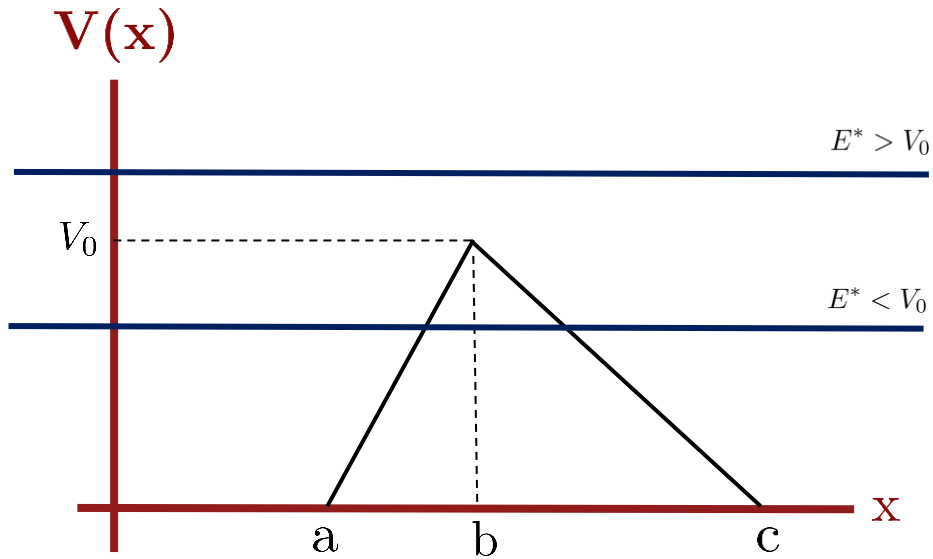


# Desarrollo Triangular

Picture



$$-\frac{\hbar^2}{2m} \frac{d^2\psi}{dx^2} + V(x)\psi = E^*\psi$$

$$\Psi(x) = \begin{cases} Ae^{ikx} + Be^{-ikx} & x < a \\ C u(z_1) + D v(z_1) & a \leq x \leq b \\ E u(z_2) + F v(z_2) & b \leq x \leq c \\ Ge^{ikx} + He^{-ikx} & x > c \end{cases}$$

$$V(x) = \begin{cases} 0 & x \leq a \\ \frac{V_0}{b-a}(x-a) & a \leq x \leq b \\ \frac{-V_0}{c-b}(x-c) & b \leq x \leq c \\ 0 & x \geq c \end{cases}$$

$$k^2 = \frac{2mE}{\hbar^2}$$

$$q^2 = \frac{2mV_0}{\hbar^2}$$

$$\alpha_1 = \left( \frac{q^2}{b-a} \right)^{1/3}$$

$$\alpha_2 = \left( -\frac{q^2}{c-b} \right)^{1/3}$$

$$\beta_1 = -\frac{1}{\alpha_1^2} \left( \frac{q^2 a}{b-a} + k^2 \right) \quad \beta_2 = \frac{1}{\alpha_2^2} \left( \frac{q^2 c}{c-b} - k^2 \right)$$

$$z_1(x) = \alpha_1 x + \beta_1$$

$$z_2(x) = \alpha_2 x + \beta_2$$

# Desarrollo Triangular

Matriz de Transferencia

$$\begin{pmatrix} A \\ B \end{pmatrix} = M_1^{-1} M_2 M_3^{-1} M_4 M_5^{-1} M_6 \begin{pmatrix} G \\ H \end{pmatrix}$$

$$\begin{pmatrix} A \\ B \end{pmatrix} = \begin{pmatrix} \Gamma_{11} & \Gamma_{12} \\ \Gamma_{21} & \Gamma_{22} \end{pmatrix} \begin{pmatrix} G \\ 0 \end{pmatrix}$$

