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Zdeněk Dvořák (rakdver@iuuk.mff.cuni.cz) and **Bernard Lidický***
(lidicky@iastate.edu). *Precoloring extension for planar graphs.*

Aksenov proved that in a planar graph G with at most one triangle, every precoloring of a 4-cycle can be extended to a 3-coloring of G . We give an exact characterization of planar graphs with two triangles in that some precoloring of a 4-cycle does not extend. We apply this characterization to solve the precoloring extension problem from two 4-cycles in a triangle-free planar graph in the case that the precolored 4-cycles are separated by many disjoint 4-cycles.

As a corollary, we prove that there exists a constant $D > 0$ such that if H is a planar triangle-free graph and $S \subseteq V(H)$ consists of vertices at pairwise distances at least D , then every precoloring of S extends to a 3-coloring of H . This gives a positive answer to a conjecture of Dvořák, Král' and Thomas, and implies an exponential lower bound on the number of 3-colorings of triangle-free planar graphs of bounded maximum degree. (Received July 29, 2015)