List colorings of planar graphs

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A *list-assignment* L of G assigns to each vertex v of G a set (list) $L(v)$ of colors. A graph G is called L-*colorable* if there is a proper coloring φ of G such that $\varphi(v) \in L(v)$ for all $v \in V$. A function $f : V \to \mathbb{N}$ is called a *choice function* of G and G is said to be f-*list colorable* if G is L-colorable for every list assignment L with $|L(v)| = f(v)$ for all $v \in V$. When $f(v) = k$ for all $v \in V$, the corresponding term becomes k-*list-colorable* or k-*choosable*.

Since 1993 it is well-known that every planar graph is 5-list-colorable but there are planar graphs which are not 4-list-colorable. In the talk we want to take a closer look at this topic.

We will consider the (a, b)-list colorability of planar graphs where a graph G is called *(a,b)-list colorable* if for every list-assignment with $|L(v)| = a$ for all $v \in V$ we can choose color sets $C(v) \subseteq L(v)$ such that $|C(v)| = b$ and the color sets of adjacent vertices are disjoint.

Furthermore, we study the average list length investigating the minimum of $\sum_{v \in V} f(v)/|V|$ taken over all choice functions f of a planar graph G.

Finally, we consider a special kind of list assignments and obtain a strengthening of the results on non-4-list colorable planar graphs.