"Scattering rigidity with trapped geodesics; the higher dimensional case"

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Tuesday April 3, 4:10-5:00

Fields Institute, Room 230

ABSTRACT:
We will consider compact Riemannian manifolds M with boundary N. We let IN be the unit vectors to M whose base point is on N and point inwards towards M. Similarly we define OUT. The scattering data (loosely speaking) of a Riemannian manifold with boundary is map from IN to OUT which assigns to each unit vector V of IN a the unit vector W in OUT. W will be the tangent vector to the geodesic determined by V when that geodesic first hits the boundary N again. This may not be defined for all V since the geodesic might be trapped (i.e. never hits the boundary again). A manifold is said to be scattering rigid if any other Riemannian manifold Q with boundary isometric to N and with the same scattering data must be isometric to M. In this talk we will discuss the scattering rigidity problem and related inverse problems. There are a number of manifolds that are known to be scattering rigid and there are examples that are not scattering rigid. All of the known examples of non-rigidity have trapped geodesics in them. In these two talks (one tomorrow at Fields) we discuss the first scattering rigidity results for manifolds that have trapped geodesics. The main issue is to show that the unit vectors tangent to trapped geodesics in any such Q have measure 0 in the unit tangent bundle of Q.

In Monday's talk we will concentrate on the scattering rigidity of some two dimensional manifolds (joint work with Pilar Herreros). The two dimensional case is different in a number of ways from the higher dimensional case.

In Tuesday's talk we explain how to show that the flat solid torus D^n\times S^1 is scattering rigid where D^n is the flat ball in R^n. We will also discuss some generalizations.

Each talk is self contained. In particular, it will not be necessary to attend Monday's talk to understand Tuesday's talk (which will contain a certain amount of overlap with Monday's).