

Bi-Hamiltonian structures and super-separability

P. Tempesta

Depto. De Física Teórica II, Universidad Complutense de Madrid, Spain

G. Tondo

Dip. di Matematica e Informatica, Università di Trieste, Italy

April 15, 2009

The aim of the proposed project work is to enquire about the relation between bi-Hamiltonian structures and super-separability of classical Hamiltonian systems.

In the last years, the classical analytical theory by Levi-Civita about separation of variables in the Hamilton-Jacobi equation has been revisited and encompassed in the more geometrical setting of bi-Hamiltonian structures [1] and *generalized* Lenard chains [2].

On the other side, there are many results about the so-called multi or super-separability of some Hamiltonian systems, i.e. separability in more than one coordinate system in their configuration space [3].

I am going to visit P. Tempesta for studying with him bi-Hamiltonian structures of super-separable systems, being Tempesta an expert in the later subject [4]. We expect that any separable coordinate system should be characterized in terms of a bi-hamiltonian structure and that different (nonequivalent) separation coordinate systems should correspond to different and *not compatible* bi-Hamiltonian structures.

References

- [1] Falqui, G., Pedroni, M. 2003 Separation of variables for bi-Hamiltonian systems. *Math. Phys. Anal. Geom.* **6**, 139–179.
- [2] Magri, F. 2003 Lenard chains for Classical Integrable Systems. *Theor. Math. Phys.* **137**, 1716-1722.
- [3] Perelomov A.M. 1990 *Integrable systems of classical mechanics and Lie algebras*, Basel: Birkhäuser.
- [4] M.B. Sheftel, P. Tempesta, P. Winternitz 2001 Superintegrable systems in quantum mechanics and classical Lie theory *J. Math. Phys.* **42**, 659-673.

GIORGIO TONDO

Curriculum Vitae

Actual position Assistant Professor of Mathematical Physics,
Faculty of Engineering, University of Trieste.

Address Dipartimento di Matematica e Informatica, Università degli Studi,
via A. Valerio 12/1, 34127 TRIESTE.

Fax 040/558-2636

Phone 040/558-2651

E-mail tondo@units.it

VITAE

1982 Laurea (= Degree) in Physics, University of Lecce.
Title of the thesis: *Metodo del prolungamento di struttura e applicazione all' equazione di Harry Dym* (= Method of prolongation structures and application to the Harry Dim equation).

From 1985 Member of Gruppo Nazionale per la Fisica Matematica.

1990 Ph.D in Mathematics, Methods and Applications, University of Milan.
Title of the thesis: *Varietà bistrutturate e sistemi bi-Hamiltoniani integrabili.* (= Bi-structured manifolds and bi-hamiltonian systems).

1991–1992 Post-Doc position, University of Milan.

From 1992 Assistant Professor of Mathematical Physics, Faculty of Engineering, University of Trieste.

INVITED TALKS

1998 May 26–30: XXX Symposium on Mathematical Physics, Torun (PL).

VISITING POSITION

1998 February-July: Center of Nonlinear Studies, University of Leeds (UK).

EDITORIAL ACTIVITY

From 1997 Referee for the following journals:
Journal of Physics A, Physics Letters A, Reports on Mathematical Physics, Applied Mathematical Letters.

Publications related with the project

- [1] C. Morosi, G. Tondo, *Quasi-Bi-Hamiltonian Systems and Separability*, J. Phys. A.: Math. Gen. **30** (1997), 2799-2806.
- [2] C. Morosi, G. Tondo, *On a class of dynamical systems both quasi-bi-Hamiltonian and bi-Hamiltonian*, Phys. Lett. A **247** (1998), 59–64.
- [3] G. Tondo, C. Morosi, *Bi-Hamiltonian manifolds, quasi-bi-Hamiltonian systems and separation variables*, Rep. Math. Phys. **44** (1999), 255–266.
- [4] G. Falqui, F. Magri, G. Tondo, *Reduction of bihamiltonian systems and separation of variables: an example from the Boussinesq hierarchy*, Theor. Math. Phys. **122** (2000), 176–192.
- [5] C. Morosi, G. Tondo, *The quasi-bi-Hamiltonian formulation of the Lagrange top*, J. Phys. A.: Math. Gen. **35** (2002), 1741-1750.
- [6] C. Morosi, G. Tondo, *Separation of variables in multi-Hamiltonian systems: an application to the Lagrange top*, Theor. Math. Phys. **137** (2003), 1550–1560.
- [7] G. Tondo, *Generalized Lenard chains and separation of variables*, Quaderni Matematici, University of Trieste **573** (2006), 1–27.