

**Professor Sergei Silvestrov,**  
**Research environment in Mathematics and Applied Mathematics MAM,**  
**Division of Applied Mathematics, Mälardalen University, Västerås, Sweden**  
[sergei.silvestrov@mdh.se](mailto:sergei.silvestrov@mdh.se)  
<http://www.mdh.se/ukk/personal/maa/ssv01>

## **Quasi Lie algebras and Hom-algebra structures**

In this talk, an introductory overview will be presented on the subject of hom-algebra structures, with focus on quasi Lie algebras, quasi-hom Lie algebras, hom-Lie algebras and related hom-algebra structures. These objects appear for example when discretizing the differential calculus. Quasi Lie algebras encompass in a natural way the Lie algebras, Lie superalgebras, color Lie algebras, hom-Lie algebras, q-Lie algebras and various algebras of discrete and twisted vector fields arising for example in connection to algebras of twisted discretized derivations, Ore extension algebras, q-deformed vertex operators structures and q-differential calculus, multi-parameter deformations of associative and non-associative algebras, one-parameter and multi-parameter deformations of infinite-dimensional Lie algebras of Witt and Virasoro type some of which appear in the context of conformal field theory, string theory and deformed vertex models, multi-parameter families of quadratic and almost quadratic algebras that include for special choices of parameters algebras appearing in non-commutative algebraic geometry, universal enveloping algebras of Lie algebras, Lie superalgebras and color Lie algebras and their deformations. Common unifying feature for all these algebras is appearance of some twisted generalizations of Jacoby identities providing new structures of interest for investigation from the side of associative algebras, non-associative algebras, generalizations of Hopf algebras, non-commutative differential calculi beyond usual differential calculus and generalized quasi-Lie algebra central extensions and Hom-algebra formal deformations and co-homology. Hom-algebra generalizations of Nambu algebras, associative algebras and Lie algebras to n-ary structures are also actively studied.

### **Some key initial references on Quasi Lie Algebras and Hom-algebra structures:**

J. T. Hartwig, D. Larsson and S. D. Silvestrov, Deformations of Lie algebras using  $\sigma$ -derivations, *J. Algebra* **295** (2006) 314–361. (originally published in 2003: J. Hartwig, D. Larsson, S.D. Silvestrov, Deformations of Lie algebras using  $\sigma$ -derivations, Preprints in Mathematical Sciences 2003:32, LUTFMA- 5036-2003, Centre for Mathematical Sciences, Department of Mathematics, Lund Institute of Technology, Lund University, 2003; and arxiv.org: math.QA/0408064 in 2004)

D. Larsson, S. Silvestrov, Quasi-hom-Lie, Algebras, Central Extensions and 2-cocycle-like Identities, *J. Algebra*, 288, 2, (2005), 321--344.

D. Larsson, S. Silvestrov, Quasi-Lie algebras, in "Noncommutative Geometry and Representation Theory in Mathematical Physics", Contemporary Mathematics, Vol. 391, 2005, 7 pp .

D. Larsson, S. D. Silvestrov, Quasi-deformations of  $sl_2(\mathbb{F})$  using twisted derivations, *Comm. Algebra* 35 (2007), 4303--4318. (originally published in 2004: Preprint in Mathematical Sciences 2004:26, LUTFMA-5047-2004, Centre for Mathematical Sciences, Lund Institute of Technology, Lund University (2004), 19pp; and arxiv.org: math.RA/0506172)

A. Makhlof, S. D. Silvestrov, Hom-algebra structures, *J. Gen. Lie Theory. Appl.* 2, 2, (2008), 51--64. (original preprint appeared in 2006 in Preprints in Mathematical Sciences, Lund University, Centre for Mathematical Sciences, Centrum Scientiarum Mathematicarum, (2006:10) LUTFMA-5074-2006; and arxiv.org/math/0609501v3)