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The geometry of the Waddington Landscape LING-NAN ZOU, ADELE DOYLE, FAS Center for Systems Biology, Harvard University, SUMIN JANG, SHARAD RAMANATHAN, Department of Molecular and Cell Biology, Harvard University — We study the "landscape" of cell states that emerge during *in vitro* differentiation of mouse embryonic stem (ES) cells. Profiling the gene expression of cell populations captured at specific locations along different developmental trajectories, we uncover a low-dimensional landscape with an ultrametric distance structure between states; this provide a natural basis (and limit) for reconstructing cell lineages from gene expression profiles. From the correlation spectrum of this landscape, we infer "directions" in gene expression along which cells transition from one state to another, as well as signaling pathways that control these transitions. Finally, we study the dynamics of cell movement on this landscape using an ES cell line where yellow fluorescent protein (YFP) has been fused to Otx2, a transcription factor that plays an important role during early development.

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