

# Groups in Galway and Groups St Andrews conferences

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## 1. Introduction to the Groups in Galway conference



Eglinton Canal outside NUI Galway

The conference Groups in Galway owes its origins to Professor Martin Newell of the National University of Ireland, Galway see [2]. Professor Martin Newell writes:

At the inaugural meeting of the Irish Mathematical Society in Dublin in December 1977, I proposed that a series of instructional conferences be organised in various topics in Mathematics. The Departments in Cork and Galway undertook to arrange conferences in History of Mathematics and Group Theory, respectively, in 1978. Only the one in Galway has been held on an annual basis ever since.

In the inaugural Newsletter of the Irish Mathematical Society in 1978 we have the following words.

The Irish Mathematical Society intends to hold a series of short instructional conferences. It is intended to choose a particular theme for each conference and to have a number of survey-type lectures on this theme. The aim is to survey a particular area for the benefit of non-specialists. A small number of short more specialized contributions may also be given for the benefit of experts in the area.

The first of these conferences was held at University College Galway, May 12-13, 1978. The organiser was Martin L Newell and the topic was Group Theory. The following lectures were given:

Some aspects of permutation groups	J P McDermott (U.C.G.)
Finite simple groups	T J Laffey (U.C.D.)
The representations of $GL(n,q)$	G Thomas (U.C.C.)
Augmentation quotients of some finite nonabelian groups	N Losey (Manitoba and Warwick)

The next mini-conference will be held at U.C.C. in late September. The topic will be in the area of the history of Mathematics. Details about this conference will be issued at later.

In issue 2 of the Newsletter of the Irish Mathematical Society in 1979 there is the following paragraph.

The Group Theory Conference in Galway was a tremendous success with over 25 participants, including a small number from abroad. Great credit is due to the main speakers for their very informative presentation, tending to review some of the main areas of the theory and not getting bogged down in technical detail. Martin Newell, the organiser, has plans well in hand for another conference in May this year and informs us that he hopes to make it an annual event. Group Theory is alive, well and flourishing in Ireland.

In the same issue of the Newsletter there is the announcement of a Short Conference. It states:

One of the main activities of the Society has been its organisation of short, mainly instructional, conferences. The next conference of this type will be held in University College, Galway, on May 11-12, and will be on Group Theory. The organiser is Professor M L Newell. A similar conference on Function Theory will be held in University College, Cork, in the Autumn.

The conference is often referred to as 'GiG'. This phrase GiG, Groups in Galway, was penned in an announcement in the Newsletter of the LMS (London Mathematical Society) in 1982 and that title has stuck with the conference ever since.

Thus the series of Groups in Galway was well launched [3]. I (Colin M Campbell -- University of St Andrews) have been a participant at many of the conferences over the years and always look forward to my 'spring treat'. It is a pleasure to note that the conference remains a great success. Perhaps this is due to the fact that the talks are taken seriously but the atmosphere within the conference is always friendly. Many of my colleagues from St Andrews have been at these annual meetings which always attract a good number of international participants. Long may the conferences continue!

## 2. Introduction to Groups St Andrews conferences

Both Edmund Robertson and I had been involved with the St Andrews Colloquium of the Edinburgh Mathematical Society in the nineteen-seventies. This was a conference held every four years in St Andrews which was, and is, an excellent holiday town at the seaside with two large beaches, the East Sands and the West Sands and also the world-famous Old Course for golf. The Old Course is one of seven golf courses administered by the St Andrews Links Trust. The format for the EMS St Andrews Colloquia was three or four main speakers each giving an instructional series in the morning of about four lectures on a variety of mathematical topics, a time for holiday activities in the afternoon and an evening social programme (for more details see [5]). I was involved in the Colloquium from 1968 onwards and later was on the EMS St Andrews Colloquium Committee. In 1980 I was the Colloquium Secretary. For the 1972 Colloquium Edmund Robertson and I produced a booklet on 'Walks in St Andrews and Tours from St

Andrews'. This, our first joint activity, led over the years to many mathematical discussions, mathematical arguments but also mathematical research output. We were able to work as a team.



The Old Course, St Andrews

In 1979 Edmund Robertson was visited by his friend and colleague Ian Macdonald and a small group theory meeting was arranged in St Andrews so that we could attend a series of lectures by Joachim Neubüser from RWTH Aachen. After discussion with Joachim a further larger meeting was proposed. 1980 was, as I noted above, the year of a St Andrews Colloquium but we decided to organise a one-week group theory meeting for 1981. We initially invited as main speakers Joachim Neubüser, Sean Tobin and Jim Wiegold, the latter two knowing each other from their time as research students at the Victoria University of Manchester. When it became apparent that a larger than expected meeting was likely to take place, a fourth speaker was added to the list. He was Derek Robinson. Derek was a graduate of St Andrews and, like Ian Macdonald, had been brought up in Montrose, a fishing village on the east coast of Scotland. The 1981 meeting was the first of a series of Groups St Andrews meetings that have taken place every four years since then.

