



# Rene Birkner

## "Incoherent components of the Toric Hilbert scheme"

**ZEIT:**

19.10.2009, 16:15 Uhr

**ORT:**

Freie Universitaet Berlin  
Institut fuer Mathematik  
Arnimallee 3, Rm. 119

The classical Hilbert scheme is the scheme whose closed points are all subschemes of  $\mathbb{P}^n$  with the same Hilbert function. That is, for  $S = k[x_0, \dots, x_n]$  and an ideal  $I \subset S$  the function  $H(t) = \dim_k (S/I)_t$  whose value at  $d$  is the dimension over  $k$  of the degree  $t$  part of  $S/I$ . Endowing the ring  $S$  with a multigrading, i.e. the degree of  $x_i$  is  $a_i$ , we construct the multigraded Hilbert function. This is the analogon to the classical Hilbert function with degrees in  $\mathbb{N}^n$  for some  $d > 0$ . Then one can consider all ideals  $I \subset S$  with the same multigraded Hilbert function, these are the closed points of the multigraded Hilbert scheme. We consider the simplest case, taking the semigroup  $\langle \sum a_i e_i \mid e_i \in \mathbb{N}^n \rangle$  and the multigraded Hilbert function

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**Kontakt:**

Humboldt-Universität zu Berlin . Institut für Mathematik  
SFB 647 . Unter den Linden 6 . 10099 Berlin  
Tel. +49 30 2093 1804 . Fax. +49 30 2093 2727  
sfb647@math.hu-berlin.de

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