PROFESSOR ILIAS E. PERAKIS: a two-page Bio

Ilias Perakis is Professor of Physics and former Chair of the Department of Materials Science & Technology at the University of Crete. He is an Adjoint Professor at Vanderbilt University and Affiliated Faculty with the Foundation of Research & Technology-Hellas (FORTH). He is an OSA Fellow and recipient of the NSF CAREER award. His undergraduate degree is in Electrical Engineering from the National Technical University of Athens, Greece. He received his Ph.D. in Physics from the University of Illinois at Urbana-Champaign, as an IBM fellow, and joined the Physics Department of Vanderbilt University as Assistant Professor (and later tenured Associate Professor) in 1995, after four years at Bell Laboratories and Rutgers University. He is an expert on the theory of *Ultrafast Quantum Manipulation of Complex Materials* for next-generation device applications (nano-structures, compex/correlated systems, semiconductors, metals, quantum materials, hybrid nanostructures, large (bio)molecular complexes,…). He collaborates closely with experimental groups to advance science & technology with quantum theory used to design & interpret experiments that capitalize on U.S. and European investments in state-of-the-art spectroscopic tools with unprecedented temporal, spectral, & spatial resolution. His non-equilibrium many-body calculations, which treat the interplay between femtosecond quantum coherence, nonlinearity, and correlation using mainly practical density matrix and Green's function equation-of-motion techniques, support and validate THz/MIR laser & magneto-optical multidimensional femtosecond spectroscopy experiments for THz switching, imaging, energy harvesting, and other applications. They directly relate to ultrafast spectroscopy experiments on control of quantum materials, including the billion-dollar large scale U.S.-DOE synchrotron user facilities (Linac Coherent Light Source (LCLS) at Stanford and Advanced Light Source (ALS) at Berkeley). The scientific thrust on non-equilibrium materials manipulation is expected to attract significant funding & attention in the coming years. Ilias' track record & collaborations in an emerging cross-disciplinary field and his unique combination of research-education-administration experiences put him in a unique position to make breakthroughs and open new initiatives & U.S. funding opportunities, by turning the disruption of the U.S. research funding and STEM education systems into new opportunities for our University. His current research projects and developing interests include:

1. ***All-Optical Switching of THz quantum photonic-electronic-magnetic multifunctional devices***- complex oxides, semiconductors, metals, molecular magnets, nanostructures, etc. Develop new spin-electronics & photonics platforms that exploit the rich physical behaviors of diverse materials to achieve next-generation nanoscale, terahertz, low power, and multifunctional devices: optically- and electrically-addressable memories, switches, logical processing devices, etc. Explore the interplay between laser-induced quantum coherence, strong correlation, spin-orbit interaction, and nonlinearity during light-matter ultrafast interactions for all-optical control and dynamical disentangling of coupled order parameters at terahertz speeds. The non-adiabatic response to an initial highly non-equilibrium metastable state, created by selective femtosecond-laser excitation of a superposition of quantum electronic states, can be tailored to achieve coherent control of magnetic and electronic orders and implement non-equilibrium materials manipulation via phase transitions to meta-stable transient states. One such example is the *quantum femtosecond magnetism* that we recently discovered.

2. ***Organic, hybrid organic/inorganic, and 2D-crystal/graphene photonics***: Micro- and nano-devices based on organic, large molecular, 2D-crystal, and hybrid structures enable low-cost nanoscale photonic integration together with novel functionalities. Use physical phenomena such as cavity QED, phononics, and Dirac electrons for inversion-less and infrared optical gain/lasing, spintronics, condensation, energy transfer via controlled exciton coupling to discrete modes & cavity photons, nano-photonics applications, etc. Near-infrared light emission in graphene, graphene quantum dots, ultrafast dynamics of Dirac electrons, optical gain from THz to ultraviolet frequencies and spintronics/spin-photonics in 2D-crystals. Implementing a *graphene laser*.

