Linear Expansion Problems

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1 Thermal Expansions

1.1 Three Dimensions

You have a rectangular prism that has a length L_0, a height H_0, and a width W_0. First, consider that the thermal expansion of the prism is isotropic (equal in all directions). It has a linear expansion coefficient α. What is the volume expansion coefficient of the prism for a small temperature change?

Now consider that the thermal expansion of this prism is anisotropic. Its length expands with linear expansion coefficient α_L, and its other dimensions expand with linear expansion coefficient α_{HW}. What is the volume expansion coefficient of the prism for a small temperature change?

1.2 Expanding/contracting holes

If you heat an annulus of inner radius a_0 and outer b_0, does the hole get larger or smaller? Why? Can you quantify this change? How? Expalin and justify this (hint: there is more that one way/dimension to think this through in).

1.3 Becoming an experimenter

How might you measure the coefficient of either linear or volumetric expansion?