1165-60-219 **Tobias Johnson*** (tobias.johnson@csi.cuny.edu). *Continuous phase transitions on Galton-Watson trees.*

When does a system undergo a continuous phase transition, and when does a system undergo a first-order (i.e., discontinuous) phase transition? This is the question in some of the most central problems in discrete probability and statistical physics, like whether bond percolation occurs at criticality on the lattice in dimensions 3–10. Though physicists have many nonrigorous thoughts about this, not much is known in general. We look at the question for branching process events satisfying recursive properties. For example, let $\mathcal{T}_1$ be the event that a Galton–Watson tree is infinite, and let $\mathcal{T}_2$ be the event that it contains an infinite binary tree starting at the root. The event $\mathcal{T}_1$ holds if and only if $\mathcal{T}_1$ holds for at least one of the trees initiated by children of the root, and $\mathcal{T}_2$ holds if and only if $\mathcal{T}_2$ holds for at least two of these trees. The probability of $\mathcal{T}_1$ has a continuous phase transition, increasing from 0 when the mean of the tree's child distribution increases above 1. On the other hand, the probability of $\mathcal{T}_2$ has a first-order phase transition, jumping discontinuously to a nonzero value at criticality. We give some explanation of why. (Received January 18, 2021)