

Thompson and Tits Receive 2008 Abel Prize

On March 27, 2008, the Norwegian Academy of Science and Letters announced it would award the Abel Prize for 2008 to JOHN GRIGGS THOMPSON, University of Florida, and JACQUES TITS, Collège de France. Thompson and Tits receive the Abel Prize “for their profound achievements in algebra and in particular for shaping modern group theory”.

Citation of the Abel Prize Committee

Modern algebra grew out of two ancient traditions in mathematics, the art of solving equations, and the use of symmetry as for example in the patterns of the tiles of the Alhambra. The two came together in late eighteenth century, when it was first conceived that the key to understanding even the simplest equations lies in the symmetries of their solutions. This vision was brilliantly realized by two young mathematicians, Niels Henrik Abel and Evariste Galois, in the early nineteenth century. Eventually it led to the notion of a group, the most powerful way to capture the idea of symmetry. In the twentieth century, the group theoretical approach was a crucial ingredient in the development of modern physics, from the understanding of crystalline symmetries to the formulation of models for fundamental particles and forces.

In mathematics, the idea of a group proved enormously fertile. Groups have striking properties that unite many phenomena in different areas. The most important groups are finite groups, arising for example in the study of permutations, and linear groups, which are made up of symmetries that preserve an underlying geometry. The work of the two laureates has been complementary: John Thompson concentrated on finite groups, while Jacques Tits worked predominantly with linear groups.

Thompson revolutionized the theory of finite groups by proving extraordinarily deep theorems that laid the foundation for the complete classification of finite simple groups, one of the greatest achievements of twentieth century mathematics. Simple groups are atoms from which all finite groups are built. In a major breakthrough, Feit and Thompson proved that every non-elementary simple group has an even number of elements. Later Thompson extended this result to establish a classification of an important kind of finite simple group called an N -group. At this point, the classification project came within reach and was carried to completion by others. Its almost incredible conclusion is that all finite simple groups



John Thompson



Jacques Tits

belong to certain standard families, except for 26 sporadic groups. Thompson and his students played a major role in understanding the fascinating properties of these sporadic groups, including the largest, the so-called Monster.

Tits created a new and highly influential vision of groups as geometric objects. He introduced what is now known as a Tits building, which encodes in geometric terms the algebraic structure of linear groups. The theory of buildings is a central unifying principle with an amazing range of applications, for example to the classification of algebraic and Lie groups as well as finite simple groups, to Kac-Moody groups (used by theoretical physicists), to combinatorial geometry (used in computer science), and to the study of rigidity phenomena in negatively curved spaces. Tits's geometric approach was essential in the study and realization of the sporadic groups, including the Monster. He also established the celebrated “Tits alternative”: every finitely generated linear group is either virtually solvable or contains a copy of the free group on two generators. This result has inspired numerous variations and applications.

The achievements of John Thompson and of Jacques Tits are of extraordinary depth and influence. They complement each other and together form the backbone of modern group theory.

Biographical Sketch: John G. Thompson

John Griggs Thompson was born in Ottawa, Kansas, on October 13, 1932, and now holds a position as Graduate Research Professor at the Department of Mathematics, University of Florida in Gainesville.

Thompson received his bachelor's degree from Yale University in 1955 and his Ph.D. from the University of Chicago in 1959. His thesis advisor was

More on Buildings and the Monster

Two installments of the *Notices* "What is...?" column relate to the work of this year's Abel Prizewinners: "What is the Monster?" by Richard Borcherds (October 2002), and "What is a Building?" by Kenneth S. Brown (November 2002). Find these articles online at <http://www.ams.org/notices>.

Saunders Mac Lane, one of the founding fathers of category theory.

Thompson was an assistant professor at Harvard University until he was appointed as a professor at the University of Chicago in 1962. In 1970 he moved to Britain to take up the Rouse Ball Professorship of Mathematics at the University of Cambridge. After 23 years in Cambridge he moved back to the United States to his present position at the University of Florida. He is currently Professor Emeritus of Mathematics at the University of Cambridge.

