Einstein familiarized the world with fairly abstract higher-dimensional manifolds, with his 4-dimensional space-time continuum. Manifolds are spaces, in any number of dimensions, which are “smooth”.

Hawking’s research and writings popularized the fact that, in theory, black holes produce singularities in space-time, i.e., places where space-time is not smooth. A singular space is a space which is smooth almost everywhere, but has an exceptional locus where the space has singularities.

The basic problem in studying singular spaces is to describe “how singular” a space is at a singular point. At the very least, one would like to know when one singular point is “equally as singular” as another singular point. This leads to the notion of *equisingularity*, and of *stratifying* a space into equisingular pieces.

In addition to studying a space itself, one can also specify data associated to the various strata (physical analog: electric charge at each point in our singular space-time universe).
This leads to the modern approach of specifying *constructible complexes of sheaves* on stratified spaces.

- Most of my own work, in 33 research papers, and two research-level books, has consisted, and still consists, of taking a constructible complex of sheaves on a singular space, and proving theorems which tell one how to algebraically, effectively, calculate “how singular” the space/complex is at each point, and how the constancy of algebraic data implies the equisingularity of the space/complex.

- The theory of singular spaces ties in with almost every other branch of mathematics: analysis, topology, differential and algebraic geometry, representation theory, combinatorics, etc. While I am a bit of a purist in my work, I did find myself writing a joint paper with 5 combinatorialists, including Richard Stanley at MIT. This paper involved general combinatorics results that grew out of the properties that I had proved for Lê numbers of hyperplane arrangements.

- In one of my most recent papers, I have proved my first results for real analytic singularities (as opposed to complex analytic singularities). The failure of the *nullstellensatz* over the real numbers makes essentially all results more difficult to obtain in the real case.

- On the other hand, unlike complex singularities, real singularities have applications to medical imaging, gravitational lensing, and robotics. See [Applications of Singularity Theory](#).