Exercise 6.7. Implement a weighted median filter (Sec. 6.4.3) as an ImageJ plugin, specifying the weights as a constant, two-dimensional `int` array. Test the filter on suitable images and compare the results with those from a standard median filter. Explain why, for example, the weight matrix

$$W(i,j) = \begin{bmatrix} 0 & 1 & 0 \\ 1 & \mathbf{5} & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

does *not* make sense.

Exercise 6.8. Verify the properties of the *impulse* function with respect to linear filters Eqn. (6.30). Create a black image with a white pixel at its center and use this image as the two-dimensional impulse. See if linear filters really deliver the filter matrix H as their impulse response.

Exercise 6.9. Describe the effect of a linear filter with the following filter matrix:

$$H(i,j) = \begin{bmatrix} 0 & 0 & 0 \\ 0 & \mathbf{0} & 1 \\ 0 & 0 & 0 \end{bmatrix}.$$

Exercise 6.10. Design a linear filter (matrix) that creates a horizontal blur over a length of 7 pixels, thus simulating the effect of camera movement during exposure.

Exercise 6.11. Program your own ImageJ plugin that implements a Gaussian smoothing filter with variable filter width (radius σ). The plugin should dynamically create the required filter kernels with a size of at least 5σ in both directions. Make use of the fact that the Gaussian function is x/y-separable (see Sec. 6.3.3).

Exercise 6.12. The "*Laplacian of Gaussian*" (LoG) filter (Fig. 6.8) is based on the sum of the second derivatives of the two-dimensional Gaussian. It is defined as

$$\mathrm{LoG}_\sigma(x,y) = -\Big(\frac{x^2+y^2-2\sigma^2}{\sigma^4}\Big) \cdot e^{-\frac{x^2+y^2}{2\sigma^2}}.$$

Implement the LoG filter as an ImageJ plugin of variable width (σ), analogous to Exercise 6.11. Find out if the LoG function is x/y-separable.