3. ***Non-equilibrium materials phases for rapid switching applications:*** Femtosecond photoinduced phase transitions in different materials, where the delicate balance of competing electronic/magnetic/superconducting ordered phases leads to complexity. How to tailor superpositions of charge/spin quantum mechanical states with ultra-short light pulses to induce and control non-equilibrium materials phases in iron-based superconductors, complex oxides, topological insulators, etc. How to disentangle coupled order parameters by bringing then off—equilibrium via femtosecond and THz photoexcitation and then monitoring their distinct dynamics with different isotropic or anisotropic ultrafast probes. Learning how to dissect complex order parameters in their individual components within the femtosecond temporal regime, far away from equilibrium, and simultaneously monitoring the dynamics of the different components.

4. ***Biological Spintronics:*** Magnetic and light-harvesting properties of biological complexes & proteins, magnetic macromolecules, magnetic nanostructures & hybrid materials for novel light-harvesting architectures, coherent control of (bio)chemical reactions, ultrafast photoinduced spin-dependent quantum biology & chemistry, solar cell applications, signals of nano-magnetism in multi-dimensional femtosecond coherent spectroscopy.

5. ***Attosecond/Sub-femtosecond Science and Coherent Multi-dimensional Spectrocopy*****:** ultra-short X-ray pulses, extreme nonlinear optics, imaging of complex & magnetic systems, biological complexes, and large molecules for possible applications in lithography, sensing of very short-lived species, and the development of instrumentation for attosecond and THz science.

Ilias' other passion is communicating Science, Technology, Engineering, and Math (STEM) to the general public and **all** students through innovation. He believes in *skill-oriented* Higher Education achieved by designing *active learning environments* that transform teaching "from a rhetoric of conclusions" into an "enquiry into enquiry". He implemented such ideas in the classroom through the curriculum intervention *"Conceptual Understanding, Scientific Explanations & Arguments In First Year University Physics: Development and evaluation of an intervention"*, whose success and impact on students was evaluated by a Ph.D. dissertation in the Department of Education at the University of Southampton, http://www.physics.uoc.gr/faculty/Chaimala_thesis.pdf, and was highlighted as an innovation by the recent external review of the Physics Department in Crete. He is currently writing a textbook for Cambridge University Press entitled *"Ultrafast Processes in Condensed Matter Systems",* which will serve as the basis for an online STEM course and for teaching STEM via case-studies. Finally, Ilias combines research and STEM-education innovation with top-level administrative experience, as Department Chair of Materials Science, Associate Chair of Physics, Director of Undergraduate Studies, and coordinator of European Union research consortia (STREP consortium *HYSWITCH*).

PROFESSOR ILIAS E. PERAKIS

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LinkedIn: https://www.linkedin.com/pub/ilias-perakis/58/711/8b4

Citizenship: USA

EDUCATION AND TRAINING

- *Ph.D. in Physics*, January 1992, University of Illinois at Urbana-Champaign, USA
  Advisor: Prof. Yia-Chung Chang
- *M.S. in Physics*, May 1988, University of Illinois at Urbana-Champaign, USA
- *B.S. in Electrical Engineering*, June 1986, National Technical University of Athens, Greece
- *Research Associate*, Department of Physics, Rutgers University, Piscataway, NJ, USA, *1993-1995*
  Advisor: Prof. Shirley A. Jackson
- *Postdoctoral member of technical staff*, Bell Laboratories, Murray Hill, NJ, USA, *1991-1993.*
  Advisors: Profs. Chandra M. Varma, Wayne H. Knox, Andrei Ruckenstein, and Daniel S. Chemla,
- *Teaching & Research Assistant,* Department of Physics, University of Illinois at Urbana-Champaign, USA *(1987-1991).*

