**The Swelling of Olympic Gels** MICHAEL LANG, JAKOB FISCHER[1],
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Dresden, Hohe Straße 6, Dresden, Germany — The swelling equilibrium of Olympic
gels is studied by Monte Carlo Simulations. We observe that gels consisting of
flexible cyclic molecules of a higher degree of polymerization $N$ show a smaller
equilibrium swelling degree $Q \propto N^{-0.28}\phi_0^{-0.72}$ for the same monomer volume fraction
$\phi_0$ at network preparation. This observation is explained by a disinterpenetration
process of overlapping non-concatenated polymers upon swelling. In the limit of a
sufficiently large number of concatenations per cyclic molecule we expect that the
equilibrium degree of swelling becomes proportional to $\phi_0^{-1/2}$ independent of $N$. Our
results challenge current textbook models for the equilibrium degree of swelling of
entangled polymer networks.

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