

# GEORGII OBLAPENKO

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Ph.D. (Mechanics of Fluids, Gases and Plasma)

Saint-Petersburg State University ◊ Department of Hydroaeromechanics

## EXPERIENCE

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### **GODA New Media Artist Collective**

October 2016 – Present

*Programmer, sound designer*

- Design of interactive installations, concept creation
- Programming (Python, MAX/MSP, Arduino)
- Sound design, soundtrack work

### **Saint-Petersburg State University**

September 2015 – Present

*Assistant engineer*

*Department of Hydroaeromechanics*

- Lead developer of a C++ library aimed at kinetic theory computations
- Implementation of state-to-state models in Direct Simulation Monte Carlo (DSMC) codes
- Development of simplified models for vibrational relaxation rates
- Numerical modeling of reaction rates in viscous gas flows

### **Freelance**

September 2013 – June 2014

*Web developer*

- Creation of educational online games
- Creation of online interface for an interactive remote laboratory

### **Saint-Petersburg State University**

April 2013 – September 2015

*Assistant researcher*

*Department of Hydroaeromechanics*

- Development of theoretical models of reaction rates in viscous gas flows
- Numerical modeling of reaction rates in viscous gas flows

### **Internships**

- DLR, Gottingen, Germany (November 2017–January 2018). Implementation of modern models of physico-chemical process rates in the DLR-TAU solver.
- The Federal University of Parana, Curitiba, Brazil (October 2016). Studied the influence of variable diameters of vibrationally excited molecules on relaxation processes.
- Khristianovich Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia (February 2016). Worked on implementing state-to-state non-equilibrium process models in DSMC code.

## TECHNICAL SKILLS

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### Brief overview:

<b>Computer languages</b>	C++, Python, MATLAB MAX/MSP, L <sup>A</sup> T <sub>E</sub> X, Javascript, HTML, CSS
<b>Tools</b>	Git, Vim, make, Paraview
<b>Skills</b>	Numerical modeling, machine learning, digital signal processing, Arduino programming
<b>Online profiles</b>	<a href="https://github.com/knstmrd">https://github.com/knstmrd</a> <a href="https://github.com/godacollective">https://github.com/godacollective</a> <a href="https://www.kaggle.com/kunstmord">https://www.kaggle.com/kunstmord</a>

### Detailed:

#### Kinetic theory

- Experience in application of kinetic theory to non-equilibrium flow modeling (rate coefficient and transport properties computation)
- Lead developer of the **KAPPA** kinetic theory library
- Experience in DSMC modeling of strongly non-equilibrium rarefied gas flows and development of DSMC code

#### Numerical modeling

- Experience in implementing various numerical algorithms in C++, Python, MATLAB
- Well-acquainted with numerical libraries for C++ (Armadillo, GSL, Boost numerical libraries) and Python (Numpy, Scipy, Pandas)

#### Digital Signal Processing

- Developer of a C++ library (**arma-dsp**) for DSP
- Experience in implementation of various audio processing algorithms in C++, Python, MAX/MSP

#### Machine learning

- Experience in working with data-processing tools, various classification and regression algorithms (scikit-learn, XGBoost)
- Participant in Kaggle competitions
- Some experience with deep learning (Keras)

#### Kaggle competition participation and results

##### The Marinexplore and Cornell University

##### Whale Detection Challenge, 2013

Top 23%

##### Galaxy Zoo - The Galaxy Challenge, 2014

Top 48% (part of a team)

##### Driver Telematics Analysis, 2015

Top 15% (part of a team)

##### Otto Group Product Classification Challenge, 2015

Top 7%

##### Liberty Mutual Group: Property Inspection Prediction, 2015

Top 55%

##### TalkingData Mobile User Demographics, 2016

Top 60%

##### Sberbank Russian Housing Market, 2017

Top 66%

#### Web development

- Familiar with Django, Django REST framework
- Some experience working with Javascript, React, HTML, CSS

## EDUCATION

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### Saint-Petersburg State University

*September 2015 – Present*

PhD student (successfully defended Ph.D. thesis in April 2017)

Area of research: Mechanics of Fluids, Gases and Plasma

Department of Hydroaeromechanics

Research supervisor: Prof. Kustova E.V.

**Saint-Petersburg State University**

*June 2015*

Masters degree (with excellence) in Mechanics and Mathematical Modelling

Area of specialization: Molecular Kinetic Theory of Fluids and Gases

Department of Hydroaeromechanics

Research supervisor: Prof. Kustova E.V.

**Saint-Petersburg State University**

*June 2013*

Bachelors degree in Mathematics and Mechanics

Department of Hydroaeromechanics

Research supervisor: Prof. Kustova E.V.

## RESEARCH GRANTS

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Participant of 3 Saint-Petersburg University grants, 1 Russian Science Foundation grant and 3 Russian Foundation for Basic Research grants.

Participant of the ESA research project “Exploring angular-momentum phenomenology in aerothermodynamics and MHD” (as a subcontractor to the DLR), 2015–2016.

