

## Guttman 2015: 70 and Counting

### Judy-anne Osborn\*

The 70th birthday of Professor Tony Guttman was celebrated in late 2015 at *Guttman 2015: 70 and Counting*, <http://www.andreabedini.com/guttman2015/> held as a satellite to the Australian and New Zealand Association of Mathematical Physics annual meeting.



Tony Guttman  
(photo: Jesper Jacobsen).

The meeting, held over two days at *Noah's on the Beach* in Newcastle, Australia, brought together 46 attendees including 21 presenters, speaking on aspects of mathematical physics and pure and applied mathematics that contribute towards the understanding of critical phenomena in statistical mechanics. Critical phenomena describe the emergence of macroscopic behaviour from interactions between simpler microscopic systems, and research in this area draws upon a large range of mathematical areas and tools, to many of which Professor Guttman has significantly contributed.

Research areas represented include critical phenomena, enumerative and algebraic combinatorics, and computational algorithms. Many of those who presented are international leaders in these fields, including special speakers:

- Professor Mireille Bousquet-Mélou of the University of Bordeaux, 2014 winner of the French National Centre for Scientific Research (CNRS) Silver Medal for Mathematics, an expert in enumerative combinatorics, who spoke on combinatorics of lattice walks avoiding a quadrant.
- Professor Jesper Jacobsen of the Ecole Normale Supérieure in Paris, expert on integrable systems in mathematical physics, who spoke on the connection between graph colourings (related to the four colour problem) and their unexpected connection with conformal field theory.
- Professor Christian Krattenthaler of the University of Vienna, expert in combinatorics, who spoke on the unexpected relationship between random walkers with excluded volume constraints (which are a model of polymer phase transitions), and group characters.
- Professor Jean-Marie Maillard, director of research (CNRS), Pierre and Marie Curie University in Paris, an expert in algebraic statistical mechanics who spoke on selected non-holonomic functions in lattice statistical mechanics and enumerative combinatorics.

---

\*Judy-anne.Osborn@newcastle.edu.au

- Professor Dr Christoph Richard of the Friedrich-Alexander-Universität Erlanger-Nürnberg, an expert in mathematical physics and non-periodic structures, who spoke on the celebrated diffraction formula for regular model sets (which describe quasi-crystals) and argued it is equivalent to the Poisson summation formula for the underlying lattice.



Two of the special speakers at the meeting, Professor Mireille Bousquet-Mélou (left), and Professor Jean-Marie Maillard (right) (photos: Jesper Jacobsen).

The rich interplay between mathematical physics, pure mathematics and computation was illustrated by many of the talks at the meeting. Professor Jonathan Borwein of *CARMA* at the University of Newcastle, in one of his last conference presentations in Australia before tragically and unexpectedly passing away last year in Canada whilst on sabbatical, spoke about random walks. Professor Borwein's talk demonstrated deep connections with number theory. Professor Murray Batchelor of the ANU spoke about the Heun equation, its relationship to a model for quantum light interacting with matter, and how he first noticed this equation in talks by Tony Guttmann on the enumeration of staircase polygons. Dr Tim Garoni of Monash University spoke of the famous combinatorial 'worm' algorithm, and how the efficiency of this algorithm allows it to be used to calculate critical phenomena.

The range of ages and career stages of the meeting participants represented some of the extensive breadth of Tony Guttmann's collaborations and mentoring relationships. Amongst Tony's former students who were present were Nick Beaton, now of the University of Saskatchewan in Canada, who spoke on models of polymer adsorption, and Yao-ban Chan, recently of the University of Queensland and now back at the University of Melbourne in a lectureship. Many former CIs and postdocs from MASCOS, which Tony founded as the ARC Centre of Excellence for Mathematics and Statistics of Complex Systems over a decade ago, presented. Conference attendees also included PhD students from various Australian institutions, and one undergraduate student. Also present on the wings and even attending some of the talks were the small babies of several of the conference participants.



Public Lecturers Cassandra Portelli (left) and Professor Nalini Joshi (right).  
(Photo of Professor Joshi by Ted Sealey.)

