



# Andi Petculescu

## Curriculum Vitae

*"La sapienza è figliola della sperienza." - Leonardo da Vinci*

### Education

- 1996–2002 **Ph.D. in Physics**, *Ohio University*.  
1988–1993 **Diploma in Physics**, *The University of Bucharest*.

### Ph.D. Dissertation

- Title *Viscous Losses in Porous Media and Jet-Pumps under Oscillatory Flow Conditions*  
Supervisor Dr. Larry Wilen

### Languages

- Native **Romanian**  
Fluent **English**  
Fluent **French**  
Good **Italian**

### Professional history

- 2017–present **Sammie W. Cospers Endowed Professor in Physics**, *University of Louisiana at Lafayette*.  
2012–present **Associate Professor**, *University of Louisiana at Lafayette*.  
2006–2012 **Assistant Professor**, *University of Louisiana at Lafayette*.  
2004–2006 **Postdoctoral Fellow**, *Northwestern University*.  
2002–2004 **Postdoctoral Fellow**, *National Center for Physical Acoustics, Oxford, MS*.

### Professional membership

- The American Physical Society  
The Acoustical Society of America  
The Audio Engineering Society

## Professional Activities

- Journal Editor:
  - Associate Editor for the *Journal of the Acoustical Society of America* (since 2014).
  - Guest Editor for the JASA Special Issue "Acoustic and Related Waves in Extraterrestrial Environments." (2016)
- Reviewer:
  - *Proceedings of the Royal Society*
  - *Journal of the Acoustical Society of America*, *Applied Acoustics*
  - *Sensors and Actuators*, *IEEE Sensors*, *Measurement Science and Technology*
  - *Icarus*, *Planetary and Space Sciences*
- Conference/session organizer:
  - Co-organized the 174th Meeting of the Acoustical Society of America, New Orleans (LA), Dec 4 – 8, 2017.
  - Organized the Special Session "Acoustics Probes of Planetary Environments," 155th Joint Meeting of the European Acoustics Association and the Acoustical Society of America, Paris (France), 29 June – 4 July, 2008.
  - Organized the Special Session "Acoustics Probes of Planetary Environments," 153rd Meeting of the Acoustical Society of America, Salt Lake City (UT), June 4 – 8, 2006.

## Research

- **Infrasonic absorption in Earth's lower thermosphere (theoretical/computational).**
  - Developing a model for infrasound absorption and dispersion in Earth's upper mesosphere/lower thermosphere (UMLT). Goals: 1) improve prediction accuracy for thermospheric arrivals; 2) investigate using long-range infrasonic signals to study UMLT dynamics (especially winds).
- **Acoustic absorption and dispersion in clouds and fogs (theoretical).**
  - We study the propagation characteristics of sound in convective clouds. Goal: develop a framework for low-frequency acoustic sensing of Venus's middle atmospheric dynamics from balloons deployed around 55 km altitude.
- **Infrasonic wind-noise inside porous dome structures (theoretical).**
  - We calculate the non-acoustic contributions to the fluctuating pressure at the center of porous domes, arising from turbulent interactions. Goal: investigate using porous domes as wind-noise filters (instead of rosette assemblies), especially in extreme environments like Antarctica or Mars.
- **Predicting thunder on Earth and Titan (theoretical/computational).**
  - Modeling the generation and propagation of thunder, combining microscale lightning thermochemistry, shockwave theory, and nonlinear ray-tracing. Goals: 1) improve thunder models to better understand lightning discharges, 2) assess the feasibility to use thunder sensing as a tool to quantify lightning on Titan.
- **Adaptive beamforming (experimental) [completed].**
  - We developed beamforming algorithms in the time-frequency domain, based on measured impulse responses. Goal: seek efficient techniques to localize moving sources and enhance signals in reverberant and/or noisy environments.
- **Acoustics of granular media (experimental) [completed].**
  - Measured, for the first-time, the minute energy lost as sound during collisions of small plastic balls. Obtained small corrections to Hertz's contact law. Experimental studies of sound propagation in granular media, with an eye toward the onset of jamming.

