

Andrey Geondzhian

Researcher | Theoretical physicist

Skolkovo Institute of Science and
Technology, Moscow, Russia

a.geondzhian@skolkovo.ru

<https://geonda.github.io>

Education

2019 PhD in theoretical condensed matter physics. Université Grenoble Alpes, Grenoble, France

2015 BSc+MSc in condensed matter physics. National Research Nuclear University "MEPhI", Moscow, Russia

Skills and Expertise

- **Scientific interests:** Many-body physics, excited state problems, theoretical spectroscopy, quantum information
- **First-principle methods:** DFT, TDDFT, DFTPT, MD, GW, BSE
- **Programming:** Python, Fortran, C/C++, Matlab, bash, version control (GitLab, **GitHub**), MPI/OpenMP, SQL
- Python libraries: Numpy, Scipy, scikit-learn, **TensorFlow, Qiskit, PennyLane**, Plotly/**Dash, Dask, Pandas**
- **Soft skills:** communication, adaptability, problem-solving, critical thinking, teamwork, project management.
- Machine Learning and Data

Experience

2023 -present Researcher

Skolkovo Institute of Science and Technology, Moscow, Russia

- First-principle study of Li-ion batteries.
- Development of ab-initio workflow manager for high throughput calculations

2022 - 2023 Postdoctoral Researcher

Theory Department, Max Planck Institute for the Structure and Dynamics of Matter, Hamburg, Germany.

- **Developed a new approach** for the valley selectivity diagnostic (valleytronics) in monolayers of transition metal dichalcogenides and applied it for estimation of topological properties.
- Studied exciton-lattice dynamics in the moiré structures of twisted hBN and collaborated with experimental groups to explain phonon-assisted photoluminescence spectra.
- Studied beyond dipole contribution from structured light with non-zero angular momentum interacting with solids.
- Participated in **open-source code development for TDDFT** (octopus-code/Fortran).
- Participated in joint experiment and theory study of strong correlations in neodymium nickel oxide.

2021 - 2022 Postdoctoral Researcher

Physics Department, POSTECH, MPK Max Planck Korea Research Initiative, Pohang, South Korea.

- Developed **model analysis** for the strong laser field interaction in Weyl semi-metals.
- Maintained and **developed code** (antelope/C++) for real time solution of semi conductor Bloch's equations.
- Led theoretical part in the **international project** (USA, Germany, UK) on the electron-lattice interaction in low dimensional systems (e.g. graphite) by means of resonant inelastic x-ray scattering.

2019 - 2020 Visiting Scientist

Theory Group, ESRF European Synchrotron Radiation Facility, Grenoble, France.

- Led theoretical part in the international project (France, Italy) studying polarons in transition metal oxides (STO, LAO/STO).
- Developed a **model to explain experimental results**. Coordinated meetings between experimental and theory groups.
- **Published an open source package** (phlab/Python) for spectroscopy's **data analysis**.

2015 - 2019 Associate researcher (PhD student)

Theory Group, ESRF European Synchrotron Radiation Facility, Grenoble, France.

- Developed a **new theoretical approach** and a framework to treat dynamical contributions in resonant inelastic x-ray scattering based on many-body Green's functions technique and *ab initio* calculations.
- Showed importance of the core-hole contribution in the analysis of resonant inelastic x-ray scattering experiment.
- Participated in the **code development** and successfully **managed 2 projects** on application of the developed framework.
- Guided master students in theory department.
- Published results in high impact journals, participated in international conferences and wrote a PhD thesis.

Other

Conferences and Publications:

Presented results of the research at international conferences and scientific schools (>10)

Awards and scholarships:

2022 Max Planck scholarship
2014-2015 Research achievements scholarship
2010-2012 University scholarship
2009 Presidential Grant, Junior Intel Award

Languages:

Russian, English (C),
French (A)
Certificates: ML, SQL

Publication list

1. **Geondzhian, A.**, Rubio, A., Altarelli, M.*, (2022): *Valley selectivity of soft x-ray excitations of core electrons in two-dimensional transition metal dichalcogenides*, Physical Review B 106, 115433 (2022).
2. Dashwood, C. D., **Geondzhian, A.**, Vale, J.G., Pakpour-Tabrizi, A. C., Howard, C. A., Faure, Q., Veiga, L. S. I., Meyers, D., Chiuzaian, S. G., Nicolaou, A., Jaouen, N., Jackman, R. B., Nag A., GarcíaFernández, M., Ke Jin Zhou, Walters, A. C., Gilmore, K., McMorro, D. F., Dean, M. P. M., *Probing electron-phonon interactions away from the Fermi level with resonant inelastic x-ray scattering*. Phys. Rev. X 11, 041052 (2021).
3. **Geondzhian, A.**, Sambri, A., DeLuca, G. M., Di Capua, R., Di Gennaro, E., Betto, D., Rossi, M., Peng, Y.Y., Fumagalli, R., Brookes, N. B., Braicovich, L., Gilmore, K., Ghiringhelli, G., Salluzzo, M., *Large polarons as key quasiparticles in SrTiO₃ and SrTiO₃ based heterostructures*. Physical Review Letter 125, 126401 (2020).
4. **Geondzhian, A.**, Gilmore, K., *Generalization of the Franck Condon model for phonon excitations by resonant inelastic X-ray scattering*. Physical Review B 101, 214307 (2020).
5. **Geondzhian, A.**, Gilmore, K., *Demonstration of RIXS as a probe of exciton-phonon coupling*. Physical Review B 98, 214305 (2018).
6. Menushenkov, A. P., Yaroslavl'tsev, A. A., **Geondzhian, A. Y.**, Chernikov, R. V., Nataf, L., Tan, X. and Shatruk. M., *Driving the europium valence state in EuCo₂As₂ by external and internal impact*. Journal of Superconductivity and Novel Magnetism, 30(1):75–78 (2017).
7. Tan, X., Ovidiu, V., Chai, P., **Geondzhian, A. Y.**, Yaroslavl'tsev, A., Xin, Y., Menushenkov, A., Chernikov, R., Shatruk, M., *Synthesis, crystal structure, and magnetism of A₂Co₁₂As₇ (A = Ca, Y, Ce – Yb)*. Journal of Solid State Chemistry, 236:147–158 (2016).
8. Tan, X., Yaroslavl'tsev, A. A., Cao, H., **Geondzhian, A. Y.**, Menushenkov, A. P., Chernikov, R. V., Nataf, L., Garlea, V. O., Shatruk, M., *Controlling magnetic ordering in Ca_{1-x}Eu_xCo₂As₂ by chemical compression*. In: Chemistry of Materials 28(20):7459–7469 (2016).
9. **Geondzhian, A. Y.**, Yaroslavl'tsev, A. A., Alekseev, P. A., Chernikov, R. V., Gaynanov B. R., Baudet, F., Nataf, L., Menushenkov A. P., *Pressure induced electronic phase transition in compound EuCu₂Ge₂*. Journal of Physics: Conference Series, 712(1):012112 (2016).
10. Menushenkov, A. P., Yaroslavl'tsev, A. A., **Geondzhian, A. Y.**, Chernikov, R. V., Zubavichus Y. V., Tan X., Shatruk M., *Local electronic and crystal structure of magnetic RCo₂As₂ (R = La, Ce, Pr, Eu)*. Journal of Superconductivity and Novel Magnetism, 28(3):995–997 (2015).