
MAG MAG Issue 2

September 2013



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Editorial

Hello everybody and welcome to the second issue of MAG MAG, the newsletter of the Institute of Acoustics Musical Acoustics Group. My name is Owen Woods and I am the editor of this publication. As many of you will know, this is a new venture for the current MAG committee, so please do write and tell us what you like and dislike about this issue. With feedback we can improve and consistently deliver something which is of value to our members. I am very new to this game, as you can probably tell, so please bear with me as the formatting is gradually tweaked over the next few issues.

If you have anything which you think would be of interest to your fellow members then please email me on ukebert@googlemail.com. I would welcome any contribution, however small. This newsletter will only be as good as its content and that will be decided by you, the readers.

At this point I would like to pay tribute to MAG MAG's erstwhile predecessor, *Notes*. Peter Dobbins, the former Chair of this group did a sterling job and we hope that we will be able to continue where he left off. In particular, to provide some continuity between the two publications, I have decided to continue the "Picture on the cover" feature of *Notes* in MAG MAG.

This newsletter will be published quarterly, in March, June, September and December. The deadline for submissions for the Christmas Issue will be the **8th December 2013**.

MAG News

This section is devoted to what we in the group are up to. If you have any MAG related news that you would like to share with us then please contact the editor.

A one day meeting was held on the 2nd July 2013 on "Acoustic Challenges in Quires and Places Where They Sing" which was an enormous success. For a more detailed write-up of this event please see page 6.

Committee

At the MAG AGM on the 2nd July 2013, a new committee was elected, the first for five years. This committee will serve until the next AGM in 2014. The new MAG committee is as follows:

Michael Wright (Independent Consultant) - Chair

David Sharp (Open University) - Secretary

Murray Campbell (University of Edinburgh)

Lisa Greenhalgh (Atkins Acoustics)

Christina Higgings (Adnit Acoustics)

David Howard (University of York)

Stephen Parker (hurleypalmerflatt)

Chris Stanbury (University of West London)

Chris Turner (Adnit Acoustics)

Owen Woods (SRL Technical Services)

Questionnaire

We have sent out an online questionnaire to all our members to see what you would like from this group. Questions will range from what aspects of Musical Acoustics you are interested in, to what kind of meetings you would like and when you would like to have them. Please do complete this questionnaire, as without your input we can't run the group in your interests.

Events

This section is for relevant events to group members, either devoted to Musical Acoustics or containing a significant Musical Acoustics component. If you would like to see your event listed here then please get in touch with the editor.

MAG Events

Following on from our very successful one day meeting in July, we are busy organising a range of events over the next two years. More details will follow in later issues, as they develop. In addition to large scale national events, we are also developing links with local groups. The first event that I can announce is one such local event in Exeter. It will be repeated in Bristol in 2014.

Video Games and the Right Temperament - Wednesday 23 October at 18:30

SW Branch in collaboration with the Musical Acoustics Group

Dan Pope: Calling Cthulhu: A study of the sound design process for the video game Call of Cthulhu: The Wasted Land

Dan will talk, and play audio examples, covering his experience in providing the music and sound design for this game. How do you create antique artillery noises without shooting people? How do you create an atmosphere of spiralling insanity? What sound does "The Spider of Leng" make? Find out the answers to all these questions and more.

Mike Wright: What is the Right Temperament in Music?

The Western European 'classical music' convention uses a 12 note scale. Instruments supposedly tuned to 'equal temperament'. However, this was rarely achieved in practice until the 20th century. Even today, it is not found where there is an absence of fixed pitch instruments such as a piano. How does this affect music and its performance? Mike will demonstrate with audio samples and illustrate with musical examples.

This event will be held at:

**The Octagon
2nd floor, Pynes Hill Court
Rydon Lane
Exeter
EX2 5AZ**

Other Events and Calls for Papers

In this section will appear details of events of interest to MAG members and Calls for Papers. If you know of any relevant conferences which do not appear in this section then please get in touch.

