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**How Free Volume Controls Polymer Segmental Relaxation Times**<sup>1</sup> RONALD WHITE, JANE LIPSON, Dartmouth College — In this talk we calculate the free volume in polymer melts and map out the underlying connection with temperature- and pressure- dependent segmental relaxation times. Free volume has had a long and controversial history in the polymer physics community. Historical "free volume models" have failed in explaining pressure-dependent dynamics. A problem with some of these models has been that they assumed an *a priori* connection between dynamics and free volume. We do not make this assumption. Instead we use our locally correlated lattice (LCL) model equation of state to determine free volume in polymer melts first, and then, we look for correlations with the experimentally measured dynamics data. In our discussion we will propose predictive relationships for dynamics wherein free volume plays an important role.

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