization. (c) Sampling and quantization. (d) Digital scan line.

ADQUISICION & DIGITALIZACION



a b

FIGURE 2.17 (a) Continuos image projected onto a sensor array. (b) Result of image sampling and quantization.

ADQUISICION & DIGITALIZACION

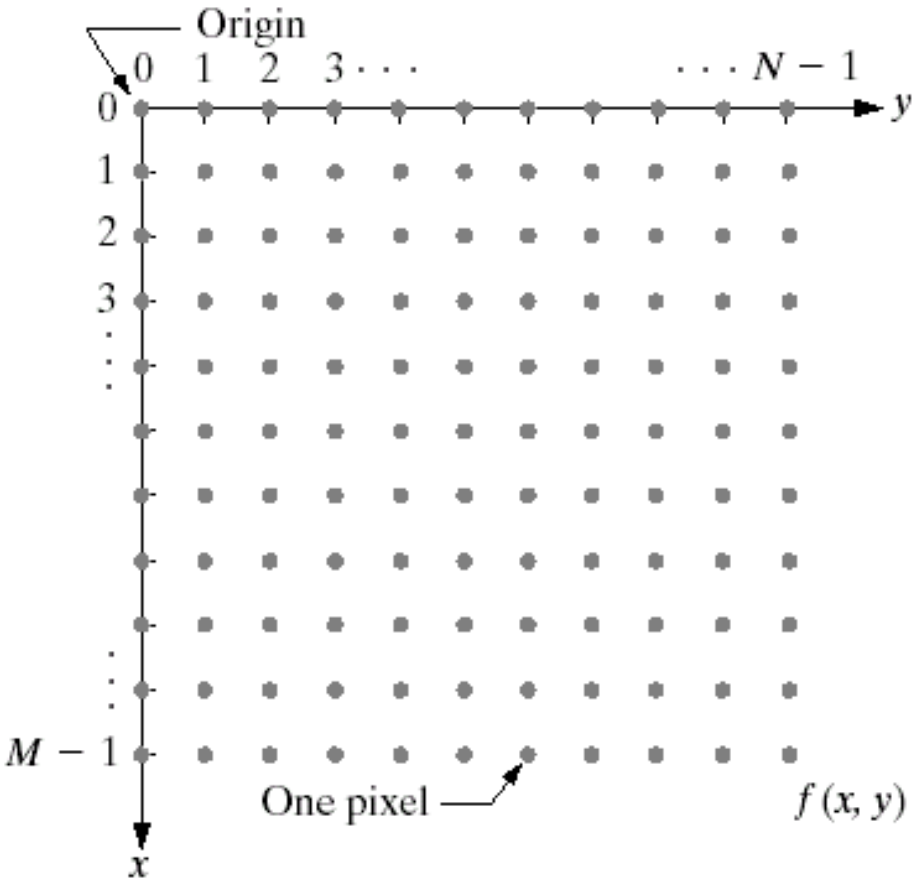


FIGURE 2.18 Coordinate convention used in this book to represent digital images.

ADQUISICION & DIGITALIZACION

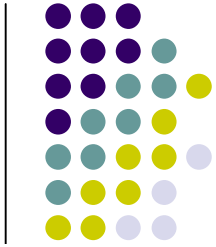


TABLE 2.1
Number of storage bits for various values of N and k.

N/k	1 ($L = 2$)	2 ($L = 4$)	3 ($L = 8$)	4 ($L = 16$)	5 ($L = 32$)	6 ($L = 64$)	7 ($L = 128$)	8 ($L = 256$)
32	1,024	2,048	3,072	4,096	5,120	6,144	7,168	8,192
64	4,096	8,192	12,288	16,384	20,480	24,576	28,672	32,768
128	16,384	32,768	49,152	65,536	81,920	98,304	114,688	131,072
256	65,536	131,072	196,608	262,144	327,680	393,216	458,752	524,288
512	262,144	524,288	786,432	1,048,576	1,310,720	1,572,864	1,835,008	2,097,152
1024	1,048,576	2,097,152	3,145,728	4,194,304	5,242,880	6,291,456	7,340,032	8,388,608
2048	4,194,304	8,388,608	12,582,912	16,777,216	20,971,520	25,165,824	29,369,128	33,554,432
4096	16,777,216	33,554,432	50,331,648	67,108,864	83,886,080	100,663,296	117,440,512	134,217,728
8192	67,108,864	134,217,728	201,326,592	268,435,456	335,544,320	402,653,184	469,762,048	536,870,912

