
Mathematical structures in algebra, geometry and logic

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Foundations of the research in algebra, geometry and logic at the Faculty were laid in the 20th century by Eduard Čech and Petr Vopěnka. Over the past decade, activities of the Eduard Čech Institute and Center of Excellence (ECI and ECC) have fostered research in these areas.

Since 2018, the seven year University Research Center (UNCE) project “Methods in Algebra and Logic” is running at the Faculty, headed by a renown expert in proof complexity, [Jan Krajíček](#). Applications of universal algebra to constraint satisfaction problems are a major topic pursued by the group of [Libor Barto](#) with the support by his [CoCoSym](#) Consolidator Grant of the ERC. Algebraic topics include representation theory, and its connections to homotopy theory ([Jan Šťovíček](#)) and set-theoretic homological algebra (Jan Šaroch). Since 2019, the five year EXPRO project “Homotopy and homology methods and tools related to mathematical physics” is financed by GAČR. It includes research in algebraic topology ([Petr Somberg](#)), differential geometry ([Vladimír Souček](#)), and applications in theoretical physics (Branislav Jurčo).

Selected outputs

- Barto, L. [Finitely related algebras in congruence modular varieties have few subpowers](#) J. European Math. Soc. 20(2018), 1439-1471.
- Jurčo, B. (with Vysoký, J.) [Poisson–Lie T-duality of string effective actions: A new approach to the dilaton puzzle](#) J. of Geom. and Physics 130(2018), 1-26.
- Krajíček, J. [Proof Complexity](#), Encyclopedia of Math. and Its Appl., vol. 170, Cambridge Univ. Press, 2019, 588 pp.
- Somberg, P. (with Hu, P., and Kříž, I.) [Derived representation theory of Lie algebras and stable homotopy categorification of \$\mathfrak{sl}_k\$](#) Adv. Math., 341 (2019), 367- 439.
- Souček, V. (with Cap, A.) [Relative BGG sequences; II. BGG machinery and invariant operators](#) Adv. Math., 320(2017), 1009-1062
- Šaroch, J. [On the non-existence of right almost split maps](#) Invent. math. 209(2017), 463-479.
- Šťovíček, J. (with Groth, M.) [Tilting theory via stable homotopy theory](#) J. reine angew. Math. 743(2018), pp. 29-90.