



Derivations and Projections on Jordan Triples. An introduction to nonassociative algebra, continuous cohomology, and quantum functional analysis

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This paper is an elaborated version of the material presented by the author in a three hour minicourse at "V International Course of Mathematical Analysis in Andalusia," Almeria, Spain, September 12-16, 2011. Part I is devoted to an exposition of the properties of derivations on various algebras and triple systems in finite and infinite dimensions, the primary questions addressed being whether the derivation is automatically continuous and to what extent it is an inner derivation. One section in Part I is devoted to the subject of contractive projections, which play an important role in the structure theory of Jordan triples and in Part III. Part II discusses cohomology theory of algebras and triple systems, in both finite and infinite dimensions. Although the cohomology of associative and Lie algebras is substantially developed, in both finite and infinite dimensions, the same could not be said for Jordan algebras. Moreover, the cohomology of triple systems has a rather sparse literature which is essentially non-existent in infinite dimensions. Thus, one of the goals of this paper is to encourage the study of continuous cohomology of some Banach triple systems. Part III discusses three topics, two very recent, which involve the interplay between Jordan theory and operator space theory (quantum functional analysis). The first one, a joint work of the author, discusses the structure theory of contractively complemented Hilbertian operator spaces, and is instrumental to the third topic, which is concerned with some recent work on enveloping TROs and K-theory for JB^* -triples. The second topic presents some very recent joint work by the author concerning quantum operator algebras.

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