

Davisson-Germer Experiment

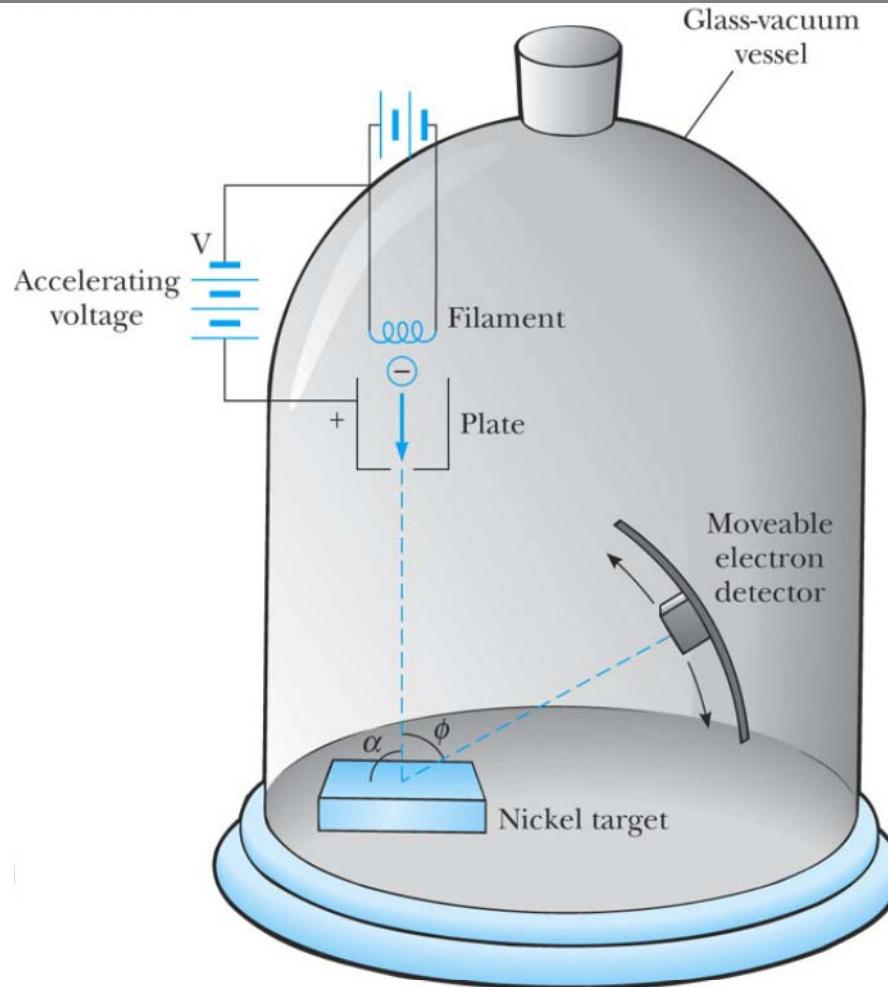
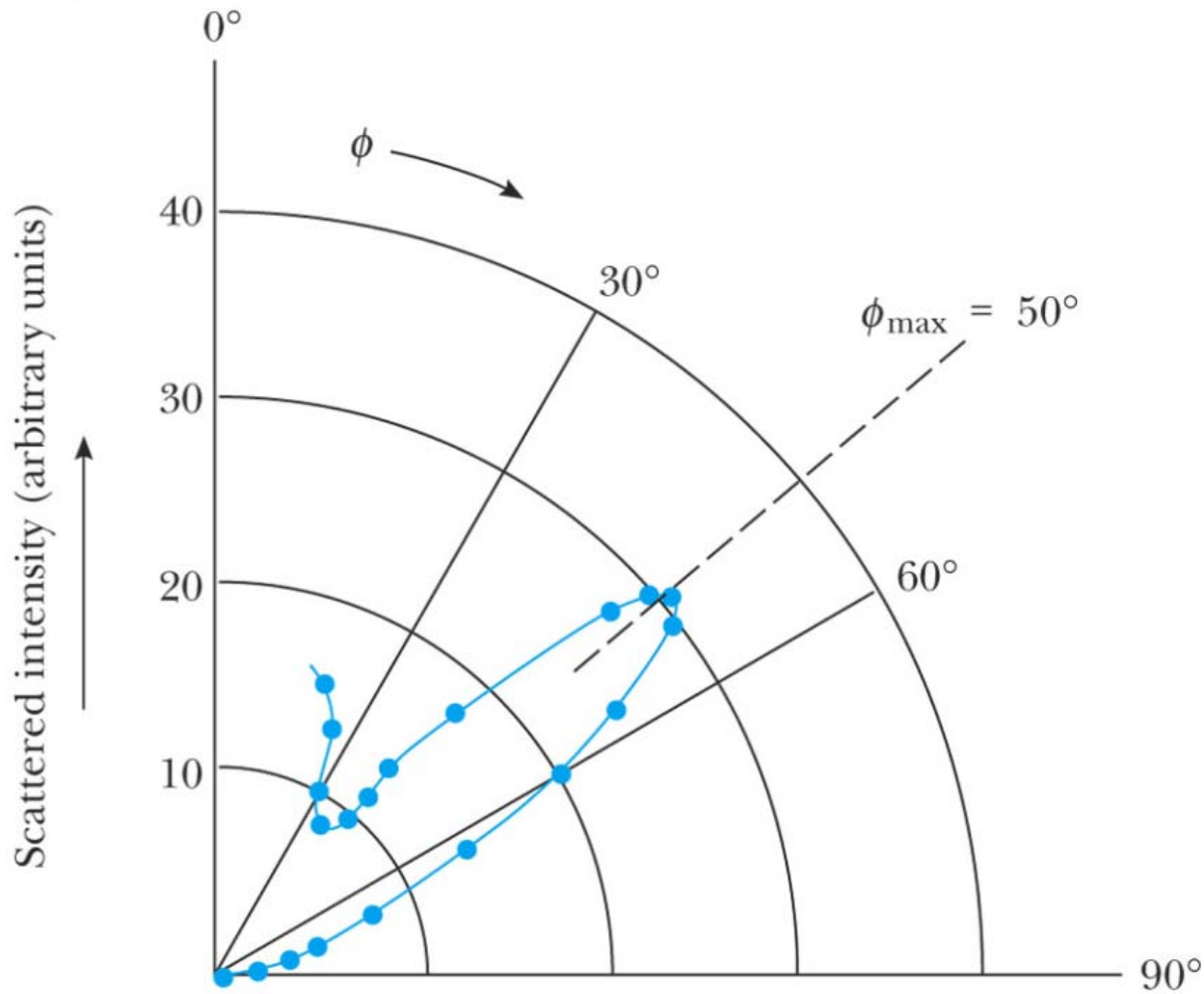


