1064-05-197 **John Engbers*** (jengbers@nd.edu), Department of Mathematics, 255 Hurley Hall, Notre Dame, IN 46556, and **David Galvin**. *The typical structure of H-colorings of the Hamming cube.*

The d-dimensional discrete hypercube Q_d is the graph on $\{0,1\}^d$ with two strings adjacent if they differ on one coordinate. For a graph H (possibly with loops), an H-coloring of Q_d is a function from $\{0,1\}^d$ to $V(H)$ which preserves adjacency. With appropriate choices of H, H-colorings can encode independent sets and proper colorings of Q_d.

We are interested in the following question: In a uniformly chosen H-coloring of Q_d, what proportion of vertices of Q_d get mapped to each vertex of H? We obtain a quite precise answer to this question. For example, we can say that in a uniformly chosen proper $2k$-coloring of Q_d, asymptotically almost surely each color class has size very close to $2^d/(2k)$, and in a uniformly chosen proper $(2k+1)$-coloring, asymptotically almost surely there are k color classes with size very close to $2^d/(2k)$ and $k+1$ class with size very close to $2^d/(2(k+1))$. In both cases, each color class is contained almost exclusively in a single bipartition class of Q_d.

The results generalize to the discrete torus with fixed even side length. The approach is through entropy, and extends results obtained by Jeff Kahn (who had considered the case when H is a doubly infinite path). (Received September 08, 2010)