ACADEMIC POSITIONS

- *Professor,* Department of Physics, University of Crete, Greece *(2009-present).*
- *Adjoint Professor,* Department of Physics, Vanderbilt University, Nashville, TN, USA *(2007-present).*
- *Associate Professor,* Department of Physics, Vanderbilt University, Nashville, TN, USA *(2002).*
- *Assistant Professor,* Department of Physics, Vanderbilt University, Nashville, TN, USA *(1995-2002).*
- *Associate Professor,* Department of Physics, University of Crete, Greece *(2000-2009).*
- *Affiliated Researcher*, Materials Science Division, Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology-Hellas (FO.R.T.H), Heraklion, Crete, Greece *(2000-present).*
- *Visiting Professor,* Boston University, Boston, MA, USA *(*Summer *2011).*
- *Visiting Professor,* Oakridge National Laboratory, Oakridge, TN, USA *(1996–1998).*
- *Visiting Professor,* Louis Pasteur University and CNRS Strasbourg, France *(1997 and 2012-2013).*
- *Consultant*, Advanced Photonics Research Department, Bell Laboratories, Holmdel, NJ, USA *(1993-1994).*

ADMINISTRATION

1. *Chair,* Department of Materials Science & Technology, University of Crete *(2009-2010).*
2. *Associate Chair,* Department of Physics, University of Crete *(2007-2009).*
3. *Director of Undergraduate Studies*, Department of Physics. University of Crete *(2005-2008).*
4. *Coordinator* of consortium HYSWITCH, European Union Specific Targeted Research Project (STREP) "*Tunable Josephson Dots*" (*2006–2009*, a >2M € project).
5. *Coordinator* of Undergraduate Student Practical Training Program, Physics Department, University of Crete-funded by the Greek ministry of Education and the European Union (*2006–2008* and *2010-present*).

AWARDS AND HONORS

1. Fellow of the Optical Society of America "*for contributions to the many-body theory of the coherent optical properties of semiconductors and metals"* (*2011*).
2. National Science Foundation CAREER award "*Coulomb–induced Dynamics in the Non-linear Optical Spectra of Low-Dimensional Systems: Beyond Mean Field Theory"* (ranked #1 in the program out of 87, *1997*).
3. U.S. Department of Energy, Faculty Research Participation award at Oakridge National Lab (*1996–1998*).
4. I.B.M. Pre-doctoral Fellow, University of Illinois-Urbana (*1989–1991*).
5. University of Illinois Jordan Asketh Award (*1989*).
6. Honor Society of Phi Kappa Phi (*1988*).
7. Greek National Team, International Mathematical Olympiad, Washington DC (*1981*).
8. Technical Chamber of Greece (TEE) fellowships for exceptional performance in undergraduate studies.
9. Scholarships from the Greek National Scholarship Foundation for performance in undergraduate studies.
10. Second prize in the National high-school competition of the Mathematical Society of Greece (*1981*).

SCIENTIFIC PROFILE AND INTERESTS

1. Theoretical Condensed Matter Physics, with emphasis on non-equilibrium and quantum phenomena.
2. Computational Materials Science, with emphasis on material-laser nonlinear interactions.
3. Theory of Optical, Electronic, Photonic, and Magnetic properties of Complex Materials, with emphasis on ultrafast dynamics and non-equilibrium manipulation.
4. Multi-dimensional Coherent Ultrafast Spectroscopy of Quantum Materials and Nanostructures.
5. Femto-/Atto-second Science, Rapid Photo-induced Phase Transitions with THz, MIR, & X-ray pulses.

6. All-Optical, Coherent, and Non-thermal Control of Spin & Charge Excitations in Nanostructures, Complex Oxides, Quantum Materials, Multiferroics, Iron-based Superconductors, Topological Insulators, Charge/Spin Density Wave Materials, Bio-Materials, Two-dimensional Crystals.
7. All-Optical Ultrafast Switching & Modulation of Magnetic, Superconducting, and Structural Properties.
8. Ultrafast Photonics and Bio-Photonics, Spin-dependent Quantum Biology.
9. Spectroscopy of Many–body Processes in Nanostructures and Two–Dimensional Electron Gas systems.
10. Apply Quantum Optics and Quantum Information Concepts to Condensed Matter Science
11. Innovative STEM Teaching, Science Communication, Online Education, and Innovative Course Design.

