1165-35-180 **Andrei Tarfulea*** (tarfulea@lsu.edu), **Christopher Henderson** and **Stanley Snelson**.

Self-generating lower bounds for the Boltzmann equation.

The Boltzmann equation arises in statistical physics and plasma dynamic. Particles in a diffuse gas collide with each other at microscopic scales, leading to a quadratic, nonlocal collision operator that behaves like a fractional Laplacian. There has been substantial recent progress on the regularity and continuation program for the Cauchy problem. A smooth and unique solution exists for as long as the mass, energy, and entropy densities stay bounded above and the mass density stays bounded below. The last condition is crucial for smoothing since it gives the collision operator certain elliptic properties.

We show that the solution to the Boltzmann equation (even starting from initial data that contains large regions of vacuum) instantaneously fill space. That is, the gas diffuses and spreads positive mass to every space and velocity coordinate at any positive times. We obtain this result dynamically through barrier arguments for moving mass through space and a De Giorgi type iteration for spreading mass to arbitrary velocities. A consequence is that the above continuation criterion can now be weakened; it is no longer necessary to assume that the mass density is bounded from below for continuation of smooth solutions. (Received January 17, 2021)