



FRIEDRICH-SCHILLER-  
UNIVERSITÄT  
JENA



The **Aero-Aquatic Virus Research Group** within the Faculty of Mathematics and Computer Science has an open position for a

## **Master thesis project in Environmental Microbiology**

**Topic: The role of viral infection for the ice-nucleating ability of bacterial hosts**

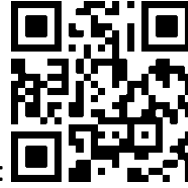
Ice nucleating (IN) bacteria play a fascinating role in atmospheric processes by initiating the formation of ice crystals in clouds. These microscopic organisms serve as catalysts for the freezing of supercooled water droplets, a crucial step in the creation of ice particles. In rainwater, IN bacteria contribute to the development of precipitation by providing a substrate for ice crystal growth. Understanding the mechanisms behind ice nucleation is essential for comprehending cloud dynamics and precipitation patterns, as it directly influences weather and climate patterns. The study of IN bacteria sheds light on the intricate interplay between microorganisms and the Earth's atmospheric processes, highlighting their significance in the broader context of environmental science.

In the suggested project, the student will establish a protocol to measure the expression of ice-nucleating genes (*ina* genes) in natural atmospheric samples and existing bacterial isolates from marine surface films, cloud water, and rainwater. In addition, overall ice-nucleation activity will be determined in aquatic samples using established ice nucleation assays. The potential role of bacteriophages in modulating ice nucleation activity will be explored, e.g. by evaluating the expression of *ina* genes in the ice nucleating bacteria under both phage-infected and non-infected conditions, in resistant versus non-resistant strains. Own interests and research ideas are welcome.

### **Requirements:**

- Background or strong interest in environmental microbiology, microbial/viral ecology, molecular biology
- Team player
- Good English and communication skills

Interested candidates can send a short letter of motivation, transcript of records and CV to Dr. Janina Rahlff ([Janina.rahlff@uni-jena.de](mailto:Janina.rahlff@uni-jena.de)).



Further information about our group can be found here:

### **Suggested reading:**

Adams, M.P., Atanasova, N.S., Sofieva, S., Ravantti, J., Heikkinen, A., Brasseur, Z., Duplissy, J., Bamford, D.H. and Murray, B.J., 2021. Ice nucleation by viruses and their potential for cloud glaciation. *Biogeosciences*, 18(14), pp.4431-4444.

Constantinidou HA, Hirano SS, Baker LS, and Upper CD. 1990. Atmospheric dispersal of ice nucleation-active bacteria: the role of rain. *Phytopathology* 80:934–937.

Failor, K.C., Schmale, D.G., Vinatzer, B.A. and Monteil, C.L., 2017. Ice nucleation active bacteria in precipitation are genetically diverse and nucleate ice by employing different mechanisms. *The ISME journal*, 11(12), pp.2740-2753.

Hill, T. C., Moffett, B. F., DeMott, P. J., Georgakopoulos, D. G., Stump, W. L., & Franc, G. D. (2014). Measurement of ice nucleation-active bacteria on plants and in precipitation by quantitative PCR. *Applied and Environmental Microbiology*, 80(4), 1256-1267.

Kozloff, L.M., Lute, M., Arellano, F. and Turner, M.A., 1992. Bacterial ice nucleation activity after T4 bacteriophage infection. *Journal of General Microbiology*, 138(5), pp.941-944.

Šantl-Temkiv, T., Sahyoun, M., Finster, K., Hartmann, S., Augustin-Bauditz, S., Stratmann, F., Wex, H., Clauss, T., Nielsen, N.W., Sørensen, J.H. and Korsholm, U.S., 2015. Characterization of airborne ice-nucleation-active bacteria and bacterial fragments. *Atmospheric Environment*, 109, pp.105-117.