

Curriculum Vitae

Dr. Charles M. Harris

School of Mathematics,
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1 Personal Information.

Name : Charles Milton Harris.
Date of Birth : 12th April 1960.
Nationality : British.
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2 Education.

2001-6 University of Leeds, UK.

Phd: *Enumeration Reducibility and Polynomial Time Bounds.*

- Extended review of enumeration reducibility.
- Introduction and analysis of the properties of a symmetric version and two polynomial time bounded versions of enumeration reducibility.
- Presentation of results obtained in the study of the degree structures induced by these relations. In particular, lattice theoretic results, embeddings and properties of the first order theory of the degree structures.

1997-9 Université de Paris 7, France.

DEA: Algorithms and Discrete Mathematics - First Part.

DEA: Logic and Foundations of Computer Science.

1996-7 University of London, Kings College, UK.

MSc: Philosophy and History of Science (Distinction).

1995-6 University of Oxford, UK.

MSc: Logic and Foundations of Computer Science.

1992-5 University of Bristol, UK.

BSc Honours Degree: Mathematics (1st Class).

1991-2 Paris Tutorial Centre, France.

GCE A-levels: Pure Mathematics, Applied Mathematics.

3 Current Employment.

2011-2 School of Mathematics, University of Leeds, UK.

Teaching Fellow, comprising lecturing and organisation of the following courses.

First year modules : *Numbers and Vectors* and *Introductory Linear Algebra*.

Third year modules : *Algebra and Numbers* and *Coding Theory*.

4 Recent Research and Teaching Experience.

2008-11 School of Mathematics, University of Leeds, UK.

EPSRC Research Fellow (in collaboration with Professor S. Barry Cooper).

Project Title. Computing with Partial Information - Definability in the Local Structure of the Enumeration Degrees.

Project Objective. The investigation of first order definability, and related structural properties, of various naturally arising classes of the local enumeration degrees. These classes include the total, Δ_2^0 , Π_1^0 , properly Σ_2^0 , and those pertaining to the high/low jump hierarchy.

2010 School of Mathematics, University of Leeds, UK.

Lecturer of the course *Mathematical Logic 2*: Representability of Recursive Functions in Peano Arithmetic, Arithmetisation of Peano Arithmetic, Gödel's First Incompleteness Theorem, Undecidability, Creative Sets, Church's Theorem.

5 Publications.

- (1) An application of 1-Genericity in the Π_2^0 Enumeration Degrees, (with *L. Badillo*), to be published in *TAMC 2012, 9th Annual Conference on Theory and Applications of Models of Computations*.
- (2) Badness and Jump Inversion in the Enumeration Degrees, *Archive for Mathematical Logic*, Online Publication: doi:10.1007/s00153-012-0268-9, 2012.
- (3) Noncuppable Enumeration Degrees via Finite Injury, *Journal of Logic and Computation*, Online Publication: doi:10.1093/logcom/exq044, 2011.
- (4) On the Jump Classes of Noncuppable Enumeration Degrees, *Journal of Symbolic Logic*, Volume 76(1), pages 177-197, 2011.
- (5) Goodness in the Enumeration and Singleton Degrees, *Archive for Mathematical Logic*, Volume 49(6), pages 673-691, 2010.
- (6) On the Symmetric Enumeration Degrees, *Notre Dame Journal of Formal Logic*, Volume 48(2), pages 175-204, 2007.
- (7) Enumeration Reducibility with Polynomial Time Bounds, *Logical Approaches to Computational Barriers: Second Conference on Computability in Europe, CiE 2006, Swansea*, LNCS Volume 3988, pages 209-220, 2006.
- (8) Symmetric Enumeration Reducibility, *New Computational Paradigms: First Conference on Computability in Europe, CiE 2005, Amsterdam*, LNCS Volume 3526, pages 196-208, 2005.

6 Recent Papers.

- (1) Avoiding Uniformity in the Δ_2^0 Enumeration Degrees, *In preparation*, 2012.
- (2) Automorphisms of Computable Linear Orders and The Ershov Hierarchy, (with *K.I. Lee* and *S.B. Cooper*), *In preparation*, 2012.

7 Conference Talks.

- (a) *Automorphisms of Computable Linear Orders and the Ershov Hierarchy*, Contributed talk at the CiE 2011 Conference, Sofia, June 2011.
- (b) Jump Classes of Noncuppable Enumeration Degrees, Invited Talk at the *Workshop on Computability Theory*, Logic Colloquium Satellite Meeting, Sofia, 2009.
- (c) Enumeration Reducibility with Polynomial Time Bounds, Contributed Talk at the *Second Conference On Computability in Europe*, Swansea, 2006.
- (d) Symmetric Enumeration Reducibility, Contributed Talk at the *First Conference On Computability in Europe*, Amsterdam, 2005.

