MAGMAG

June 2014

The stunning design of the Kuhn organ installed in the Duke's Hall, Royal Academy of Music, London

# Editorial

Christopher Stanbury

Hello and welcome to the fifth issue of MAG MAG, the newsletter of the Institute of Acoustics' Musical Acoustics Group.

As you will be aware from last month's newsletter, Owen Woods has stepped down from the editor's chair. I've agreed to take his place for the time being and would like to begin my tenure by thanking him for his efforts and for making the previous newsletters such a success.

This issue marks an important milestone for the MAG in its current incarnation. Members will no doubt remember the relaunch conference of the Musical Acoustics Group in London on the 2 July 2013, entitled "*Quires and places where they sing*".

As we are now one year from that event, I am pleased to include details of the forthcoming MAG Annual General Meeting, to be held at our event at the Royal Academy of Music on the 4th July 2014. More information on the AGM and the conference can be found in the Events section of this newsletter.

This month's technical article has kindly been produced by Catherine Ingram at Solent Acoustics, summarising an investigation into the acoustic effect of different violin mutes. I'm sure you will find it a most interesting read.

This month also marked the culmination of Michael Wright's research into the history of the Musical Acoustics Group. Michael chairs the MAG and has kindly agreed to allow some of the results of his research to be used in this edition of MAG MAG. He has also contributed a 'Letter from the Chairman' on page two.

Until next time, I hope this MAG MAG proves interesting and look forward to seeing you at a conference soon!

# Letter from the Chairman

**Michael Wright**

It occurred to me that some people need to be reminded about the superb conferences and meetings that are organised by the IOA with the sterling efforts of the specialist Groups and the priceless work of Linda Canty.

The one day meeting '*The Acoustics of Organs and the buildings in which they are housed*' has taken some 'pushing' to get members to sign up but is now looking to get an encouraging attendance. If anyone has forgotten, this will be held on Friday 4 July 2014 at the Royal Academy of Music, Marylebone Road, London.

Whilst the new IOA website has had criticism from some regarding the 'visibility' of forthcoming meeting notices, this probably reflects the obvious problem that there is only a limited amount of space on the home page! Maybe I am being a bit cynical and I also realise that we all have busy lives. Perhaps the possibility of spending a few extra minutes delving a bit deeper into the site may seem like a deterrent when you are working flat out to meet a deadline!

Nevertheless, it seems that many (not just those in MAG) tend to leave things to the last minute! However, spare a thought to those who are trying to set up these valuable meetings which can help to update and broaden the knowledge of acousticians and perhaps add a bit to their CPD target. The risk that a potentially undersubscribed meeting being cancelled is real and has happened in the past. The MAG has done much to try and address the problem of costs by offering meetings at substantially lower fees than many other IOA meetings. Costs have been a major concern by many members, especially those who are not able to get comp[any sponsorship to attend. The Group intend to work further in this direction in the future. Whilst there may be a need to economise on some of the 'frills' such as delegate packs and lunches, the quality of the presentations will be at the very least, maintained to the high standards expected.

Looking forward to the IOA 40, I thought that it would be appropriate to highlight the papers that should be of interest to many MAG members. Under Musical Acoustics, we have the following seven papers which represent a really broad range of topics which clearly demonstrate that MAG is not simply an 'interest group' as a few people have suggested. We also have some world-class presenters!

Here is the list – more details on the IOA website.

- *Why do brass instruments sound "brassy" ?*
  Murray Campbell, University of Edinburgh

- *Developing and evaluating a hybrid wind instrument excited by a loudspeaker*
  Kurijn Buys, David Sharp, Robin Laney, Open University

- *Motion of the Cello Bridge*
  Ailin Zhang, Jim Woodhouse, Cambridge University

- *Pitch drift in acappella choral singing: the outcomes from an international survey*
  Richard Seaton, David Sharp, Dennis Pim, Open University

- *Applied acoustics for musicians: how to make the space your ally*
  Inès Neuhaus, Fabian Neuhaus, I & F Neuhaus

- *Acoustics and vibration are an intrinsic part of the study of musical instruments*
  Owen Wood, Consultant

- *Interactive performance for musicians with hearing impairments using the vibrotactile mode*
  Carl Hopkins, Saul Mate-Cid, Gary Seiffert, University of Liverpool,Jane Ginsborg, Robert Fulford, Royal Northern College of Music

