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POS-E32 – Optical design challenges of subnivean camera trapping under extreme arctic conditions

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Camera trapping is widely used in different ecological studies and is particularly important for remote locations and extreme environments. However, due to certain optical challenges of adapting this approach to small rodents, combined with the logistical and environmental issues, it was not possible to use camera traps for subnivean observation during the arctic winter before. The frost formed on each lens of the camera preventing it from working continuosly during the whole winter season.

In this work we propose an optimized camera trap design, that allowed us to obtain the first videos of lemmings in winter, when direct observations are impossible. We also suggest a design of tunable liquid-crystal lens that has a potential to considerably improve the image quality. This lens can provide a range of optical powers from around 1 to 10D and is fully controlled by an external electric field application, so it does not require any mechanical movement. This lens has a low power consumption and can be adapted to the temperature change during the year (from around -20℃ to +20℃). Using such a lens with an autofocus algoritm will help to obtain enough details on each animal for individual recognition.

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