PROFESSIONAL ACTIVITIES

- *Co–author* of textbook *"Ultrafast Processes in Condensed Matter Systems",* Cambridge University Press (in preparation). In the future, we plan to use this unique book, which applies to several disciplines of science and engineering, for online STEM education via case studies and for training graduate students.
- *Organizer* of the International Workshop *"Non-equilibrium Dynamics in Interacting Systems*" at the Max-Planck Institut fur Physik Komplexer Systeme in Dresden, Germany, April 18 - May 05 (*2006*).
- *Organizer* of the symposium "*Spin Photonics: Light-spin interactions in semiconductors, metals, and quantum dots*" at the International Conference on Quantum Electronics and Laser Science (CLEO/IQEC) of the Optical Society of America (OSA), San Francisco, CA, USA (*2004*).
- *Organizer* of Symposium U "*Ultrafast Non–linear Optical Phenomena*" at the Materials Research Society Fall 2000 Meeting (MRS 2000), Boston, MA, USA (*2000*).
- *Co–organizer* of the *International Conference on Condensed Matter Theories XXII*, Nashville, USA *(1998).*
- *Editor* of book *"Condensed Matter Theories"* Vol. 14, Nova Science Publishers (*2001*).
- *Program Committee Member* at the CLEO conference of the Optical Society of America (OSA), committee on *"Optical Interactions with Condensed Matter and Ultrafast Phenomena" (2013).*
- *Program Committee Member* at the International Conference on Quantum Electronics and Laser Science (CLEO/QELS) of the Optical Society of America (OSA), committee on *"Ultrafast Dynamics" (2007).*
- *Program Committee Member* at the International Conference on Quantum Electronics (IQEC07) of the Optical Society of America (OSA), committee on *"Nonlinear Optics and Ultrafast Phenomena" (2007).*
- *Founding Member of the Science Advisory Committee, Institute for Complex Adaptive Matter*, Los Alamos National Laboratory, USA (*1998*).
- *Referee* for the European Research Council (ERC), the US National Science Foundation (NSF), and many peer–reviewed scientific journals (Nature, Science, Physical Review Letters, Physical Review B, Applied Physics Letters, Solid State Communications, Chemical Physics, Optics Letters, and others).
- *Member,* Optical Society of America (OSA) and American Physical Society (APS).