Musical acoustics has quite a bit of common ground with building acoustics and the following BAG paper will have 'crossover interest' to MAG members:

- *An investigation into the Helmholtz resonators of the Queen Elizabeth Hall, London*
  Raf Orlowski, Christina Higgins, Ramboll UK

The EAG also has significant common ground with MAG and they are also offering:

- *Profiling the distortion characteristics of commercial music using amplitude distribution statistics*
  Alex Wilson, Bruno Fazenda, University of Salford

- *How important is audio quality to usage of online recordings?*
  Trevor Cox, Bruno Fazenda, Iain Jackson, Paul Kendrick, Francis Li, University of Salford

Last but not least, there is the important Keynote and Tyndall Medal lectures. Both of these will highlight the importance of the musical side of acoustics in the design of buildings:

- *Concert hall design: new findings*
  Leo L. Beranek

- *Conservatoires -acoustics and music working together* -
  Stephen Dance, London South Bank University.

I hope to see you there!

# Technical Article

## Bridge-mounted mutes on a violin: A summary

**By Catherine Ingram**

The following is a summary of the study which I undertook for the Project module of the IoA Diploma in Acoustics and Noise Control, submitted in October 2013 (full title, 'Effect of bridge-mounted mutes on level and spectral output of a violin)'.

Bridge-mounted mutes may be used by players of the violin family of instruments to reduce the sound power level of the instrument. They may be used in performance to achieve a certain timbre, and heavier practice mutes are also popular with players who wish to practise without causing a disturbance to others.

Four bridge-mounted mutes were examined in this study, with analysis of their effect on the level of harmonics of bowed open strings.

*Fig. 1 – The mutes under test.*
*Images not to scale.*

The mutes under test in this study were, from left to right:

*Tourte mute* – Lightweight rubber mute (1.9g), which can be kept on the strings below the bridge when not in use. This mute offers a noticeable reduction in level, but does not aggressively change the timbre of the instrument.

*Ebony trident mute* – Lightweight mute (5.5g), which pinches the bridge between the strings. Offers a noticeable reduction in level, and a reduction in some of the higher overtones of the instrument.

*Rubber practice mute* - A heavy rubber mute (14.6g), which fully covers the top of the bridge. Very effective at reducing the level for practice, but changes the timbre considerably. Produces a somewhat nasal or 'boxy' sound.

*Tonwolf metal mute* – A heavy metal prong mute (33.8g), which pinches the bridge between the strings. A heavy metal cylinder on the top adds to its mass. This mute extends above the bridge, by around 2cm. It is very effective as a practice mute, producing a thin timbre, akin to playing a silent or electric violin.

Other mutes are certainly available, and other DIY muting methods are popular, such as a clothes peg on the bridge - cost effective, if not aesthetic! The above selection represents a sample of the materials and shapes of mute in use. The violin on which the mutes were analysed was a full-size student violin (Stentor II), favoured as a teaching instrument and popular for beginner players.

The violin was suspended by means of strings attaching the scroll and pin to a frame, to minimise damping effects on the body of the instrument. Chin and shoulder rests were removed. The violin was hand-bowed for the measurements; although vibration of the instrument by means of an electromagnetic shaker or impact hammer can be useful in studying the performance of plates or body resonances of the instrument, it was necessary for this study that the initial excitation of the instrument was from the top of the bridge, and with harmonics corresponding to the overtones of a bowed string. The varying shapes of the mutes made applying a shaker to the top of the bridge infeasible.

A microphone was placed 0.5m from the top of the bridge, and perpendicular to the body of the violin. A number of sound samples were recorded onto a digital recorder. A spectral analysis was carried out on each sample, using the Hanning windowing function and a sample size of 65536 points, to achieve the best frequency resolution and amplitude accuracy available. 15 recordings were analysed for each string and mute combination, as well as an unmuted set for comparison – a total of 300 recordings – and the average sound pressure level for each set calculated in a spreadsheet. By taking the average spectrum of each string with the mutes applied, and subtracting these from the spectra of the umuted strings, the attenuation of the mutes could be plotted for each string (see figures 2-5).

