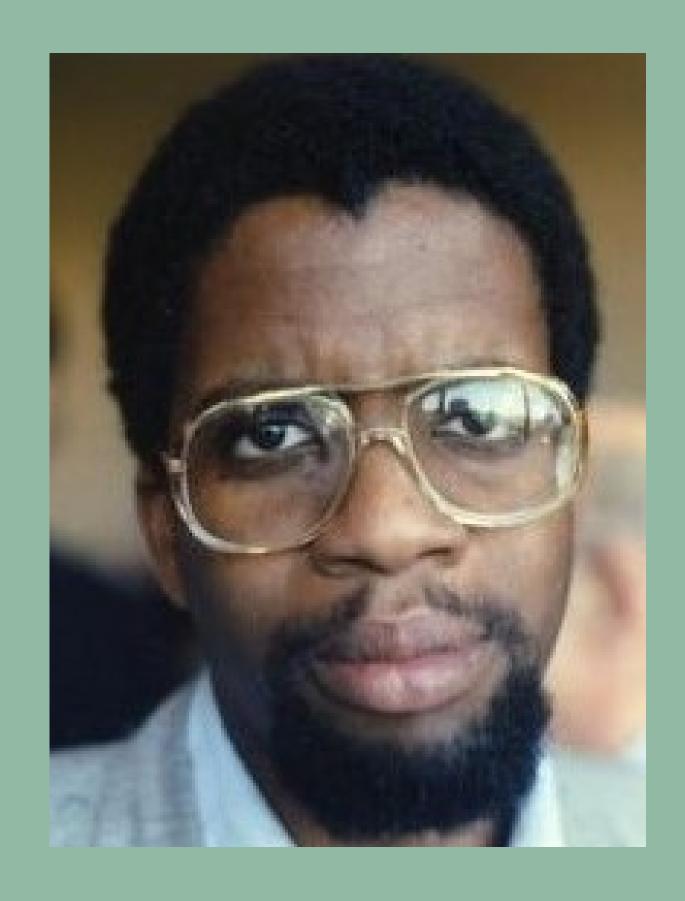
# Black Mathematics at Cambridge

## Adebisi Agboola



#### Education

PhD, Columbia University, New York, 1991 Dissertation: 'Abelian Varieties and Galois Module Structure in Global Fields' Supervisors: Ted Chinburg

MA, Columbia University, New York, 1988 Part III of the Mathematical Tripos, University of Cambridge, Peterhouse, 1986 BA, University of Cambridge, Peterhouse, 1985

#### **Academic Positions**

Professor (previously Associate Professor and Assistant Professor), University of California, Santa Barbara (1995-)

Visiting Scholar, Harvard University, Cambridge (1999-2000)

Member of the Institute for Advanced Studies, Princeton (1995-1996)

Charles B. Morrey Assistant Professor, University of California, Berkeley (1992-1995)

Research Fellow, Mathematical Sciences Research Institute, Berkeley (1991-1992)

### Profile

Professor Adebisi Agboola was born in Ogbomoso, Nigeria. He didn't like mathematics as a child. "I found it dull, confusing, and difficult" - he says  $^1$  - "I was interested in, and good at, most subjects in school, but I had no interest at all in mathematics - despite being told by my parents and teachers how important it was to acquire a good knowledge of the subject - and for years I regularly failed almost every

ANTICYCLOTOMIC IWASAWA THEORY OF CM ELLIPTIC CURVES by Adebisi AGBOOLA & Benjamin HOWARD (\*)

ABSTRACT. — We study the Iwasawa theory of a CM elliptic curve E in the anticyclotomic  $\mathbf{Z}_p$ -extension of the CM field, where p is a prime of good, ordinary reduction for E. When the complex L-function of E vanishes to even order, Rubin's proof of the two variable main conjecture of Iwasawa theory implies that the Pontryagin dual of the p-power Selmer group over the anticyclotomic extension is a torsion Iwasawa module. When the order of vanishing is odd, work of Greenberg show that it is not a torsion module. In this paper we show that in the case of odd order of vanishing the dual of the Selmer group has rank exactly one, and we prove a form of the Iwasawa main conjecture for the torsion submodule.

Résumé. — Nous étudions la théorie d'Iwasawa d'une courbe elliptique E à multiplication complexe, dans la  $Z_p$ -extension anticyclotomique du corps de multiplication complexe (ici p est un nombre premier ou E a une bonne réduction ordinaire). Si la fonction L complexe de E a un zero à s=1 de multiplicité paire, la preuve de Rubin de la conjecture principale d'Iwasawa en deux variables impliquent que le dual de Pontryagin de la composante p-primaire du groupe de Selmer est de torsion comme module d'Iwasawa. Si la multiplicité est impaire, les travaux de Greenberg impliquent que ce module n'est pas un module de torsion. Ici nous montrons que, en cas de multiplicité impaire, le dual de Pontryagin du groupe de Selmer est un module de rang un, et nous prouvons une conjecture principale d'Iwasawa pour le sous-module de torsion.

mathematics examination." He developed his interest in it through the history of mathematics: as a young boy of twelve, he read David Bergamini's Life Series volume, Mathematics, which changed his attitude towards the subject and inspired him towards a path that led him to Cambridge first, then to Columbia University, and a distiguished academic careeer. Adebisi Agboola's research focus is on number theory and algebraic geometry. His work on Iwasawa theory has been particularly influential, and important

developments in this field build on anticyclotomic

CM Iwasawa theory by Agboola and other number theorists. He also works on Galois theory and algebraic K-theory, and has proved substantial new results concerning the Galois module structure of rings of integers. Professor Agboola has held several visiting positions at prestigious institutes and universities around the world, among these the Université de Montreal, the Institute Poincaré, and the Institute for Advanced Studies, Princeton, as well as being a frequent visitor to Cambridge.

Mathematische Annalen

On Rubin's variant of the p-adic Birch and Swinnerton-Dyer conjecture II

Received: 29 September 2009 / Revised: 5 April 2010 / Published online: 25 June 2010 © The Author(s) 2010. This article is published with open access at Springerlink.com

Abstract Let E/Q be an elliptic curve with complex multiplication by the ring of integers of an imaginary quadratic field K. In 1991, by studying a certain special value of the Katz two-variable p-adic L-function lying outside the range of p-adic interpolation, K. Rubin formulated a p-adic variant of the Birch and Swinnerton-Dyer conjecture when E(K) is infinite, and he proved that his conjecture is true for E(K) of rank one. When E(K) is finite, however, the statement of Rubin's original conjecture no longer applies, and the relevant special value of the appropriate p-adic L-function is equal to zero. In this paper we extend our earlier work and give an unconditional proof of an analogue of Rubin's conjecture when E(K) is finite.

Mathematics Subject Classification (2000) 11G05 · 11R23 · 11G16

1 Introduction

The goal of this article is to extend the results of [1] to give an unconditional proof of a certain variant of the p-adic Birch and Swinnerton-Dyer conjecture for elliptic curves with complex multiplication.