Fig. 5-4, p. 156

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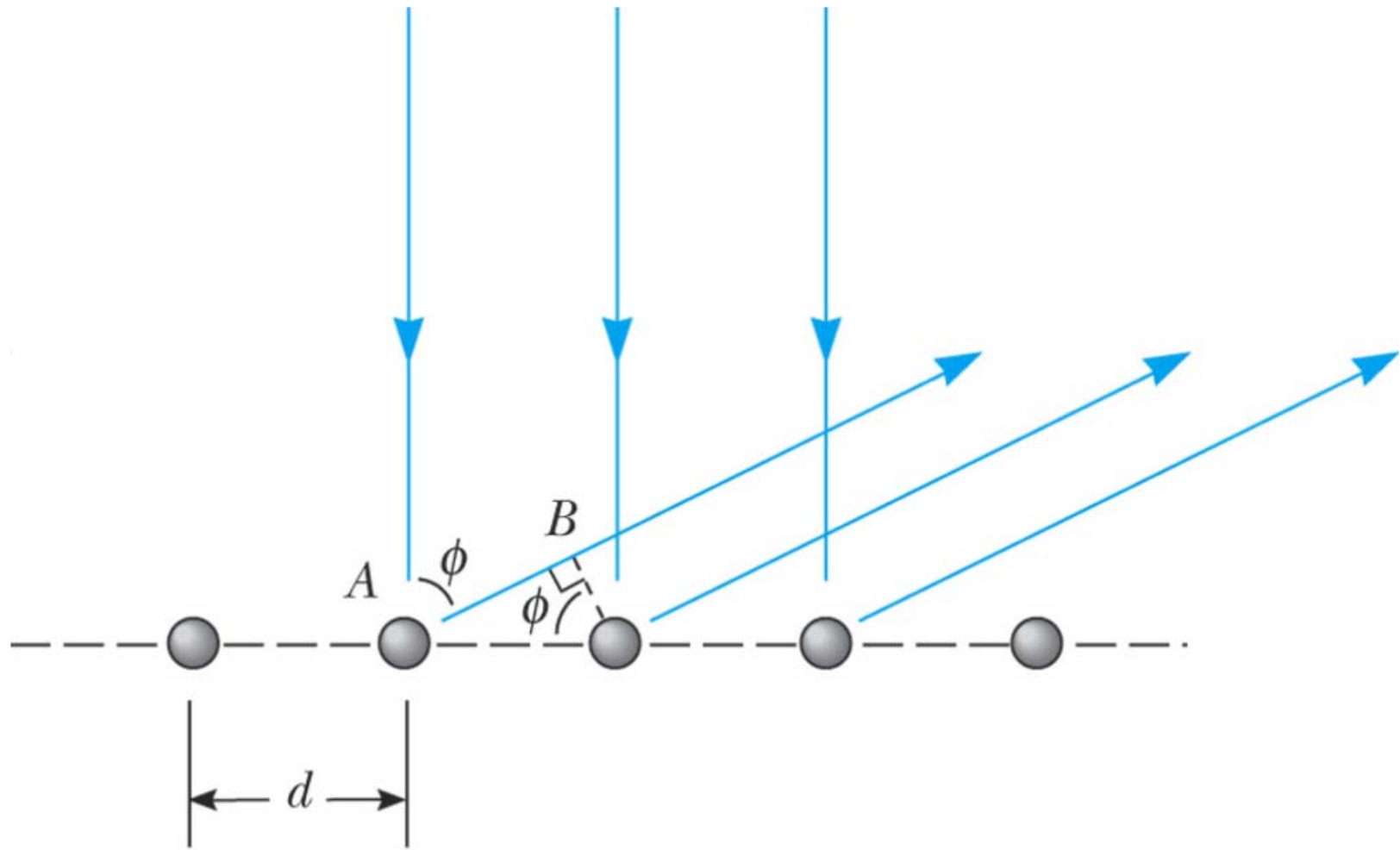




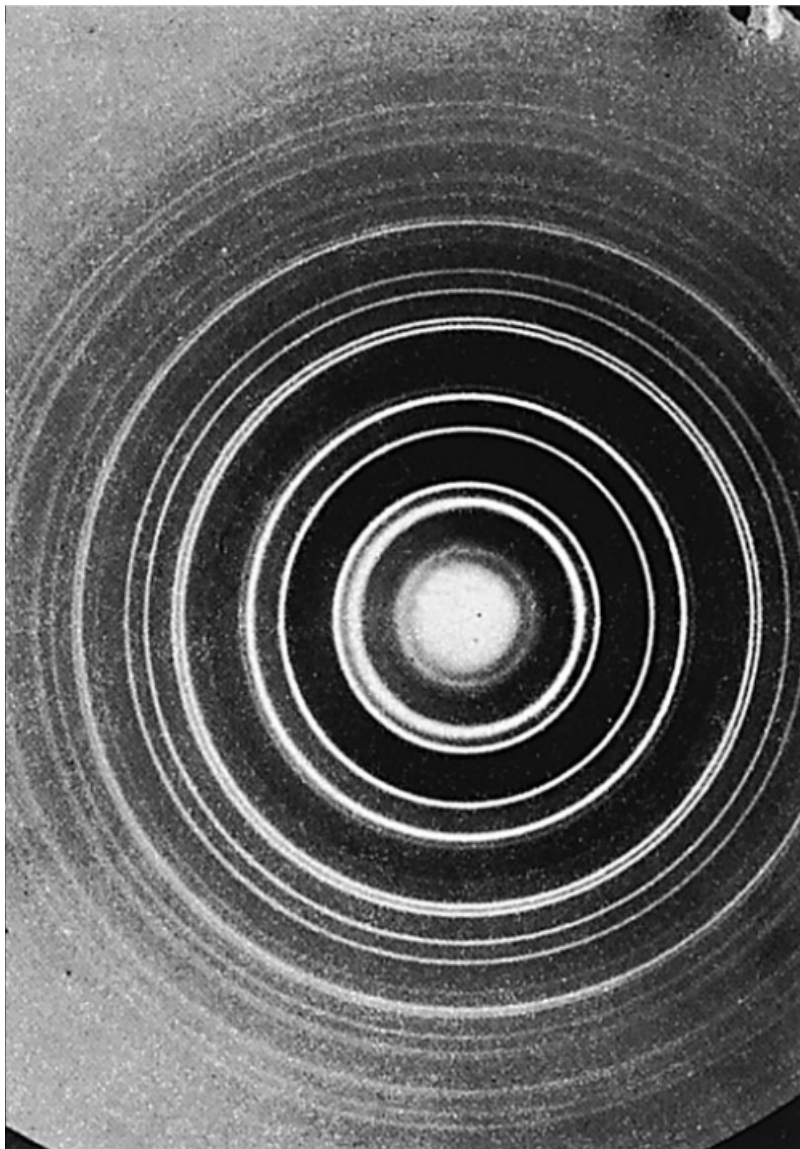
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Fig. 5-5, p. 156



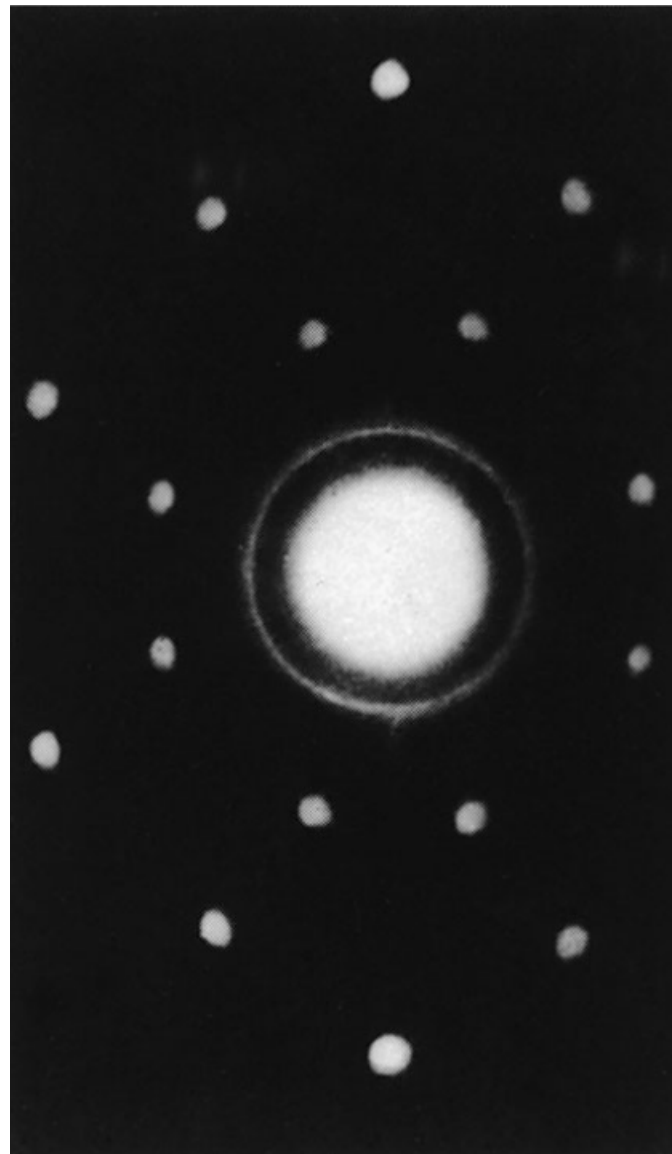


$$AB = d \sin \phi = n\lambda$$



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Fig. 5-7, p. 157



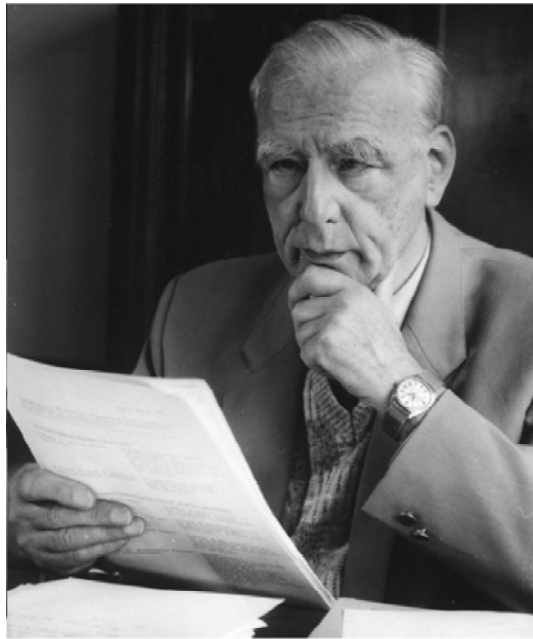
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Fig. 5-8, p. 158