There was a clear relationship between the attenuation offered by the mutes on the three lowest (G, D and A) strings, and the mass of the mutes. The metal Tonwolf mute, the heaviest at 33.84 grams, offered the most attenuation, based on analysis of the reduction in level of the first ten harmonics of each string. This was followed by the rubber practice mute, the ebony mute, and finally the lightest, the Tourte mute, offered only a light attenuation. The top E string does not follow such a clear pattern – some attenuation is offered by the Tonwolf mute and, to a lesser degree, the Tourte mute, but the rubber practice mute makes little difference to this string, and the ebony mute augments the overall level on this string, and the fundamental in particular is 14.8dB higher with the ebony mute in place than unmuted!

It is interesting to note that the ebony and tourte mutes do not reduce the level of the fundamental, and in fact increase it, on all four strings. It seems that where patterns in performance of the mutes emerge in the results, they were more closely related to the absolute frequency of the harmonic than the order of the harmonics – and certain characteristics of the mutes were present on all strings, regardless of the harmonic components of the bowed open string.

The following graphs show the performance of the four mutes compared (each graph represents one string) up to 700Hz.The horizontal axes are labelled where there are features of interest, and/or harmonics.

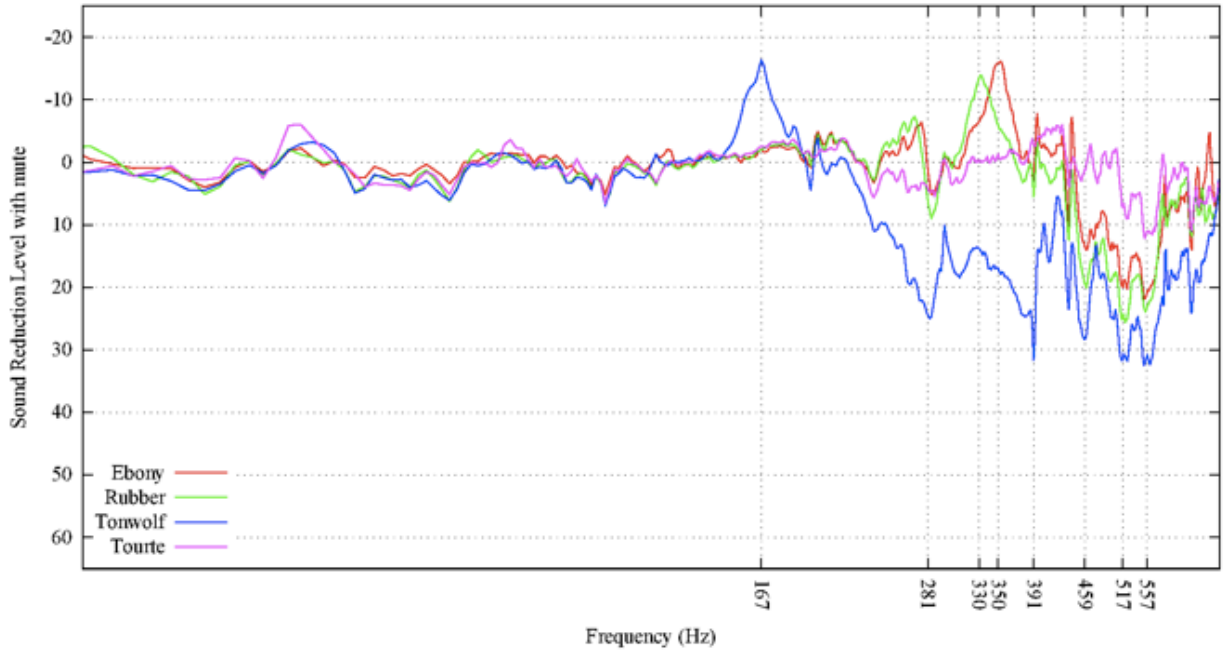



*Fig. 2 – Sound level reduction by mute up to 700Hz – open G string(G3, 196Hz)*

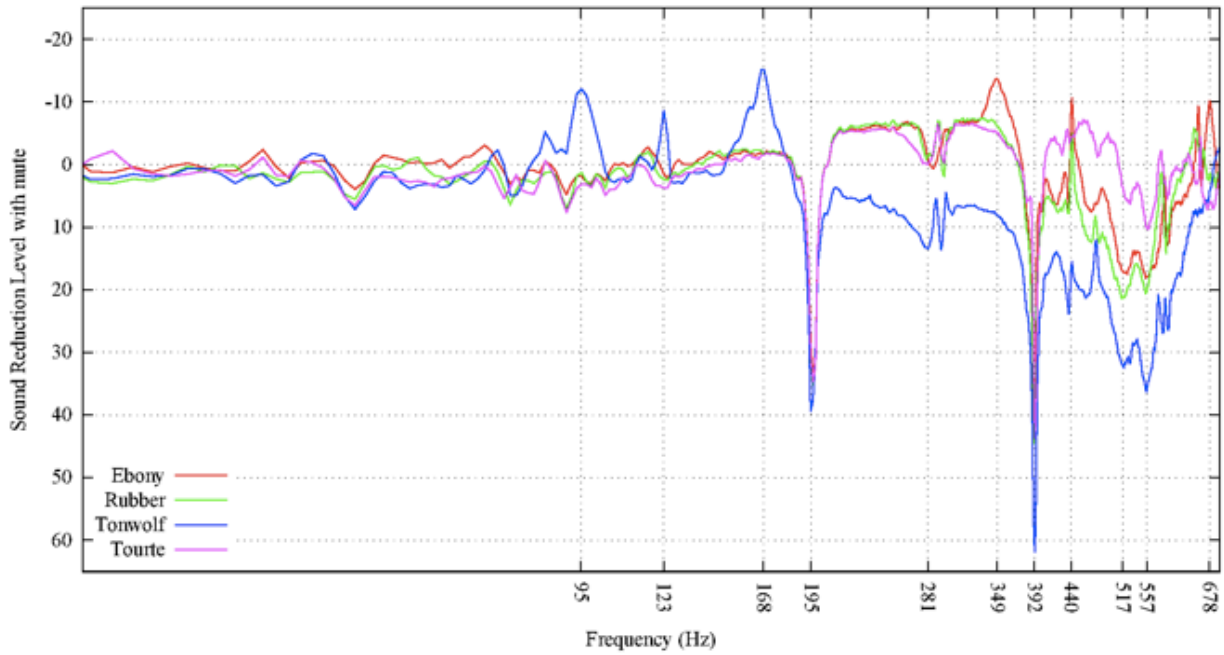



*Fig.3 – Sound level reduction by mute up to 700Hz – open D string(D4, 294Hz)*

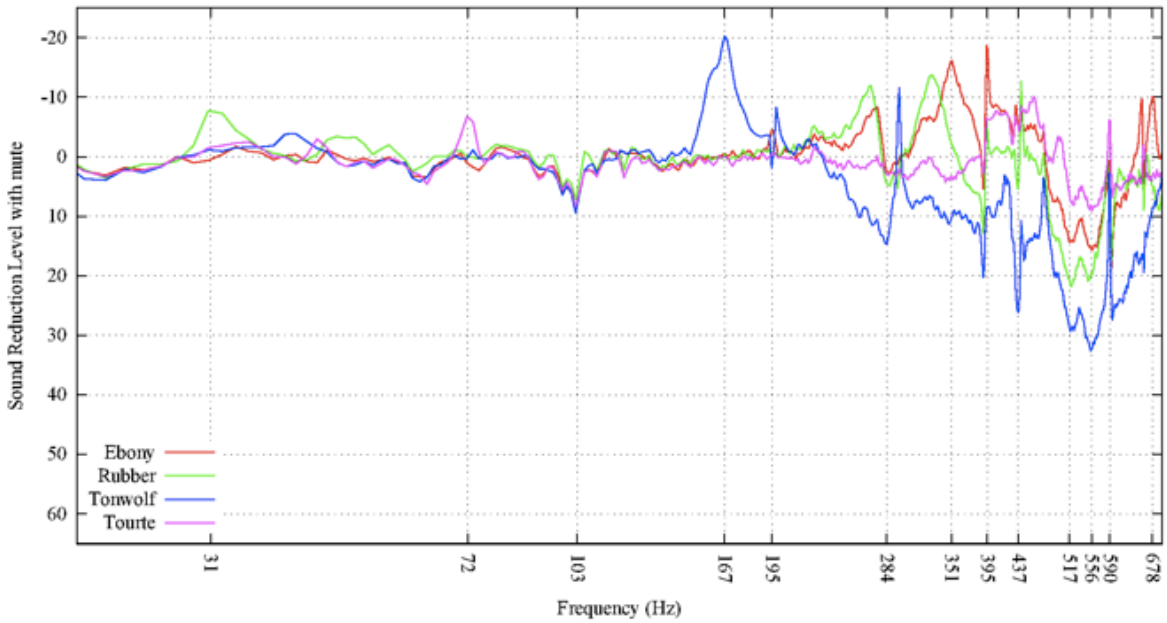



*Fig. 4 – Sound level reduction by mute up to 700Hz – open A string(A4, 440Hz)*

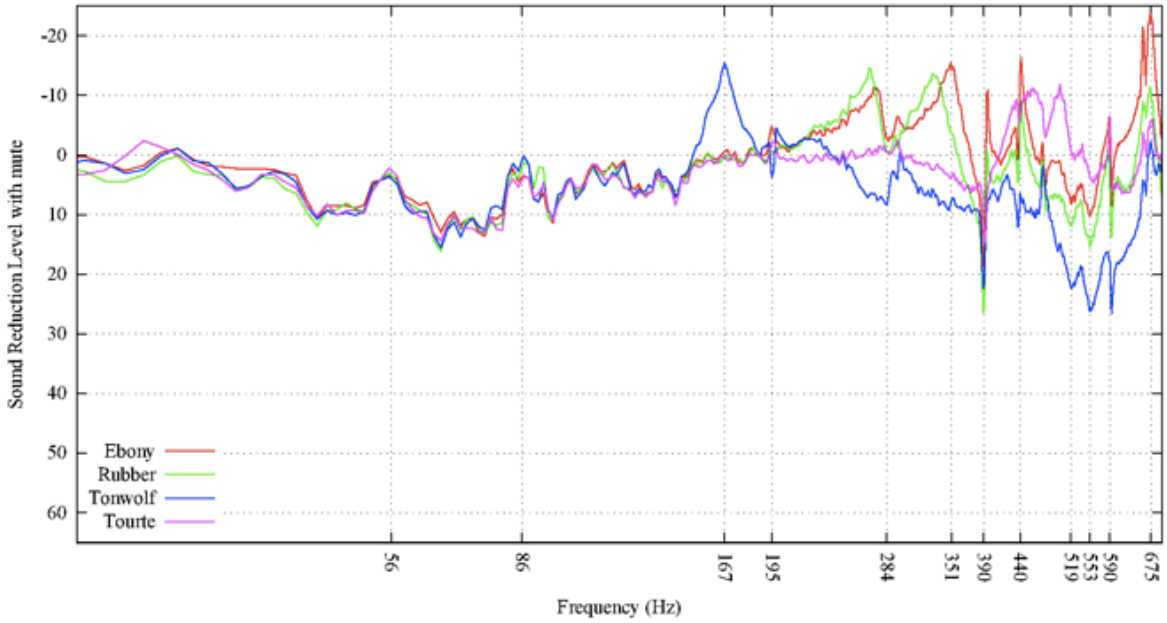



*Fig. 5 – Sound level reduction by mute up to 700Hz – open E string(E5, 659Hz)*

This article is a brief summary of the full project report. If you'd like to know more, or if you have any questions or additions, please do get in touch - catherine.ingram@solent.ac.uk

# A Short History of the IoA Musical Acoustics Group

**Summarised by Christopher Stanbury from original research by Michael Wright**

**1947** - The Physical Society Acoustics Group was formed and regular Science Meetings were held.

**1950** - *Wave Motion and Sound* published by by R W B Stephens, a leading member of the Group (later the founding member of the British Acoustical Society and the first president of the Institute of Acoustics).

**1951** - A meeting held at the RIBA at Portland Place, 'Musical and Acoustical Aspects of the Festival Hall Organ' attracted an attendance of 400+

**1960** - The Physical Society merges with the Institute of Physics.

**1971** - Prof. Charles Taylor (Cardiff University) presents the Royal Institution Christmas Lectures on acoustics and music.

**1974** - The Institute of Acoustics is formed. The first Annual report mentions that the Council has agreed to support the formation of a limited number of specialist groups. 'The first group to be approved is the Aerodynamic Noise Group, which was a successful group of the former British Acoustical Society. A new group on Underwater Acoustics is under consideration and some members expressed an interest in forming a group on Musical Acoustics.'

**1975** - The Musical Acoustics Group (MAG) is formed. Dr John Bowsher, a founder and current member of the MAG was elected Chair, a position he held until 1981.

**1976** - Membership of the MAG is 'around 40'. The group's first meeting was held at the London College of Furniture. The meeting 'covered subjects as varied as musical string technology, differences in sound quality between horn player, and the electronic solo keyboard instrument of the late Mr K A Macfadyen', author of 'Physics Laboratory Handbook' (1970). The MAG newsletter is published and a later Autumn conference is held in Edinburgh.