ADQUISICION & DIGITALIZACION

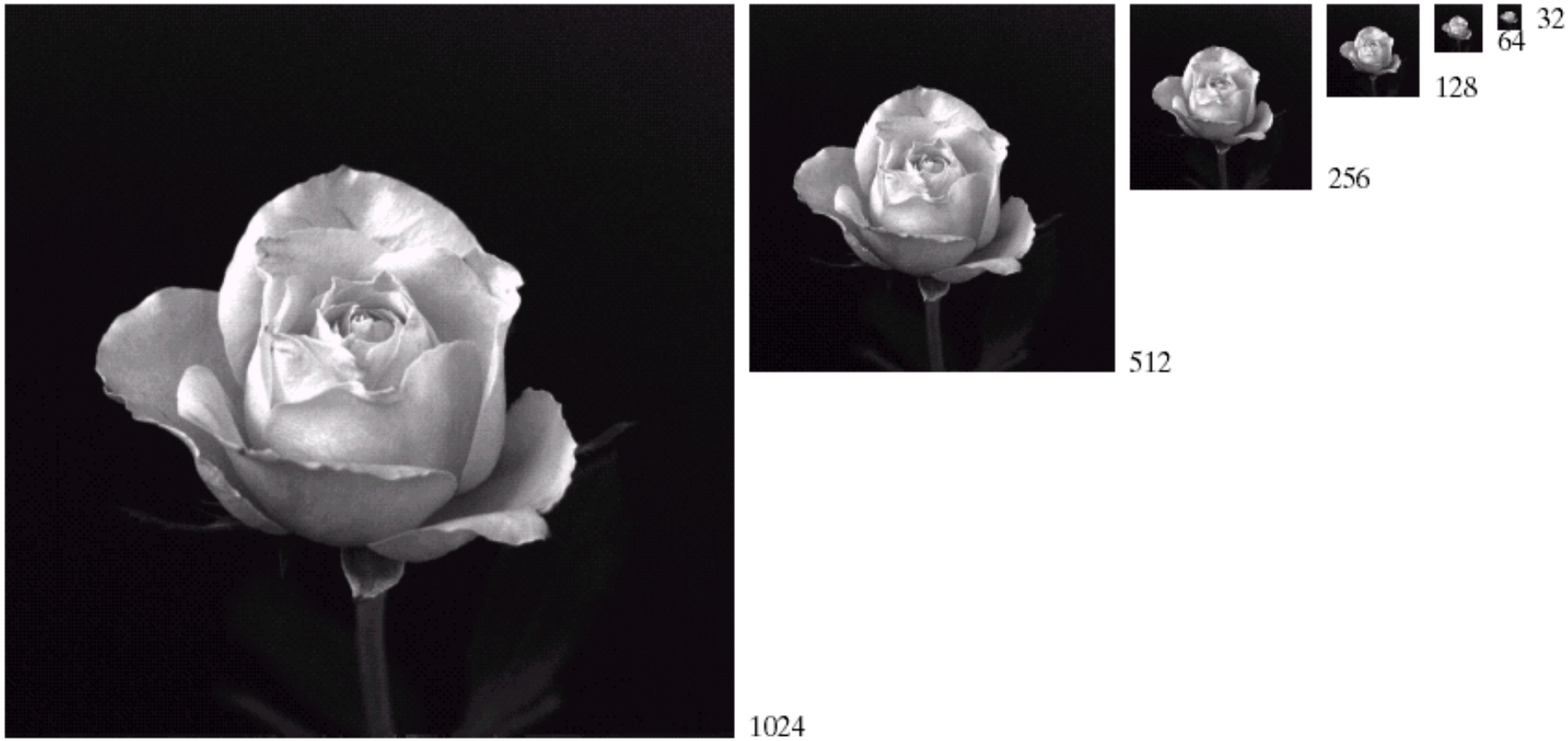
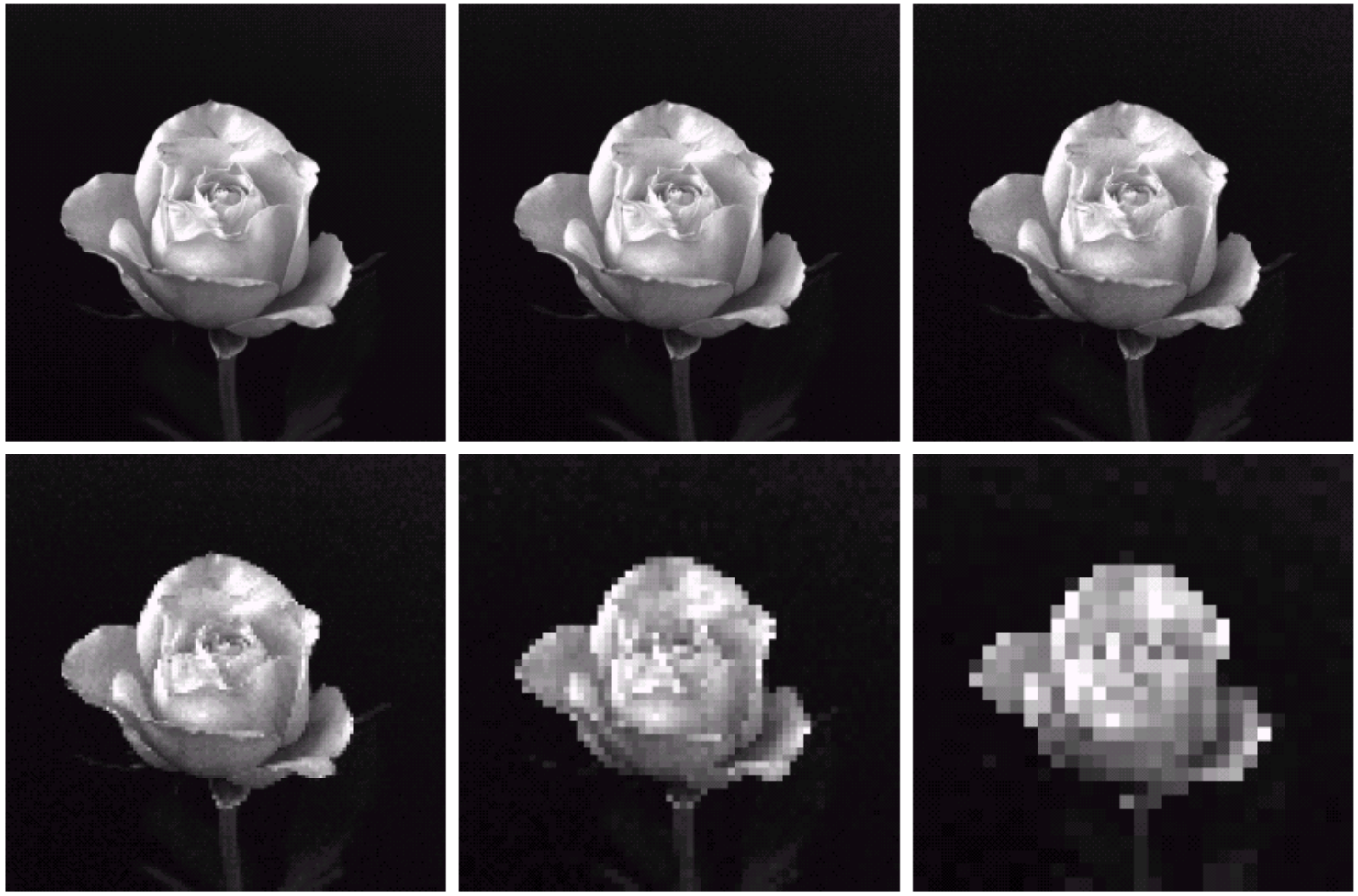


FIGURE 2.19 A 1024 × 1024, 8-bit image subsampled down to size 32 × 32 pixels. The number of allowable gray levels was kept at 256.