The Nobel Prize in Physics 1986

“for his fundamental work in electron optics, and for the design of the first electron microscope”



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Ernst Ruska (1906-1988)

“for their design of the scanning tunneling microscope”



Gerd Binnig
(1947-)



Heinrich Rohrer
(1933-)

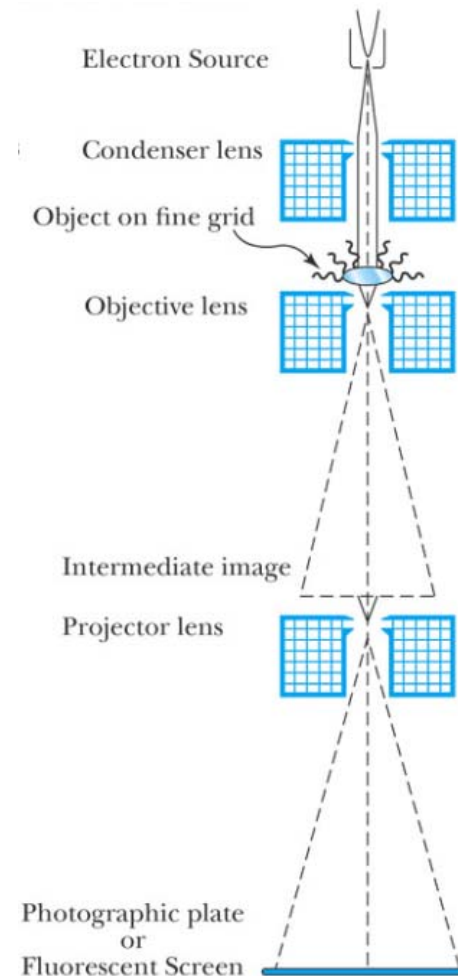


Electron Microscopes – TEM, SEM



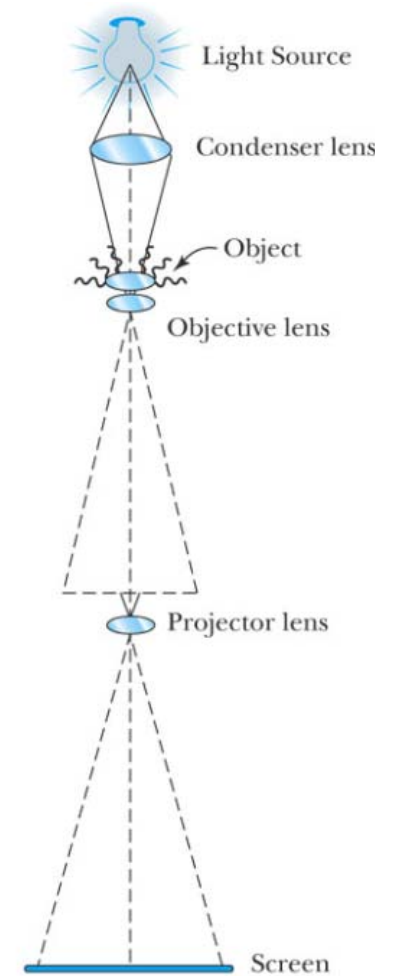
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Fig. 5-10, p. 160



(a)

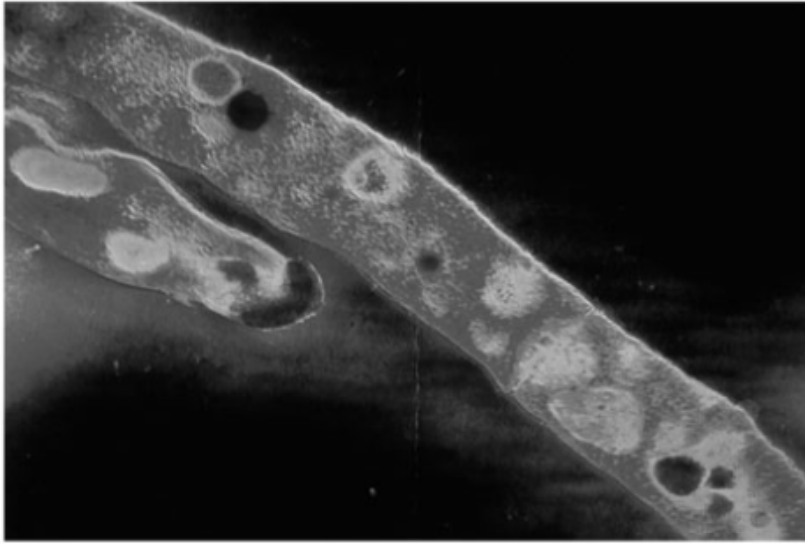
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(b)

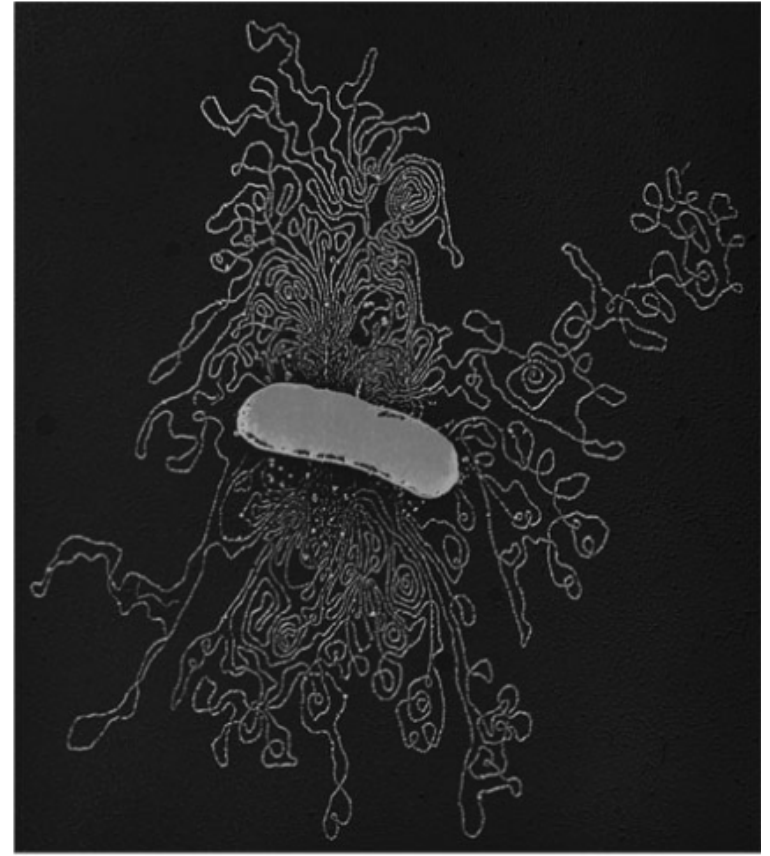
Fig. 5-11, p. 160





(a)

