1030-60-129 **Hosam M. Mahmoud*** (hosam@gwu.edu), Department of Statistics, The George Washington University, 2140 Pennsylvania Avenue, Washington, DC 20151. *Phase Changes in Subtree Varieties in Random Trees.*

We consider the variety of subtrees of various sizes and shapes lying on the fringe of a recursive tree. For the number of subtrees of a given size k = k(n) in a random recursive tree of size n, three cases are identified: the subcritical, when k(n)/sqrt(n) tends to zero, the critical, when k(n) is of the exact order sqrt(n), and the supercritical, when k(n)/ sqrt(n) tends to infinity. We show by analytic methods convergence in distribution to 0 in the supercritical case and to normality (of a normalized version of the size) in the subcritical case. We show that the size in the critical case when k/sqrt(n) approaches a limit converges in distribution to a Poisson random variable, and in the case k/sqrt(n) does not approach a finite nonzero limit, the size oscillates and does not converge in distribution to any random variable. This provides an understanding of the complete spectrum of phases and the gradual change from the subcritical to the supercritical phase.

We utilize the same battery of methods to derive similar results for binary search trees. Connections are made to Riccati equations, Polya urns and contraction in metric spaces of distributions and fixed-point equations for distribution functions. (Received July 27, 2007)