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Order Parameters for Two-Dimensional Networks FORREST KAATZ, ADHEMAR BULTHEEL, TAKESHI EGAMI, Owens Community College, Toledo, OH — We derive methods that explain how to quantify the amount of order in "ordered" and "highly ordered" porous arrays. Ordered arrays from bee honeycomb and several from the general field of nanoscience are compared. Accurate measures of the order in porous arrays are made using the discrete pair distribution function (PDF) and the Debye-Waller Factor (DWF) from 2-D discrete Fourier transforms calculated from the real-space data using MATLAB routines. An order parameter, OP_3, is defined from the PDF to evaluate the total order in a given array such that an ideal network has the value of 1. When we compare PDFs of man-made arrays with that of our honeycomb we find OP_3=0.399 for the honeycomb and OP_3=0.572 for man's best hexagonal array. The DWF also scales with this order parameter with the least disorder from a computer-generated hexagonal array and the most disorder from a random array. An ideal hexagonal array normalizes a two-dimensional Fourier transform from which a Debye-Waller parameter is derived which describes the disorder in the arrays. An order parameter **S,** defined by the DWF, takes values from [0, 1] and for the analyzed man-made array is 0.90, while for the honeycomb it is 0.65. This presentation describes methods to quantify the order found in these arrays.

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