SCIENTIFIC REPORT
on the project "Global Bifurcation Analysis of Biomedical and Ecological Rational Dynamical Systems" supported by the IMU-Simons Foundation

Valery Gaiko

Missouri University of Science and Technology, USA
March–April 2015

- **Research in progress:**

1. Developing our bifurcational geometric approach, we solve the limit cycle problem for the general Liénard polynomial system.

2. Using a similar approach and some numerical results, we present a new scenario of chaos transition for the classical Lorenz system.

3. We complete the global qualitative analysis of a quartic family of planar vector fields corresponding to a rational Holling-type dynamical system which models the dynamics of the populations of predators and their prey in a given ecological or biomedical system.

- **Papers published or in preprint form:**

1. V.A.Gaiko, Bifurcation analysis of Liénard and Lorenz polynomial dynamical systems, submitted to the journal of *Dynamical Systems: An International Journal*, 11 p.

2. V.A.Gaiko, The maximum number of limit cycles in a Holling type dynamical system, submitted to the journal of *Nonlinear Analysis: Real World Applications*, 12 p.

3. V.A.Gaiko, Global bifurcations of limit cycles in a Holling-type dynamical system, *arXiv:math.DS/150403353*, 2015, 19 p.

- **PhD students advised:** Sabrina Streipert, Nasrin Sultana, Tom Cuchta, Gülşah Yeni, Ismail Tiryaki.

- **Dates spent at the university:** 02.03.2015–29.04.2015.

26.05.2015