Supplementary Figure 1. Contribution of the non-linear response to the neurogram distance. (a) As in Figure 6 of the main paper, the spectrogram of a song with the responses of all neurons in MLd is shown pictorially as a neurogram. For each cell, we obtained the STRF as described in the text and methods. The STRFs of each cell are used to obtain a predicted response shown here as the linear neurogram. Finally, the difference between the actual response and the predicted response is called the non-linear response and shown here as the non-linear neurogram. (b) Average neurogram distance between segments of song and ml-noise for auditory processing stages, MLd, L and CM. Neurogram distances are calculated for the overall response, the linear fraction of the response obtained from the STRFs (as in Figure 6), and for the non-linear fraction of the response. The non-linear neurogram distance was obtained by subtracting the estimation of the linear response obtained with the STRFs from the total response and then repeating the distance calculation on this “non-linear” response. Note that although the linear and non-linear neural responses are additive (by construction), the distance measures are not. The results of non-linear analysis are almost identical to those of the linear analysis: the non-linear neurogram distance is greater for song than ml-noise in all three brain areas. The contributions to the difference in distance observed for song versus ml-noise is also similar between the linear and the non-linear response. The non-linear tuning properties of these cells therefore amplify the selective effect observed and described in the linear properties. Once a parametric description of the non-linear stimulus-response function is obtained, it will be possible to understand how the non-linear tuning emphasizes neural discrimination for natural sounds. For example, as proposed in the discussion in the main text, one would be able to test whether the non-linear responses show sensitivity to spectral modulations that were not well represented in the linear response. Error bars are s.e.m. $P < 0.0001$