CURRICULUM VITAE

I. General data

I.1. Biographical data

Family name and first name: BALUS OANA
Date and place of birth: 24.05.1976, Craiova, Dolj county

I.2. High School

During 1990-1994 I was enrolled at the High School "Fratii Buzesti" from Craiova. In June 1994 I graduated from the same institution by passing the final exam.

I.3. Academic studies

During 1994-1998 I was enrolled at the Faculty of Sciences, Physics section, University of Craiova. I passed the final exam at the same faculty in June 1998.

I.4. Mastership studies

In 1998 I was admitted at the mastership programme “Quantum Field Theory”, organized at the Faculty of Sciences, University of Craiova. I graduated this programme in June 2000, after defending my master thesis.

I.5. *Ph.D. studies*

Beginning with November 2001 I am a Ph.D. student in Physics at the University of Craiova.

II. Scientific activity

II.1. Approached problems

The main topic approached is devoted to the constrained Hamiltonian systems, with emphasis on the systems with second-class constraints reducible of an arbitrary order. Within this topic, I investigated the following subjects:

1) quantization of the massive Abelian 2-forms;

2) irreducible canonical approach to second-class constraints reducible of an arbitrary order.

II.2. Main results

- Massive Abelian 2-Forms was analyzed from the point of view of the Hamiltonian quantization using the gauge-unfixing approach and respectively the Batalin–Fradkin method. The first approach (gauge unfixing method) relies on separating the second-class constraints into two subsets, one of them being first-class and the other providing some canonical gauge conditions for the first-class subset. Starting from the canonical Hamiltonian of the original second-class system, one constructs a first-class Hamiltonian with respect to the first-class subset through an operator that projects any smooth function defined on the phase-space into a function that is in involution with the first-class subset. The second approach (Batalin–Fradkin method) relies on enlarging the original phase-space and constructing a first-class constraint set and a first-class Hamiltonian, with the property that they coincide with the original second-class constraints and respectively with the starting canonical Hamiltonian if one sets all the extravariables equal to zero. Both methods finally output the manifestly Lorentz covariant path integral for 1- and 2-forms with Stueckelberg coupling.

- The strategy of the irreducible approach to second-class constraints reducible of an arbitrary includes three main steps. First, we express the Dirac bracket for the reducible system in terms of an invertible matrix. Second, we construct an intermediate reducible second-class system (of the same reducibility order like the original one) on a larger phase-space and establish the (weak) equality between the original Dirac bracket and that corresponding to the intermediate theory. Third, we prove that there exists an irreducible second-class constraint set equivalent to the intermediate one, such that the corresponding Dirac brackets coincide (weakly). These three steps enforce the fact that the fundamental Dirac brackets derived within the irreducible and original reducible settings coincide (weakly). The equality between the fundamental Dirac brackets associated with the original phase-space variables in the reducible and respectively irreducible formulations has major implications on the relationship between the reducible and irreducible systems: (i) the two systems exhibit the same number of physical degrees of freedom, which is precisely the rank of the induced symplectic form (since the Dirac bracket restricted to the constraint surface is determined by the inverse of the induced symplectic form); (ii) the physical content of the two theories is the same from the perspective of quantization as they display the same fundamental observables; (iii) the original, reducible system can be equivalently replaced with the irreducible one. It is important to remark that the irreducible approach is useful mainly in field theory because it does not spoil the important symmetries of the original system, such as the spacetime locality of second-class field theories.

III. Selected papers

1. C. Bizdadea, E. M. Cioroianu, S. O. Saliu, S. C. Sararu, **O. Balus**, J. Phys. A: Math Theor. 40 (2007) 14537

2. C. Bizdadea, E. M. Cioroianu, I. Negru, S. O. Saliu, S. C. Sararu, **O. Balus**, Nucl. Phys. B812 (2009) 12

3. C. Bizdadea, **O. Balus**, E. M. Cioroianu, S. O. Saliu, S. C. Sararu, Proceedings of the "6th International Spring School and workshop on Quantum Field Theory and Hamiltonian Systems", 6-11 May 2008, Calimanesti-Caciulata, Romania, Annals of the University of Craiova, Physics AUC 18 (2008) 207

4. C. Bizdadea, **O. Balus**, E. M. Cioroianu, S. O. Saliu, S. C. Sararu, Rom. J. Phys. 53 (9–10) (2008) 1023

5. E. M. Cioroianu, S. C. Sararu, **O. Balus**, First-class approaches to massive abelian 2-forms, accepted for publication in Int. J. Mod. Phys. A

IV. Teaching experience

Beginning with September 1998 I am a high school theacher. At present, I am hired at the National College "Fratii Buzesti", Craiova.

12.09.2009 Oana BALUS