**1977** saw the membership of the MAG increasing to 51. The newsletter circulated two editions and there was a visit to the Boosey and Hawkes brass instrument factory, in Edgware, North London.

**1978** - MAG visit to the instrument-making workshop founded by Arnold Dolmetsch in Haslemere, Surrey. Autumn Meeting at Aston University in collaboration with the Building Acoustics Group. This included a major, and most successful session on 'Halls for music from the performers' point of view'.

**1981**- Musical Acoustics sessions are held at the Spring Conference held at Newcastle University, Tyne and Wear. This event included thirteen papers on a range of topics and owed much of its success to the efforts of the Group Chairman, Dr John Bowsher.

**1982** - Visit to the BBC Radiophonic Workshop, founded in 1958 and well known for its pioneering development of electronic music and special audio effects such as the 'Dr Who' theme.

**1983** - Visit to QUAD hi-fi audio manufacturers. Peter Walker (MD) gave an excellent demonstration of some of the finer points of stereo reproduction, including that from the new Compact Disc.

**1984** - Professor Taylor retired as Chairman and Dr Brown took over with Dr Zarek becoming the Secretary and Mr Pamplin as treasurer. The visits programme continued with the visit to the (National) Musical Museum at Kew, Brentford and the organ works of Henry Willis and Sons. MAG also collaborated with the Electro-acoustic Music Association of Great Britain (formally EMAS) founded in 1979 and the Institute of Musical Instrument Technology in a joint meeting on Electro-Acoustics and music. The delegates were honoured by the presence of Professor Zavier Rodet of Institute for Research and Coordination in Acoustics/Music (IRCAM) in Paris who spoke on the synthesis of the singing voice.

**1992** - MAG now chaired by Dr Bernard Richardson from the Physics and Astronomy Department, College of Cardiff (now University of Cardiff) with Dr Jennifer Zarek remaining as Secretary. Membership of the MAG significantly increased to 138 .

**1994** - MAG membership declined slightly to 130 and the Annual Report contained a rather stark message 'that it had not been active that year' and that 'members interested in becoming involved in regenerating the Group's activities should contact Headquarters.' However, it was encouraging to note that the London Branch helped to keep things going by holding

an interesting meeting at the Royal Academy of Music in London featuring the recently refurbished Dukes Hall including the new a two manual organ by J.L. van den Heuvel.

**1996 - 1998** - Despite a continuing programme of activities, Annual Reports showed a continued fall in membership of the Group to 94 in 1998. However, there were indications of a revival taking place thanks to the efforts of Dr Peter Dobbins, now elected Chair of the Group. Involvement in ISMA'97 – the International Symposium on Musical Acoustics, a major annual event held at the University of Edinburgh at the time of the Festival in August contributed to this revival. This event was organised by the University with the IOA, the Catgut Acoustical Society and the European Acoustics Association. This event included over 100 papers and attracted 150 participants. The event was the main activity and the efforts of Dr Murray Campbell founder of the Musical Acoustics Research Group at Edinburgh and Dr Bernard Richardson were also noted.

**1999** - Despite a further small decline in membership to 90, the efforts of the Group continued. The project of the year was an Industry Focus Meeting on Musical Acoustics, funded by the Engineering and Physical Sciences Research Council (EPSRC) formed by Royal Charter in 1994. This major meeting 'Making Good Musical Instruments: Can Acoustics Help?' at the University of Edinburgh was aimed at bringing representatives from industry and academia together.

**2004** - A successful application was made to the EPSRC for a UK Musical Acoustics Research Network under the culture and Creativity Programme, led by Dr Murray Campbell.

**2013** - MAG relaunches with a new committee. At the AGM the Committee formed with Mike Wright (Chair) David Sharp (Secretary), Lisa Greenhalgh (Young Member Representative) and, Chris Turner, Murray Campbell, Owen Woods and David Howard. Chris Stanbury and Christina Higgins were later co-opted to the committee. The quarterly e-newsletter 'MAG MAG, appeared in June with Mike Wright kicking off the first edition, Owen Woods taking the next 3 issues and Christopher Stanbury set for issues 5 and 6. MAG MAG is now accessible on the IOA website.

