

# Free subgroups of 3-manifold groups

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We show that any cocompact Kleinian group  $\Gamma$  has an exhaustive filtration by normal subgroups  $\Gamma_i$  such that any subgroup of  $\Gamma_i$  generated by  $k_i$  elements is free, where  $k_i \geq [\Gamma : \Gamma_i]^C$  and  $C = C(\Gamma) > 0$ . Together with this result we prove that  $\log k_i \geq C_1 \text{sys}_1(M_i)$ , where  $\text{sys}_1(M_i)$  denotes the systole of  $M_i$ , thus providing a large set of new examples for a conjecture of Gromov. In the second theorem  $C_1 > 0$  is an absolute constant. We also consider a generalization of these results to non-compact finite volume hyperbolic 3-manifolds.

In the talk, I will discuss the proofs of these theorems and some related open problems. This is a joint work with Cayo Dória.

## References

- [1] M. BELOLIPETSKY AND C. DÓRIA, *Free subgroups of 3-manifold groups*, Groups, Geometry, and Dynamics, to appear.