1077-52-866 **Richard Ehrenborg*** (jrge@ms.uky.edu), Department of Mathematics, University of Kentucky, Lexington, KY 40506, **Menachem Lazar** (lazar@math.ias.edu), School of Mathematics, Institute for Advanced Study, Einstein Drive, Princeton, NJ 08540, and **Jeremy Mason** (mason47@llnl.gov), Condensed Matter and Materials Division, Lawrence Livermore National Laboratory, 7000 East Avenue, Livermore, CA 94550. *The Law of Aboav–Weaire and its analogue in three dimensions.*

When investigating the structure of metals it is known that the atoms lie in a lattice structure. However, the lattice property only holds locally, that is, in a three dimensional cell called a grain. Bordering the grain is a boundary where the atoms lie chaotically, and beyond that is a new grain where the lattice has a different orientation. The structure of these grains amounts to a three dimensional simple subdivision of space.

Looking at the two dimensional analogue, one observes that grains with a small number of sides tend to be surrounded by grains with a large number of sides, and vice versa. The Law of Aboav–Weaire states that the average number of sides of the neighbors of an n-sided grain should be roughly $5 + 6/n$. By introducing the correct error term we prove this law of Material Science and discuss its extension to three dimensions. (Received September 14, 2011)