## Teaching

### ○ Core courses:

- *Algebra-Based Physics.*
- *Electrodynamics I, II.*
- *Quantum Mechanics I, II.*
- *Statistical Physics and Thermodynamics.*

### ○ Special courses:

- *Atmospheric Physics (graduate level).*
  - This course addresses the physics of planetary atmospheres, including radiative and convective transfer, cloud formation, atmospheric circulation, and waves. The atmospheric characteristics of various planets are analyzed and compared throughout the course. Homework includes theoretical problems as well as analyzing data from NASA/NOAA/ESA.
- *Theoretical Acoustics (graduate level).*
  - This course develops the theory of physical acoustics from the full Navier-Stokes-Fourier framework. Among the topics covered are energy losses in the bulk and at boundaries, non-classical absorption in polyatomic gases, sound radiation, reflection, transmission, and scattering, atmospheric acoustic sensing, and sound generation by turbulence.
- *Room Acoustics (graduate level).*
  - The course addresses the main aspects of room acoustics, including modal/statistical theory, reverberant fields, the physics of acoustic absorbers and other wall treatments, transmission through porous plates, as well as elements of concert-hall and classroom acoustics.
- *Matlab/Python-Based Applied Acoustics (senior undergraduate/graduate level).*
  - This is an applied acoustics course, which I have developed to give the students the opportunity to develop simple models of acoustic processes and also do a series of mini-experiments in which they acquire and analyze data, covering various topics in acoustics.
- *Quantum Computing (senior undergraduate/graduate level).*
  - This new course addresses the fundamentals of quantum computing, such as entanglement, multi-qubit states, quantum gates and circuits, quantum key distribution, dense coding and teleportation, the Quantum Fourier Transform, quantum parallelism, decoherence and quantum dissipation.

## Computing

Operating systems Linux, OSX, Windows

Programming Matlab, Python

## Recent publications

(full list available upon request)

- A. J. Trahan and A. Petculescu, "Low-Frequency Acoustic Absorption through the Lower/Middle Clouds of Venus," submitted to the Journal of Geophysical Research–Planets.
- D. Bowman, A. Petculescu, R. Garcia, D. Banfield, J.-P. Williams, M. Siegler, "Infrasound on Mars: Source phenomena, propagation patterns, and detection capabilities," under review, Geophysical Research Letters.
- K. Pitre and A. Petculescu, "Porous domes as wind-noise filters for infrasound sensing on Mars," Planetary and Space Science **167** 33-41 (2019).
- A. Petculescu, "Acoustic properties in the low and middle atmospheres of Mars and Venus," J. Acoust. Soc. Am. **140** 1439-1446 (2016).
- T. G. Leighton and A. Petculescu, "Guest Editorial: Acoustic and Related Waves in Extraterrestrial Environments," J. Acoust. Soc. Am. **140** 1397-1399 (2016).
- A. Petculescu and R. Kruse, "Predicting the characteristics of thunder on Titan: A framework to assess the detectability of lightning by acoustic sensing," J. Geophys. Res. Planets **119** 2167-2176 (2014).
- A. Akintunde and A. Petculescu, "Infrasonic attenuation in the upper mesosphere-lower thermosphere: A comparison between Navier-Stokes and Burnett predictions," J. Acoust. Soc. Am. **136** 1483 (2014).
- A. C. Raga, J. Cantó, A. Rodríguez-González, and A. Petculescu, "The strong/weak shock transition in cylindrical and planar blast waves ," Rev. Mex. Astron. Astrofísica **50** 145-150 (2014).
- A. Petculescu and P. Achi, "A model for the vertical sound speed and absorption profiles in Titan's atmosphere based on Cassini-Huygens data," J. Acoust. Soc. Am. **131** 3671-3679 (2012).
- A. Petculescu and R. M. Lueptow, "Quantitative acoustic relaxational spectroscopy for real-time monitoring of natural gas: a perspective on its potential," Sensors and Actuators B: Chemical **169** 121-127 (2012).

## Miscellaneous interests

- Writing, reading
- Humor and comedy
- Audio systems
- Hapkido, volleyball, (table) tennis, soccer-tennis
- Crafty comic books
- Coffee-shop witticisms

## References

### **Richard Raspet (University of Mississippi)**

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### **Timothy Leighton (University of Southampton)**

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### **Larry Wilen (Yale University)**

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