**Figure S7 - Convergence of the EM algorithm on held-out test data.**

10-fold cross-validation tests show a significant improvement in the average log-likelihood per interaction (in bits), along 14 EM iterations. We show the improvement of the recognition preferences for different starting points. These include the prior knowledge parameters from Mandel-Gutfreund et al. (2001) and random starting points.

**Figure S8 - Likelihood of held-out test data given different sizes of training dataset.**

The original training data (455 canonical Cys2His2 zinc finger sites from TRANSFAC 7.3) were split into 10 equally-sized sets. We used each one as held-out test data, while applying the following procedure 10 times: Various portions at different sizes (from 10 to 400 binding sites) were sampled from the remaining 90% of the data. These sites were used as training data for the EM algorithm (15 iterations). We then used the held-out data as test data, and calculated its likelihood. We then averaged the likelihood over all 10 repeats.