FUNDED PROJECTS

1. **EU**-*REGPOT program "CCQCN: Crete Center for Quantum Complexity and Nanotechnology"* (2013 - 2017, co-PI, ~5M€ funding for 4 years, http://qcn.physics.uoc.gr/, FP7-REGPOT-2012-2013-1 under grant agreement No. 316165).
2. **EU/Greece**-*"Nano-photonic Semiconductor Devices"*, Thales program NANOPHOS (2012-2015, co-PI in consortium of three institutions, 500,000€ budget, responsible for modeling of electrically-pumped polariton light-emitting devices- LED and laser- in inorganic, organic, & hybrid nano-structured and quantum dot light-emitting devices).
3. **EU**-*"Hybrid Organic–Inorganic Nanostructures for Photonics and Optoelectronics"*, European Union Initial Training Network (ITN) ICARUS, FP7-237900 (2009–2012, co-PI, 200,000€ budget for Crete node, polariton relaxation and lasing in organic microcavities).
4. **EU**- "*Tunable Josephson Dots*", European Union Specific Targeted Research Project (STREP) HYSWITCH, FP6-517467 (2006–2009) (500,000€ budget, PI and coordinator of the entire 2M€ budget multi-country European consortium, correlation effects on non-equilibrium quantum transport and optical properties).
5. **EU**-*"The Physics of Hybrid Organic–Inorganic Heterostructures for Photonics and Telecommunications*", European Union Research Training Network (RTN) HYTEC, HPRN–CT–2002–00315 (2003–2006) (PI, 200,000€ budget for Crete node, polariton luminescence in J-aggregate microcavities).
6. **NSF**- *"Coulomb–induced Dynamics in the Non–linear Optical Spectra of Low Dimensional Systems*: *Beyond Mean Field Theory*", National Science Foundation CAREER award, ECS–9703453 (1997–2001, PI, budget of $250,000).
7. **DARPA/ONR**-"*Spintronics and Spin–Photonics in Ferromagnetic InAs/GaAb–Based Heterostructures*", part of Vanderbilt University node of US DARPA/ONR spintronics consortium (2001-2004, co-PI with budget of ~$200,000).
8. **Greece**- "*IRAKLITOS Program", Greek Ministry of Education*, support of Ph.D. student M. Kapetanakis (2003–2007).
9. **NSF**-*"Optical Processing of Information in Doped Semiconductors*", National Science Foundation International Travel award #0605801 with Prof. Carlo Piermarocchi at Michigan State University (co-PI, $12,000, 2007–2009).
10. **Greece**-*Coordinator of Undergraduate Student Practical Training Program* for the Physics Department, University of Crete-funded by the Greek ministry of Education and the European Union (*2006–2008* and *2010-present,* PI, Physics Department budget of ~170,000€).
11. **Japan**-*Advanced Research Laboratory, Hitachi Ltd*: Research grant of $20K (PI, 1998-2000).
12. As Chair of the Department of Materials Science & Technology, I was able to almost double the annual budget received from the University of Crete and to secure a new building to host the Department and its activities.

SELECT INVITED TALKS (2013-2000)

1. *"Ultrafast Phenomena and Nanophotonics XVIII"* conference, part of SPIE OPTO, San Francisco, USA http://spie.org/app/program/index.cfm?fuseaction=conferencedetail&symposium=PW14O&conference_id=2025597 (invited talk, February 2014).
2. UMC 2013 *"Ultrafast Magnetism Conference"* http://umc2013.u-strasbg.fr/, Strasbourg, France (invited talk, October 2013). This event is the first in a series of conferences on ultrafast magnetism that will be held every two years in different cities worldwide.
3. XXIX Panhellenic Conference on Solid State Physics and Materials Science, Athens, Greece (invited talk, September 2013), http://physics.ntua.gr/xxix-pcssp/
4. *APS March Meeting of the American Physical Society*, Baltimore, USA (invited talk, March 2013), http://meetings.aps.org/Meeting/MAR13/Event/188155
5. *Gordon Research Conference* on "Ultrafast Phenomena in Cooperative Systems", Galveston, Texas, USA (invited talk, February 2012), http://www.grc.org/programs.aspx?year=2012&program=ultrafast
6. *Fundamental Optical Processes in Semiconductors (FOPS 2011*), Lake Junaluska, North Carolina, USA (invited talk, August 2011), http://www.fops2011.phyast.pitt.edu/
7. *9th Optics of Surfaces and Interfaces (OSI9) International Conference*, Akumal, Mexico (invited talk, September 2011).
8. *Gordon Research Conference* on "Ultrafast Phenomena in Cooperative Systems", Il Ciocco, Italy (invited talk, February 2008).
9. *APS March meeting of the American Physical Society*, New Orleans, Louisiana, USA, (March 2008, invited talk delivered by Dr. J. Wang).
10. *International Workshop on "Nanoscopic Transport: quantum noise, Josephson junctions, and molecular electronics"*, Freiburg, Germany (November 2007).
11. *Fundamental Optical Processes in Semiconductors (FOPS 2007*), Big Sky, Montana, USA (invited talk, July 2007).
12. *Keynote address* of the 10th joint conference of the Greek and Cypriot Physical Societies, "*Innovative Teaching Approaches at the Physics Department of the University of Crete"* (March 2007).
13. *International Workshop on Spin Currents*, Sendai, Japan (invited talk, February 2007).
14. *International Workshop on "Non-equilibrium Dynamics in Interacting Systems"*, Max Planck Institute fur Physik Komplexer Systeme, Dresden, Germany (April 2006) http://www.mpipks-dresden.mpg.de/~neqdis06/
15. *8th International Workshop on "Nonlinear Optics and Excitation Kinetics Semiconductors" (NOEKS 8)*, Muenster, Germany (February 2006).
16. Harrington Symposium on *Solid State Cavity Quantum Electrodynamics* in Austin, Texas (2006).
17. International School & Workshop on *"Modern Problems of Spin* Dynamics", Strasbourg, France (2006).

