New results on 2-polyhedra in 3- and 4-manifolds

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We shall present a very broad survey of results, starting from the mid 1960's, addressed at a very general audience, concerning the geometric topology of polyhedra and the main applications. Here are the key topics to be covered in the talk:

- *2-dimensional PL topology.* We shall consider the problem of resolving arbitrary 2-polyhedra by fake surfaces and its application to getting a reduction of the classical Whitehead asphericity conjecture to the case of special polyhedra (Casler, Ikeda, Piergallini-Matveev, Wright, Hog-Angeloni-Metzler, Repovš-Skopenkov).

- *3-dimensional PL topology.* We shall study spines of topological 3-manifolds and an interesting application of the classical knot theory in producing nonhomeomorphic 3-manifolds with equivalent spines (Mitchell-Przytycki-Repovš, Cavicchioli-Lickorish-Repovš, Glock-Hog-Angeloni) as well as problems of thickenings (Brodsky-Repovš-Skopenkov, Benedetti-Petronio).

- *4-dimensional PL topology.* We shall investigate embeddings of 2-polyhedra into topological 4-manifolds and an interesting application of the classical Bing shrinking techniques to the problem of different regular neighborhoods of codimension 2 embeddings (Geoghegan-Mihalik, Lasheras, Salihov, Oniščenko-Repovš-Skopenkov, Bestvina-Daverman-Venema-Walsh).

- *Higher-dimensional PL topology.* We shall present results on inequivalent embeddings of codimension 2 polyhedra into higher-dimensional PL manifolds (Flores, van Kampen, Borsuk, Zeeman, Massey, Lickorish-Siebenmann, Repovš-Skopenkov).

We shall also list several open problems and open conjectures from this and related areas of geometric topology.