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Co-ordinatizing Jordan Algebras of degree three by means of cubic étale subalgebras

An old device originally due to Albert [1] will be resuscitated here under the name of cyclic trisotopies in order to co-ordinatize absolutely simple Jordan algebras of degree 3 by means of cyclic cubic subalgebras. The results obtained are intimately tied up with Springer's theory of cyclic compositions ([2], [5]) and may be regarded as a natural extension of the Jacobson co-ordinatization theorem [3]. They will also provide us with an invariant, called the multiplier, of the way a cyclic cubic algebra sits inside an absolutely simple Jordan algebra of degree 3. Combining the study of unitary involutions on cyclic compositions and trisotopies with the method of descent it will follow that the co-ordinatization results as well as the multiplier survive, more generally, for arbitrary étale cubic subalgebras rather than just cyclic ones. Finally, some speculative evidence will be presented suggesting that the multiplier might play a pivotal role in describing the obstructions to the validity of the Skolem-Noether theorem for cubic tale subalgebras of Albert algebras. Some of the main results discussed in this talk may be found in [4].

- [1] A. A. Albert, A construction of exceptional Jordan division algebras, *Ann. of Math.* (2), 67 (1958), pp. 1-28.
- [2] M.-A. Knus, A. Merkurjev, M. Rost, and J.-P. Tignol, *The book of involutions*, vol. 44 of *American Mathematical Society Colloquium Publications*, American Mathematical Society, Providence, RI, 1998.
- [3] K. McCrimmon, A general theory of Jordan rings, *Proc. Nat. Acad. Sci. U.S.A.*, 56 (1966), pp. 1072-1079.
- [4] H. P. Petersson, *Cyclic compositions and trisotopies*, Submitted, (2005), pp. 1-48.
- [5] T. A. Springer and F. D. Veldkamp, *Octonions, Jordan algebras and exceptional groups*, Springer Monographs in Mathematics, Springer-Verlag, Berlin, 2000.