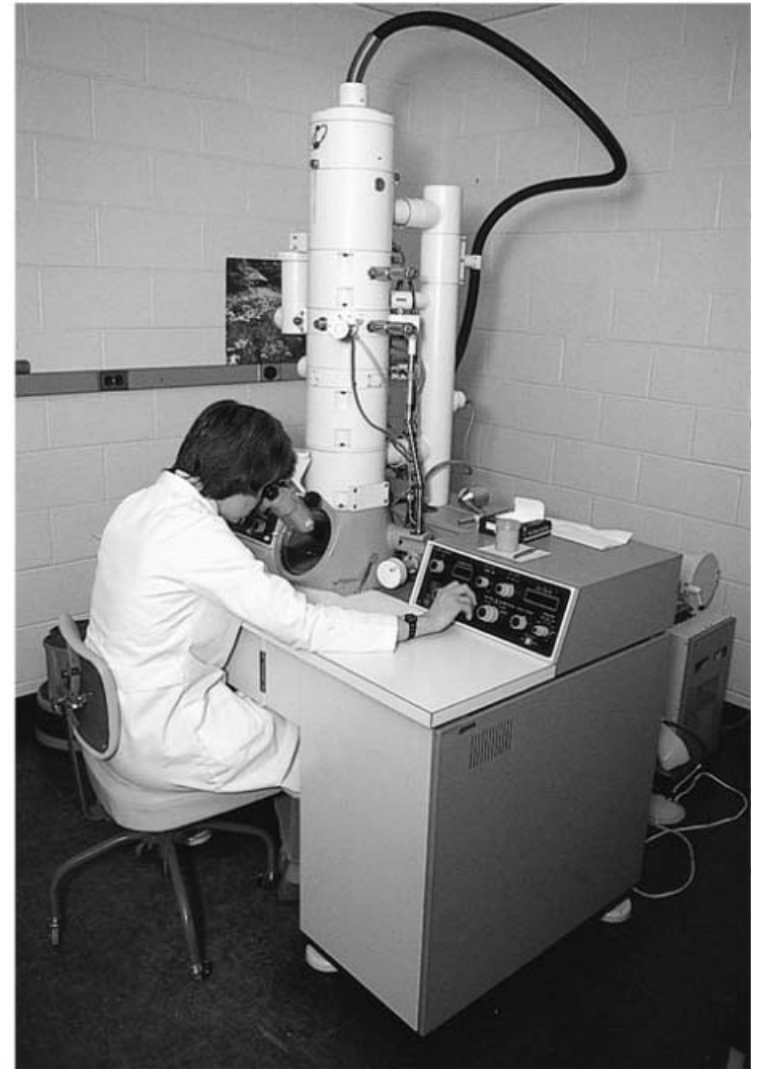
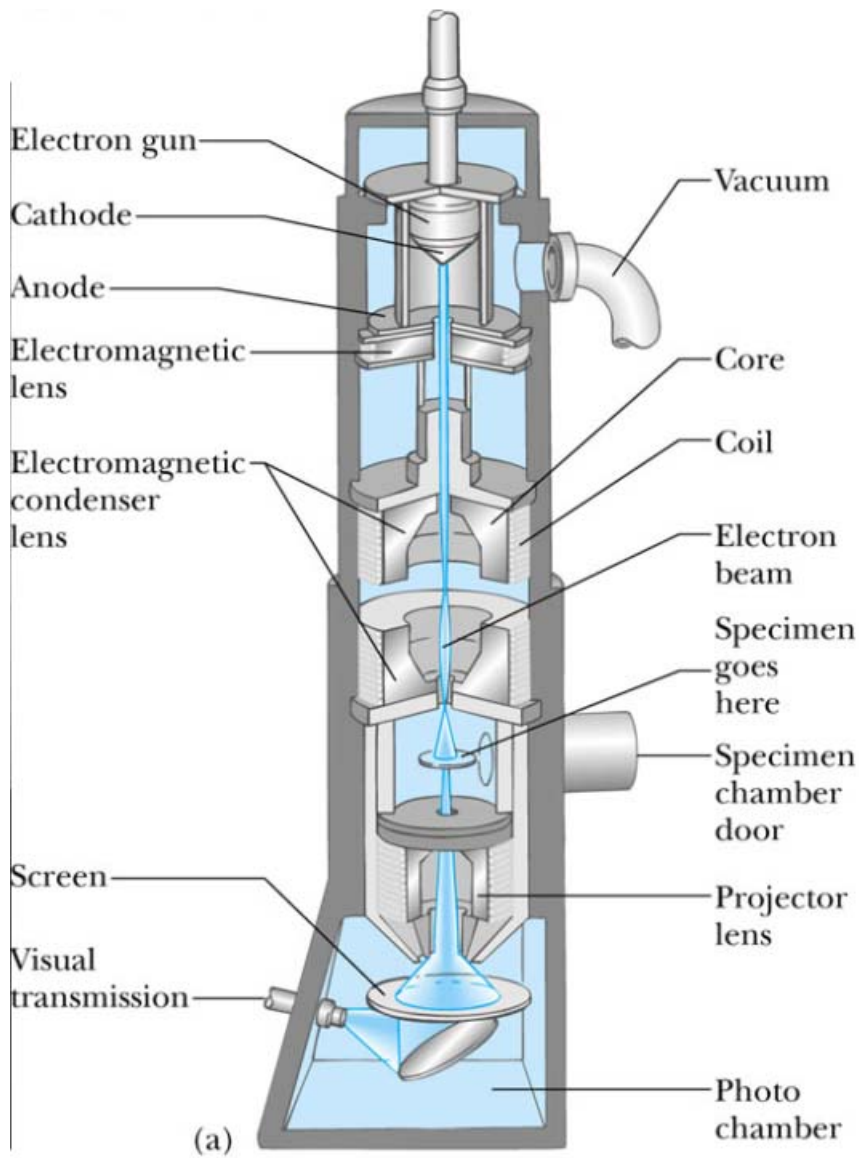
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(b)

