

- PETER LEFANU LUMSDAINE, *Building higher categories from type theory*.  
Department of Mathematical Sciences, Carnegie Mellon University, Pittsburgh, USA.  
*E-mail:* [plumsdai@andrew.cmu.edu](mailto:plumsdai@andrew.cmu.edu).  
*URL Address:* [www.math.cmu.edu/~plumsdai/](http://www.math.cmu.edu/~plumsdai/).

In Martin-Löf intensional type theory [1], equalities (or proofs of equality) between terms  $a, b : A$  of the theory are themselves represented internally as terms  $p : \text{Id}_A(a, b)$  of a dependent identity type.

Similarly, in a higher-dimensional category [2], we have not just objects  $X$  and arrows  $f : X \rightarrow Y$  between them, but also 2-cells  $\alpha : f \Rightarrow g$  between parallel arrows, and so on to higher cells, all subject to various composition operations and axioms. Various kinds of higher category exist: strict or weak,  $n$ - or  $\omega$ -, and more.

Starting with the Hofmann-Streicher groupoid model [3], higher-dimensional categories have been used to give semantics for intensional type theory, modelling types as objects, terms as arrows, terms of identity type as 2-cells, etc. In this talk, following on from Steve Awodey's survey of the programme, I will describe some specific recent results, in particular the construction of syntactic weak  $\omega$ -categories from intensional type theories [4], [5].

[1] PER MARTIN-LÖF *An intuitionistic theory of types: predicative part*, **Logic Colloquium '73** (H.E. Rose and J.C. Sheperdson, editors), North-Holland, 1975, pp. 73–118.

[2] TOM LEINSTER, *Higher Operads, Higher Categories*, London Mathematical Society Lecture Notes Series, vol. 298 Cambridge University Press, 2004.

[3] MARTIN HOFMANN AND THOMAS STREICHER, *The groupoid interpretation of type theory*, **Twenty-Five Years of Constructive Type Theory (Venice 1995)** (Giovanni Sambin and Jan Smith, editors), Oxford Logic Guides, Vol. 36, Oxford University Press, New York, 1998, pp. 83–111.

[4] RICHARD GARNER AND BENNO VAN DEN BERG, *Types are weak  $\omega$ -groupoids*, submitted.

[5] PETER LEFANU LUMSDAINE, *Weak  $\omega$ -categories from intensional type theory*, to appear in **Typed Lambda Calculi and Applications 2009** (Pierre-Louis Curien, editor), Lecture Notes in Computer Science, Springer-Verlag, 2009.