Our main speakers for the 1981 conference were: Joachim Neubüser (Aachen), Derek J S Robinson (Urbana, Champaign), Sean Tobin (Galway) and Jim Wiegold (Cardiff).

The topics of the four series of lectures were:

Neubüser: *An elementary introduction to coset table methods in computational group theory*

Robinson: *Applications of cohomology to the theory of groups*

Tobin: *Groups with exponent four*

Wiegold: *The Schur multiplier: an elementary approach*

In MathSciNet the citations for articles 1, 2 and 4 are 24, 23 and 26. Sean Tobin was of course one of the great organisers and supporters of Groups in Galway. He was also highly involved in Groups St Andrews 1993 in Galway.

Unlike Groups in Galway, which has always been held at NUI Galway, the Groups St Andrews meetings have been held in several venues.

St Andrews Groups St Andrews 1981

St Andrews Groups St Andrews 1985

St Andrews Groups St Andrews 1989

Galway Groups St Andrews 1993

Bath Groups St Andrews 1997

Oxford Groups St Andrews 2001

St Andrews Groups St Andrews 2005

Bath Groups St Andrews 2009

St Andrews Groups St Andrews 2013

Birmingham Groups St Andrews 2017

We provide brief details of the main speakers and participants at the Groups St Andrews conferences.

1981 main speakers:	Germany, Ireland, U.S.A., Wales	
1985 main speakers:	England (2), France, U.S.A. (2)	366 from 43 countries
1989 main speakers:	Canada, England (2), Germany, U.S.S.R.	293 from 37 countries
1993 main speakers:	England, France, Germany, Israel, U.S.A. (2)	285 from 35 countries
1997 main speakers:	Australia, England (2), Israel, U.S.A.	299 from 41 countries
2001 main speakers:	England (2), Hungary, New Zealand, U.S.A.	230 from 35 countries
2005 main speakers:	England, U.S.A. (3)	230 from 37 countries
2009 main speakers:	England, Germany, New Zealand, U.S.A. (2)	about 200
2013 main speakers:	England, France, U.S.A. (2)	just under 200
2017 main speakers:	Belgium, England, Germany, U.S.A.	just over 200

**Note** that in 1989 we had five main speakers because we were very far from certain that Ol'shanskii from the U.S.S.R. would be able to visit St Andrews. Our Principal at St Andrews and the Rector of Moscow State University worked hard to make the visit possible, the visit taking place at a time of heightened tension between the Soviet Union and the U.K. I still vividly remember taking Ol'shanskii to Edinburgh Airport and his emotion on leaving the 'free world'. How times have changed (or have they?).

### 3. Groups in Galway

For the Groups in Galway conferences the table below lists the country of origin of the speakers.

Year	Galway	Rest of Ireland	United Kingdom	Rest of Europe	North America	Rest of world	Total
1978-1981	4	7	3		2		16
1982-1985	10	17	8		1	2	38
1986-1989	5	13	6	3	4	4	35
1990-1993	9	9	9	3	4		34
1994-1997	3	9	11	1	9	3	36
1998-2001	6	4	16	9	4	1	40
2002-2005	7	14	9	9	9		48
2006-2009	4	9	20	9	1	1	44
2010-2013	7	2	16	9	4		38
2014-2017	4	2	11	16	3	2	38

We now provide brief details about the participants at some of the Groups in Galway conferences.

1990 participants 35 countries 7

Ireland (20), England (5), Scotland (3), Germany (2), Italy (2), Canada (2), Bulgaria

1998 participants 39 countries 9

Ireland (17), England (8), Scotland (5), Italy (3), U.S.A. (2), France (1), Greece (1), U.S.S.R. (1), Australia (1)

2000 participants 29 countries 9

Ireland (18), Spain (3), Scotland (2), England, Germany, Greece, New Zealand, U.S.A., Wales

2016 participants 41 countries 6

Ireland (24), England (8), Scotland (5), Spain (2), Italy (1), USSR (1)

2017 participants 54 countries 12

Ireland (29), England (11), Scotland (4), U.S.A. (2), Australia, Belgium, France, Germany, Hungary, Norway, Poland, Spain

In looking at the above information one notes that Groups in Galway was very much designed to serve group theory in Ireland. Over the years we in St Andrews have been represented at many of the Groups in

Galway conferences. Like NUI Galway our mathematics department, although relatively small, did have strength in algebra and group theory. We felt we were outposts of algebra on the fringe of Europe!

