MCA2013-01 **Ingrid Daubechies*** (susan@math.northwestern.edu). *Computational differential geometry with biological applications.*

At present, biological scientists using physical traits to study evolutionary relationships among living and extinct animals analyze data extracted from carefully defined anatomical correspondence points (landmarks). Identifying and recording these landmarks is time consuming and can be done accurately only by trained morphologists; this renders these studies inaccessible to non-morphologists and causes phenomics to lag behind genomics in elucidating evolutionary patterns.

This motivated a team of mathematicians and biologists to propose new ways of defining "similarity distances" between morphological surfaces. Unlike many other algorithms presented for morphological correspondences, the new approaches do not require any preliminary marking of special features or landmarks by the user. It also differs from other seminal work in computational geometry in that the algorithms are polynomial in nature and thus faster, making pairwise comparisons feasible for significantly larger numbers of digitized surfaces.

The talk will present the motivation, the new mathematical constructions, and directions for future work.

The work reports on joint work with Yaron Lipman, Jesus Puente, Reema Al-Aifari, Tingran Gao, Doug Boyer, Liz St.Clair and Gabriel Yapuncich.