**Own research and travel grants:**

1. Research project “Improvements of the thermo-chemical relaxation model used by the DLR-TAU code” jointly sponsored by the DAAD and Saint-Petersburg State University
2. Research project “Influence of variable diameters of vibrationally excited molecules on relaxation processes in strongly non-equilibrium gas flows” jointly sponsored by the Santander Bank and Saint-Petersburg State University
3. Saint-Petersburg State University travel grants (2013, 2014, 2017)

**Stipends and awards:**

- Stipend of the Russian President for students and PhD students studying disciplines corresponding to the prioritized areas of modernization of Russian economics (2017)
- Stipend of the Russian Government for students and PhD students studying disciplines corresponding to the prioritized areas of modernization of Russian economics (2016)
- Stipend of the Russian Government for students and PhD students (2016)
- Winner of the Saint-Petersburg Government Grant Competition for Students and Graduate Students (2013)

## PUBLICATIONS, CONFERENCE PARTICIPATION

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Co-author of 10 publications in SCOPUS/Web of Science-indexed peer-reviewed journals, participant of 6 international and 6 all-Russian conferences.

**Publications in SCOPUS/Web of Science-indexed journals:**

1. *Kremer G.M., Kunova O.V., Kustova E.V., Oblapenko G.P.* The influence of vibrational state-resolved transport coefficients on the wave propagation in diatomic gases // *Physica A: Statistical Mechanics and its Applications*, 2018. V. 490 P. 92-113

2. *Oblapenko G.P., Kashkovsky A.V., Bondar Ye.A.* State-to-state models of vibrational relaxation in Direct Simulation Monte Carlo (DSMC) // *Journal of Physics: Conference Series*, 2017. V. 815 No. 1 P. 012011 (1-7)
3. *Kustova E.V., Oblapenko G.P.* Vibration-dissociation Coupling in Multi-Temperature Viscous Gas Flows // *AIP Conference Proceedings*, 2016. V. 1786. P. 150004 (18)
4. *Baikov B.S., Bayalina D.K., Kustova E.V., Oblapenko G.P.* Inverse Laplace Transform as a Tool for Calculation of State-specific Cross Sections of Inelastic Collisions // *AIP Conference Proceedings*, 2016. V. 1786. P. 090005 (1-8)
5. *Shoev G.V., Bondar Ye.A., Oblapenko G.P., and Kustova E.V.* Development and testing of a numerical simulation method for thermally nonequilibrium dissociating flows in ANSYS Fluent // *Thermophysics and Aeromechanics*, 2016. Vol. 23 No. 2. P. 151-163
6. *Kustova E.V., Oblapenko G.P.* Mutual effect of vibrational relaxation and chemical reactions in viscous multitemperature flows // *Phys. Rev. E – Statistical, Nonlinear, and Soft Matter Physics*, 2016. Vol. 93. No. 033127.
7. *Kustova E.V., Nagnibeda E.A., Oblapenko G.P., Savelev A.S., Sharafutdinov I.Z.* Advanced models for vibrationalchemical coupling in multi-temperature flows // *Chem. Phys.*, 2016. Vol. 464. P. 1-13
8. *Kustova E.V., Oblapenko G.P.* Reaction and internal energy relaxation rates in viscous thermochemically non-equilibrium gas flows // *Phys. Fluids*, 2015. Vol. 27. P. 1.4906317
9. *Kustova E.V., Oblapenko G.P.* Rates of VT Transitions and Dissociation and Normal Mean Stress in a Non-equilibrium Viscous Multitemperature  $N_2/N$  Flow // *AIP Conference Proceedings*, 2014. V. 1628. P. 602-609
10. *Kustova E.V., Oblapenko G.P.* Normal mean stress and rates of slow process in chemically and vibrationally non-equilibrium multi-temperature gas flows // *Vestn. S.-Peterb. Univ., Ser 1*, 2013. P. 111-120.

#### **Other publications:**

1. *Kustova E.V., Oblapenko G.P., Sharafutdinov I.Z.* Vibrational relaxation models for non-equilibrium multi-temperature flows // *Physico-chemical Kinetics in Gas Dynamics*, 2015. Vol. 16.
2. *Kustova E.V., Oblapenko G.P.* Vibrational relaxation rates in multi-temperature gas flows // *Physico-chemical Kinetics in Gas Dynamics*, 2014. Vol. 15. P. 1-4

#### **Conference and school participation:**

1. International conference “7th European Conference for Aeronautics and Space Sciences”, 2017 (Milan, Italy)
2. International EUCASS workshop “Aerospace Thematic Workshops: Fundamentals of Aerodynamic Flow and Combustion Control by Plasmas”, 2017 (Pushkin, Russia)
3. All-Russian school-seminar “Aerophysics and physical mechanics of classical and quantum systems”, 2016 (Moscow, Russia)
4. International conference “30th International Symposium on Rarefied Gas Dynamics”, 2016 (Victoria BC, Canada)
5. All-Russian school-seminar “Aerophysics and physical mechanics of classical and quantum systems”, 2015 (Moscow, Russia)
6. All-Russian seminar “XXIV All-Russian seminar with international partnership on jet, separation, and non-stationary flows”, 2015 (Novosibirsk, Russia)

7. International conference “International Scientific Conference On Mechanics “The Seventh Polyakhonv’s Reading””, 2015 (Saint-Petersburg, Russia)
8. All-Russian school-seminar “Aerophysics and physical mechanics of classical and quantum systems”, 2014 (Moscow, Russia)
9. International conference “29th International Symposium on Rarefied Gas Dynamics”, 2014 (Xi’an, China)
10. All-Russian conference “Modern problems in rarefied gas dynamics”, 2013 (Novosibirsk, Russia)
11. International conference “9th IFAC Symposium on Advances in Control Education”, 2012 (Nizhniy Novgorod, Russia)
12. All-Russian conference “XIV Conference of Young Scientists on Navigation and Motion Control”, 2012 (Saint-Petersburg, Russia)