Fig. 5-12, p. 161

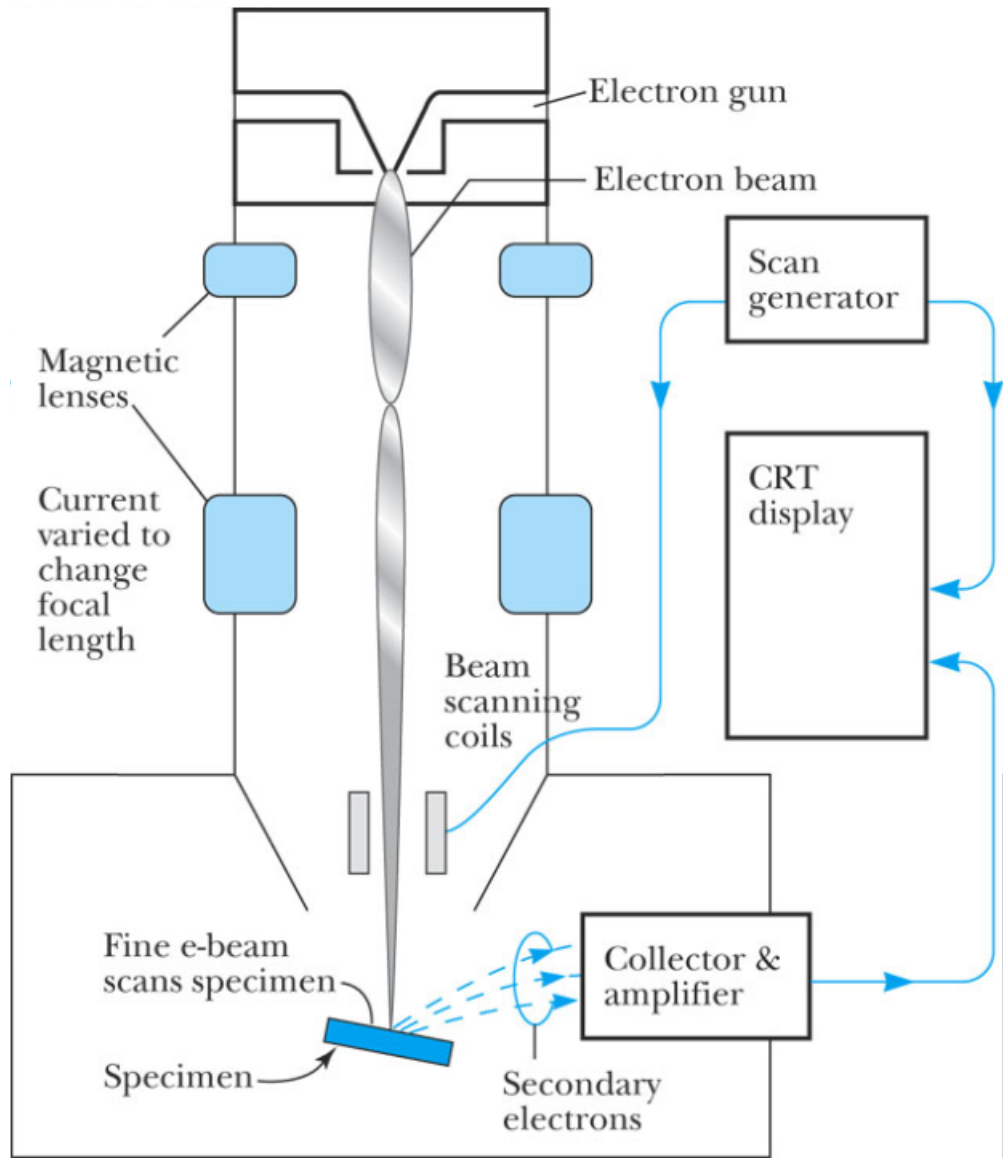




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Fig. 5-13, p. 162

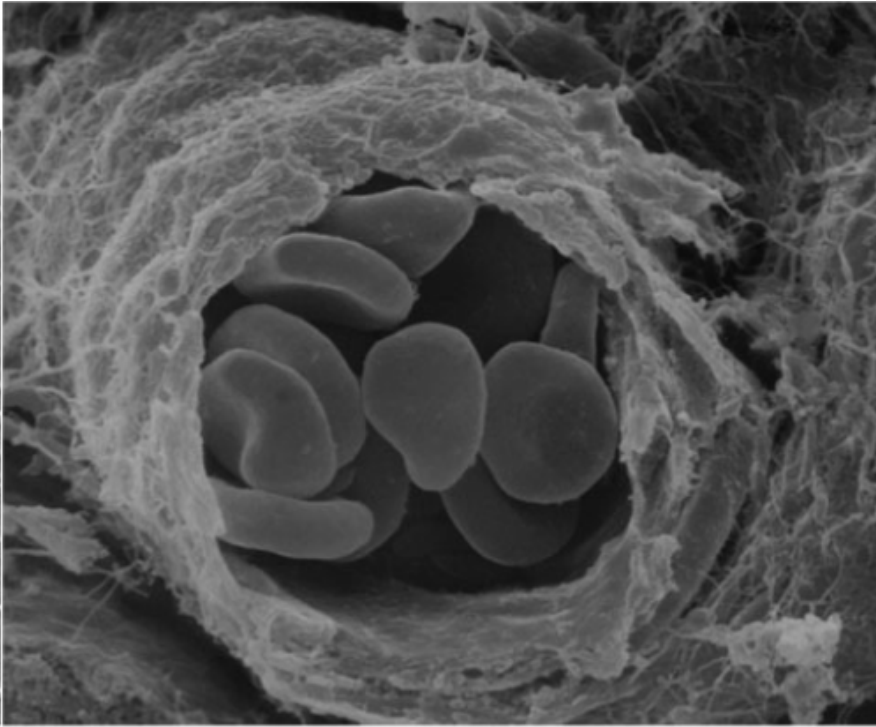




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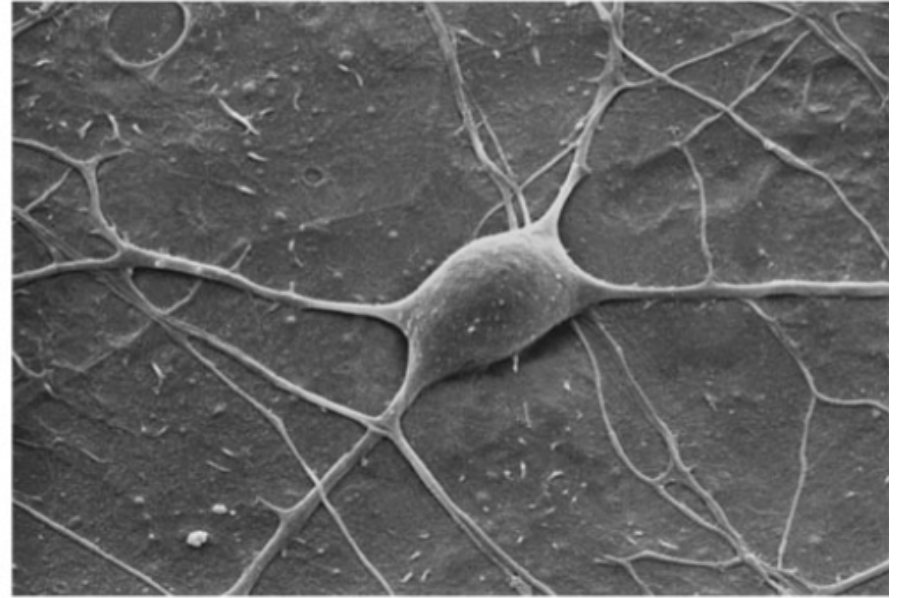
Fig. 5-15, p. 163





(a)

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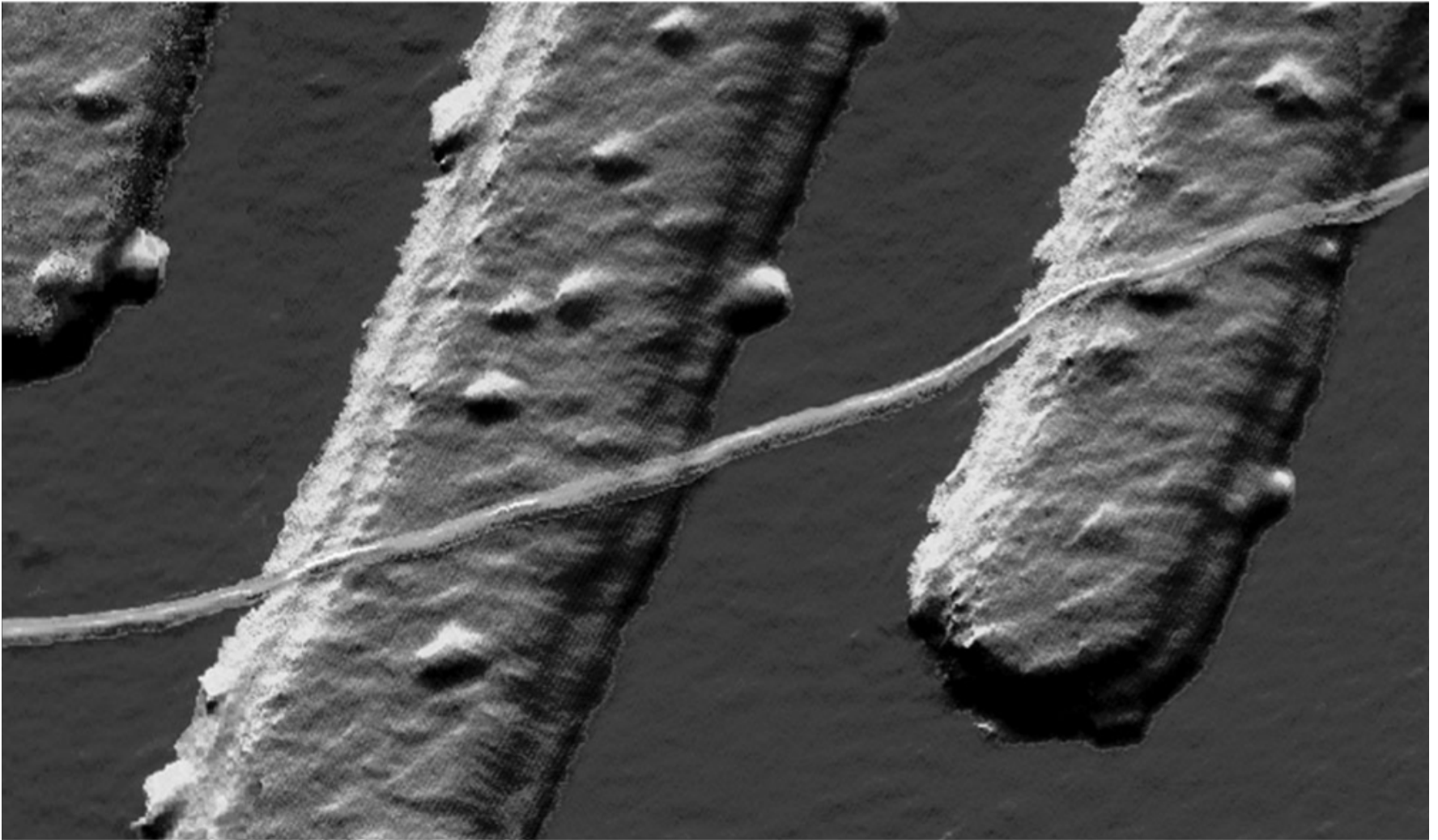
(b)

Fig. 5-14, p. 162



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NRL HoloTech



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Atomic Force Microscope (AFM) image

