UNM-PNM STATEWIDE MATHEMATICS CONTEST LECTURE

Practical Uses of Complex Analysis

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Conformal maps are used by mathematicians, physicists and engineers to change regions with complicated shapes into much simpler ones, in a way that preserves shape on a small scale (that is, when viewed up close). This makes it possible to ``transpose'' a problem that was formulated for the complicated-looking region into another, related problem for the simpler region (where it can be easily solved) -- then one uses conformal mapping to ``move'' the solution of the problem over the simpler region, back to a solution of the original problem (over the complicated region). The beauty of conformal mapping is that its governing principle is based on a very simple idea that is easy to explain and to understand (much like the statement of Fermat's celebrated last theorem) .

In the first part of this talk I will introduce the notion of conformal mapping and will briefly go over its basic properties and some of its history (including a historical mystery going back to Galileo Galilei). I will then describe some of the many real-life applications of conformal maps, including: cartography; airplane wing design (transonic flow); art (in particular, the so-called ``Droste effect'' in the work of M. C. Escher). Time permitting, I will conclude by highlighting a 2013 paper by McArthur fellow L. Mahadevan that uses the related notion of *quasi-conformal mapping* to link D'Arcy Thompson's iconic work *On Shape and Growth* (published in 1917) with modern morphometric analysis (a discipline in biology that studies, among other things, how living organisms evolve over time).

No previous knowledge of complex analysis is needed to enjoy this talk.

Public Lecture in Science and Math Learning Center

Saturday, February 3, 2018, Room 102 at 10am

Refreshments served before lecture. All are welcome.

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