

ZARZĄD ODDZIAŁU GÓRNOŚLĄSKIEGO  
POLSKIEGO TOWARZYSTWA MATEMATYCZNEGO

zaprasza na

# ***O D C Z Y T***

**prof. dr. hab. Franza – Viktora Kuhlmann**

(Uniwersytet Śląski w Katowicach)

pt.

„Resolution of Singularities  
and the Decidability of Laurent Series Fields  
over Finite Fields”

Odczyt odbędzie się w czwartek, **dnia 17 marca 2016 r.**, o godz. **16<sup>00</sup>** w Instytucie Matematyki  
Uniwersytetu Śląskiego w Katowicach przy ul. Bankowej 14, sala 553.

Za Zarząd Oddziału  
Prezes  
dr Krystyna Skórnik

**Abstract:**

In 1964 Hironaka proved resolution of singularities for algebraic varieties of arbitrary dimension over fields of characteristic 0. In positive characteristic, it has only been proved for dimensions up to 3 by Abhyankar and recently by Cossart and Piltant. The general case has remained open although several working groups of algebraic geometers have attacked it.

In 1965, Ax and Kochen, and independently Ershov proved that the elementary theory of the fields  $\mathbb{Q}_p$  of  $p$ -adic numbers is decidable, that is, there exists a recursive algorithm which for every given assertion formulated in first order logic decides whether it holds in  $\mathbb{Q}_p$  or not. Laurent series fields over finite fields are very similar to the  $p$ -adics; both of them are complete discretely valued fields. Nevertheless, it is still an open problem whether they have a decidable elementary theory, in spite of the efforts from several excellent model theorists.

At first glance there seems to be no connection between these two deep open problems. But following ideas by Zariski, one can also consider local uniformization, a local form of resolution. Already in 1940 he proved it to hold for algebraic varieties of all dimensions in characteristic 0. But again, the case of positive characteristic has remained open. By its definition, local uniformization is a problem of valuation theoretical nature.

My own work has shown that the local uniformization as well as the decidability problem have a common core: the structure of valued function fields, It is horrendously complex and not well enough understood in positive characteristic. In my talk, I will give a survey on the present state of the ongoing research related to both problems.