1120-05-138 **Noga Alon**, **Alexandr Kostochka**, **Benjamin Reiniger*** (reiniger@ryerson.ca), **Douglas West** and **Xuding Zhu**. *Coloring, sparseness, and girth via augmented trees.*

An r-augmented tree is a rooted tree plus r edges added from each leaf to ancestors. For $d, g, r \in \mathbb{N}$, we construct a bipartite r-augmented complete d-ary tree having girth at least g. The height of such trees must grow extremely rapidly in terms of the girth.

Using the resulting graphs, we construct sparse non-k-choosable bipartite graphs, showing that maximum average degree at most $2(k-1)$ is a sharp sufficient condition for k-choosability in bipartite graphs, even when requiring large girth. We also give a new simple construction of non-k-colorable graphs and hypergraphs with any girth g. (Received February 19, 2016)