Second International Bagpipe Conference - 8th March 2014, Senate House, London

Perhaps one which will only be of interest to those (like myself) who have a fascination with organology, musical technique and ethnomusicology alongside acoustics. Any papers on musical acoustics related to bagpipes would be welcome. Deadline for abstracts is the first of December 2013. For more information see the conference website here:

<http://internationalbagpipeorganisation.wordpress.com/>

International Symposium on Musical Acoustics (ISMA) - 7th-12th July 2014, Le Mans, France

Call for papers was due to open on the first of this month, however at the time of publication nothing had appeared on their website. The deadline for abstracts will be the first of January 2014. For more information please see their website here:

<http://isma.univ-lemans.fr/en/index.html>

Featured Article

This section is for articles on aspects of Musical Acoustics by our members. If you would like to write an article for the next issue, please email the editor.

Acoustic Challenges in Quires and places where they sing

The Chair writes:

"Many, many thanks to you 'movers and shakers' who are just as keen as I am to revitalise the MAG. The first one-day meeting held for more than 5 years, 'Acoustic Challenges in Quires and Places Where They Sing' at Friends House, Euston Road, London on Tuesday 2 July 2013 was promising start. With an attendance of 30, the meeting really proved that there is a real need for more."



I have asked the contributors on the day to provide me with a short piece on their paper, which I am delighted to say that they have done. You can find them below.

Conservatoires – Acoustics and Music working together

This presentation summarised a collaboration between music and acoustics to address the new Control of Noise at Work Regulations. By working closely with the Royal Academy of Music over the past six years it has been possible to tackle this challenging problem. Firstly, by increasing awareness of the risk of hearing damage to classical musicians through educational seminars as held during Fresher's Week. Then all new students must undergo health surveillance building an audiometric database of 1900 hundred individuals. Thirdly, noise exposure measurements are

undertaken for solo playing, sections and orchestral rehearsals in a variety of venues to gauge those students most at risk. Finally, cultural acceptable solutions have been designed, tested and piloted to allow easy of music exposure monitoring, Audio3 SoundBadge; reduce music exposure during solo practice, the Musical Mirror; and zero footprint acoustic screens tuneable to each instrument in the orchestra. The research is ongoing as the problem is more complex than initially thought!

Stephen Dance, London South Bank University (presented by Bridget Shields)

Interaction between music, acoustics, and architecture in renaissance churches in Venice

The presentation to the Institute of Acoustics described a unique research project carried out by the University of Cambridge over the last five years. The outstanding feature of this project is that equal emphasis was placed on each of three key disciplines namely, architectural history, musicology and acoustics. The main questions that the study addressed are: "How far did architects consider acoustic needs when designing new churches in Renaissance Venice" and "How far did composers take account of the acoustics of church interiors when writing sacred music".

Renaissance Venice is particularly relevant to this study because there was a remarkable flowering of architecture and music there in the sixteenth century. At the Basilica San Marco there were outstanding developments in musical composition such as *coro spezzato* (split choirs) by composers such as Adrian Willaert, Andrea and Giovanni Gabrieli and Claudio Monteverdi. There was also great innovation in the design of churches by eminent architects of the time such as Andrea Palladio and Jacopo Sansovino.

Eleven Renaissance churches in Venice were selected for the study and the research team was fortunate in securing the services of the choir of St John's

College, Cambridge who spent a week singing music of the period in each church in turn. This permitted a detailed subjective analysis of the acoustics of each church by means of questionnaires completed by both experienced listeners and public attendees. The results of this analysis were complemented by comprehensive objective room acoustic measurements which correlated well with the subjective results.

One of the conclusions reached is that there is evidence that the architect Sansovino collaborated with the composer Willaert to enhance the acoustic quality for choral music, particularly in those areas of churches occupied by the most important members of the congregation. By contrast, Palladio designed highly reverberant churches although when they were used for special occasions with a full congregation and decked out with drapes and banners, they became more suited to the polyphonic music of the period.

Note: A full description of the project is published in the book "Sound and Space in Renaissance Venice" by Deborah Howard and Laura Moretti. Musical tracks that illustrate the book can be found in MP3 format at www.yalebooks.co.uk/soundandspace

Raf Orłowski, Ramboll Acoustics

Editor's note: Those interested in this research may be interested to know that it is published in *Acoustics in Practice* - see the Resources section on page 15.

