ARE CI CHONDRITES COMETARY SAMPLES? OLIVINE AS A DIAGNOSTIC TOOL. Y. Le Gac[1,2], G. K. Benedix[1], P. A. Bland[2] and S. S. Russell[1]. [1]Impacts and Astromaterials Research Centre, Natural History Museum, London SW7 5BD, UK; [2]Impacts and Astromaterials Research Centre, Department of Earth Science and Engineering, Imperial College London, South Kensington Campus, London SW7 2AZ, UK. E-mail: y.legac@nhm.ac.uk.

Introduction: CI chondrites are among the most unusual and primitive type of carbonaceous chondrites. There are only five CI1 meteorite falls. They are heavily altered [1], yet show a similar bulk composition to the solar photosphere [2, 3]. There still remain uncertainties about the origin and formation of the parent bodies for such meteorites. One theory, based on evidence from textural and mineralogical arguments [4] and orbital parameters [5], is that CI chondrites derive from cometary nuclei.

We now have known cometary material to compare to CI chondrites. The Stardust sample return mission collected cometary dust particles by flying through the coma of comet 81P/Wild 2 and then brought the samples back to Earth in January 2006.

To determine the relationship between CIs and returned cometary material, we may therefore have to focus on the distinctive composition of anhydrous minerals, which are rare in CI meteorites. Olivine is a common mineral in the solar system, and has been reported in diverse compositions within Stardust samples, especially with distinctive levels of Fe, Cr and Mn. In cold cometary bodies it is unlikely that the chemical composition of olivine will have been affected by parent body processing, so olivines are likely to be unaltered and could provide evidence for any primary genetic link between CIs and cometary material.

In this study we present a compositional dataset of olivine grains in CI chondrites Orgueil and Ivuna, made on a Cameca SX100 Electron Microprobe, previously detected with a SEM routine [6]. We plan to present data from TEM and EBSD investigations as well. We then compare CI olivine compositions with Stardust ones, in order to establish any genetic link.

Results and Discussion: Olivine in both Orgueil and Ivuna range from Fa_{01} to Fa_{13}. Over this compositional range there is a peak in frequency at Fa = 10 mol%. These compositions are more similar to Wild 2 particles and anhydrous IDPs than to other carbonaceous chondrite types. This feature might mainly rely on a sampling bias, perhaps not representing the entire compositional range. Using these mineral analyses as a starting point, the next logical step is to investigate the olivine at the submicron scale. TEM analyses will allow investigation of much finer compositional data, as well as grain size distribution, mineral structure and texture.

References: [1] Bullock E. S. et al. 2005. *Geochimica et Cosmochimica Acta* 69:2687-2700. [2] Anders E. and Grevesse N. 1989. *Geochimica et Cosmochimica Acta* 53:197-214. [3] Lodders K. 2003. *Astrophysical Journal* 591:1220-1247. [4] Campins H. and Swindle T. D. 1998. *Meteoritics and Planetary Science* 33:1201-1211. [5] Gounelle M. et al. 2006. *Meteoritics and Planetary Science* 41:135-150. [6] Le Gac Y. et al. 2009. *Geophysical Research Abstracts* 11:EGU2009-8972.