An initiative designed to foster the engagement of school teachers and trainee school teachers with the mathematical research community, in the form of a public lecture entitled ‘Journeys Through Mathematics and Life’ closed the conference. This was a joint initiative between the Guttmann Conference, *ANZAMP*, the OLT project *Inspiring Mathematics and Science in Teacher Education (IMSITE)* and ARC Centre of Excellence *ACEMS – Mathematical and Statistical Frontiers*. The speakers at the Public lecture, Professor Nalini Joshi of the University of Sydney and Cassandra Portelli, Head Maths teacher at the Hunter School of the Performing Arts, were chosen for their eminence in their respective work in mathematical physics and mathematics, their ability as communicators, and as exemplars of women living creative, successful and joyful mathematical careers. The lecture was well attended by a mix of conference attendees, mathematics students and pre-service teaching students from the University of Newcastle. The in-lecture activity of making polyhedra out of straws and investigating their projections was particularly embraced by the trainee teachers in attendance.



Some of the *Guttmann 2015: 70 and Counting* participants, from left to right: Eren Metin Elçi, Tim Garoni, Alexandr Garbali, Inna Lukyanenko, Jesper Ipsen, Jens Grimm, Laurence Field, Paul Pearce, Jorgen Rasmussen, Nicholas Beaton, Yao-ban Chan, ?, Christoph Richard, Zeying Chen, Andrea Bedini, Ian Enting, Vladimir Mangazeev, Joshua Hartigan, Aleks Owczarek, Jan De Gier, Tony Guttmann, Jean-Marie Maillard, Richard Brak, Omar Foda, Mireille Bousquet-Mélou, Ole Warnaar, Christian Krattenthaler, Vladimir Bazhanov, Michael Assis, Nathan Clisby, Murray Batchelor (photo: Jesper Jacobsen).

It was fitting that *Guttman 2015: 70 and Counting* should be held in Newcastle, since this was a return to an old home for Tony, who had his first lectureship at the University of Newcastle. Newcastle city beach, overlooked by the conference venue, provided an opportunity for morning and evening swims and runs by conference participants, including Tony who is known for his love of such pursuits.

### **Biography of Anthony J. Guttman**

Anthony John Guttman is a mathematical physicist, mathematician, educator, mentor and leader within the mathematical community. He is a leading expert in his research areas, and his vigorous international collaborations have strengthened the research ties between Australia and many countries in the wider world, especially France and Canada. Tony is an outspoken and eloquent advocate of equity and quality of education systems at all levels. As founder of AMSI and MAS-COS, and mentor of other young leaders, his positive influence on the Australian mathematical community is ever widening.

Tony was born April 8th, 1945, in Melbourne, the only child of Hungarian immigrants László and Anna Guttman. Tony's parents had come to Australia in 1939 to get away the rising militarism that was of particular concern to them given that they were both Jewish, and settled in Melbourne, originally in St Kilda, and then moved to Hawthorn when Tony was about 8 or 9. He remembers a regular suburban childhood. There was one other boy living close by of Tony's age, and after school they would kick a football in the street. When he was 12 or 13 he got a bicycle, and loved the speed and ease with which it gave him access to places like a huge park just out of comfortable walking distance.

Tony was not sporty at all at school, which might be a surprise to those who know him now for his athletic endeavours. The reason was probably that he was significantly the youngest of his class. The age difference arose as a curious result of a case of the mumps at age six, which caused deafness in his left ear. Tony's parents arranged for him to go to Sydney for a course of treatment, where he stayed for six months billeted with a family in Lindfield and attending a local Sydney school. The treatment didn't work, but when he returned to Melbourne the school tested his knowledge and decided that he should skip a class. Tony's only strong memory of Sydney was of the final part of the trip there. The journey was by ship, and as they sailed into Sydney harbour he recalls looking up, as a very small boy, and being convinced that the mast was going to hit the Harbour Bridge.

As a child, Tony was inventive, practical and hands-on. One of his projects was to make a big aviary for his dozen or so budgerigars. Curiosity and a drive to experiment were also features. The house in Hawthorn had many sheds in the backyard, which Tony soon put to use. One was his chemistry lab. Another was his electronics lab, in which he made radios. He remembers an aspect of 'ultimate nerdiness', from the time that the UK's most famous band visited Australia. Tony had just constructed his first oscilloscope, and he was in his shed tuning in to the cheering crowds and music of the Beatles, with pride and interest watching

the curves the sound traced out on his new machine, instead of going to join the cheering crowds in person.

Tony's self-directed research at home was more inspiring to him than his school classes. He went to Camberwell Central School, followed by Wesley college. He remembers an excellent French teacher at Camberwell, and later a brilliant Chemistry teacher at Wesley. It was the Chemistry teacher, Alan Gess, who sparked the interest that inspired the backyard lab.

