

Vassilios Kovanis Curriculum Vitae: Circa 2014

1 RESEARCH FOCUS AREAS

Theoretical, numerical, analytical and experimental work in ultrafast photonics, applied nonlinear dynamics, tunable photonic oscillators and photonic clocks, next generation optical and radio frequency metamaterials, control and synchronization of chaotic waveforms, phased arrays of coupled oscillators and laser emitters, science policy and technology investment strategy.

2 BIOGRAPHY

Vassilios Kovanis joined the faculty of the Department of Physics at Astana as a professor in 2014. In the past he held academic faculty positions at the University of New Mexico, Albuquerque, New Mexico, and at the Rochester Institute of Technology, Rochester, New York. He is also affiliated as a Research Professor with College of Optics and Photonics, at the University of Central Florida, and with the Bradley Department of Electrical and Computer Engineering at Virginia Polytechnic Institute and State University. In the past he served as the technical advisor of the photonics technologies branch at the Air Force Research Laboratory, Dayton Ohio. The branch had over twenty staff members and was operating a whole host of laboratories, fabrication facilities as well managing a set of national photonic initiatives. His responsibilities included executing an Air Force Office of Scientific Research research line for photonic oscillators and quantum dot multi section devices for generation of diverse waveforms. He served as a DARPA agent for microwave photonics, high precision oscillators and transformational antenna programs. He was the lead technical program manager on the optical metamaterials enterprise mandated by Office of the Secretary of Defense.

Vassilios studied physics at the University of Athens, Greece followed by graduate work at Temple University in Philadelphia, Pennsylvania and wrote his PhD dissertation at the University of New Mexico, Albuquerque, New Mexico in condensed matter theory. In 1989 joined the Nonlinear Optics Center at Air Force Weapons Laboratory, at Kirtland Air Force Base. He remained with that organization for the next eleven years, working on multiple projects of nonlinear optics and photonics. During that period he held research faculty positions with the Applied Mathematics and the Electrical Engineering Departments at

the University of New Mexico, and was a National Research Council Fellow between 1992 and 1994 with the Nonlinear Optics Center. Subsequently did a stint in Corporate Research and Development Laboratories with Corning Incorporated in Corning, as a Senior Research Scientist and with BinOptics Corporation in Ithaca, New York. Between 2003 and 2005 was member of the faculty, Associate Professor, at the Applied Mathematics Department at Rochester Institute of Technology. He has served as a guest editor of JSTQE, on two issues focused on *Semiconductor Lasers*. He has lectured internationally and published over 130 papers. Vassilios Google *h*-factor is 27 as of the fall of 2014. His research portfolio has been supported via AFOSR and DARPA.

3 KEY TECHNICAL ACCOMPLISHMENTS

1. Over the past 20 years Vassilios and the team, proposed low-phase noise [tunable photonic oscillators](#) concepts for the design of next generation photonic clocks in 2012.
2. Articulated the concept of [Photonic Synthetic Matter](#) based on Parity-Time symmetries paradigm for applications such as on chip-scale optical isolation in 2012.
3. Proposed the concept of [Photonics](#) without [Photons](#) with the goal to print the bifurcation structure of photonic integrated circuits on CMOS electronic circuits in 1999.
4. Deployed concepts of [compressive sensing](#) to predict [catastrophes](#) in complex nonlinear dynamical systems in 2011.
5. Articulated the concept of [bandwidth enhancement](#) on quantum dot gain lever systems and its connections and analogies of the modulation response of optically injected diode oscillators in 2010.
6. Proposed [reconfigurable monolithic quantum dot photonic circuits](#) for efficient optical generation of diverse waveforms in 2007.
7. Investigated the [Synchronous Sisyphus](#) effect in long and short external cavity semiconductor lasers in 1998.
8. Derived higher order [Adler like phase equations](#) reductions on key semiconductor laser systems, including feedback, injected diode and optically coupled lasers, as well in-depth analysis of the Period One Tunable Limit Cycles in 1996 and 2014.
9. Experimentally demonstrated synchronization of diode resonators based on [Qtt Grebogy Yorke](#) theory in 1994.

10. The ABQ Nonlinear Optics Team was responsible for the first ever theoretical and experimental demonstration of [Period Doubling Route into Optical Chaos](#) in injected semiconductor lasers devices in 1995.

4 SELECTED PUBLICATIONS

1. [Limit-Cycle Dynamics with Reduced Sensitivity to Perturbations](#), Thomas B. Simpson, Jia-Ming Liu, Mohammad AlMulla, Nicholas G. Usechak, & Vassilios Kovanis. *Physical Review Letters*, **112**, 023901 (2014).
2. [Localized Synchronization in two Coupled Nonidentical Semiconductor Lasers](#), Angela Hohl, Athanasios Gavrielides, Thomas Erneux, & Vassilios Kovanis, *Physical Review Letters*, **78**, 4745 (1997).
3. [Nonlinear Dynamics of an Injected Quantum Cascade Laser](#), Thomas Erneux, Vassilios Kovanis & Athanasios Gavrielides, *Physical Review E*, **88** 032907 (2013).
4. [Parity Time \(PT\) Symmetric Talbot Effects](#), H. Ramezani, D.N. Christodoulides, Vassilios Kovanis, Ilya Vitebskiy, & Tsampikos Kottos, *Physical Review Letters*, **109**, 033902 (2012).
5. [Predicting Catastrophes in Nonlinear Dynamical Systems by Compressive Sensing](#), Wang, Wen-Xu, Rui Yang, Ying-Cheng Lai, Vassilios Kovanis, & Celso Grebogi, *Physical Review Letters*, **106**, 154101 (2011).
6. [Tunable Photonic Oscillators using Optically Injected Quantum-Dash Diode Lasers](#), Michael Pochet, Nader A. Naderi, Yan Li, Vassilios Kovanis, & Luke F. Lester, *Photonics Technology Letters, IEEE* **22**, 763-765 (2010).
7. [Encoding and decoding messages with chaotic lasers](#), P.M. Alsing, A. Gavrielides, Vassilios Kovanis, Rajarshi Roy, & K. Scott Thornburg Jr., *Physical Review E*, **56**, 6302 (1997).
8. [Frequency Entrainment in Optically Injected Semiconductor Lasers](#), Petros M. Varangis, Athanasios Gavrielides, Thomas Erneux, Vassilios Kovanis, & Luke F. Lester, *Physical Review Letters*, **78**, 2353-2356 (1997).
9. [Experimental Demonstration of Antimonotonicity](#), Timothy C. Newell, Vassilios Kovanis, & Athanasios Gavrielides, *Physical Review Letters*, **77**, 1747-1750 (1996).
10. [Instabilities and Chaos in Optically Injected Semiconductor Lasers](#), Vassilios Kovanis, Athanasios Gavrielides, Thomas B. Simpson, & Jia-Ming Liu, *Applied Physics Letters*, **67**, 2780-2782 (1995).

11. [Synchronization of Chaotic Diode Resonators by Occasional Proportional Feedback](#), Timothy C. Newell, P. M. Alsing, Athanasios Gavrielides, & Vassilios Kovanis, *Physical Review Letters*, **72**, 1647 (1994).
12. [Self-organization of coupled nonlinear oscillators through impurities](#), Athanasios Gavrielides, Tsampikos Kottos, Vassilios Kovanis, & G.P. Tsironis, *Europhysics Letters*, **44**, 559 (1998).