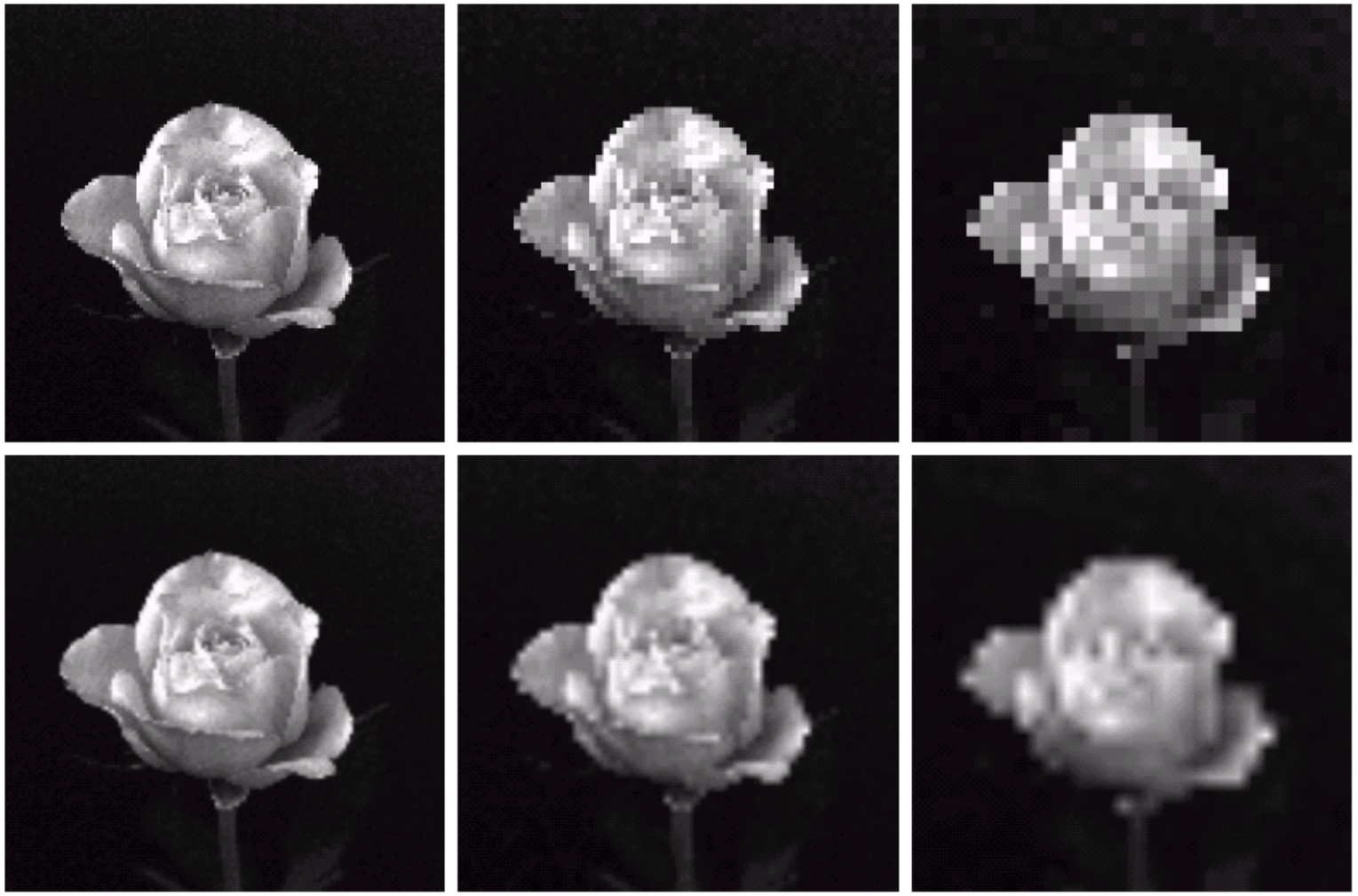
‘Muestreo’ sin interpolación (*resampled*): Res. Espacial



a b c
d e f

FIGURE 2.20 (a) 1024 × 1024, 8-bit image. (b) 512 × 512 image resampled into 1024 × 1024 pixels by row and column duplication. (c) through (f) 256 × 256, 128 × 128, 64 × 64, and 32 × 32 images resampled into 1024 × 1024 pixels.

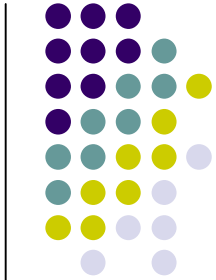
‘Muestreo’ con interpolación



a b c
d e f

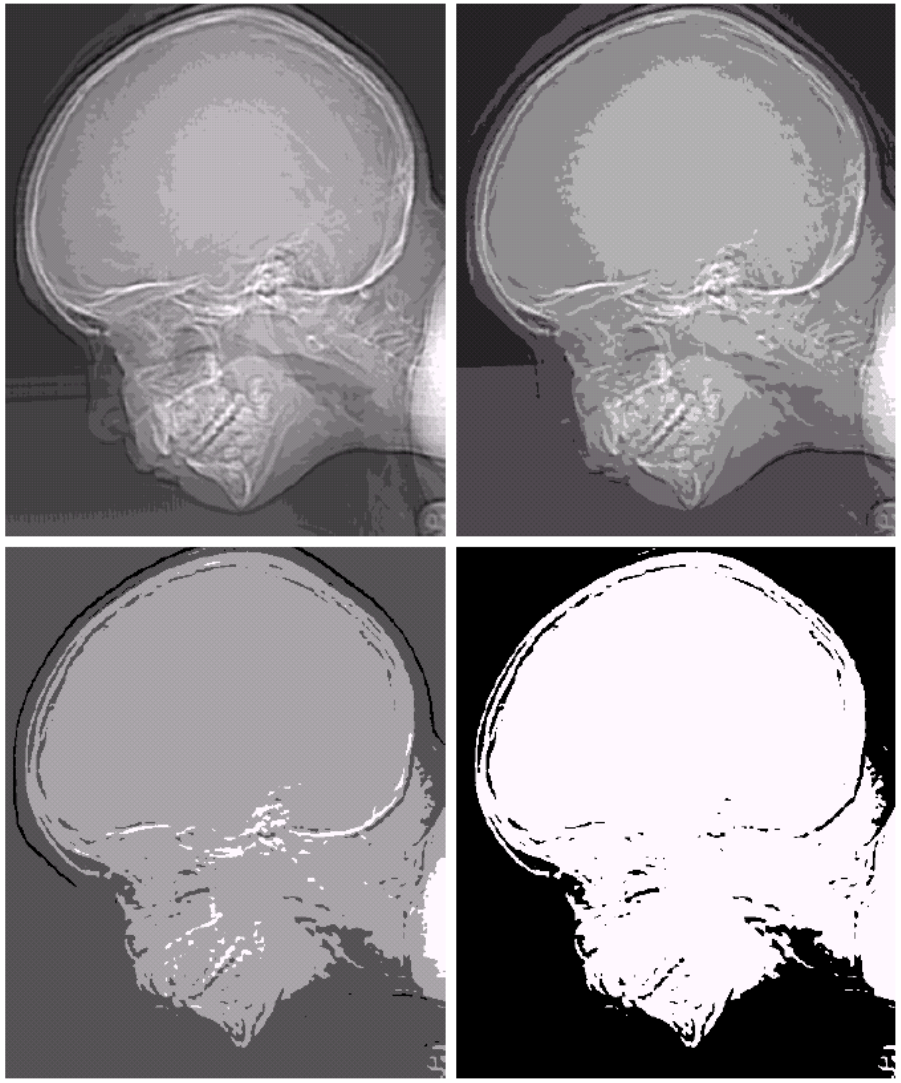
FIGURE 2.25 Top row: images zoomed from 128 × 128, 64 × 64, and 32 × 32 pixels to 1024 × 1024 pixels, using nearest neighbor gray-level interpolation. Bottom row: same sequence, but using bilinear interpolation.

