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Planar Graphs are Local Girth Choosable

Perhaps the most famous theorem in the field of graph colouring is the four colour theorem, which states that every planar graph is 4-colourable. This theorem does not carry over directly to the realm of list colouring: Voigt gave a construction of a planar graph that is not 4-choosable. However, if we increase our list sizes by one, the resulting theorem holds: Thomassen proved that every planar graph is 5-choosable. In addition, Thomassen proved that every planar graph of girth at least five is 3-choosable. Voigt showed that this girth condition is best possible in the sense that there exist planar graphs of girth four that are not 3-choosable. In this talk, I will introduce the concept of a local girth list assignment, wherein the list size of each vertex depends not on the girth of the graph but only on the length of the shortest cycle in which the vertex is contained. I will present a local choosability theorem that unifies and strengthens the two theorems of Thomassen mentioned above. This is joint work with Luke Postle.