Learning modern acoustical design from traditional choir venues

Since the birth of modern acoustical science at the beginning of the 20th century, acousticians have avoided concave focusing geometries. This despite the fact that the buildings choirs have sung in for centuries have concave barrel vaulted ceilings or domes or both. New mathematics and, just as importantly, the

software that makes the mathematics accessible, is revolutionising modern acoustical thought. Non-uniform Rational B-splines (NURBS) now allow acousticians to calculate reflections off of curved surfaces whereas previously, they could only be calculated off of flat surfaces. If one was dealing with a curved surface it

had to be broken down into a series of contiguous flat surfaces; a procedure prone to inaccuracy. This paper uses NURBS to study the acoustics of a church that the author has sung in for 20 years, including its barrel vaulted ceiling. Other conceptual rooms have also been studied, with an aim to learn from traditional building geometries that have been

abandoned for more than a century. A copy of the transcript used in the presentation at the "Acoustic Challenges in Quires and places where they sing" symposium has been posted on the Akutek website and may be found at: http://www.akutek.info/Papers/JO_Chair_NURBs.pdf

John O'Keefe, Aeroustics Engineering, Canada

Singing and space – a study of choral singers and perceptions of auditorium acoustics

This study set out to explore the relationship between singers and the spaces into which they sing.

A survey was undertaken to determine the acoustic preferences of a semi-professional choral group, Anuna, following performances at church, theatre and concert hall venues in Ireland, Holland, Belgium and China.

Questionnaires were designed to address specific musical acoustic parameters used in the evaluation and design of concert venues.

Two data sets were derived: one subjective, made up of coded data from singers' survey responses, and one objective, made up of measured and post-processed acoustical and architectural data.

Statistical analyses revealed moderately strong relationships between particular

objective (acoustic/architectural) and subjective (musical) parameters. Although many of the existing measures have been developed from studies with orchestral music, these relationships were largely in line with the findings of previous work in the area. Singers' evaluations were most strongly determined by perceptions of liveness, loudness, warmth, and brilliance, and the associated acoustical measures RT / EDT, G_{mid} and G_{late} . Discrepancies were noted between more specific parameters, such as stage support (ST1) and clarity (C_{80}), and their presumptive corresponding judgments.

It was concluded that singers' judgments were likely influenced by both acoustic and non-acoustic factors (e.g. visual impact), but that the key universal acoustic parameters can be useful predictors of a venue's suitability for choral performance.

Shane Sugrue, London South Bank University

Problems with concerts of unamplified music in cathedral-type spaces

Problems with musical clarity are well known in large church spaces and the cause is often attributed to a long reverberation time. While this is relevant, the fact that the audience is on a flat floor was also found to be significant. A computer simulation model study of Bath Abbey has been undertaken as used for unamplified concerts. Grazing incidence attenuation data measured by Mommertz

(Acustica 79, 42-52 (1993)) was used to specify the transparencies of semi-transparent screens in the model. Several possible remedial measures were tested, such as the effect of raising the stage. The only measure which really improved listening conditions for the whole audience in the nave was the introduction of suspended reflectors. These would provide additional early reflections which

did not suffer from grazing incidence effects. The problem of flat floors exists in nearly all large older churches used for concerts. Reflectors could be made of

thick plastic sheeting, but installing fixing points for their support might be problematic in historical churches.

Mike Barron, Fleming & Barron

Investigating singing performance in different acoustic environments in the virtual singing studio

Auralisation traditionally uses anechoic sound sources which are then convolved with computed or measured room impulse responses in order to (re-)create a musical performance in a space. However, recordings made in anechoic rooms are very often compromised in terms of the musical performance since musicians generally, and singers in particular, adapt their output to the acoustic characteristics of the environment in which they are performing. This talk described a novel

“Virtual Singing Studio” developed in the AudioLab, University of York which allows a singer to perform in the dry acoustics of the lab, but hear themselves (in real-time) in a real performance venue. Initial objective and subjective evaluation results were presented – professional singers who have used the system report that the simulated performance space is highly plausible and offers potential as a rehearsal/training tool.

