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Instabilities and topology changes in planar polarized epithelial sheets¹ DAVID LUBENSKY, University of Michigan — Epithelia–sheets of cells joined together by specialized junctional structures–are one of the basic building blocks of tissues and organs in animals. In many epithelia, rotational symmetry is broken and cells become polarized in a particular direction in the plane of the sheet. Here, we study the interplay between such planar cell polarity and the shape and packing of individual cells. Using general symmetry arguments and simple phenomenological models, we give a classification of the instabilities that can occur in such a coupled system. In particular, we show that two routes to chiral symmetry breaking are possible, both of which require that cells first become elongated along one axis. We also consider the evolution of the cell packing after an initial instability, including how planar polarity affects T1 topological transitions. We close with possible applications of these results to development in *Drosophila* and in zebrafish.

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