

Přednášky se konají v 16:30 v seminární místnosti, první patro budovy č.8, areál Přírodovědecké fakulty, Kotlářská 2, Brno.

### **30. září**

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#### **Free and cofree Hopf algebras**

##### **Abstrakt:**

The existence of free Hopf algebras over coalgebras and of cofree Hopf algebras over algebras (all relative to a field  $k$ ) has been claimed by Sweedler in 1969 (without any hint of a proof). The only known free-Hopf-algebra construction is due to Takeuchi some years later. Street proved re ectivity of the category of Hopf algebras in that of bialgebras in 2007 (also relative to field only), from which the existence of free Hopf algebras can be deduced. Whether cofree Hopf algebras really exist seems to be unknown. By using the more abstract approach of Hopf monoids over a symmetric monoidal category whose underlying category is locally presentable we solve these existence problems by reduction to a manageable description of limits and colimits respectively in categories of bimonoids. These descriptions are based on standard categorical results only and the limit case moreover is got essentially for free" by simple categorical dualization of the colimit description.

Our main results then are:

1. The category of  $R$ -Hopf algebras has cofree objects over arbitrary  $R$ - algebras and is core active in the category of  $R$ -bialgebras, for any commutative unital ring  $R$ .
2. The category of  $R$ -Hopf algebras has free objects over arbitrary  $R$ - coalgebras and is re active in the category of  $R$ -bialgebras, provided that the ring  $R$  is von Neumann regular.