John Griggs Thompson has been awarded honorary doctorates at the Universities of Illinois, Yale, Oxford, and Ohio State. He was elected a member of the U.S. National Academy of Sciences in 1967 and became a Fellow of the American Academy of Arts and Sciences in 1998. He is a foreign member of the Royal Society of London and of the Accademia Nazionale dei Lincei. Thompson has received many international awards for his outstanding contribution to mathematics. Among them are the Fields Medal, the Senior Berwick Prize, the Sylvester Medal, the Wolf Prize, and the Poincaré Medal. In 1965 he and Walter Feit received the AMS Cole Prize in Algebra for their paper "Solvability of groups of odd order", *Pacific Journal of Mathematics*, volume 13 (1963), pp. 775–1029. In 2000 he was awarded the National Medal of Science by U.S. President Bill Clinton.

The late Walter Feit, with whom Thompson proved one of the key theorems of group theory, said of him: "He is a mathematician who studies important problems and does not let difficulties discourage him. He frequently overcomes such difficulties by introducing new ideas which then have an enormous impact on future developments." This impact is all the greater for the generosity with which he shares the ideas with his many research students and other mathematicians.

Biographical Sketch: Jacques Tits

Jacques Tits was born in Uccle, in the southern outskirts of Brussels, Belgium, on August 12, 1930. He retired from his professorship at the Collège de France in Paris in 2000 and has since then been professor emeritus.

His father a mathematician, Jacques had mathematical talent that showed early. At the age of three he was able to do all the operations of arithmetic. He skipped several years at school. His father died when Jacques was only thirteen years old. Since the family had very little to live on, Jacques started

tutoring students four years older to contribute to the household expenses. He passed the entrance exam at the Free University of Brussels at the age of fourteen and received his doctorate in 1950 at twenty years of age.

Tits was promoted to professor at the Free University of Brussels in 1962 and remained in this position for two years before accepting a professorship at the University of Bonn in 1964. In 1973 he moved to Paris, taking up a position as Chair of Group Theory in the Collège de France. Shortly after, in 1974, he became a naturalized French citizen. Tits held this chair until he retired in 2000.

Jacques Tits has been a member of the French Académie des Sciences since 1974. In 1992 he was elected a foreign member of the U.S. National Academy of Sciences and the American Academy of Arts and Sciences. In addition he holds memberships in science academies in Holland and Belgium. He has been awarded honorary doctorates from the Universities of Utrecht, Ghent, Bonn, and Leuven.

Tits has received many awards, such as the Wolf Prize, the Cantor Medal, the Grand Prix des Sciences Mathématiques et Physiques, and the Wettrems Prize. He was appointed Chevalier de la Légion d'Honneur in 1995 and Officier de l'Ordre National du Mérite in 2001.

In addition to his mathematical research Tits has played a major role in international mathematical life. He was editor-in-chief for mathematical publications at the Institut des Hautes Études Scientifiques from 1980 to 1999. He served on the committee awarding the Fields Medal in 1978 and again in 1994. He has also served since 1985 on the committee awarding the Balzan Prize.

The publications of Jacques Tits contain a remarkable number of fundamental and path-breaking mathematical ideas, making him one of the most influential and original mathematicians of our time.

About the Abel Prize

The Niels Henrik Abel Memorial Fund was established in 2002, to award the Abel Prize for outstanding scientific work in the field of mathematics. The prize amount is 6 million NOK (approximately US\$1.2 million), and it was awarded for the first time in 2003. The prize is awarded by the Norwegian Academy of Science and Letters, and its choice of Abel Laureate is based on a recommendation by the Abel Prize Committee consisting of five internationally recognized mathematicians. The 2008 prize will be presented by His Majesty King Harald at the Abel Prize Award Ceremony in Oslo, May 20, 2008.

Previous recipients of the Abel Prize are Jean-Pierre Serre (2003), Michael Atiyah and I. M. Singer (2004), Peter Lax (2005), Lennart Carleson (2006), and S. R. S. Varadhan (2007).

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