GEORGE SZEKERES

29 May 1911–28 August 2005

The month of August, 2005 has been a sad one for mathematics in Australia, with the passing of Ren Potts[1] (on 9 August), and George Szekeres. Both mathematicians were closely associated with Adelaide, and many New Zealand mathematicians have had the pleasure of meeting these remarkably creative individuals. Of special note is that both may perhaps be best known for work performed outside their specialist areas, with the Potts model applying to statistical physics (not in Operational Research) and the Kruskal-Szekeres coordinates applying in general relativity (not in combinatorics).

Figure: George and Esther at the Investiture Ceremony for Australian Honours, held at Government House. George Szekeres received his award of Member of the Order of Australia, September, 2002, at the age of 90.

The following notes on George draw heavily from an article for the annual newsletter of the National Mathematics Summer School in 2001 by David Harvey, now studying for a PhD in Harvard. George inspired admiration and optimism from those fortunate to have met him.

George Szekeres was born in Budapest, Hungary, in 1911, and his gifts in science and mathematics were soon apparent. An important influence during his high school career was the journal Kzpiskolai Matematikai s Fizikai Lapok, which provided mathematical problems and enrichment. (George was much later instrumental in establishing a similar high school mathematics journal Parabola in Australia.) George went on to study chemical engineering at the Technological University of Budapest, to contribute to the family's leather business. During his time at university, he often met with a small group of enthusiastic students, drawn from the ranks of the Lapok problem-solvers, to pose mathematical problems and discuss solutions. The group was simmering with talent, including Paul Erdös and Paul Turán, both outstanding mathematicians of this century. Also attending was Esther Klein, who has lectured on geometry at NMSS on two occasions, and whom George would marry in 1937.

[1] see the article (and accompanying photos) by Earnie Tuck on Ren Potts at www.maths.adelaide.edu.au/applied/recent/RenPotts/

Towards the end of the 1930s, life was becoming increasingly difficult for Jews in Hungary. George and Esther eventually found it necessary to leave, and moved to Shanghai, where their son Peter was born in 1940. George worked as a leather chemist there, and later as a clerk in an American air force base. In 1948 George accepted an offer of a lectureship at the University of Adelaide. He remained there for fifteen years, during which time their daughter Judith was born in 1954. In 1963, the family moved to Sydney (except for Peter who was studying physics in London), where George had accepted a position at the University of New South Wales as the Chair of Pure Mathematics on the condition that he would not have to be an administrator. Also in 1963, he was elected to the Australian Academy of Science, and awarded the Academy's Lyle Medal in 1968. George retired in 1976, but continued to work several days a week as Emeritus Professor in the mathematics department at UNSW. In Sydney, George was also a valued member of the amateur classical musical scene, playing violin and viola in the North Sydney Symphony Orchestra and the Ku-ring-gai Philharmonic Orchestra.

George's original mathematical output continued through most of his adult life, beginning even during his undergraduate days. His mathematical interests were incredibly diverse, but there are several recurring themes. One prominent topic is combinatorics, and there is at least one combinatorial problem which has been a thread running through George's whole life. It was first posed by Esther in the early 1930s, and was the subject of a collaborative paper with Paul Erdös (A combinatorial problem in geometry, 1935). Erdös referred to this problem as the 'Happy Ending Problem', because it had a happy ending—namely George and Esther's marriage! The problem has yet to be fully solved, and George continued working on a computer search that would test a particular special case. Besides combinatorial geometry, he also made contributions in the theory of partitions, graph theory, and other areas of combinatorics. He embraced the computer age with enthusiasm, making early contributions to techniques of numerical analysis, especially in the theory of computing high dimensional integrals. His later research interests included combinatorial geometry, Hadamard determinants, and chaos theory.

Despite these wide areas of activity, many applied mathematicians in New Zealand will associate George with yet another area—because of his ground breaking work in general relativity in 1960, when he studied the passage of (hypothetical) observers through the event horizon of a black hole, in his paper "On the singularities of a Riemannian manifold". This original work was also published almost simultaneously and independently by Kruskal, who originally received the credit. However, over time, the contribution of George was recognised, so that today the Kruskal-Szekeres coordinates are widely known.

These coordinates do not follow the passage of an observer, but rather follow the paths of light as it moves into the black hole. The light cone then looks as it does in special relativity, which can greatly facilitate some calculations. A remarkable aspect of these coordinates is that the coordinate singularity in the Schwarzschild metric at the event horizon is now missing in the new line element, but the real singularity at the "origin" of the Schwarzschild metric now splits into two singular surfaces, revealing the presence of two exterior regions. This had been found by Synge in 1950, but the Kruskal-Szekeres coordinates are probably the easiest way to observe this. The classic text, Gravitation, by Misner, Thorne and Wheeler advises students, "One good way for the reader to become conversant with the basic features of the Schwarzschild geometry is to ... carefully reinterpret everything ... in terms of the Kruskal-Szekeres diagram". It seems likely then that George's influence will extend far into the future.

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