Resolución en Frecuencia

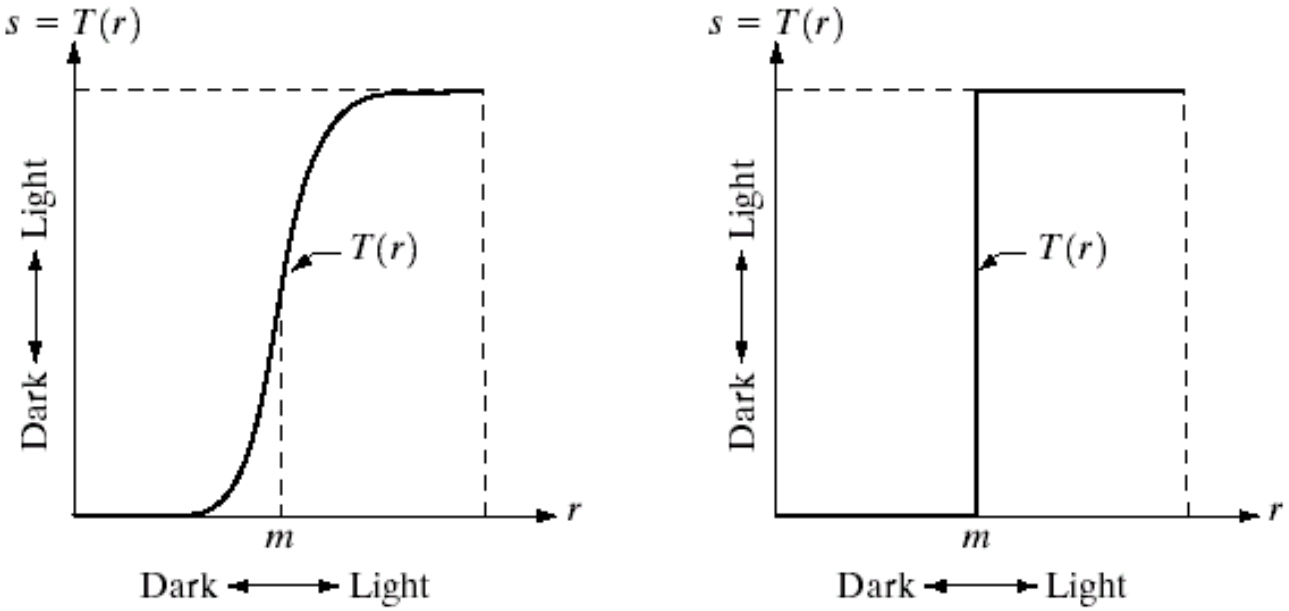


e f
g h

FIGURE 2.21
(Continued)
(e)–(h) Image displayed in 16, 8, 4, and 2 gray levels. (Original courtesy of Dr. David R. Pickens, Department of Radiology & Radiological Sciences, Vanderbilt University Medical Center.)



Tratamiento de Imágenes:
funciones sobre el nivel de gris o “funciones de contraste”



a b

FIGURE 3.2 Gray-level transformation functions for contrast enhancement.

Tratamiento de Imágenes:
funciones sobre el nivel de gris o “funciones de contraste”

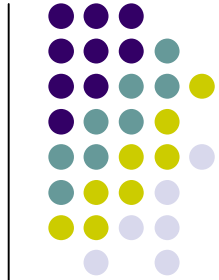
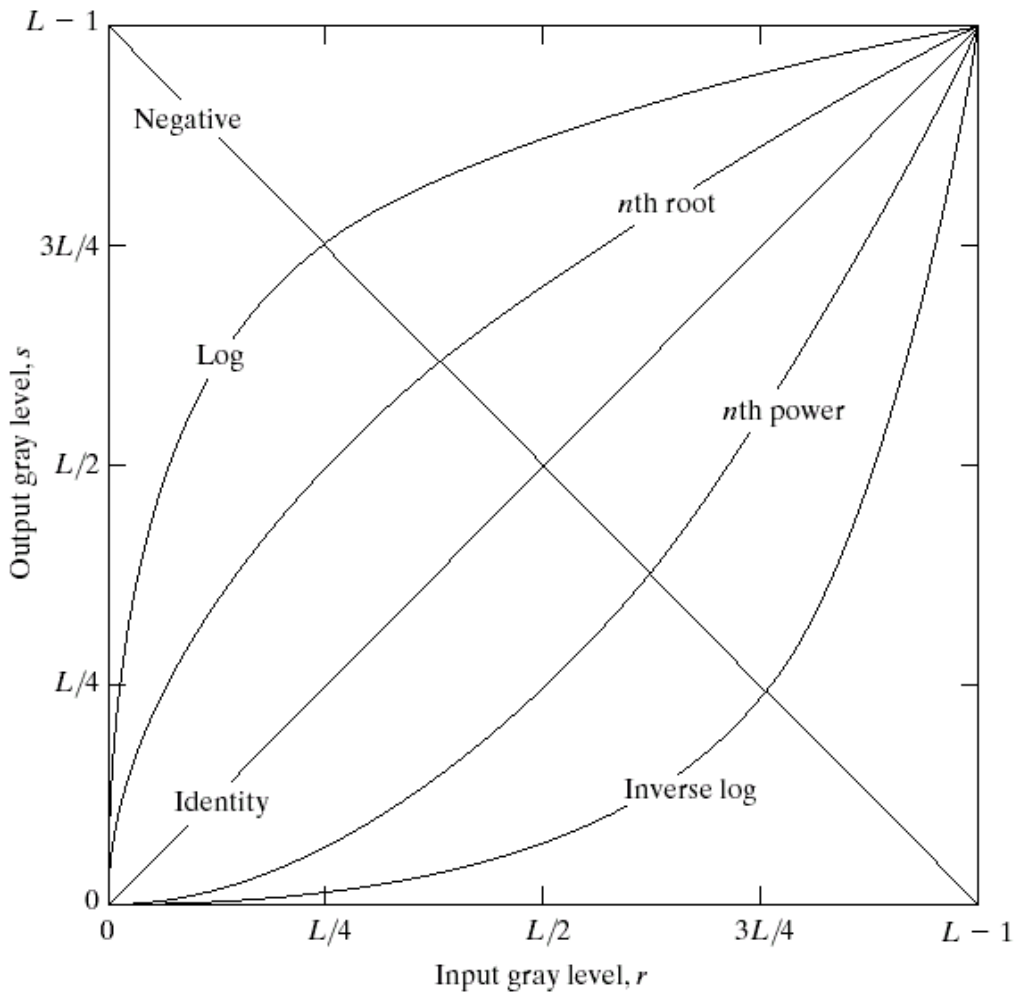
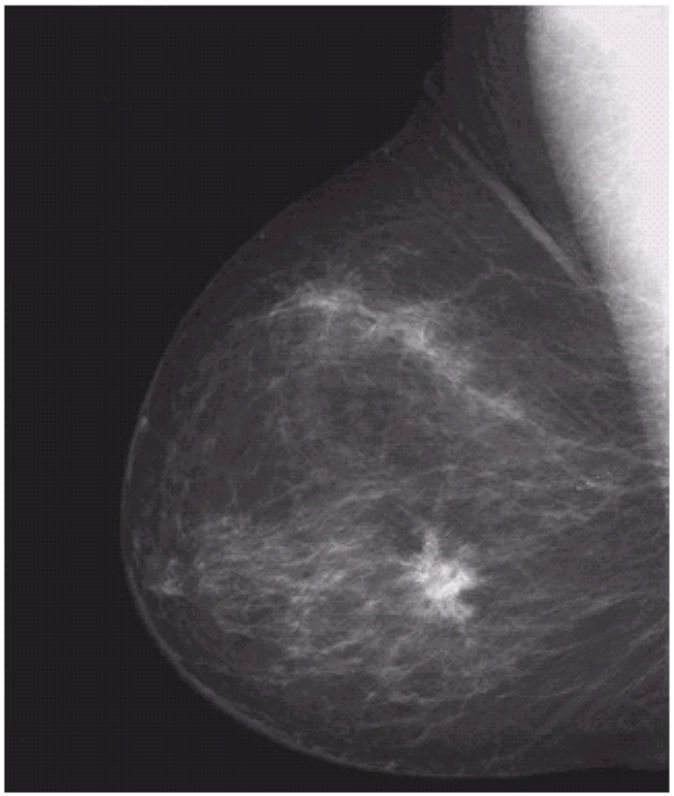


FIGURE 3.3 Some basic gray-level transformation functions used for image enhancement.



