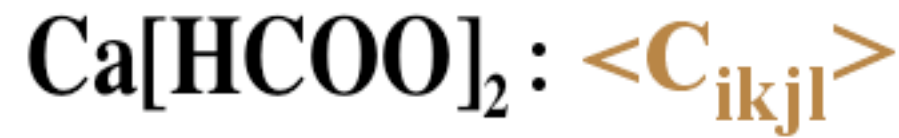
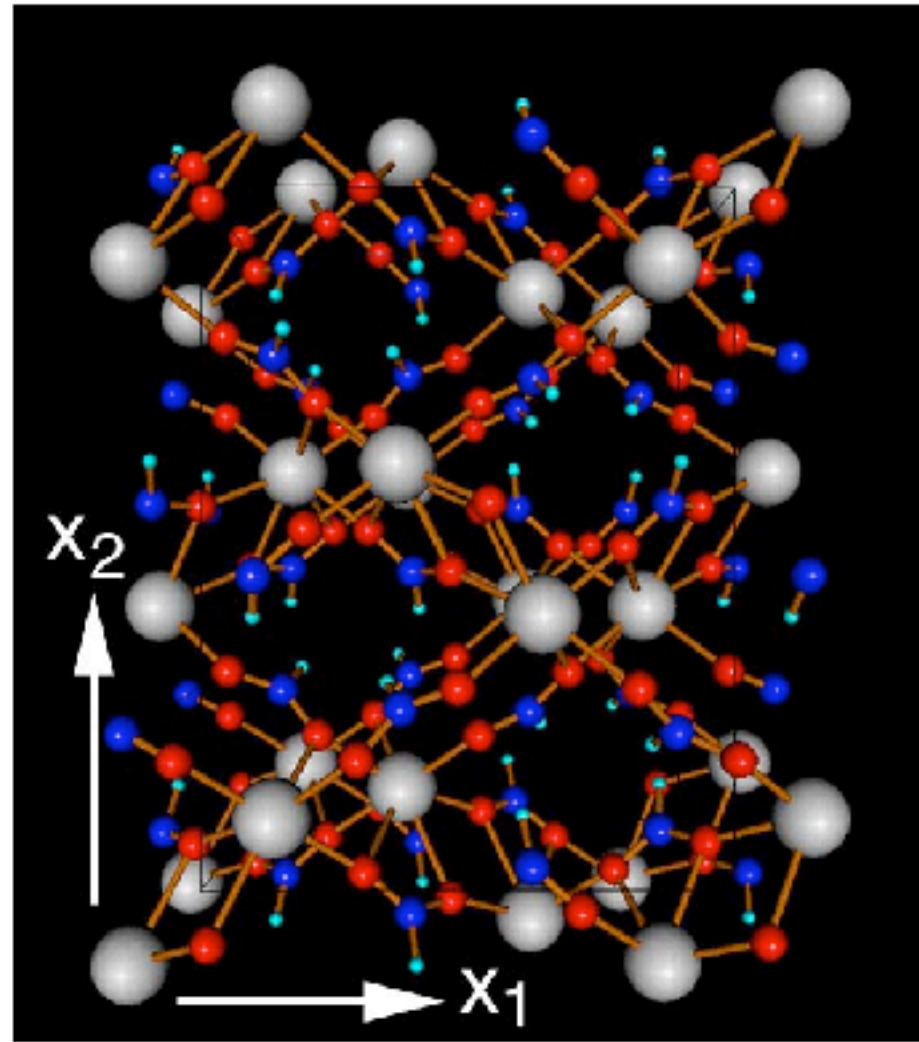


