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Nanoscale Order in Marginal and Bulk Amorphous Metal Alloys[1] PAUL VOYLES, WILLIAM STRATTON, JINWOO HWANG, JOSEPH HAMANN, HONGBO CAO, JOHN PEREPEZKO, Y. AUSTIN CHANG, Materials Science and Engineering, University of Wisconsin, Madison — Using fluctuation electron microscopy (FEM), we have shown that both an Al-based marginal amorphous Al alloy, $Al_{88}Y_7Fe_5$, and a Zr-based bulk amorphous alloy, $Zr_{54}Cu_{38}Al_8$, have significant nanoscale structural order at a length scale of ∼1.5 nm. In both cases, that order can be reduced by annealing below T_g. In the Al alloy, this order is associated with proto-crystalline clusters formed in the liquid or during the rapid quench. The size and/or density of these clusters can also be modified by small additions of Cu and Ti. The nature of the structure in the Zr alloy has not been determined, but our results show that structural relaxation on aging, which in bulk metallic glasses is commonly understood in terms of redistribution of free volume in the form of atom-size voids, involves rearrangments of groups of ∼10-100 atoms.

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