Tratamiento de Imágenes:
funciones sobre el nivel de gris o “funciones de contraste”



a b

FIGURE 3.4 (a) Original digital mammogram. (b) Negative image obtained using the negative transformation in Eq. (3.2-1). (Courtesy of G.E. Medical Systems.)

Tratamiento de Imágenes:
funciones de corrección Gamma

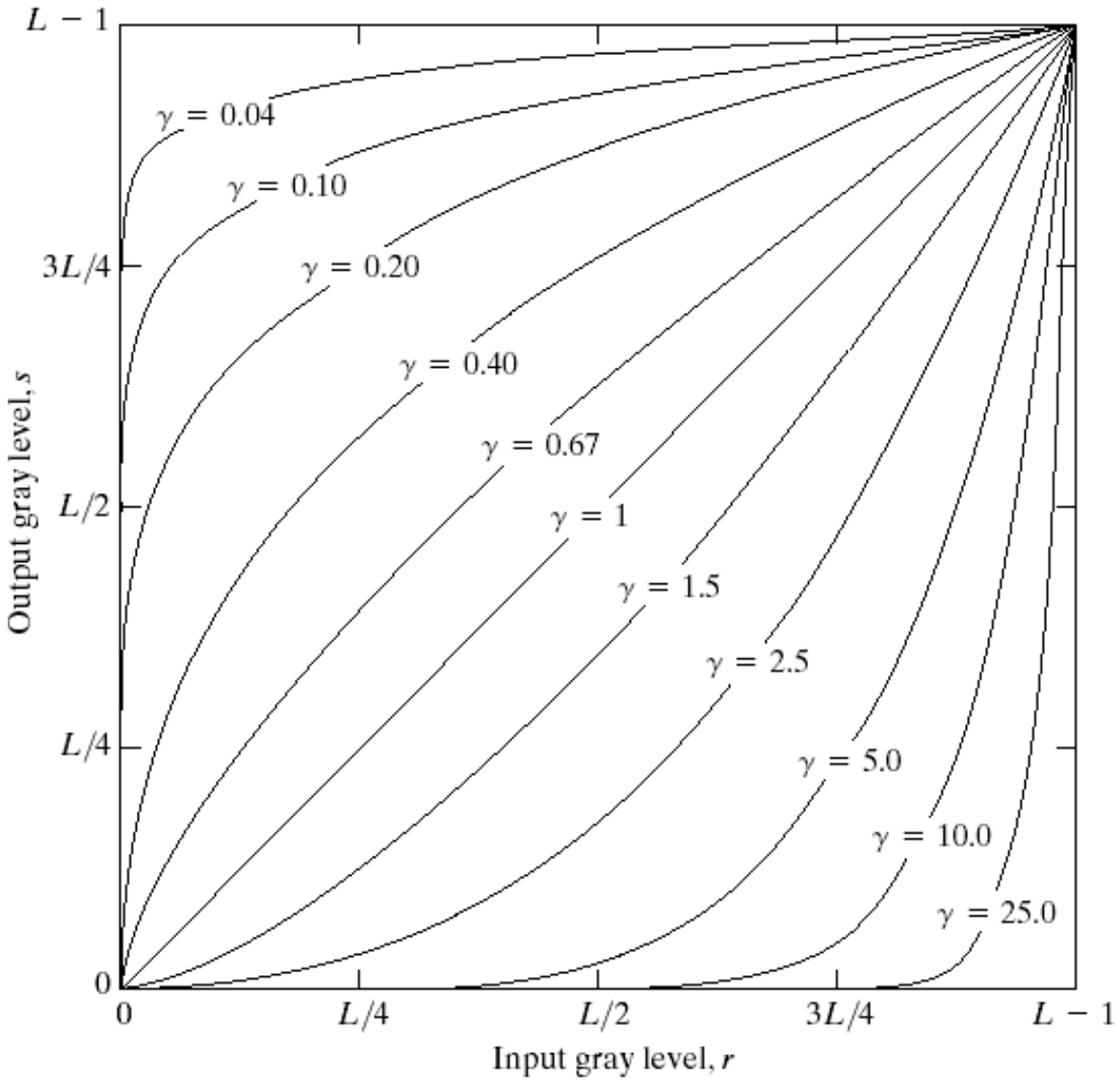
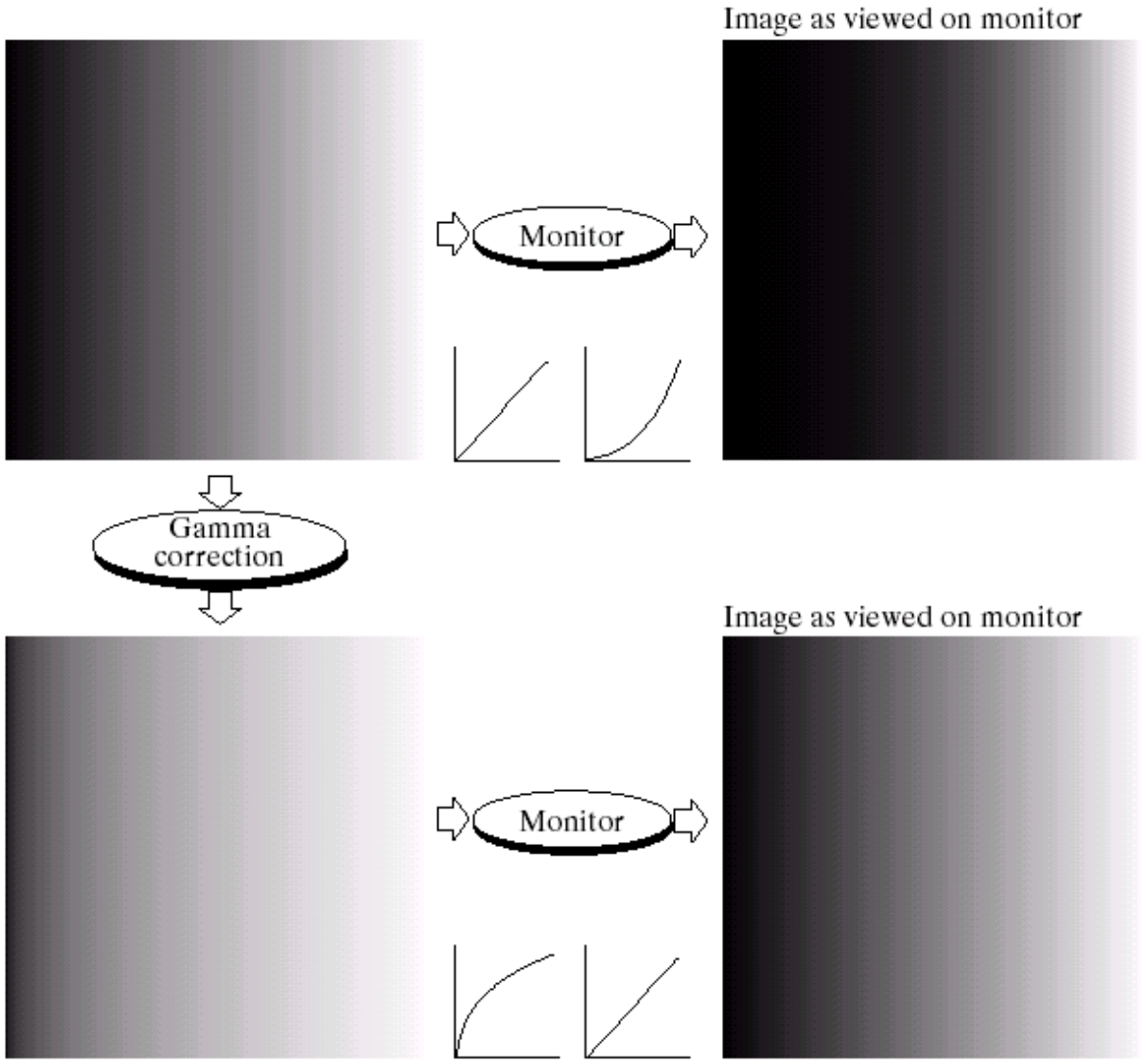


