GOLFBALL, A LARGE ALLENDE TYPE B INCLUSION WITH EVIDENCE FOR MULTIPLE STAGES OF REMELTING. S. B. Simon[1], A. M. Davis[1,2], and L. Grossman[1,2]. [1]Dept. of the Geophys. Sci., 5734 S. Ellis Ave., [2]Enrico Fermi Inst., Univ. of Chicago, Chicago IL 60637. (sbs8@midway.uchicago.edu).

Description: A large Type B inclusion found in Allende has a typical bulk composition [1] and a unique texture: a vesicular, fassaite-rich mantle enclosing a melilite-rich core. The inclusion, named Golfball, is 7 mm in diameter. The core and mantle have sharply contrasting textures. Radially-oriented melilite laths typically 500 µm long occur at high angles to the inclusion rim. Many of the laths have straight, crystallographically controlled terminations, consistent with free growth into a liquid, and are enclosed in coarse fassaite crystals that are ~1 mm across. The mantle is also very rich in fine-grained (1–10 µm) spinel. Coarser (20–50 µm) spinel occurs in framboids and palisade bodies. A very unusual feature of the inclusion is that melilite laths extend outward from the core into the coarse mantle fassaite. In contrast to the coarse-grained mantle, the core consists of relatively small (20–50 µm), prismatic melilite grains poikilitically enclosed in anhedral, spinel-rich fassaite grains that are optically continuous over ~1 mm. Melilite in the core encloses very little spinel. Sparse anorthite occurs mainly in grossular-rich regions.

Mineral chemistry: The mantle melilite laths are normally-zoned inward from the inclusion rim ($Åk_{32}$ to $Åk_{68}$), and have reverse zoning over the last ~70 µm to crystallize. The laths attached $_{\sim 60}$ over most of their length, and Åk contents decrease over their outermost ~100 µm to $Åk_{\sim 50}$. In the mantle laths, Na_2O contents decrease from the inclusion rim inward, reach a minimum (below detection for $Åk_{<35}$), then increase (to 0.2 wt%) with increasing Åk. In the core laths, Na_2O contents either increase slightly or remain uniform with distance from the core. The prismatic melilite grains are each strongly and concentrically zoned, typically from $Åk_{30}$ and Na-poor to $Åk_{50}$ and Na-rich (0.2 wt%). Grains with cores of $Åk_{5–10}$, more gehlenitic than the melilite at the very edge of the inclusion, also occur in the core and are very likely relict. Fassaites in the core and mantle have the same range in Ti contents, 2–9 wt% TiO_2 + Ti_2O_3, but the fassaite in the core has lower V/Ti ratios than that in the mantle.

Discussion: Golfball probably records two major remelting events. Only spinel and gehlenitic melilite ($Åk_{10}$) survived the first one, indicating a peak temperature ~1400°C, and became concentrated in a porous core, into which melt infiltrated. The inclusion was altered, introducing Na. Assuming, based on [2], that closed-system fractional crystallization cannot account for the sharp increase in and overall range of Na contents in $Åk_{>30}$, it melted again, this time with Na-free, $Åk_{30–35}$ melilite also surviving. Upon cooling, Na-bearing, $Åk_{>40}$ melilite crystallized upon these relict grains, growing inward away from the rim of the inclusion, outward from the core, and enclosing small relict grains in the core. Melilite crystallization was followed by melilite + fassaite, as indicated by zoning reversals in both mantle and core melilite. The inclusion was altered again, causing formation of grossular and diffusion of Na inward from the rim of the inclusion. While remelting of refractory inclusions was probably not as rare as once thought, this inclusion apparently had an unusual thermal history. Based on the compositions of relict melilite, one remelting event reached a higher temperature than experienced by other remelted Type Bs [2], and a second event had a typical, lower peak temperature, ~1300°C.

References: [1] Simon S. B. et al. (2002) *LPS XXXIII,* abstr. #1620. [2] Beckett J. R. et al. (2000) *GCA, 64,* 2519–2534.