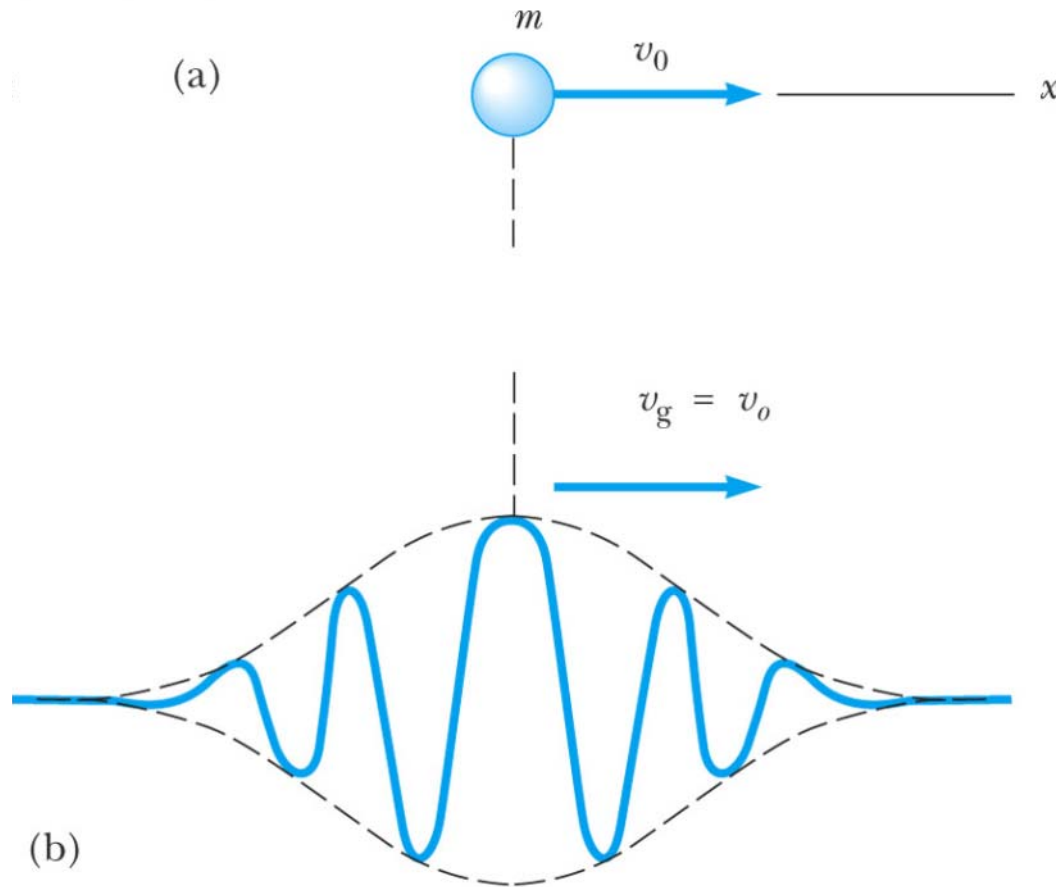
Fig. 5-16, p. 163



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Wave Packet



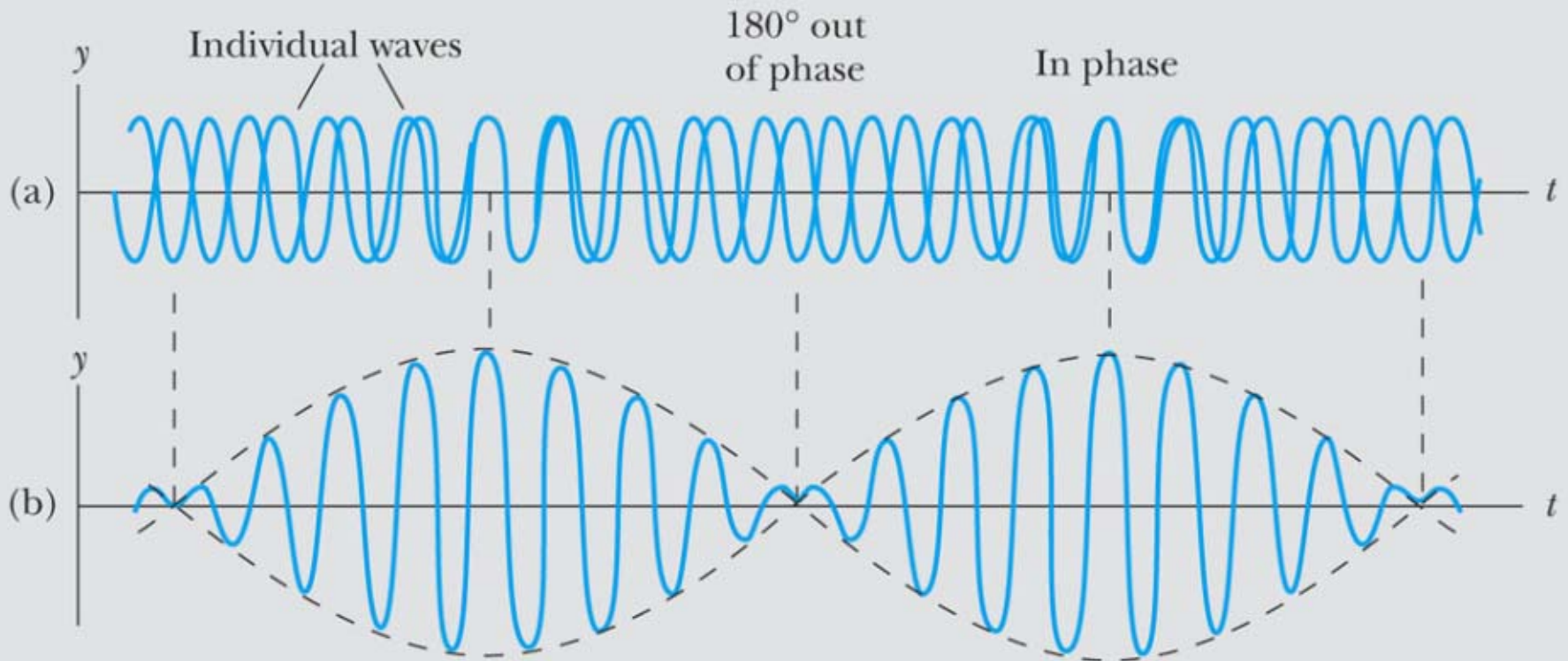
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Fig. 5-17, p. 164



$$y = y_1 + y_2 = A \cos(k_1 x - \omega_1 t) + A \cos(k_2 x - \omega_2 t)$$

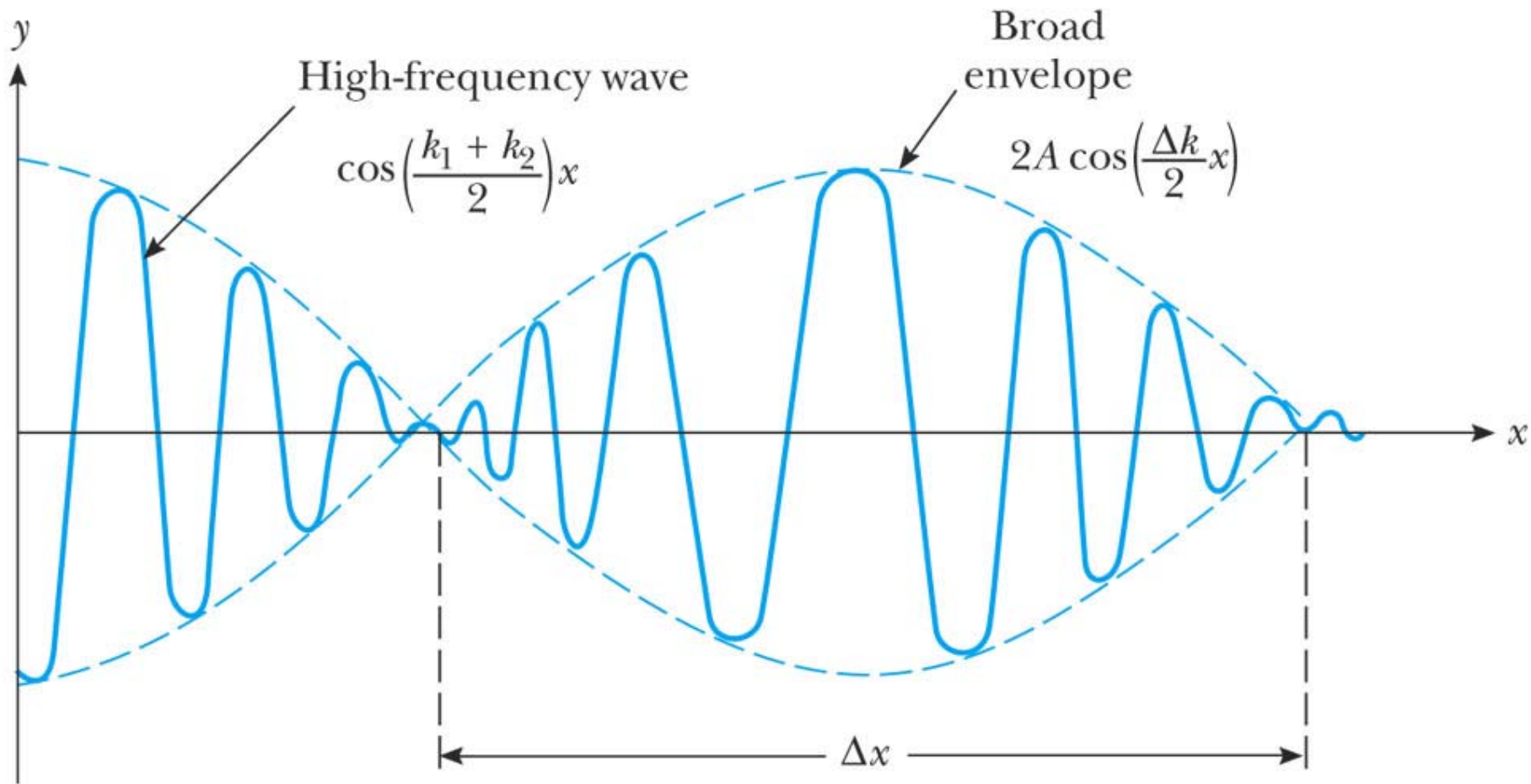
$$= 2A \cos\left(\frac{1}{2}[(k_2 - k_1)x - (\omega_2 - \omega_1)t]\right) \cos\left(\frac{1}{2}[(k_2 + k_1)x - (\omega_2 + \omega_1)t]\right)$$