Social awareness and a sense that his values did not entirely align with those promoted by his school were a feature of Tony's teenage years. This was the late 1950s and early 1960s, and the sense that Wesley College had of itself was as representing an elite culture defined by distant British Empire. Wesley held and promoted those values with the unquestioned authority of tradition, which at the time included the use of the cane. Tony's happiness was muted in this milieu, though he did enjoy his science classes.

At the age of 16 Tony went to Melbourne University. His enrolment was in neither Mathematics nor Science, but rather Electrical Engineering. He enjoyed the freedom and parties of University life, and in what was quite a shock to him came very close to failing first year. He then focused more seriously on his studies, and realised that he was enjoying mathematics and physics more than Engineering. So Tony switched to a Science degree, and made up the missed material by reading books and independently doing prac work in the labs in his spare time, supported in this plan by an academic coordinator of second year, Ken Hines, who believed in him.

Much of Tony's mathematical training was in the context of, and viewed through the lens of, physics. He learned about differential equations and group theory through quantum mechanics. Complex variable theory and integral transforms were accessed through diffraction physics. An Honours in diffraction was followed by a Masters in X-ray dispersion corrections. Tony finished the Masters early and Norm Frankel got him involved in a massive computational project on the university's mainframe computer, to compute properties of Bose–Einstein condensates. His friends would bring him food from Genevieve's Restaurant while he ran programs for 24–48 hours, on machines whose input mechanism were boxes of punched cards.

One University holiday, Tony went to visit a second cousin who lived in Sydney, and through him met a young woman by the name of Susette. Susette was a sporty type (she was the inter-varsity water-ski jump champion in her University days) and a competitive chess player who had been runner-up in the NSW junior championship. Tony had never played chess competitively but liked the game. The two started playing chess by correspondence. One thing led to another, and Susette became his girlfriend.

Tony moved to UNSW to do his PhD, in part because Susette lived in Sydney where she was studying Arts and Social Work. That was 1967, a memorable year for Tony both academically and personally. He participated in a Summer School at ANU with a stellar cast of presenters including C.N. Yang and Freeman Dyson.

Tony has noted that ‘the lectures were mostly at too high a level for me, in my first month of a graduate program, but were inspiring nonetheless’. The comment was made in an interview with the late Peter Hall for the Asia Pacific Mathematics Newsletter (see [http://www.asiapacific-mathnews.com/02/0204/0028\\_0034.pdf](http://www.asiapacific-mathnews.com/02/0204/0028_0034.pdf)) from which some of the source material for this article is adapted. The vividness with which Tony recalled the summer school of 1967 in the interview forty-five years later is indicative of its impact upon Tony. At the end of 1967, Tony married Susette.

1969 saw Tony complete his PhD dissertation, *Numerical Studies in Phase Transitions*, under the joint supervision of Barry Ninham and Colin Thompson. The latter was just a few years older than Tony, and was later to comment upon the effect it has upon one’s expectations when one’s first PhD student is so good. In Tony’s thesis work he met Self Avoiding Walks (SAWs) which were later to become one of his favourite problems, and illustrative of techniques he was to contribute to across a number of areas of mathematics. Tony’s thesis was concerned with extracting asymptotics from power series expansions and at the time SAWs were just one example.

Tony’s collaborations and friendships with international colleagues have been important in his life and professional career. He made several lifelong friendships in his next academic posting, a postdoctoral fellowship at King’s College, London. One such was Stu Whittington. In 1971 Stu was leaving Cambridge for a post-doc in Canada, and called into Kings College, which was a world centre of series analysis and series generation, to meet members of the group. Tony and Stu hit it off quite well, so that when Tony had a visiting position at the University of Waterloo in 1975 and Stu was in Toronto, Tony got in contact with Stu. Stu invited Tony and Susette to visit, Susette got on well with Stu’s wife Ann, Tony and Stu had work things in common, and the friendship between the couples grew from there. Over the years there has been a flow of visits, ideas, students and postdocs between Stu’s group in Canada (where he is Professor in the Chemical Physics Theory Group at Toronto) and Tony’s research group in Australia.

Tony returned to Australia in late 1971 to a job at the newly established University of Newcastle, which had just created Australia’s first (and maybe last) Faculty of Mathematics. Tony took a punt on the new group, and what followed was a wonderful time. Everything seemed possible. The Foundation Dean, Reyn Keats, was keen on hiring the best possible staff, and there were several new appointments each year for several years.

