INFORMAL ANALYSIS SEMINAR
Saturday and Sunday, April 20-21, 2019

LECTURES: Mathematical Sciences Building, Room 228, Second floor.
POSTER SESSION/REFRESHMENTS/LUNCHES: SCALE-UP Mathematics Lab, room 319
Mathematical Sciences Bldg., Third floor.

The Mathematical Sciences Building is located on Summit Street, Kent, OH 44242. To search
it on Google Maps, use the address 1400 East Summit Street, Kent, Ohio 44242.

Saturday, April 20
11:00 - 11:30 Coffee in Room 319 MSB
11:30 - 12:30 Alexander Shnirelman
12:30 - 1:30 Lunch in Room 319 MSB
1:30 - 2:30 Ramon van Handel
2:30 - 3:30 Break/Poster Session
3:30 - 4:30 Alexander Shnirelman
4:30 - 5:00 Break
5:00 - 6:00 Ramon van Handel
6:30pm Dinner: TBA

Sunday, April 21
8:30 - 9:00 Coffee in Room 319 MSB.
9:00 - 10:00 Ramon van Handel
10:00 - 10:15 Break
10:15 - 11:15 Alexander Shnirelman
11:15 - 11:30 Break
11:30 - 12:30 Ramon van Handel
12:30 - 1:15 Lunch in Room 319 MSB
1:15 - 2:15 Alexander Shnirelman
Convex surfaces, quantum graphs, and a problem of H. Minkowski.

Ramon van Handel

Abstract: Much of the foundation for the theory of convex geometry was put forward by H. Minkowski around the turn of the 20th century. In a seminal 1903 paper, Minkowski introduces the fundamental notion of mixed volumes and the corresponding inequalities that play a central role in the modern theory, and that turn out to have unexpected connections to various other areas of mathematics. The extremals of these inequalities (and those of their ultimate generalization due to Alexandrov-Fenchel) are unknown: the problem of characterizing them dates back to Minkowski’s original paper.

In joint work with Yair Shenfeld, we recently succeeded in fully settling this problem in the original setting of Minkowski’s quadratic inequality (which contains, for example, the Alexandrov-Fenchel inequality in three dimensions), confirming a conjecture of R. Schneider. Along the way we encounter various unusual geometric and analytic objects. My aim in these lectures will be to introduce these dramatis personae, and to sketch how they fit together to yield the characterization of the extremals.

Analytic structures related to the motion of the ideal incompressible fluid.

Alexander Shnirelman

Abstract: The fluid motion is described by the Lagrange-Euler equations. Its solution map, i.e. the fluid state at a time $t$ as a function of the initial velocity at a time 0, is the main subject of the theory. In the 2-d case, this map turns out to be an elliptic zero order paradifferential operator. This fact has multiple implications. I’ll discuss two of them:

1. There exists a Liapunov function for the Lagrange–Euler equations which is a function in the phase space which grows monotonically along every trajectory; thus irreversibility is an integral feature of the fluid motion.
2. For any fluid configuration (i.e. area preserving diffeomorphism) $g$ there exists an initial velocity field $u_0$ such that the fluid being pushed at $t = 0$ along the velocity field $u_0$ assumes at $t = 1$ the given position $g$. In other words, the group $D$ of area preserving diffeomorphisms is geodesically connected.