2010 Forder lecturer Prof. Ben Green

The 2010 Forder lecturer is Prof. Ben Green from the University of Cambridge. He will visit New Zealand in September and his travel schedule is as follows. For the titles and abstracts of the talks, see the next page.

3-8 **Canterbury University CANCELLED FROM 5 SEPT because of earth quake**

Talks: #2 on 6 September 3.10 pm - 4.00 pm, 446 Erskine Building CANCELLED

#1 on 6 September 7.00 pm - 8. 00 pm, LAW 108 CANCELLED

8-11 Otago University NOW FROM 6 SEPT

Talks: #4 on 9 September 2 pm - 2 pm, St David Seminar room 1

#1 on 10 September 4:30 pm - 5:30 pm, Archway 2 Lecture Theatre
afterwards reception in Consumer and Applied Sciences seminar room

11-14 Victoria University

Talks: #2 on 13 September 6.30pm, Maclaurin LT102

#7 on 14 September at Noon, Cotton Club, Cotton 350

14-16 Massey University at Palmerston North

Talks: #4 on 15 September 3.00 pm

#7 on 16 September 11.00 am

16-19 Waikato University

Talks: #6 on 17 September 11.00 am

#2 on 17 September 3.00 pm

19-26 Auckland

Talks: #1 on 21 September 6.00 pm, University of Auckland,
Conference Centre Lecture Theatre, Room 423-342, 20 Symonds Street

#1 on 22 September 4.00 pm, Massey University Albany, NW200 lecture theatre

#2 on 23 September 3.00 pm, University of Auckland, MLT1

Titles and abstracts

1. **Adding prime numbers**
   Prime numbers are the building blocks of multiplication, so it may seem a bit weird to try and add them up. Nevertheless some of the most famous problems in number theory concern the additive structure of the prime numbers: Goldbach's conjecture states that every even number is the sum of two primes, whilst the twin prime conjecture asserts that there are infinitely many pairs of primes that differ by two. In the lecture I will talk about how the quest for answers to questions of this type has led to deep mathematics, linking the study of the primes to several apparently unrelated parts of mathematics.

2. **Arithmetic progressions of primes**
   I will talk about my 2004 work with Terence Tao in which we showed that the primes contain arbitrarily long arithmetic progressions.

3. **Approximate algebra**
   What is meant by an approximate group? an approximate field? an approximate polynomial? What can one say about these objects - how close are they to exact structures, and what use are they anyway?

4. **Approximate groups**
   I will introduce the notion of an approximate group. Roughly speaking, this is a set A together with a multiplication table in which xy lies in A for some fraction, rather than for all, choices of x and y in A. Approximate groups have been much studied in recent years and I will give a survey of this topic. Particular issues to be addressed include
   1. Basic examples.
   2. Structure theory in particular cases (abelian, nilpotent, matrix groups. . .).
   3. A general conjecture.
   4. Applications

5. Not chosen

6. **Linear equations in primes**
   I will describe a programme of research that I have been undertaking with T. Tao for the last 6 years, recently completed in collaboration with T. Ziegler. The aim of this is to understand how often a collection of linear forms all take prime values. A particular application is an asymptotic for the number of k-term arithmetic progressions $p_1 < p_2 < \ldots < p_k$ of primes less than some threshold X, for each fixed k.

7. **Approximate polynomials**
   A map $f\colon Z \to R$ is a polynomial of degree d if, and only if, all of its $(d+1)$st difference functions vanish identically. (Here the difference function of f at a given parameter h is $n \mapsto f(n+h) - f(n)$.) But what if this difference function only vanishes some of the time? What can one say about f then?

   It turns out that this question, or at least a very closely related question, has an interesting answer with very wide-ranging applications. We will give an overview of this topic.