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Fig. 5-18, p. 165





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Fig. 5-19, p. 166



Phase Velocity & Group Velocity

$$v_p = \frac{\omega}{k}$$

$$v_g = \left. \frac{d\omega}{dk} \right|_{k_0}$$

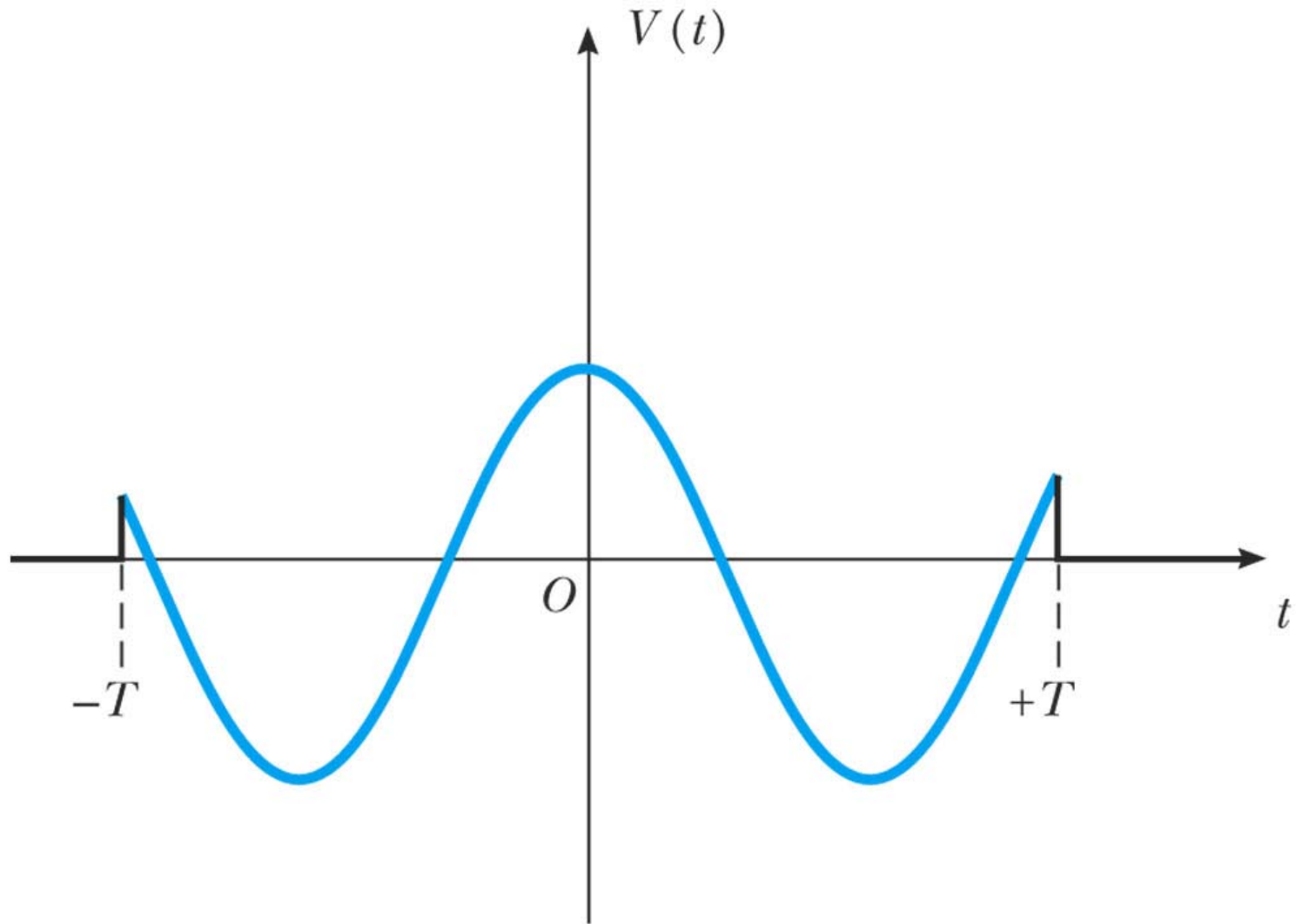


Fourier Transform & Inverse FT

$$f(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} a(k) e^{ikx} dk$$

$$a(k) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(x) e^{-ikx} dx$$