#### 4. Publications

For the **Groups in Galway** conference there is a special part of the Bulletin of the Irish Mathematical Society **56** (2005) to mark the retirement of Professor Martin L. Newell. It includes papers from the Proceedings of Groups in Galway 2005. See [1].

From the **Groups St Andrews** conferences we have a series of conference Proceedings published by Cambridge University Press [4]. We list the number of articles by main speakers and other participants after the list of titles.

Groups—St. Andrews 1981. Proceedings of the International Conference on Groups held at the Mathematical Institute, University of St. Andrews, St. Andrews, July 25–August 8, 1981. Edited by Colin M. Campbell and Edmund F. Robertson.

Proceedings of Groups—St. Andrews 1985. Held at the University of St. Andrews, St. Andrews, July 27–August 10, 1985. Edited by E. F. Robertson and C. M. Campbell.

Groups—St. Andrews 1989. Vol. 1. & Vol. 2. Proceedings of the International Conference held at the University of St. Andrews, St. Andrews, July 29–August 12, 1989. Edited by C. M. Campbell and E. F. Robertson.

Groups '93 Galway/St. Andrews. Vol. 1. & Vol. 2. Proceedings of the International Conference held at University College, Galway, August 1–14, 1993. Edited by C. M. Campbell, T. C. Hurley, E. F. Robertson, S. J. Tobin and J. J. Ward.

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Groups St. Andrews 2001 in Oxford. Vol. I. & Vol. 2. Proceedings of the conference held at the University of Oxford, Oxford, August 5–18, 2001. Edited by C. M. Campbell, E. F. Robertson and G. C. Smith.

Groups St. Andrews 2005. Vol. 1. & Vol. 2. Proceedings of the conference held at the University of St. Andrews, St. Andrews, July 30–August 6, 2005. Edited by C. M. Campbell, M. R. Quick, E. F. Robertson and G. C. Smith.

Groups—St. Andrews 1981. Selected papers from the International Conference held at the University of St. Andrews, St. Andrews, July 25–August 8, 1981. Edited by C. M. Campbell and E. F. Robertson. Revised edition.

Groups St Andrews 2009 in Bath. Vol.1 & Vol. 2. Proceedings of the conference held at the University of Bath, Bath, August 1–15, 2009. Edited by C. M. Campbell, M. R. Quick, E. F. Robertson, C. M. Roney-Dougal, G. C. Smith and G. Traustason.

Groups St Andrews 2013. Selected papers from the 9th Conference held at the University of St. Andrews, St. Andrews, August 3–11, 2013. Edited by C. M. Campbell, M. R. Quick, E. F. Robertson, and C. M. Roney-Dougal.

Year	Main speaker articles	Other survey and research articles
1981	4	19
1985	5	32
1989	5	29
1993	6	40
1997	5	52

2001	5	42
2005	4	52
2009	5	32
2013	4	26
2017	3	22

## 5. Gender Distribution

In this section we consider the gender distribution. In the first table we consider the speakers at the Groups in Galway conferences in blocks of four years. For the groups St Andrews conferences we consider the gender balance of the main speakers and also the gender balance of the authors of the other survey and research articles that form a major part of the Proceedings.

### Groups in Galway

Year	Speakers	M/F	Total
1978-1981		15/1	16
1982-1985		37/1	38
1986-1989		33/2	35
1990-1993		33/1	34
1994-1997		33/3	36
1998-2001		36/4	40
2002-2005		41/7	48
2006-2009		31/13	44
2010-2013		31/7	38
2014-2017		34/4	38

### Groups St Andrews

Year	Main speakers M/F Total		Other survey and research article contributors M/F Total	
1981	4/0	4	26/1	27
1985	5/0	5	41/2	43
1989	5/0	5	41/2	43
1993	6/0	6	61/4	65
1997	4/1	5	72/8	80
2001	5/0	5	72/11	83
2005	4/0	4	86/13	99
2009	5/0	5	59/10	69
2013	3/1	4	39/11	50
2017	3/1	4	30/5	35

## 6. Form and role of the conferences

The conference Groups in Galway takes place over two or three days. Initially the conference would start on a Friday afternoon so that participants from other universities in Ireland could easily attend.

Traditionally it ended by the early afternoon on the Saturday so that those at the conference could watch the English football cup final on television! On special occasions the conference lasts for three days rather than the traditional two.

The talks at Groups in Galway vary in length from 30 minutes to one hour. In recent years most talks have been 45 minutes. There are also some poster sessions displaying the work of the graduate students at NUI Galway.

Unlike Groups in Galway, Groups St Andrews is at least a week in length. Although advertised in 1981 as lasting a week, some participants having paid large air fares wished to stay for some days in the second week. This started the tradition of having a two-week conference only shortened in 2005 to an eight day conference because of changing attitudes to the length of a conference.

