The Lewisfest

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Conference in honour of Professor David W. Lewis on the occasion of his 65th birthday

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July 23 – 24, 2009

School of Mathematical Sciences, University College Dublin

Schedule

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Thursday, 23 July

09:45 - 10:00	**Welcome**	
10:00 - 10:50	**Anne Cortella**	*On central simple algebras with antiautomorphism*
10:50 - 11:40	**Anne Quéguiner–Mathieu**	*Algebras with involution hyperbolic over the function field of a conic*
11:40 - 12:10	**Coffee Break**	
12:10 - 13:00	**Andrew Ranicki**	*Exact braids and octagons*
13:00 - 14:30	**Lunch**	
14:30 - 15:30	**Jean-Pierre Tignol**	*The mathematics of David W. Lewis*
15:30 - 16:00	**Coffee Break**	
16:00 - 17:00	**Forum**	*Contributions from colleagues, . . .*
19:30	**Conference Dinner**	*The Schoolhouse Restaurant, Northumberland Road*

Friday, 24 July

10:50 - 11:40	**Jaka Cimprič**	*Higher product levels of skew fields*
11:40 - 12:10	**Coffee Break**	
12:10 - 13:00	**Seán McGarraghy**	*Symmetrising operations, quadratic forms and algebras with involution*
13:00 - 14:30	**Lunch**	
14:30 - 15:20	**Mystery Guest**	*The virtues of similarities*
15:20 - 15:50	**Coffee Break**	
15:50 - 16:40	**Detlev Hoffmann**	*The level and sublevel of rings*
17:00	**Wine Reception**	*Common Room Club, Newman Building*

Abstracts

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Anne Cortella
(Université de Franche-Comté)
On central simple algebras with antiautomorphism

We call antiautomorphism over an algebra A any linear automorphism σ of A such that

$$\forall a, b \in A \quad \sigma(ab) = \sigma(b)\sigma(a).$$

The antiautomorphisms over central simple algebras which are involutions (i.e. satisfy moreover $\sigma^2 = \mathrm{Id}_A$) are very studied since they are generalizations of quadratic forms: by splitting the algebras, they become the adjoint of a quadratic form.

In the same way, (non-involutive) antiautomorphisms are a generalization of (non-symmetric) bilinear forms.

Riehm classified the bilinear forms, using their asymmetry and a set of symmetric or alternating bilinear forms, or hermitian forms, but not using classical or cohomological invariants.

In this talk, we show how we can generalize some of the invariants of the quadratic forms or of the involutions to invariants of the bilinear forms or of the antiautomorphisms: the discriminant (defined with Tignol), the Clifford algebra, the trace form (defined by Lewis). We then describe the classification results for involutions one could expect to generalize to antiautomorphisms by using those invariants, especially over algebras of small degree or over small cohomological degree fields.

Finally, we construct the orthogonal sum of two Brauer equivalent c.s. algebras with antiautomorphism (done with Lewis) and explain how it could be useful to get some classification results.

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Susanne Pumplün
(University of Nottingham)
How to obtain division algebras from a generalized Cayley-Dickson doubling process

The classical Cayley-Dickson doubling process can be generalized by allowing the scalar in the doubling to be an invertible element in the algebra which is to be doubled. If D is a quaternion division algebra or a quadratic étale algebra, the resulting algebras are division algebras for all scalars outside of the base field F.

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Andrew Ranicki
(University of Edinburgh)
Exact braids and octagons

The talk will describe some of the occurrences of braids and octagons of exact sequences, in both the topology of manifolds and the algebra of quadratic forms.

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Jean-Pierre Tignol
(Université catholique de Louvain)
The mathematics of David W. Lewis

Throughout his career, David had a great impact on the development of the algebraic theory of quadratic and hermitian forms. This talk will survey some of the highlights of his mathematical work, aiming to describe in general terms his main contributions.

Anne Quéguiner–Mathieu

(Université Paris 13)

Algebras with involution hyperbolic over the function field of a conic

This talk is based on a joint work with Jean-Pierre Tignol, where we study algebras with involution that become hyperbolic over the function field K of a given conic. A typical example is the Clifford algebra of a quadratic form that is isotropic over K. Among them, Clifford algebras of K-minimal forms have some interesting properties.

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Jaka Cimprič

(Univerza v Ljubljani)

Higher product levels of skew fields

The n-th level of a field is the minimal number of elements such that the sum of their $2n$-th powers is equal to -1. I will briefly survey the commutative theory developed by Joly and Becker in the seventies and my relatively recent noncommutative extensions. For skew fields, several generalizations exist, because a product of two $2n$-th powers need not be a $2n$-th power anymore. Moreover, these generalizations can behave very differently from the original.

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Seán McGarraghy

(University College Dublin)

Symmetrising operations, quadratic forms and algebras with involution

Various constructions arising from the action of symmetric groups on tensor powers of vector spaces — for example, exterior, symmetric and related powers — may be carried across to the domain of quadratic forms. This talk looks at extending these constructions to the domain of (mostly central simple) algebras with involution. This is work in progress.

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Mystery Guest

(Miskatonic University)

The virtues of similarities

The talk will suggest that similarities have some advantages over equivalences in the theory of G-invariant quadratic forms, and will construct a graded ring of similarity classes.

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Detlev Hoffmann

(University of Nottingham)

The level and sublevel of rings

If -1 is a sum of squares in a ring, then the level of that ring is the smallest n such that -1 is a sum of n squares, otherwise the level is said to be infinite. If 0 can be written nontrivially as a sum of squares in a ring, then the sublevel of that ring is the smallest n such that 0 can be written nontrivially as a sum of $n+1$ squares, otherwise the sublevel is said to be infinite. The sublevel is always less than or equal to the level. Levels and sublevels of rings have been studied extensively, most famous perhaps being the result by Pfister from the 1960s that the level of a field, if finite, is always a 2-power, and that each such 2-power can be realized, thus solving a question posed by van der Waerden in the 1930s.

We will give an overview over some old and some more recent results on the level and sublevel of commutative rings and of division algebras.