**A 3-D TOMOGRAPHIC SURVEY OF COMPOUND CHONDRULES IN CR CHONDRITES ACFER139.** S.N. Hylton[1,2], D.S. Ebel[2], and M.K. Weisberg[2,3] [1]Dept. of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, Cambridge MA 02139. (nyoshiv@mit.edu). [2]Dept. of Earth and Planetary Sciences, American Museum of Natural History, Central Park West at 79th St., New York NY 10024. (debel@amnh.org). [3]Dept. Physical Sciences, Kingsborough College, CUNY, Brooklyn, NY 11235 (mweisberg@kbcc.cuny.edu)

**Introduction:** Compound chondrules are two or more chondrules joined together while plastic or brittle [1,2]. Studies of compound chondrules have been conducted in order to understand the chondrule formation process, including the dynamic setting and precursor materials. Chondrule formation is poorly understood and it is not entirely clear what features of chondrules are nebular and which result from processes on parent body surfaces. Our evidence suggests that both primary and secondary processes are responsible for compound chondrules. Primary processes include collisions among semi-molten individual chondrules free-floating in space [1], and secondary processes include parent-body impacts that cause jostling, fracturing and compaction [2]. By understanding chondrule collisions and impacts we can better constrain what was happening during early solar system formation, including mean interparticle distances, relative velocities, and cooling rates [3,4].

**Method:** We used synchrotron x-ray computed micron tomography (XR-CMT) as a new method of measuring and surveying compound chondrules in 3 dimensions (3-D), and explored its advantages and limitations. It is well-suited to CR chondrites with high-contrast metal rimming FeO-poor chondrules [5]. We studied ~2 $cm^3$ of Acfer139 and Renazzo (both CR2) by 3D tomographic analysis, followed by 2-D surfaces analysis of serial slices. We measured chondrule abundance, diameter, and textural relationships in 3-D. Previous (2-D) studies of 'enveloping' compound chondrules [1,2] were reexamined and two new compound categories, touching and aggregate compounds, are introduced.

**Results and Conclusion:** Our examination suggests a 9.6% frequency of compound chondrules (excluding the new categories), twice the value in ordinary chondrites of 4% reported by [1] and almost four times the value of 2.4% reported by [2] in OC. We observe little or no metal between enveloping pairs that are each rimmed by metal grains. Based on 3-D tomography, with follow-up 2-D sample analysis we conclude: (1) Compound chondrules occur more frequently in CR chondrites than in ordinary chondrites. (2) Compound chondrule study, including textural, thin section, and chemical analysis, should be expanded to include touching and aggregate compound chondrules. (3) Enveloping compound chondrules [2] constitute more than 9.6% of all CR chondrules, and, with the addition of the new categories, compounds comprise more than 75% of all chondrules in CR chondrites. (4) The high frequency of touching and aggregate compound chondrules bears upon the accretion and impact history parent body or bodies of CR chondrites.

**References:** [1] Gooding J.L. & Keil K. 1981. *Meteoritics* 16: 17-43. [2] Wasson J.T. et al. 1995 *Geochim. Cosmochim. Acta* 59: 1847-1869. [3] Ciesla F.J. et al. 2004. *Meteoritics & Planetary Sci.* 39: 531-544. [4] Desch S.J. & Connolly H.C. Jr. 2002. *Meteoritics & Planetary Sci.* 37: 183-207. [5] Hertz J. et al. 2003. Abs. #1059. 34th Lunar & Planetary Science Conference.