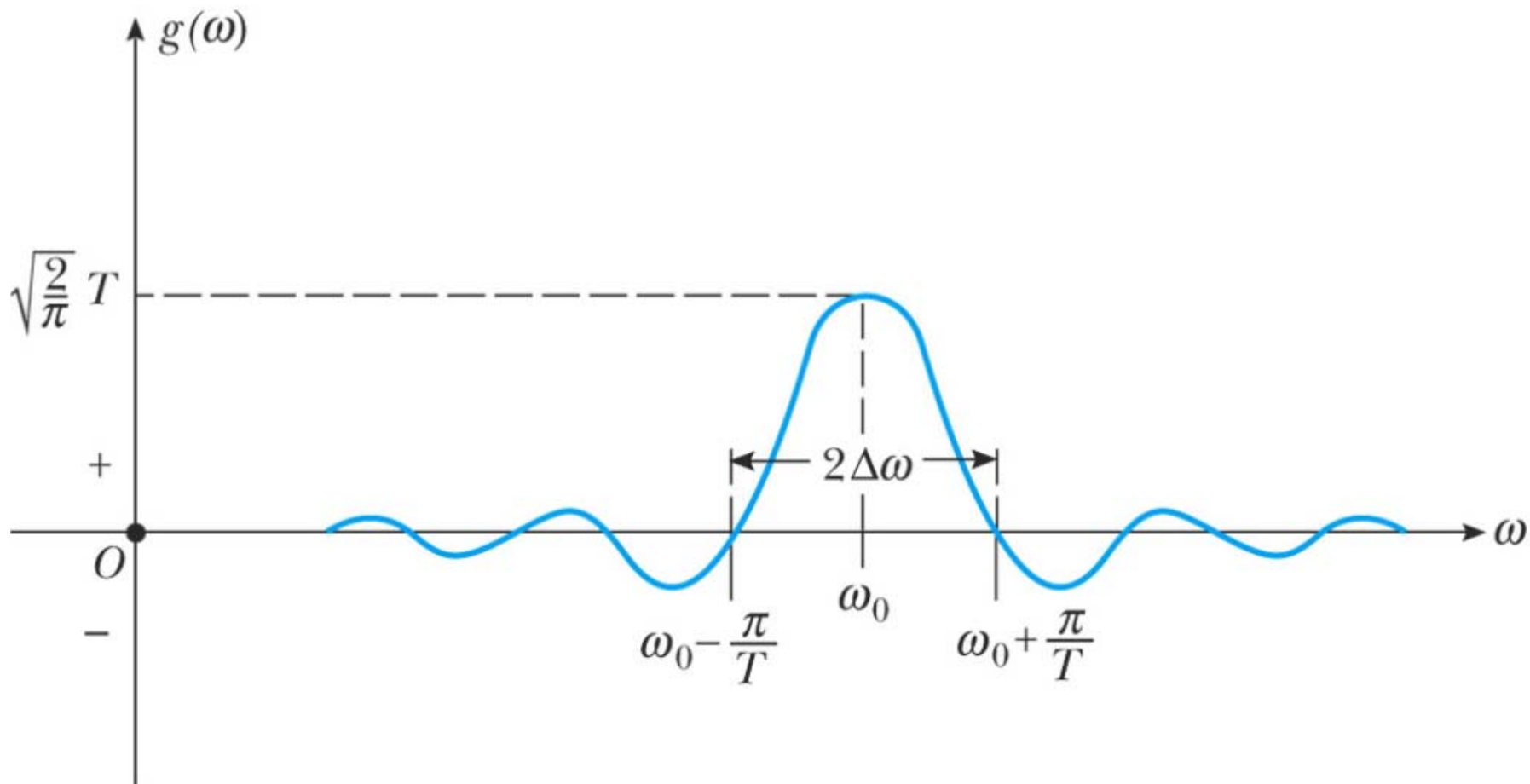




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Fig. 5-21, p. 171

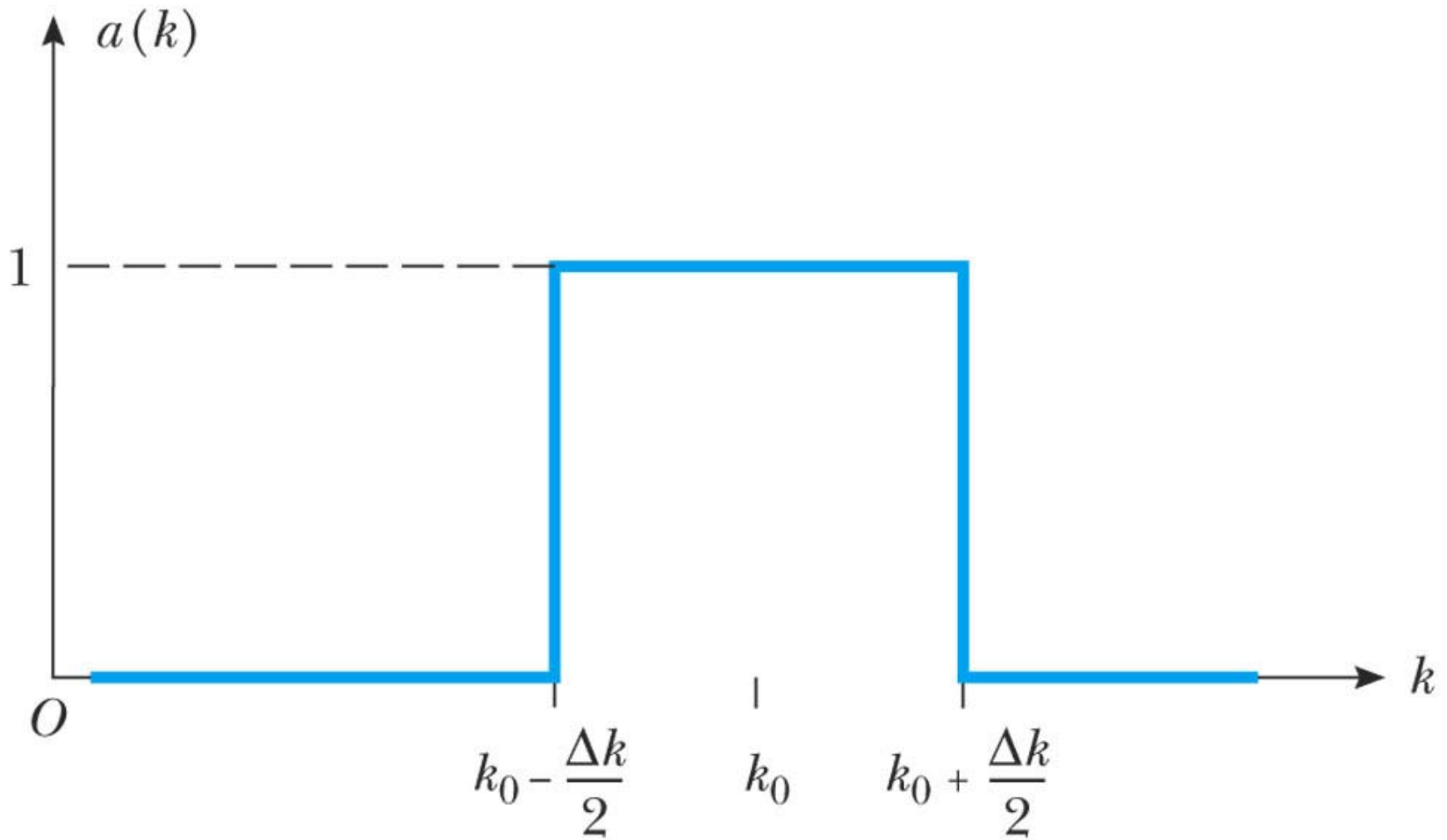




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Fig. 5-22, p. 171

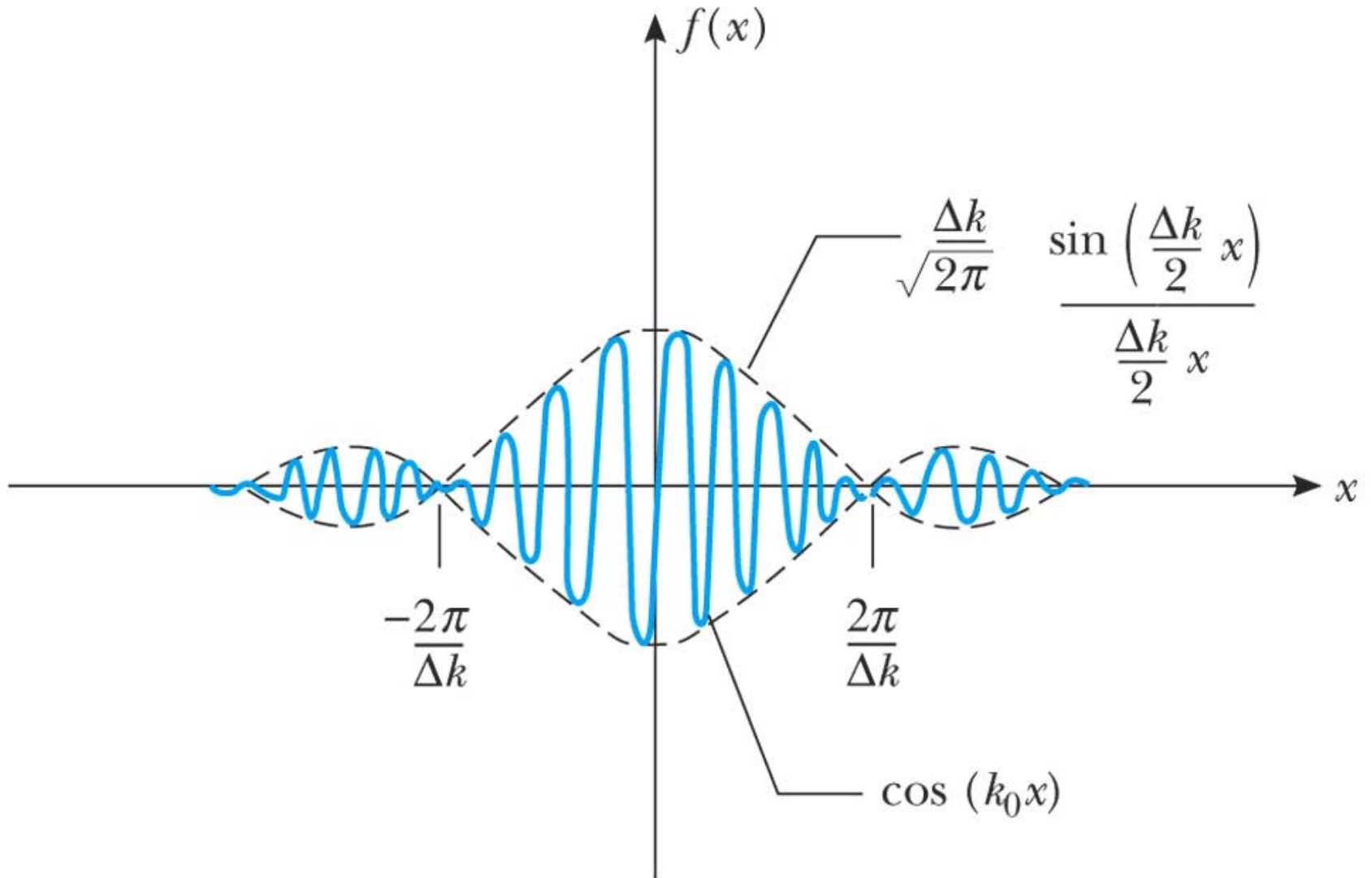




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Fig. 5-23, p. 172





Widths in Fourier Representation

Δk 와 Δx 는 반비례

$\Delta \omega$ 와 Δt 는 반비례

→ Uncertainty Principle (불확정성의 원리)

Gaussian wave packet: $\Delta x \Delta k = \frac{1}{2}$

Minimum!