# Desarrollo Triangular

## Transmisión

$$\Gamma_{11} = e^{ik(c-2a)} \begin{bmatrix} -h_1 (ik u(z_1|_a) u(z_2|_b) + \alpha_1 u'(z_1|_a) u(z_2|_b)) \\ -h_2 (ik u(z_1|_a) u'(z_2|_b) + \alpha_1 u'(z_1|_a) u'(z_2|_b)) \\ -h_3 (ik u(z_1|_a) u(z_2|_c) + \alpha_1 u'(z_1|_a) u(z_2|_c)) \\ -h_4 (ik u(z_1|_a) u'(z_2|_c) + \alpha_1 u'(z_1|_a) u'(z_2|_c)) \\ -l_4 (ik v(z_1|_a) v'(z_2|_c) + \alpha_1 v'(z_1|_a) v'(z_2|_c)) \\ -l_3 (ik v(z_1|_a) v(z_2|_c) + \alpha_1 v'(z_1|_a) v(z_2|_c)) \\ -l_1 (ik v(z_1|_a) v(z_2|_b) + \alpha_1 v'(z_1|_a) v(z_2|_b)) \\ -l_2 (ik v(z_1|_a) v'(z_2|_b) + \alpha_1 v'(z_1|_a) v'(z_2|_b)) \end{bmatrix}$$

$$h_1 = \alpha_1 \alpha_2 v'(z_1|_b) v'(z_2|_c) - \alpha_1 ik v'(z_1|_b) v(z_2|_c)$$

$$h_2 = ik \alpha_2 v(z_1|_b) v(z_2|_c) - \alpha_2^2 v(z_1|_b) v'(z_2|_c)$$

$$h_3 = \alpha_1 ik v'(z_1|_b) v(z_2|_b) - \alpha_2 ik v(z_1|_b) v'(z_2|_b)$$

$$h_4 = \alpha_2^2 v(z_1|_b) v'(z_2|_b) - \alpha_1 \alpha_2 v'(z_1|_b) v(z_2|_b)$$

$$l_1 = \alpha_1 \alpha_2 u'(z_1|_b) u'(z_2|_c) - \alpha_1 ik u(z_2|_c) u'(z_1|_b)$$

$$l_2 = \alpha_2 ik u(z_1|_b) u(z_2|_c) - \alpha_2^2 u(z_1|_b) u'(z_2|_c)$$

$$l_3 = \alpha_1 ik u(z_2|_b) u'(z_1|_b) - \alpha_2 ik u(z_1|_b) u'(z_2|_b)$$

$$l_4 = \alpha_2^2 u(z_1|_b) u'(z_2|_b) - \alpha_1 \alpha_2 u(z_2|_b) u'(z_1|_b)$$

$$T = \left| \frac{G}{A} \right|^2$$

$$T = \left| \frac{1}{\left( \frac{e^{ika}}{-2ik} \cdot \frac{\pi^2}{\alpha_1 \alpha_2} \right) \Gamma_{11}} \right|^2$$

$$T = \left| \frac{2k \alpha_1 \alpha_2}{\pi^2 \Gamma_{11}} \right|^2$$

# Desarrollo Triangular

## Reflexión

$$\Gamma_{11} = e^{ik(c-2a)} \begin{bmatrix} -h_1 (ik u(z_1|_a) u(z_2|_b) + \alpha_1 u'(z_1|_a) u(z_2|_b)) \\ -h_2 (ik u(z_1|_a) u'(z_2|_b) + \alpha_1 u'(z_1|_a) u'(z_2|_b)) \\ -h_3 (ik u(z_1|_a) u(z_2|_c) + \alpha_1 u'(z_1|_a) u(z_2|_c)) \\ -h_4 (ik u(z_1|_a) u'(z_2|_c) + \alpha_1 u'(z_1|_a) u'(z_2|_c)) \\ -l_4 (ik v(z_1|_a) v'(z_2|_c) + \alpha_1 v'(z_1|_a) v'(z_2|_c)) \\ -l_3 (ik v(z_1|_a) v(z_2|_c) + \alpha_1 v'(z_1|_a) v(z_2|_c)) \\ -l_1 (ik v(z_1|_a) v(z_2|_b) + \alpha_1 v'(z_1|_a) v(z_2|_b)) \\ -l_2 (ik v(z_1|_a) v'(z_2|_b) + \alpha_1 v'(z_1|_a) v'(z_2|_b)) \end{bmatrix}$$

$$\Gamma_{21} = e^{ikc} \begin{bmatrix} +h_1 (\alpha_1 u'(z_1|_a) u(z_2|_b) - iku(z_1|_a) u(z_2|_b)) \\ +h_2 (\alpha_1 u'(z_1|_a) u'(z_2|_b) - iku(z_1|_a) u'(z_2|_b)) \\ +h_3 (\alpha_1 u'(z_1|_a) u(z_2|_c) - iku(z_1|_a) u(z_2|_c)) \\ +h_4 (\alpha_1 u'(z_1|_a) u'(z_2|_c) - iku(z_1|_a) u'(z_2|_c)) \\ +l_4 (\alpha_1 v'(z_1|_a) v'(z_2|_c) - ikv(z_1|_a) v'(z_2|_c)) \\ +l_3 (\alpha_1 v'(z_1|_a) v(z_2|_c) - ikv(z_1|_a) v(z_2|_c)) \\ +l_1 (\alpha_1 v'(z_1|_a) v(z_2|_b) - ikv(z_1|_a) v(z_2|_b)) \\ +l_2 (\alpha_1 v'(z_1|_a) v'(z_2|_b) - ikv(z_1|_a) v'(z_2|_b)) \end{bmatrix}$$