Jude Brereton, Damian Murphy, David Howard, University of York

Intonation drift in a capella SATB quartet singing

When choirs sing unaccompanied, or a *cappella*, the tuning between the parts is left to the discretion of the singers themselves since there is no accompaniment. The tendency is for the parts to tune their fundamental frequencies in integer ratios. A keyboard cannot be tuned like this if octaves with 2:1 frequency ratios are to be preserved. The result of this is that choral music that modulates in key will tend to exhibit an overall drift in pitch. This drift can be

calculated and examples were shown for a number of different pieces of choral music. A specially composed exercise demonstrated the drift conclusively even with a quartet of final-year singing students, where four electrolyngographs (these monitor vocal fold vibration directly using an RF signal via neck electrodes) were used to avoid acoustic breakthrough. The next steps involve testing what choirs do in performance.

David M Howard, University of York

Editor’s Note - Interested readers will doubtless wish to read the first open letter to the MAG on page 11, which is on this subject.

21st Century Organ Technology: The King is Dead - Long Live the King!

The design of a modern pipe organ is the culmination of over 500 years of technological development. Every element of the design of an pipe organ can be

shown to have been modified over time. The keyboard, pedalboard, tonal variety, expressive capability and an every-increasing array of functions on

today's instruments are all results of the application of new technology.

The past decade has brought about the latest technological advance, that of instrument virtualisation. Advances in computer processor speeds and the decreasing cost of memory storage media have facilitated the development of software-based, virtual organs. Such instruments do not use pipes but generate the sound of a pipe organ by means of replayed recordings, or "samples" of each pipe. These samples are switched on and off by means of a musical keyboard connected to a host computer. Each sample is stored on the hard disk of the host computer as part of a set, with each set requiring at least 20 Gb of storage space.

Software instruments employ advanced sound sampling techniques such as extended sample length, key-on and key-off sampling and multiple samples per note. This enables a very high-quality reproduction that is in some cases better

than specifically-designed electronic instruments. Long sample lengths, combined with auralisation software such as convolution reverb are also able to preserve the unique acoustic properties of the sampled instrument i.e. the acoustic decay of each pipe in order to provide a more realistic response.

These computer-based instruments have been introduced into churches and are often used in combination with a pre-existing pipe instrument with a modified organ console fitted with MIDI capabilities. This combination proves an effective, relatively maintenance-free way to augment the tonal capabilities of an organ installation. The use of a software instrument linked to a MIDI console also offers greater musical potential, such as the use of historic tuning and the ability to load many different combinations of sampled organ "sets" immediately. This offers an almost unlimited potential for tonal variation, adding an extra dimension to the pre-existing pipe instrument.

Christopher Stanbury, University of West London



Thanks to Raf Orłowski for permitting us to use this image.

Letters

This section is for open letters to the group, on any subject which you think merits discussion. If you wish to write to the group for the next issue, please contact the editor.

Dear MAG,

Pitch drift in a cappella choral singing – a PhD research project at the Open University – needs your help!

No doubt you have experienced times when your choir struggles to maintain the pitch when singing unaccompanied. In many circumstances the change passes unnoticed by the audience, if not by you, but the fact that it happens is always of concern. This research project focuses on possible causes of pitch drift other than those due to the music itself. This aspect was presented at the IOA Musical Acoustics Group July Meeting by Prof David Howard, from the University of York, with whom we are collaborating.

In order to establish some of the most likely reasons why pitch drift occurs the project needs to survey your opinions. To do this could you please complete a short questionnaire? The outcomes of the survey, which will be completely

anonymous, will inform a set of experiments. These will be undertaken with selected choirs over an extended period in their usual rehearsal venues.

Please go to <http://acoustics.open.ac.uk/pitchdrift> to access the survey. It will only take a few minutes and may be completed anonymously if you wish. However, if you want to be kept informed about the project and its progress you are very welcome to register your interest. If you would like further information about the project please email the research team at pitch-drift@open.ac.uk.

The researchers will take the opportunity to feed back their findings at appropriate points in the progress of the project.

