"Speed-up of traveling waves by negative chemotaxis"

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We consider the traveling wave speed for Fisher-KPP (FKPP) fronts under the influence of chemotaxis and provide an almost complete picture of its asymptotic dependence on parameters representing the strength and length-scale of chemotaxis.

Our study is based on the convergence to the porous medium FKPP traveling wave and a hyperbolic FKPP-Keller-Segel traveling wave in certain asymptotic regimes. In this way, it clarifies the relationship between three equations that have each garnered intense interest on their own. Our proofs involve a variety of techniques ranging from entropy methods and decay of oscillations estimates to a general description of the qualitative behavior to the hyperbolic FKPP-Keller-Segel equation. For this latter equation, we, as a part of our limiting arguments, establish an explicit lower bound on the minimal traveling wave speed and provide a new construction of traveling waves that extends the known existence range to all parameter values.

This is a joint work with Chris Henderson and Olga Turanova.