Page 121, equation (3.211)

We have from (3.63) that $\mathrm{div}\mathbf{v} = -\dot{\rho}/\rho$. Combining this result with (3.16), we see that

$$\mathrm{tr}\mathbf{D} = -\frac{\dot{\rho}}{\rho}. \tag{1}$$

From the definition (3.199) we obtain

$$\dot{v} = \dot{\overline{\left(\frac{-1}{\rho}\right)}} = -\frac{\dot{\rho}}{\rho^2} \qquad \Rightarrow \quad \dot{\rho} = -\rho^2\dot{v}. \tag{2}$$

Inserting from (2) in (1) and using definition (3.199) we obtain:

$$\mathrm{tr}\mathbf{D} = \frac{\dot{v}}{v}. \tag{3}$$

Equation (3.189) with $\overset{\circ}{\mathbf{D}}= \mathbf{0}$ gives

$$\mathbf{T}_N = \zeta(\mathrm{tr}\mathbf{D})\mathbf{1}. \tag{4}$$

Because the nonequilibrium pressure is defined at the considered conditions by $\mathbf{T}_N = -P_N\mathbf{1}$, it follows that $P_N = -\zeta(\mathrm{tr}\mathbf{D})$. Upon substitution from (3) we get $P_N = -\zeta(\dot{v}/v)$. Bulk viscosity ζ is a function of density and temperature (see text after (3.189)) which can be transformed to a function of the specific volume (and temperature) using (3.199). This completes derivation of (3.211).