The Alfred Brauer Lectures, March 28-30, 2011

Gérard Laumon Université Paris-Sud (Orsay)

"The Fundamental Lemma And The Hitchin Fibration"

The Langlands-Shelstad fundamental lemma and Arthur's weighted fundamental lemma are a series of combinatorial identities which are required in order to complete the endoscopic part of the Langlands program. In particular, they are needed for computing the multiplicities in the spectrum of L^2 (Gamma \ X) where X is an hermitian symmetric space and Gamma an arithmetic group acting on X. They are also needed for computing the Hasse-Weil zeta functions of Shimura varieties.

The Hitchin fibration is a marvelous construction in algebraic geometry which was introduced by Hitchin for studying the Yang-Mills equations in mathematical physics. It is closely linked to Drinfeld's geometric Langlands program. Ngô Bao Châu has proved the Langlands-Shelstad Fundamental Lemma in general as a consequence of his cohomological study of the elliptic part of the Hitchin fibration. In the same way, with Pierre-Henri Chaudouard, we have obtained Arthur's weighted Fundamental Lemma by extending Ngô's cohomological study to the hyperbolic part of the Hitchin fibration.

I would like to present the recent progress in the Langlands program and to explain the geometric argument which is involved in the proof of the fundamental lemma.

Lecture 1: Phillips 215, Monday, March 28, 3:30-4:30 Pm

Lecture 2: Phillips 332, Tuesday, March 29, 4:00-5:00 Pm

Lecture 3: Phillips 332, Wednesday, March 30, 4:00-5:00 Pm

There will be a reception in the Mathematics Faculty/Student Lounge on the third floor of Phillips Hall, Room 330, starting at 4:45 P.M. on Monday, March 28. Refreshments will be available at 3:30 before the second and third lectures.

About the 2011 Brauer Lecturer

Professor Gérard Laumon, Professor at the Université Paris-Sud and Research Director of the CNRS, will deliver the 2011 Alfred Brauer Lectures in Mathematics on "The Fundamental Lemma and the Hitchin Fibration."

Professor Laumon has for years been among the world's experts on the so-called Langlands Program, a far-reaching set of conjectures unifying number theory, automorphic forms, and representation theory. His important paper with his former student Ngô Bao Châu, proving the so-called "Fundamental Lemma" in a crucial special case, led to a Clay Research Award in 2004.

This innocent sounding Lemma had for 25 years been one of the main stumbling-blocks in the entire Langlands Program. Ngô recently solved the Lemma in the general case, winning a Fields Medal at the 2010 International Congress of Mathematicians.

Professor Laumon graduated from École Normale Supérieure and received his Thèse d'État from the Université Paris-Sud in 1983 under the direction of Luc Illusie. Among his honors are the Médaille d'Argent of the CNRS (1987) and the Prix Ernest Dechelle from the French Academy of Sciences (1992). Professor Laumon has been a speaker at the International Congress of Mathematicians in Kyoto (1994), Beijing (2002), and Madrid (2006). In addition to Ngô, Laumon's former student Laurent Lafforgue won a Fields Medal in 2002. An editor of several important journals, Laumon was elected to the French Academy of Sciences in 2005.

The Alfred Brauer Fund was established by the Department of Mathematics in 1984 on the occasion of Dr. Brauer's ninetieth birthday and the Alfred Brauer Lectures began in 1985. The most recent Brauer Lecturers have been Peter Sarnak, Janos Kollár, Andrew Majda, Jeff Cheeger, Shing-Tung Yau, Percy Deift, Charles Fefferman, Claire Voisin and Alex Eskin.