Groups St Andrews has a variety of talks. At each conference there has been four or five main lecturers each giving a course of three to five lectures. Traditionally these take place in the first week of the conference.

At recent conferences there have also been a certain number of invited speakers each giving a one-hour talk. All participants are invited to speak if they wish so the conferences now have several parallel sessions of seminars.

Additionally there have been special **theme days**:

**1997** Burnside Day, Lyndon Day

**2001** Gorenstein Day

**2009** Engel groups Day, John Cannon and Derek Holt Birthdays. B H Neumann Day

## 7. The mathematics of the conferences

The initial **Groups in Galway conference** had, as one might expect, a considerable amount of finite group theory. Over the years there has been a great variety of mathematics. Our St Andrews interest in computational group theory and the development of the group theory package GAP has been well-represented. Nowadays infinite group theory and various aspects of geometric group theory feature strongly. The topics of Groups in Galway 2018 include: 'Symmetric coverings and the Bruck-Ryser-Chowla theorem', 'The groups of order  $p^nq$ ', 'Reciprocally-weighted external difference families' and 'Using groups to construct combinatorial structures and codes'.

As regards the topics for the **Groups St Andrews conferences**, we were initially very much influenced by the topics chosen by the four main speakers each talking on their specialism: computational group theory, groups with exponent four, the Schur multiplier and applications of cohomology to the theory of groups. We had deliberately stayed clear of the classification problem for finite simple groups. In due course that would change. We invited John Thompson of the classification of finite simple groups fame to speak at the 1989 conference. Reasonably enough he decided to talk on his current research interest 'Galois groups'. Apart from local input we always asked for suggestions and advice for the next conference from the main speakers at the previous conference.

Topics for the main speakers at the 2017 conference were 'Finite simple groups and fusion systems' by Michael Aschbacher, 'Locally compact groups beyond Lie theory' by Pierre-Emmanuel Caprace, 'On characters and  $p$ -blocks of finite simple groups' by Radha Kessar and 'Local-global conjectures' by Gunter Malle. Topics for invited one-hour speakers were 'Simple groups, generation and probabilistic methods', 'Irreducible subgroups of classical groups and related topics', 'Boundaries for  $Out(F_n)$ ', 'On  $l^2$ -Betti numbers and their analogues in positive characteristic' and 'The diameter of the symmetric group: ideas and tools'.

## 8. Groups tourism

The phrase has been coined 'groups tourism'. What have been the tourist delights at the two conferences?



**Groups in Galway** has not organised special outings but, over the years, I have visited many sites of interest in the west of Ireland. Galway City itself is magnificently situated on Galway Bay with the mountains of County Clare in the background. In County Clare there is the famed Burren. I have visited Athlone, Ballinasloe, Limerick, the Connemara coast and the Aran Islands. I have also been on a boat trip from Ashford on Lough Corrib as part of a church group from Belfast at the 'time of the troubles'. (The group were being hosted in Galway by Rex Dark, one of the Galway group theorists.)

As regards '**Groups St Andrews**' tourism we wrote about it in the introduction to the re-issue of Groups St Andrews 1981 which commented on twenty-five years of Groups St Andrews conferences. There we noted that the conference had taken us to a variety of interesting and scenic venues in Scotland, Ireland, England and Wales. Bus trips have included Kellie Castle, Loch Earn and Loch Tay, Falkland Palace and Hill of Tarvit, Crathes Castle and Deeside, Loch Katrine and the Trossachs, House of Dun, Connemara and Kylemore abbey, the Burren and the Cliffs of Moher, Tintern Abbey and the Welsh Valleys, the Roman Baths in Bath, Salisbury Cathedral, the Rufus Stone and the New Forest, Stonehenge, Wells Cathedral and the Cheddar Gorge, Blenheim Palace, Glamis Castle. We have been on boats on Loch Katrine, the Thames, and Galway Bay to the Aran Islands. To this list the 2009 Bath conference has added the Stourhead Gardens and Wells and the Birmingham conference has added Warwick Castle and Stratford-upon-Avon.

In addition to 'groups tourism' both conferences have a conference dinner, rather more formal in the case of Groups St Andrews. (In 1997 in Bath the conference dinner was held in the historic Bath Assembly Rooms.) Both conferences often have a wine reception. Other social events at Groups St Andrews have included music evenings, Scottish country dance evenings, whisky tasting and a visit to Bath races.



River Corrib outside NUI Galway



Galway Bay from Barna



Barna harbour, Galway Bay



The four participants at each of the first ten Groups St Andrews conferences



St Andrews Links



Worcester & Birmingham canal at Birmingham university



Warwick Castle

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