Tony was put in charge of a new postgraduate Diploma in Computer Science at Newcastle. He built this diploma and lectured its foundation courses, though he had never formally studied computer science. Tony has said that he was ‘at least a week and sometimes two weeks ahead of the students’. He wrote a book called *Programming and Algorithms* out of one of the courses he taught. Meanwhile he and Susette had set up house in Merewether, close to a wonderful ocean pool where he used to regularly swim. By his 30s, Tony was Professor at Newcastle. His first PhD student, Albert Nymeyer, had gotten him into running, and he found it a

great way to cope with the pressures when he was made Head of Department still in his early to mid-30s.

A welcome relief from the administration associated with being Dean came in the form of a sabbatical at the University of Melbourne, followed by an appointment to a Readership there in 1987 and Personal Chair in 1988. Colin Thompson had started the statistical mechanics group there, and what followed was the building of a large successful research group. During this time Tony built strong connections with researchers in France. Some connections arose because he had solved a problem of convex polygons and then found that Delest and Viennot had done it previously. Tony wrote to Delest, who suggested that Tony visit Bordeaux as part of a sabbatical he was to take at Oxford (in 1992). Tony did so and at Bordeaux met Mireille Bousquet-Mélou, who had done her PhD with Viennot. Tony and Mireille started working on problems together, she visited him in 1995, he had a sabbatical in Bordeaux in 1996, and the collaboration has been a source of inspiration ever since, in particular in algebraic combinatorics. One result was Tony's editing a special edition of *Annals of Combinatorics* highlighting the connections between statistical mechanics and algebraic combinatorics.

Tony's research has involved and influenced many areas of mathematics and mathematical physics, particularly equilibrium statistical mechanics. These include enumerative and algebraic combinatorics, probability theory, analysis and discrete analogues of analyticity such as discrete holomorphicity, critical phenomena such as phase transitions in magnetic, polymeric and percolation systems, fluid mechanics, numerical analysis, experimental mathematics and computational algorithms. In 2000 Tony was elected fellow of the AustMS, and then over the years also of SIAM, the Australian Academy of Science and the Australian Academy of Technological Sciences and Engineering. Other honours and prizes include the Hannan Medal of the Australian Academy of Science, the Centenary Medal by the Australian Government, the B.H. Neumann Award for Services to Education, and the Lyle Medal of the Australian Academy of Science.

Tony changed the Australian mathematical landscape enduringly and for the better with his founding in 2002 (together with Jan Thomas) of the Australian Mathematical Sciences Institute, via a grant from the Victorian Government. AMSI has since supported Australian research mathematics, built connections that allow us to speak with one voice to government, and advocated tirelessly and effectively for resources to improve Australia's mathematical capacity through outreach and education.

One year later Tony founded the ARC Centre of Excellence MASCOS (Mathematics and Statistics of Complex Systems), the first ARC-funded centre in the Mathematical Sciences since Neil Trudinger's Centre for Mathematical Analysis at ANU two decades prior. MASCOS had nodes and Chief Investigators at Melbourne University, LaTrobe University, the University of New South Wales, the University of Queensland and the Australian National University. Thirteen years later, Tony continues to direct MASCOS. He is also an encourager and supporter of colleagues building other centres of research in the Mathematical Sciences in Australia.

Tony spent his 70th birthday in Bordeaux, celebrating with a good restaurant meal and then four days later by running the Paris Marathon, an event involving 54 000 runners through the narrow cobbled streets of Paris. This birthday activity is typical of Tony, in ways familiar to his friends and collaborators, including in the enjoyment and pride he takes in his family. Susette had arranged, as a surprise, for Tony's two adult children Jacki and Laurence to join them in Paris. As a further surprise, at the starting line of the race, Laurence took off his jumper to reveal a Paris Marathon race number attached. Tony and Laurence (usually a cyclist rather than a runner), ran the 42.2km race together, finishing in 4:05:35. To Tony's satisfaction his finish was 11th out of 102 in his age group, and according to the WAVA website, equivalent to an age adjusted time for a youngster of 3:00:35.

Tony takes pleasure not only in his own achievements, but also in those of others around him. He appreciates quality wherever he finds it, and takes pleasure in elegant engineering solutions, whether those be the bicycle he was given as a young teenager, or the bone conduction microphone that now allows him to listen to Bob Dylan via bluetooth whilst running, and still safely hear ambient noise. Tony continues to contribute with energy to mathematics, education, colleagues and friends, swimming, running, cycling, and his family including children and grandchildren.

### **Citation**

Some content in this article is based on reporting in the Australian Mathematical Sciences Institute's Research Report 2015–16 as published November 2016: [http://amsi.org.au/publications\\_category/publications/research-reports/](http://amsi.org.au/publications_category/publications/research-reports/).