18. *20th General Conference of the Condensed Matter Division of the European Physical Society*, Prague, Czech Republic (July 2004, talk delivered by Dr. Chovan).
19. *Organizer* , symposium entitled "*Spin Photonics: Light-spin interactions in semiconductors, metals, and quantum dots*" at the International Conference on Quantum Electronics *(CLEO/IQEC)* meeting of the Optical Society of America, San Francisco, CA, USA (2004).
20. Optical Society of America *"Quantum Electronics and Laser Science Conference" (CLEO/QELS)*, Baltimore, USA (June 2003).
21. *7th International Workshop on "Nonlinear Optics and Excitation Kinetics in Semiconductors" (NOEKS 7)*, Karlsruhe, Germany (invited talk, February 2003).
22. *"Nanophase" Euroconference*, Erice, Sicily, Italy (invited talk, July 2002).
23. *Gordon-Kenan Summer School and Gordon Conference*, Bristol, Rhode Island, USA (invited talk, June 2002).
24. Optical Society of America *"Quantum Electronics and Laser Science Conference" (CLEO/QELS),* Baltimore, USA (invited talk, May 2001).
25. *Onassis 2001 Lectures in Chemistry and Physics*, Heraklion, Crete (July 2001).
26. SPIE's *"International Symposium on Optoelectronics 2001"*, San Jose, CA, USA (January 2001).
27. Materials Research Society Fall Meeting (*MRS 2000*), Boston, MA, USA (November 2000).
28. *APS March Meeting of the American Physical Society*, Minneapolis, MN, USA (invited talk, March 2000).
29. Optical Society of America "*Quantum Electronics and Laser Science Conference" (CLEO/QELS*), San Francisco, CA (invited talk, May 2000).
30. International Conference on "Induced Cooperative Phenomena", Berkeley, CA, USA (June 2000).
31. Colloquia and Seminars in many U.S. and European Universities.
32. Contributed talks in many international conferences and workshops.

POSTDOCTORAL RESEARCH ASSOCIATES

1. Prof. T. V. Shahbazyan (*1997–2002*), currently full Professor, Jackson State University, USA, http://www.jsums.edu/physics/tigran-shahbazyan-ph-d/
2. Prof. J. Chovan (*2003–2007*), currently Assistant Professor, Matej Bel Univ., Banska Bystrica, Slovakia.
3. Dr. M. Kapetanakis (*2010*), currently postdoctoral research associate at Oakridge National Laboratory, USA.
4. Dr. J. Karadamoglou (*2006–2008*), currently physics teacher in Greek Public High School system.
5. Dr. L. Mouchliadis (*2010–present*).