FIGURE 3.6 Plots of the equation $s = cr^{\gamma}$ for various values of γ ($c = 1$ in all cases).

Matlab:

B=imadjust(A,[ ],[ ],gamma)

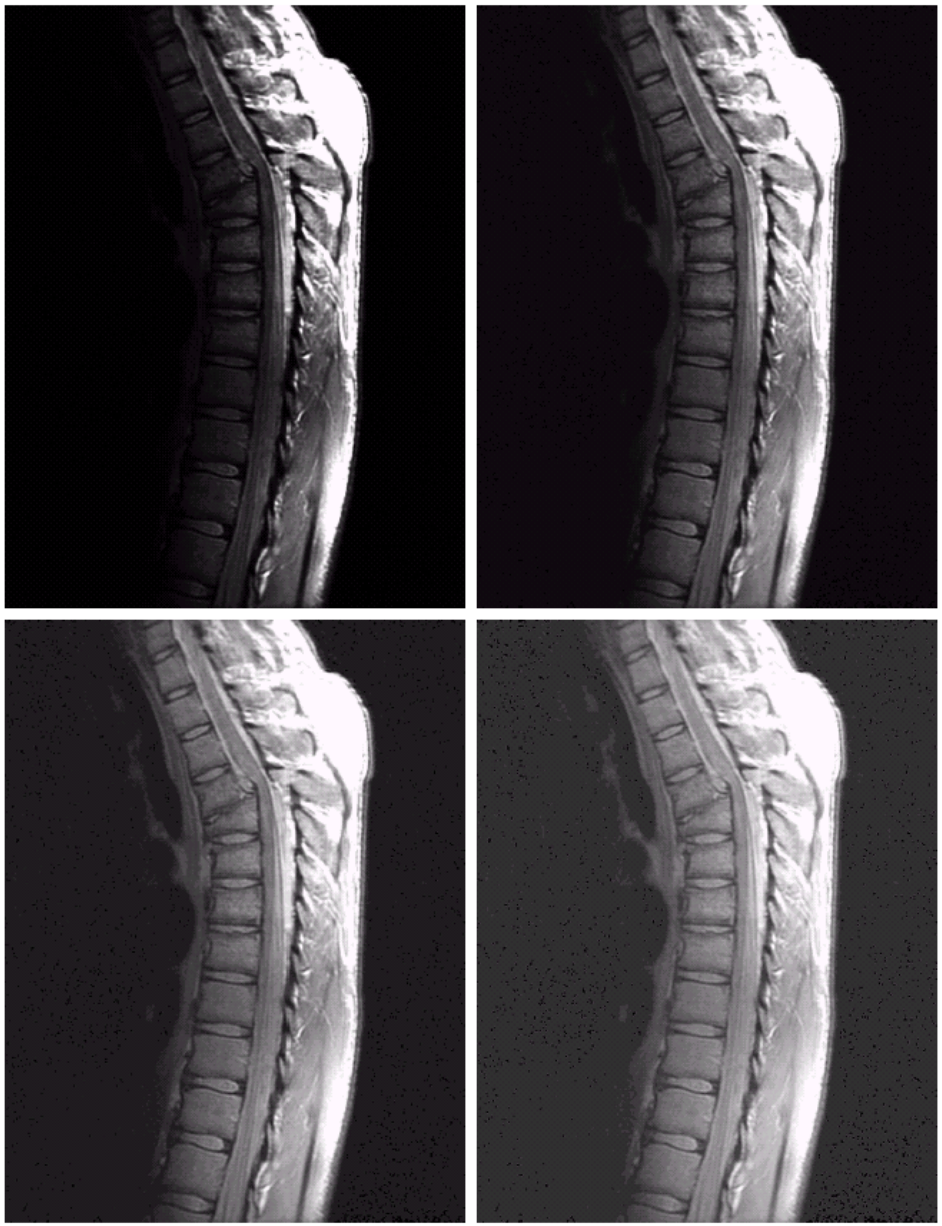
Tratamiento de Imágenes:
funciones de corrección Gamma



a b
c d

FIGURE 3.7
(a) Linear-wedge gray-scale image. (b) Response of monitor to linear wedge. (c) Gamma-corrected wedge. (d) Output of monitor.

