Sergei Matveev (Chelyabinsk State University)

## Roots of low-dimensional objects

We develop a new version of the famous Diamond Lemma [1] and describe several results on prime decompositions of different geometric objects. All results are obtained by using that version and the standard technics for removing intersections of surfaces.

1. The Kneser-Milnor prime decomposition theorem of 3-manifolds into connected sums of prime factors (new proof).
2. The similar theorem of Swarup for decompositions into boundary connected sums (new proof).
3. A prime decomposition theorem for knotted graphs in 3-manifolds containing no nonseparating 2 -spheres.
4. Counterexamples to prime decomposition theorems for knots in 3-manifolds and for 3orbifolds.
5. A new theorem on annular splittings of 3-manifolds, which is independent of the JSJsplitting theorem.
6. An existence and uniqueness theorem for prime decompositions of homologically trivial knots in thick surfaces.
7. Prime decomposition theorem for virtual knots.

## Reference:

[1] M. H. A. Newman, On theories with a combinatorial definition of "equivalence", Ann. Math. 43 (1942), 223-243.