$$R = \left| \frac{B}{A} \right|^2$$

$$R = \left| \frac{\Gamma_{21}}{\Gamma_{11}} \right|^2$$

# Desarrollo Triangular

Parámetro de Asimetría

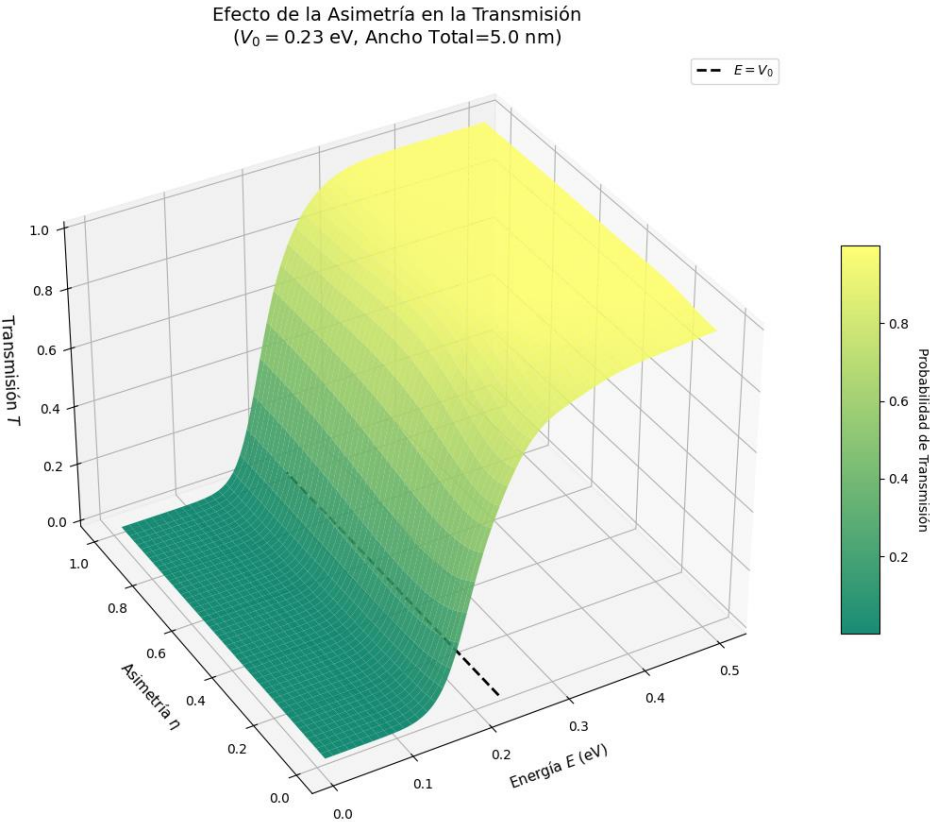
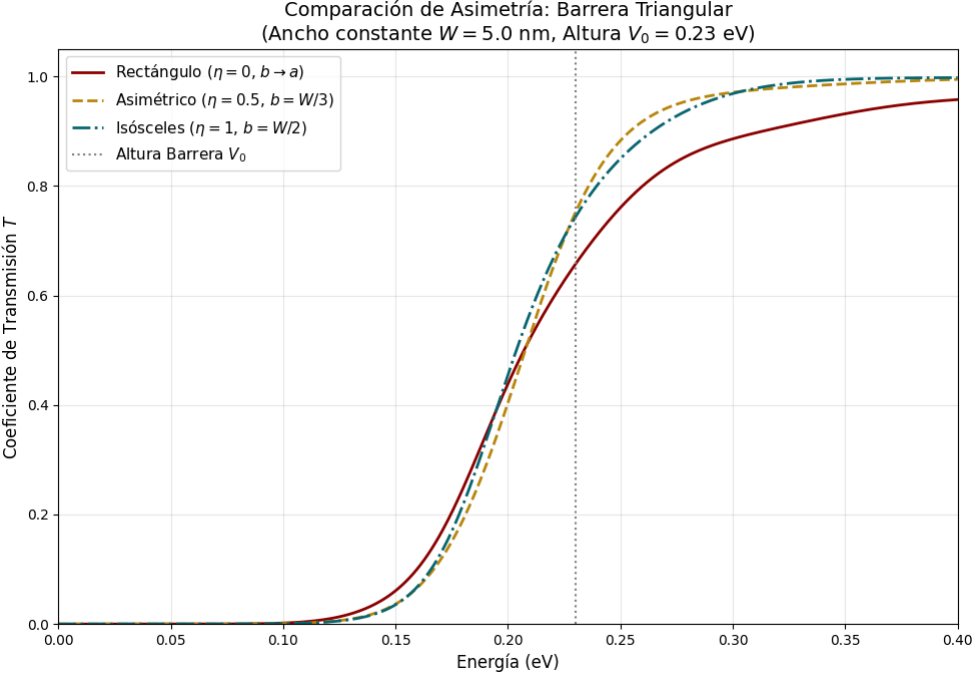
$$\eta = \frac{b - a}{c - b}$$

