Letter to the Editor

Comment on "Bifurcation analysis of parametrically excited bipolar disorder model"

Stephen Wirkus [a,*], Mason A. Porter [b]

[a] Mathematical and Natural Sciences Division, Arizona State University, Glendale, AZ 85306-4908, USA
[b] Oxford Centre for Industrial and Applied Mathematics, Mathematical Institute, University of Oxford, OX1 3LB, UK

We are writing to comment briefly on the article "Bifurcation analysis of parametrically excited bipolar disorder model" by Laurent Nana, which was accepted for publication in 2007 and is presently available online among the officially forthcoming articles in Communications in Nonlinear Science and Numerical Simulation [2]. In the article, Laurent Nana models the mood swings of a patient as a van der Pol oscillator with autonomous forcing. Specifically, he considers

$$\ddot{x} - \alpha\dot{x} + \omega^2 x = g(x, \dot{x}), \tag{0.1}$$

where

$$g(x, \dot{x}, t) = \epsilon A x^3 + \epsilon(\beta x^2 + \gamma x^4)\dot{x} + 2\epsilon f x \cos(\Omega t). \tag{0.2}$$

He states that medication is represented by $g(\dot{x}, x, t)$ and can take several possible forms. He then uses the method of averaging and energetic considerations to derive conditions for the existence of limit cycles, which correspond to the mood swings of a patient.

Together with some of our colleagues, we did similar work—modeling bipolar disorder using a modified version of a van der Pol oscillator—that we posted on the ArXiv preprint server in 2003 [1]. We considered the same Eq. (0.1), but with the forcing function

$$g(x, \dot{x}) = (\gamma x^4 + \beta x^2)\dot{x}. \tag{0.3}$$

We were surprised at how close the equations and ensuing analysis of Laurent Nana was to our own work.

Although L. Nana considers a more general form, as is seen by the inclusion of the $\epsilon A x^3 + 2\epsilon f x \cos(\Omega t)$ term (not present in our work), the results regarding the existence of limit cycles remain the same.

While our manuscript has not been published in a refereed journal, a google search for *math+models+bipolar+disorder* finds our ArXiv posting first. A scholar.google search using the same key words finds our work on the top of the third page. We feel that our paper ought to have been referenced by L. Nana, especially given the similarity of the assumptions, modeling, analysis, results, and interpretations. Accordingly, we have written this letter in order to provide a proper context (in our opinion) for Professor Nana's investigations.

References

[1] Daugherty Darryl, Roque-Urrea Tairi, Urrea-Roque John, Snyder Jessica, Wirkus Stephen, Porter Mason A. Mathematical models of bipolar disorder; 2003. Available from arXiv: nlin.CD/0311032.
[2] Nana Laurent. Bifurcation analysis of parametrically excited bipolar disorder model. Commun Nonlinear Sci Numer Simul 2009;14 (2):351–360.

* Corresponding author. Tel.: +1 602 543 8236.
  E-mail address: swirkus@asu.edu (S. Wirkus).