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After Philae on 67P, still to be done: Chirality Measurements with Cometary Material

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The payload of Philae, the Rosetta lander, included the instrument COSAC, an evolved gas analyser with the capability to differentiate chiral molecules. Philae landed on 67P on November 12, 2014. After the touchdown, as the anchoring harpoons, which were expected to fix the lander to ground, did not work, Philae bounced in the low gravity environment, and only came to rest after a 2 hours "hop" in an unforeseen area on the comet surface. Although, the scientific instruments of the lander, including the mass spectrometers (both of Ptolemy and COSAC), could be operated, and fascinating, unprecedented scientific results were obtained, it was not possible to collect a sample of the surface material. Consequently, the run of the gas chromatography sequence did not bring any scientific results. Thus, the measurement of the chirality of molecules on comets is still to be done in the future.

The paper gives an overview of the attempts to measure chiral molecules with COSAC, and suggests future measurements with returned samples from the primitive asteroids (162173) Ryugu and (101955) Bennu with the spacecraft Hayabusa 2 (JAXA) and OSIRIS-REx (NASA), respectively. Both have reached their targets in 2018.