$$W = c - a$$

$$b = a + \left( \frac{\eta}{1 + \eta} \right) W$$

# Desarrollo Triangular

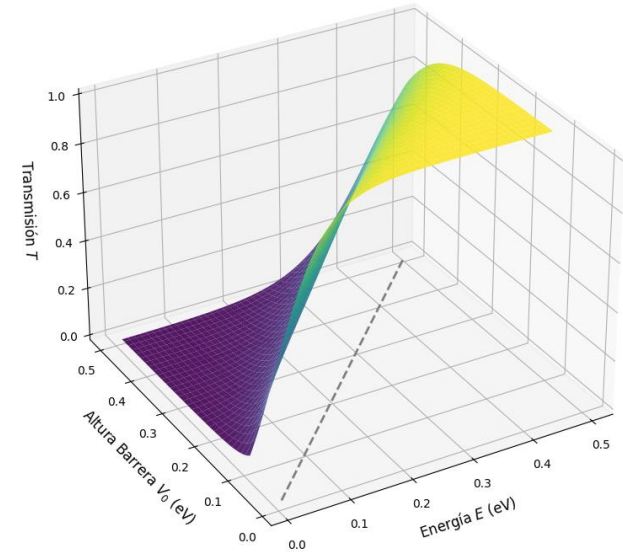
## Representación 2-Dimensional



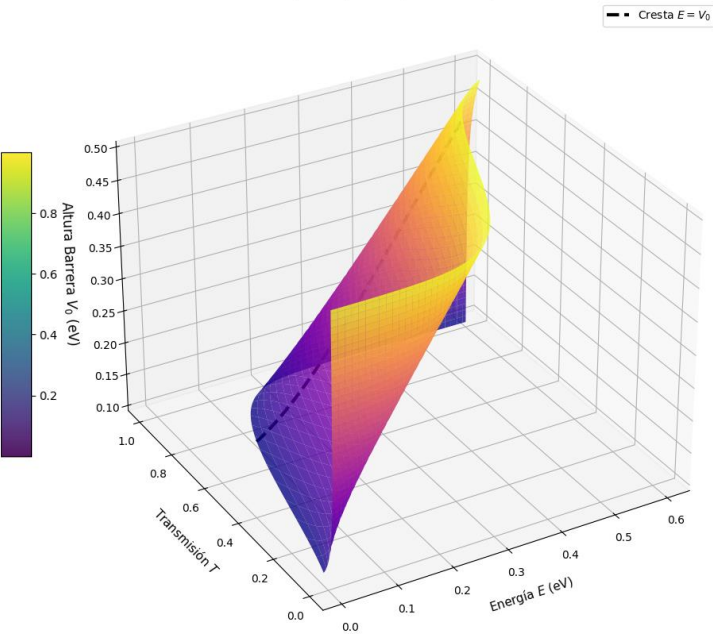
# Desarrollo Triangular

## Representación 3-Dimensional

Transmitancia 3D -  $E, V_0, T$   
( $a=3.0, b=4.0, c=5.0$  nm)



Transmitancia 3D -  $E, T, V_0$   
( $a=3.0, b=4.0, c=5.0$  nm)



Transmitancia 3D -  $V_0, T, E$   
( $a=3.0, b=4.0, c=5.0$  nm)