Tratamiento de Imágenes:
funciones de corrección Gamma



a b
c d

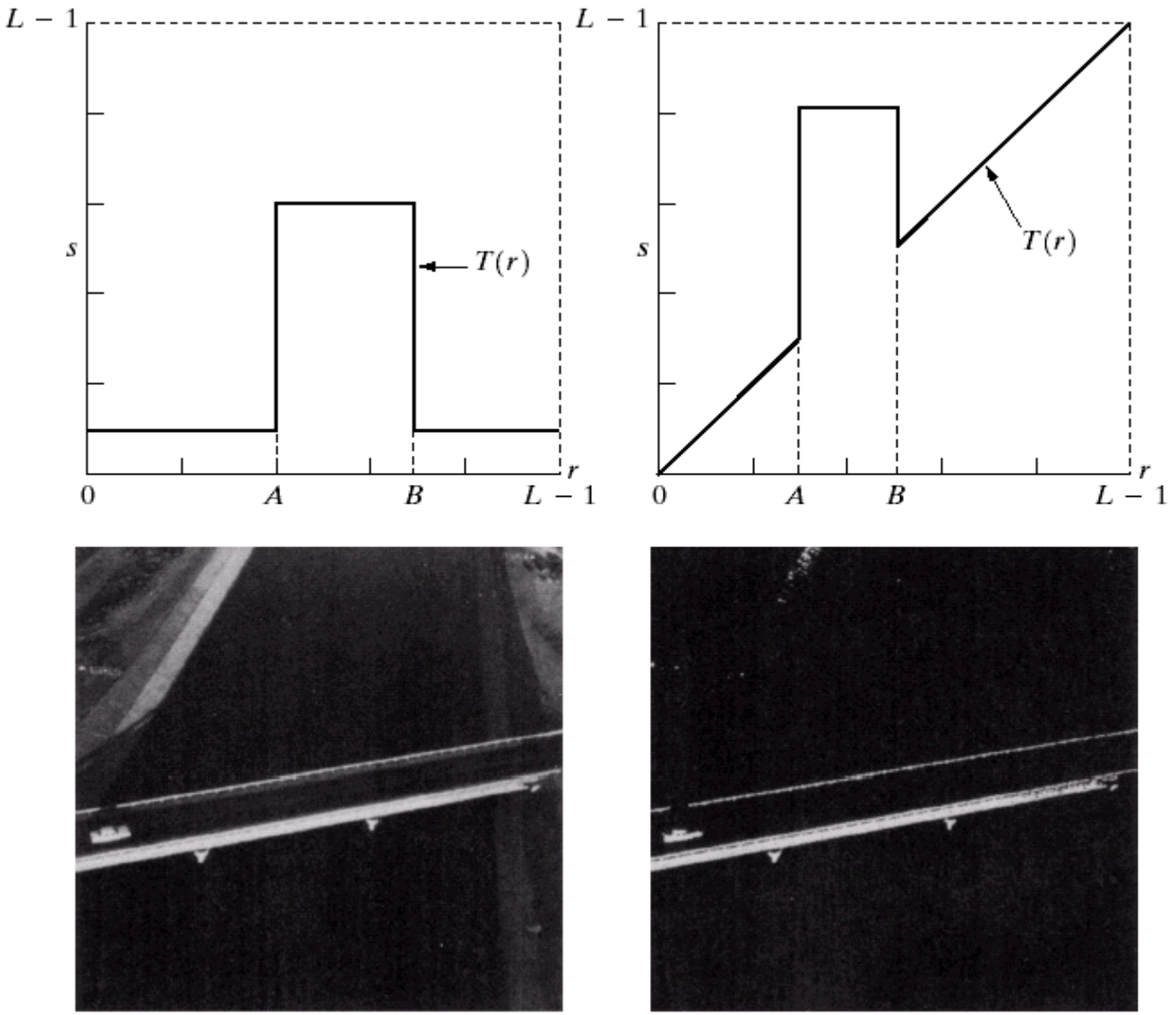
FIGURE 3.8
(a) Magnetic resonance (MR) image of a fractured human spine.
(b)–(d) Results of applying the transformation in Eq. (3.2-3) with $c = 1$ and $\gamma = 0.6, 0.4$, and 0.3, respectively. (Original image for this example courtesy of Dr. David R. Pickens, Department of Radiology and Radiological Sciences, Vanderbilt University Medical Center.)

Tratamiento de Imágenes:
funciones de corrección Gamma

a b
c d

FIGURE 3.9
(a) Aerial image. (b)–(d) Results of applying the transformation in Eq. (3.2-3) with $c = 1$ and $\gamma = 3.0, 4.0$, and 5.0, respectively. (Original image for this example courtesy of NASA.)