8 Research Interests and Current Work.

- *Positive Reducibilities.* My main interest involves positive reducibilities—i.e. those that only use positive information unlike Turing reducibility—and in particular enumeration and singleton reducibility. I have investigated¹ [5(5)] structural properties of the singleton degrees and developed tools for jump inversion in the enumeration degrees using an in depth analysis of the notion of a good approximation. I have also pioneered the use of oracle constructions in the local enumeration degrees to prove the ubiquity of noncuppable enumeration degrees in terms of the high/low jump hierarchy [5(4)] and to extend known results (by Cooper & Copestake) relating to properly Σ_2^0 enumeration degrees that are incomparable with any intermediate Δ_2^0 enumeration degree [5(3)]. My recent work in this area [5(2)] has been aimed at precisely defining in terms of both arithmetical and jump complexity the point where enumeration degrees that are *bad*—i.e. contain no set with a good approximation—arise, at characterising the double jump of the Σ_2^0 enumeration degrees, and at showing the existence of high quasiminimal Δ_2^0 enumeration degrees.
- *1-Genericity.* Over the past year I have been participating in joint research with Professor S. Barry Cooper and PhD research student Liliana Badillo on 1-genericity and the role that it plays relative to structural properties (such as nonsplitting) in the enumeration degrees. Recent developments in our work [5(1)] have shown that 1-generic degrees display interesting properties in both the Σ_2^0 and Π_2^0 enumeration degrees.
- *Linear Orders.* I am involved in ongoing research with Professor S. Barry Cooper and Dr. Kyung Il Lee relating to the computational properties of linear orders. Particular areas of interest in this work include the investigation of computable partial orders \mathcal{L} with regard to properties, such as that of being computably well founded or computably scattered, that are preserved by any computable linear extension of \mathcal{L} . We have also investigated rigidity of various order types of computable linear orders with the objective of establishing precisely where rigidity breaks down in terms of the complexity of classes of functions—as putative automorphisms—in the arithmetical hierarchy (extended via the Ershov hierarchy). Our results [6(2)] generalise previous research in this area to classes of functions whose graphs lie in a uniform Δ_2^0 class.
- Δ_2^0 *Uniformity.* I have recently reapplied the notions of Δ_2^0 uniformity arising out of the joint work on linear orders described above. In particular in [6(1)] I show that, for any given uniform Δ_2^0 class of enumeration degrees there exists a high Δ_2^0 enumeration degree incomparable with the entire class.
- *Complexity Theory.* I am interested in polynomial time bounded forms of positive reducibilities and related questions (such as problems concerning NP completeness) and dedicated part of my PhD thesis to this subject—see also [5(7)].
- *The Lambda Calculus.* I have an ongoing interest in the relationship between the Lambda Calculus and enumeration reducibility, first pointed out and investigated by Dana Scott. This is an area that I hope to develop in future work.

9 Skills and Interests

- *Management.* I have managed a team of 10 people in a retail environment—at IKEA, see section 10.
- *Interests.* My main extramural activity is dance. I run a weekly dance session of cuban salsa with a group of friends. I also organised a trip to Cuba for 8 members of the group in January 2011, involving accomodation in private houses, dance workshops, and dance shows.

¹The denotation $[m(n)]$ refers to item (n) in Section m .

- *Farm Redevelopment.* I have coordinated the planning application—now provisionally accepted by the South Oxfordshire District Council subject to legal agreement—for the redevelopment of the farmyard belonging to my family. The application involves a mixture of new build and conversions resulting in 8 residences and 3 commercial units.

10 Previous Work Experience.

- 2007** La Cave Cafe, Rue Marcadet, Paris. *Barman.* (April-December.)
- 2000-3** The Wild Geese Irish Pub, Boulevard Richard Lenoir, Paris. *Assistant Manager.* (2000: January-December & 2003: January-June).
- 1986-91** IKEA, Roissy, Paris. *Sales assistant:* 1 year. *Department Manager:* 4 years.
- 1985** Gesa Assistance, Boulevard Haussman, Paris. *Technical Assistant.* (June-September.)
- 1982-4** Harris & Son (Farmers), Oxford, UK. *Grain Store Manager.* (June-October.)
- 1977-80** *Agricultural Student/Farm Worker.* I spent 2 years working on farms in England and Scotland before attending a 3 year HND course at Harper Adams Agricultural College. I worked on farms in Germany and France during the sandwich year of the latter.