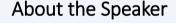# Inverse Problems and Harry Potter's Cloak

Abstract

Inverse problems arise in all fields of science and technology where causes for a desired or observed effect are to be determined. By solving a inverse problem is in fact how we obtain a large part of our information about the world. An example is human vision: from the measurements of scattered light that reaches our retinas, our brains construct a detailed three-dimensional map of the world around us. In the first part of the talk we will describe several inverse problems arising in different contexts.

In the second part of the lecture we will discuss invisibility. Can we make objects invisible? This has been a subject of human fascination for millennia in Greek mythology, movies, science fiction, etc including the legend of Perseus versus Medusa and the more recent Star Trek and Harry Potter. In the last 15 years or so there have been several scientific proposals to achieve invisibility. We will describe in a non-technical fashion a simple and powerful proposal, the so-called transformation optics, and the progress that has been made in achieving invisibility.

Professor Gunther Uhlmann

Walker Family Endowed
Professor of Mathematics

University of Washington,
USA and HKUST Jockey Club Institute for
Advanced Study, Hong Kong

About the Speaker

Professor Gunther Uhlmann's research concentrates on inverse problems and cloaking. He has done pioneer work on the Calderón of determining the conductivity of an object by making voltage and current measurements at the boundary. He has also pioneered the method of transformation optics to achieve invisibility. This leads to a proposal on how to build Harry Potter's cloak.

Professor Uhlmann received his PhD in 1976 from the Massachusetts Institute of Technology. He has been Walker Family Endowed Professor in Mathematics at the University of Washington since 2006, and is also Si-Yuan Professor at the Institute for Advanced Studies at the Hong Kong University of Science and Technology since 2014.

Prof Uhlmann is Fellow of the American Mathematical Society, named a Finland Distinguished Professor (2013), Rothschild Distinguished Visiting Fellow at the Isaac Newton Institute of Mathematical Sciences (2011) and Chair of Excellence (2012) of the Foundation Sciences Mathématiques de Paris. He is also Member of American Academy of Arts and Sciences and Foreign Member of the Finnish Academy of Sciences. In 2011, he was awarded the Bôcher Memorial Prize by the American Mathematical Society and the Kleinman Prize by the Society of Industrial and Applied Mathematics. In 2017, he received the Solomon Lefschetz Medal by the Mathematical Council of the Americas. He is on the editorial boards of many mathematical journals, including Inverse Problems and Imaging and Analysis and PDE.

FREE ADMISSION

Thursday, 16th Aug 2018

6.30 – 7.30pm

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Seminar Room, Level 1

3 Research Link,

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