Ph.D. STUDENTS

1. Dr. E. Kavousanaki, *PhD 2007*, University of Crete. Currently researcher at Femtosecond Spectroscopy Unit, Okinawa Institute of Science and Technology, Okinawa, Japan. Previously research associate at University of Konstanz, Germany (G. Burkard group) and at the University of California, Irvine, USA (S. Mukamel group).
2. Dr. M. Kapetanakis, *PhD 2007*, University of Crete. Currently postdoctoral research associate at Oakridge National Laboratory, Oakridge, TN, USA (S. Pantelides group).
3. Dr. N. Primozich, *PhD 2000*, Vanderbilt University. Currently employed in private sector, Japan.
4. Dr. A. Getter, *PhD 1998*, Rutgers Univ. (co-advisor with Prof. Shirley A. Jackson). Currently employed in private sector, USA.
5. Prof. K.M. Dani, *PhD 2006*, University of California, Berkeley (co–advisor with Prof. Daniel S. Chemla). Currently Assistant Professor at Okinawa Institute of Science and Technology in Okinawa, Japan, previously postdoctoral research Fellow at Los Alamos National Laboratory, USA (group of A. Taylor).
6. Dr. F. Chaimala, *PhD 2009*, Department of Education, University of Southampton (co–advisor with Prof. Mary Ratcliffe, Ph.D. dissertation based on my educational/innovative teaching activities in Crete). Currently researcher at FORTH.
7. Mr. M. Karadimitriou (*2007–present*).
8. Mr. P. C. Lingos (*2013-present*).

DIPLOMA THESIS UNDERGRADUATE STUDENTS

A. Manousaki (2004), G. Christou (2008), P. C. Lingos (2009), A. Giannakopoulos (2010).

TEACHING - University of Crete

PHYS 301- *Electromagnetism*, http://ph301.edu.physics.uoc.gr

Advanced E&M junior year compulsory core course for physics majors.

PHYS 351- *Computational Physics*

Junior year computational physics elective course with projects.

PHYS 441- *Introduction to Condensed Matter Physics*

Senior year elective course introducing the basic concepts of condensed matter physics.

PHYS 107- *Physics via Concept Grinders* (*"Ennoiotriveia"*), http://ph107.edu.physics.uoc.gr

I designed this innovative, fully interactive freshman physics elective course described below. The goal is three-fold: (1) acquisition of deeper knowledge on science concepts and misconceptions (*content knowledge*), (2) development of scientific explaining skills (*substantive knowledge*), and (3) enhancement of

arguing skills (*syntactic knowledge*). In addition to designing a successful tool for developing students' complex skills (explaining, argumentative, and critical thinking abilities) and for motivating them about STEM, this course is a part of a "poor man's" training program for prospective high-school teachers that I designed and run. The success of PHYS 107 in meeting its stated goals was documented by the PhD dissertation of Dr. F. Chaimala at the School of Education of the University of Southampton, http://www.physics.uoc.gr/faculty/Chaimala_thesis.pdf. The results of this research project were presented at various science education international conferences and were highlighted in the 2008 external review of the Physics Department by the Hellenic Quality Assurance Agency for Higher Education (the English version of their report can be found at http://www.adip.gr/index.php?option=com_content&view=article&id=77&Itemid=187&lang=en).

BIOL 103- *Introductory Physics*

Introductory freshman Physics for Biology majors.

PHYS 793- *Practical Training in Teaching Physics,* http://ph793.edu.physics.uoc.gr

I designed and taught a course on teaching science to high-school students, which includes a weekly workshop and hands-on activities. The purpose of this course is to create a learning environment in the classroom and to combine it with practical hands-on experience in the field in order to develop students' teaching skills and prepare the future science teachers. It includes, among others, (1) discussion of common misconceptions that high-school students have about physics, (2) design of a structured plan for teaching two hours of physics in a local high-school, with connections to pedagogy theories and identified physics misconceptions, (3) teaching activities in local high-schools, and (4) novel activities inspired by the physics education research literature and designed to address recognized challenges of high-school students in learning science. This course is part of a "poor man's" training program for prospective high-school teachers that I put together on behalf of the Physics Department. It also serves as an outreach program for recruiting highschool students interested in STEM, by having them interact with the Physics students that take this course and by talking and getting to know me while I supervise the students' teaching in the highschool classroom.