**Christoffel's equations show
 macro-properties are
 functions of the nano-structure**



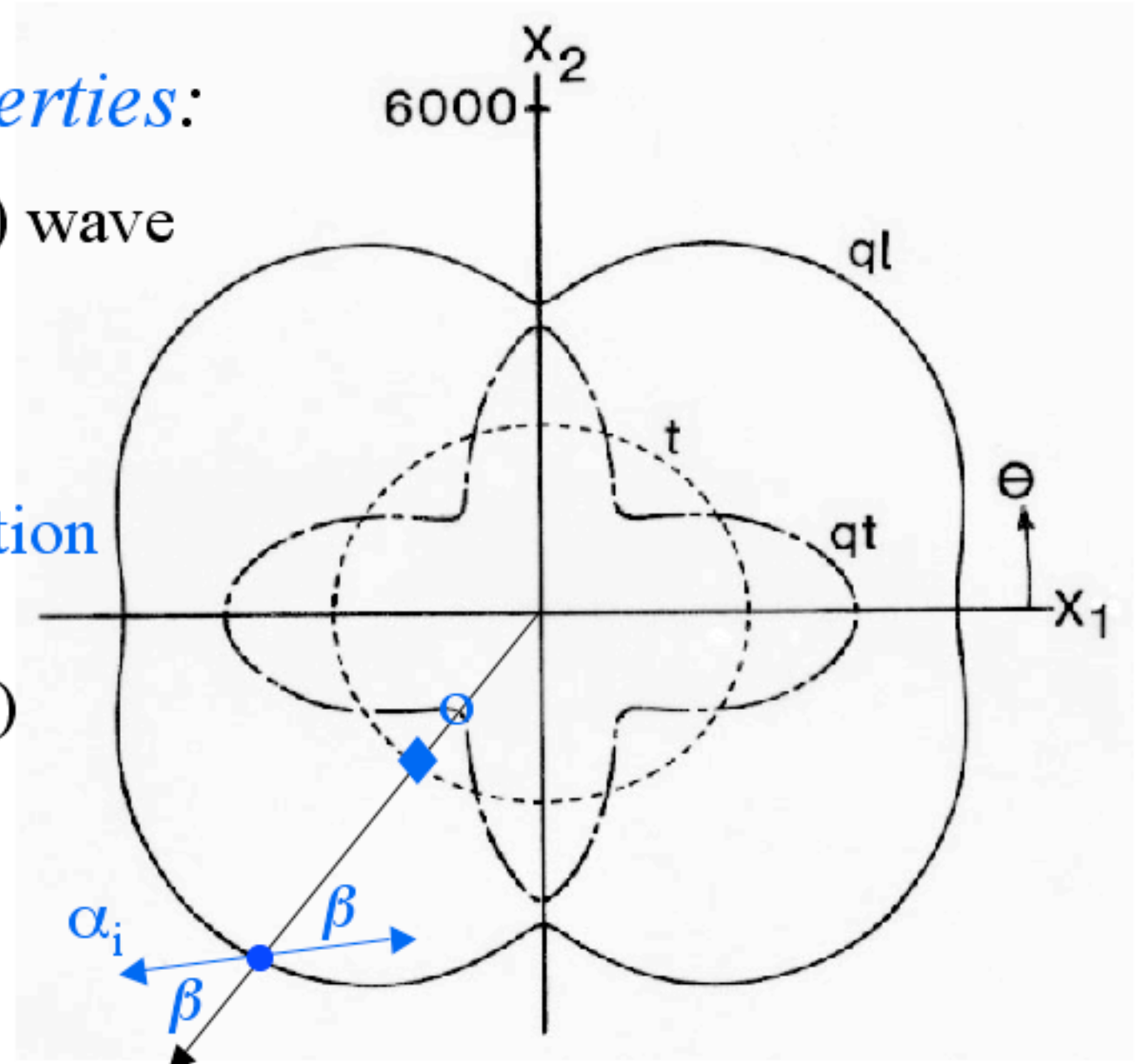
Nano-structure \longleftrightarrow *Macro-properties:*



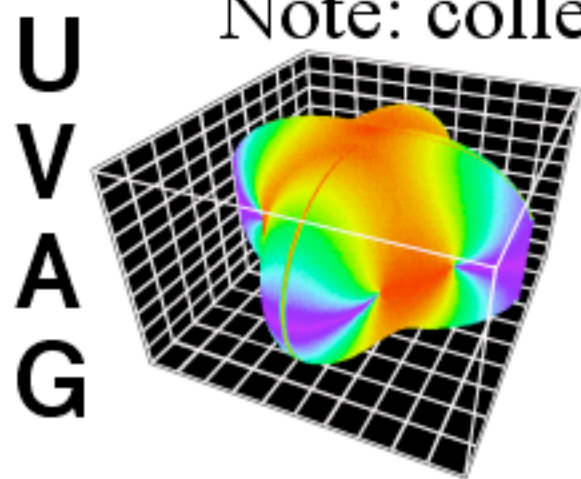
- Three (●, ◆, ○) wave velocities, v (eigenvalue)

- Particle vibration directions, α_i (eigenvectors)

Colors: β
 $\cos \beta = \alpha_i v_i$



Note: collection of all propagation directions, v_j , maps out three **velocity** surfaces



$$[C_{ijkl} v_j v_l - \rho v^2 \delta_{ik}] \alpha_i = 0$$

Christoffel's equations of motion