Tratamiento de Imágenes:
funciones específicas sobre el contraste

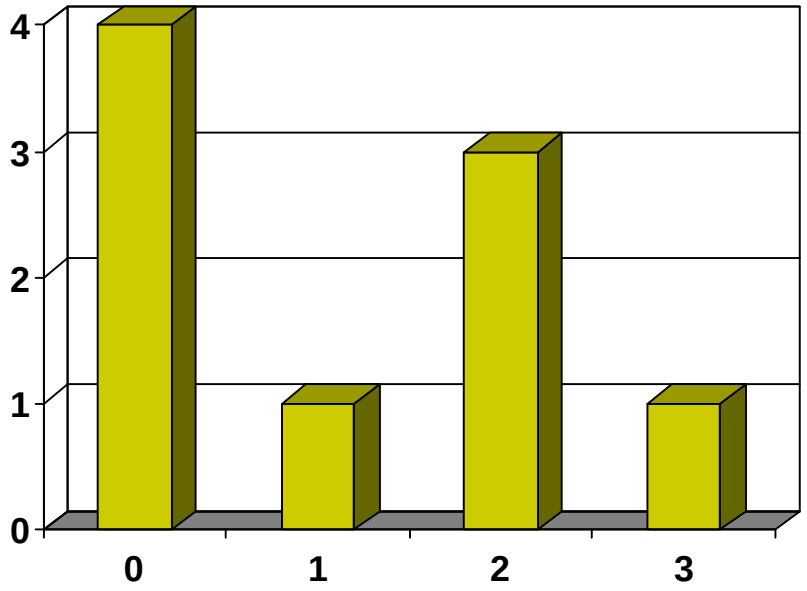


a b
c d

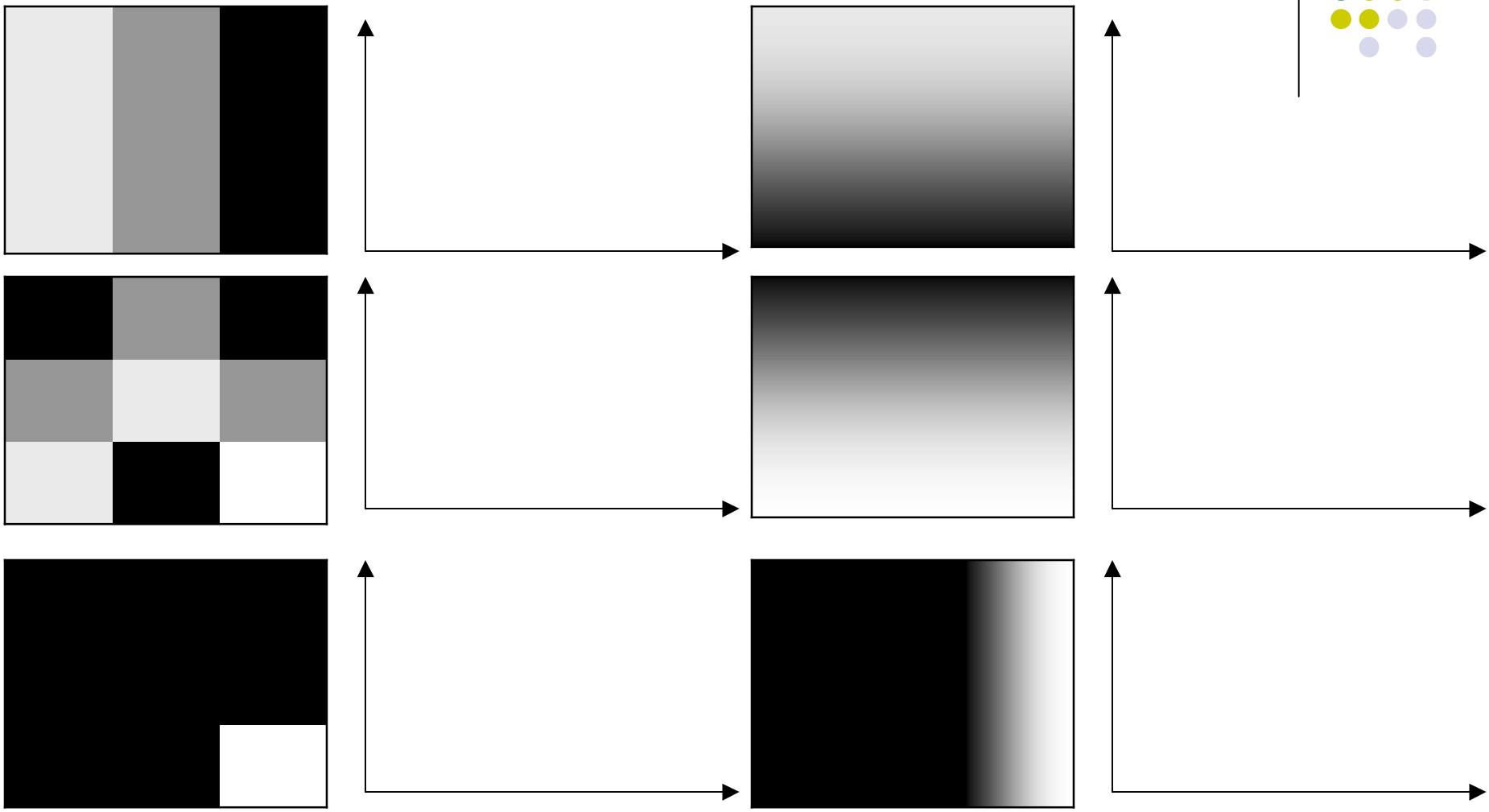
FIGURE 3.11
(a) This transformation highlights range $[A, B]$ of gray levels and reduces all others to a constant level. (b) This transformation highlights range $[A, B]$ but preserves all other levels. (c) An image. (d) Result of using the transformation in (a).

HISTOGRAMA

0	2	2
3	0	2
0	0	1



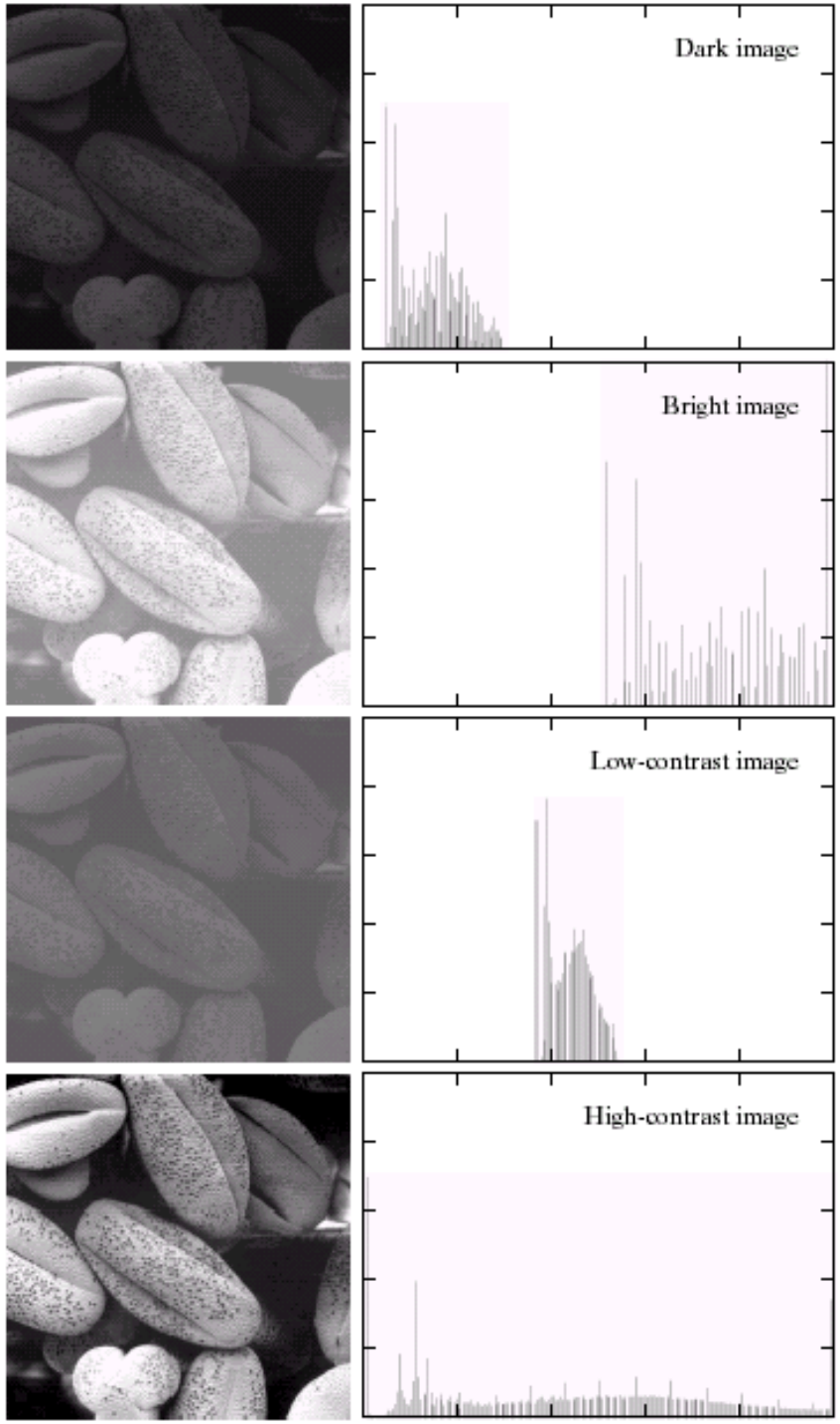
HISTOGRAMA: Ejercicios



Tratamiento de Imágenes:

Ecualización del Histograma

```
%En Matlab con Toolbox
H=imhist(A,256);
```



prb

Imágenes: Gonzalez&Wood