PHYS 10-EP- *Scientist Citizen*, http://ph10.edu.physics.uoc.gr/ep2006/ and http://ph10.edu.physics.uoc.gr

I introduced, designed, and coordinated, on behalf of the Rector of the University of Crete, an innovative elective interdisciplinary course for students from all Departments that discusses pressing scientific and ethics issues affecting modern society and addresses issues of communicating scientific facts to the general public.

PHYS 015 and 016- *Communication of Modern Physics in English*

I co-supervised the writing, scientific content, and oral presentation of a science paper as part of a weekly workshop taught by the "English for Specific Purposes" (ESP) teacher. This course aims to create a learning environment in the classroom to help develop students' skills on effective oral and written communication and dissemination of science topics.

PHYS 104- *Topics of Modern Physics II.*

PHYS 105- *Dissertation on Topics of Modern Physics.*

TEACHING - Vanderbilt University

PHYS 116A- *Introductory Physics*, http://www.vanderbilt.edu/AnS/physics/perakis/

Freshman Physics introductory course for Vanderbilt students interested in Engineering and Physics.

PHYS 330A- *Quantum Mechanics*

Graduate Quantum Mechanics core course.

PHYS 365- *Quantum Many-body Physics*

Graduate many-body physics course.

SOME SELECT PUBLICATIONS

1. *Femtosecond Magneto-Optics: Quantum Spin Switching in Step with Light,* Optics and Photonics News, December 2013. Highlighted in "Year in Optics" as "…*one of the most exciting optics research to emerge in the preceding 12 months*"
2. *Femtosecond switching of magnetism via strongly correlated spin–charge quantum excitations*, T. Li, A. Patz, L. Mouchliadis, J. Yan, T. A. Lograsso, I. E. Perakis, and J. Wang, Nature **496,** 69 (2013).
3. *Ultrafast Observation of Critical Nematic Fluctuations and Giant Magnetoelastic Coupling in Iron Pnictides*, A. Patz, T. Li, S. Ran, R. Fernandes, S. Bud'ko, J. Schmalian, P. Canfield, I.E.Perakis and J. Wang, Nature Communications (2014). http://www.nature.com/ncomms/2014/140206/ncomms4229/full/ncomms4229.html?WT.ec_id=NCOMMS-20140212#author-information

4. *Quantum Control of Magnetic Memories by Tailoring Phase–Coherent Trains of Femtosecond Laser Pulses*, P. C. Lingos, J. Wang, and I. E. Perakis, Nature Scientific Reports (2014).
5. *Dissecting excitonic and structural orders in a persisting charge density wave,* M. Porer, J.-M. Menard, U. Leierseder, H. Dachraoui, I. E. Perakis, J. Demsar, U. Heinzmann, K. Rossnagel, , and R. Huber, Nature Materials (2014).

6. *Theory of Photoexcited Femtosecond Spin–Charge Quantum Dynamics in Strongly Correlated Systems*, , P. C. Lingos, L. Mouhliadis, J. Wang, and I. E. Perakis, Physical Review B (2014).
7. *Critical Slowing Down of Femtosecond Hole Spin Relaxation in Ferromagnetic Semiconductor GaMnAs,* A. Patz, T. Li, X. Liu, J. K. Furdyna, I. E. Perakis, and J. Wang, Physical Review B (2014).
8. *Speeding of Transient Carrier Relaxation by Quantum Femtosecond Magnetism in a Strongly Correlated Manganite,* T. Li, A. Patz, J. Yan, T. A. Lograsso, I. E. Perakis, and J. Wang, Physical Review Letters (2014).
9. *Stimulated Near-Infrared Light Emission in Graphene,* I. E. Perakis, Physics 5, 43 (2012).
10. *Polariton Optical Nonlinearities and Reverse Saturable Absorption in Disordered J–aggregate Cyanine Dyes,* N. Somaschi, L. Mouchliadis, N. Healy, A. C. Peacock, D. G. Lidzey, I. E. Perakis, P. G. Savvidis, and P. G. Lagoudakis, Phys. Rev. Letters (2014).
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