As a result of the recent dormancy and attempt at revival, a survey of members was carried out amongst its members and it became as to their aspirations. The fact that the Group Committee now includes Murray Campbell and David Sharp may have attracted some members from the Musical Acoustics Network.

**2014** - MAG combines forces with the IoA Southern Branch with a lively half day meeting at Brighton - Acoustic Soundscapes which included Professor Trevor Cox's talent on an alto saxophone in some incredibly reverberant locations. In March, a one-day meeting was held at Media City, Salford in conjunction with the EAG, Professor Trevor Cox and the University of Salford on the influence of recording techniques on musical composition, interpretation, performance and appreciation. Contributors from wide backgrounds also included Professors Murray Campbell, Patrick Gaydecki, Mark Plumbley, Dr Bruce Wiggins and Dr Rob Toulson. The main MAG meeting is set for July at the Royal Academy of Music on 'Acoustics of Organs and the buildings in which they are housed'. This was chosen after a new organ, built by Orgelbau Kuhn, was installed in the Duke's Hall to replace the instrument that was installed some 20 years earlier (see above). Ambitious plans are set for the IOA 40th Conference in October. Local branch meetings featuring musical acoustics are well attended. Further meetings are being planned well into 2015 in a continued effort to stem the mistaken view by some acousticians and others that musical acoustics is simply 'an interest subject'.

## Picture on the cover..

The picture on the front cover of this edition of the MAG MAG is of the new Orgelbau Kuhn instrument installed in the Duke's Hall of the Royal Academy of Music.

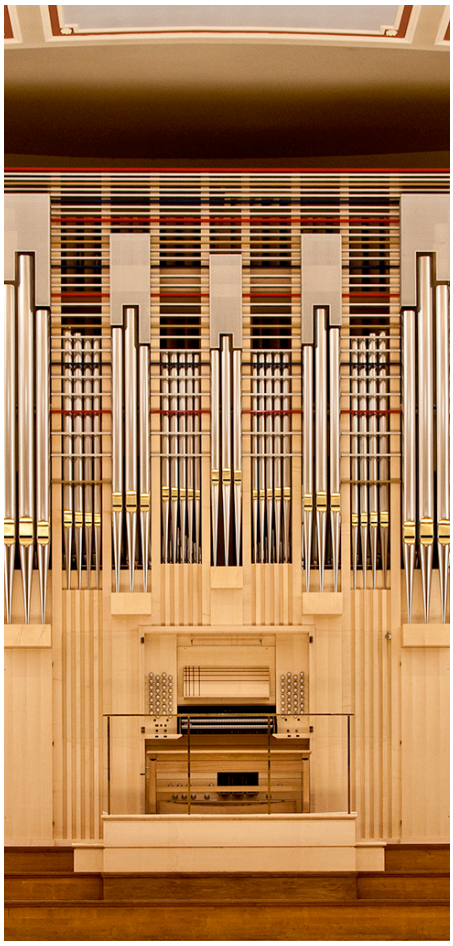
The Duke's Hall is the venue for the MAG's July 4th one-day meeting, *The Acoustics of Organs and the buildings in which they are housed*. This event will include the AGM of the Musical Acoustics Group.

## Last Word..

Lastly, I would warmly welcome any submissions from interested parties or members to be used in the next issue of our newsletter. The subject matter can be entirely up to you, the more diverse the better! Don't forget that, as this publication is published electronically, it is an ideal opportunity to link technical articles with sound recordings, video demonstrations etc and it is my intention to gradually build the MAG MAG's technical content over the next few months.

Please email any articles for publication to christopher.stanbury@btopenworld.com.

Copy deadline: 25 August 2014



Orgelbau Kuhn, RAM

FORTHCOMING MAG EVENTS...

## 2014

**July 4** - *The Acoustics of Organs and the buildings in which they are housed*, Duke's Hall, Royal Academy of Music.

**15th October /16th October** - *IOA 40th Anniversary Conference*. This event will include two sessions on Musical Acoustics. Venue: Gallery Suites, Birmingham B40 1NT

## 2015

**Advance Notice!**

**28-30th September** *MAG/Galpin Society Joint Conference at Cambridge*. This will be a 3.5-day joint conference which will be held at the University of Cambridge Music Department.

Further details will be announced in due course and the title of the conference is yet to be decided. We are currently seeking volunteers who would be interested to help with the technical liaison and accounts management. Please contact Mike Wright michaelwright946@btinternet.com in the first instance.