Series 10 (6 May 2025)

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Chapter 21 : Wave Travel and Reflection

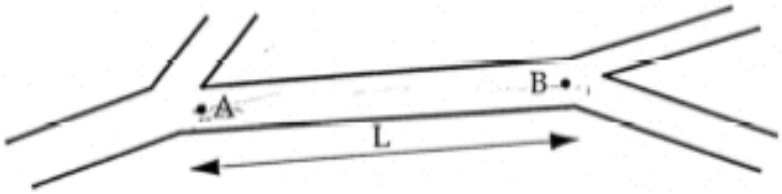
Exercise 21.1

Study the effect of conicity of an artery on the amplitude of the waves of pressure and flow.

1) Modeling the conicity as a succession of small 'steps' show that the reflected energy is negligible.
2) Show that the amplitude of a pressure wave is inversely proportional to the diameter of the artery.
3) How does the wave of velocity evolve as a function of the diameter?

Exercise 21.2

Determine the amplitude of a pressure wave $p(z,t)$ that propagates in an artery characterized by two sites of reflection $A(z = 0)$ and B separated by a distance L.



The wave $p_0 e^{i\omega t - \gamma z}$ enters at point A, propagates until point B where it is partially reflected (reflection coefficient R_2), returns to point A where it is again partially reflected (reflection coefficient R_1), returns to point B etc.

1) Consider a non-attenuated wave: $\gamma = ib$
2) Define the type of the resulting wave in case $R_1 = R_2 = 1$
3) Analyze the case of an attenuated wave: $\gamma = a + ib$