*Richard Seaton, PhD student at The Open University
Dr. Dennis Pim, lead supervisor at The Open University
Dr. David Sharp, supervisor at The Open University*

Dear MAG,

SUSTAIN – a wider musical term?

We are delighted that the Institute of Acoustics has given backing to an initiative to explore more support for sustainable design. Peter Rogers and I are leading enquiry into how this can be best achieved.

The clumsy word 'sustainability' has become embedded in so many of our design objectives, and has been used as a

catch phrase by politicians. Combined with the zeal of the pioneers in adjusting our priorities, the word has been off-putting to the engagement of many. Getting past this and focussing on what we need to do, to look after current and future generations, has taken time and can now be considered mainstream. The interest in what it means to acousticians is also

gaining momentum. There have been several IOA meetings focusing on sustainability, which have identified that there are many facets to this subject area, some obvious, some subtle and that further work is needed to share our learning with acousticians to support the applications of the principles in practice. Some of the most significant issues for practitioners and researchers in the many fields of acoustics to consider are:

- b Focussing on ways to enhance human well being e.g. music, health, inclusion
- b Collaborating with other disciplines in the restraint on energy use
- b More care in choosing, reducing and re-using materials
- b Carrying on the efforts to reduce noise and vibration pollution
- b Attention to survival, health and wellbeing of ecology (underwater and on land)
- b Using positive sound for improving health and social cohesion.
- b Expanding the idea of soundscaping to include sound fields across the different environments (including inside buildings).
- b Using sound and vibration energy to communicate more effectively
- b Measuring the subjective impacts and positive effects on people and other species, as much as the objective physical parameters
- b Finding ways to communicate how good acoustic design can bring environmental, economic and social benefit, without compromising the next generation.
- b Providing guidance on how acousticians can implement advice that is evidence based in relation to this area, and support good governance through their actions.

In view of the importance of the subject, and because there is so much to learn,(which will take some time), as noted in the March/April Bulletin, the Institute has decide to support the formation of our small Task Force devoted to explore this area, with a view to making proposals back to Council in late Autumn.

There is already plenty of activity in the IOA's Specialist Groups and Branches, including MAG, which relates well to a commitment to sustaining our society, our fellow creatures and our environment. At the same time, there remains enormous potential to provide (a) better support for this, and (b) better collaboration with non-acousticians to widen our approach e.g. with joint meetings on an holistic approach to the many issues we touch.

And so – where do we stand with MAG? Although an appreciation of the joys of music, and ability for it to change our emotional state, is widespread, we all need to learn more about the position of music in sustainable thinking. We want to do two things initially. First, we have asked Mike Wright and your Group Committee to help us to find the most effective ways to improve support in the area of sustainable design. Second, to prompt some useful debate about the scope for useful collaboration in this area, we have a few suggestions about the role of music in sustainability thinking:

- b Instrument making, refurbishment and maintenance bring important choices over the materials used (sustainable/recycled materials/fair trade supplies?) and avoidance of waste. Good care of instruments also offers scope for a long life and they can be handed on to the next generation.
- b Passive or active instruments in the environment (e.g. wind sculptures) can help to strengthen our connection to nature. An emerging meeting with the Southern Branch, with input from Peter Rogers, on Soundscapes and Aeolian Harps is an example of how this collaboration is already beginning.

- ↳ Music contributes not only to well-being, but also health. Music Therapy is a good example of the latter. Can music from the natural world also add to our healthcare consciously?
- ↳ Music contributes to our cultural identity, social cohesion and heritage. Music historians and the collection of musical heritage from a wide variety of cultures are important to sustain what we have. Mike Wright's recent review of Alexandra Hui's 'The Psychophysical Ear' helps us build understanding that we can pass on. Let's keep this among the IOA references, easily available via the website?
- ↳ Recordings of music sustain its influence on future generations. Perhaps MAG can contribute to promotion of the value of this.
- ↳ In some circumstances, music can simply be unwanted and therefore be classified as noise, so we need appropriate balance in our engagement with, and deployment of it. Beyond the obvious night club examples, the use of music for background sound in e.g. lifts and other places of public circulation has mixed reception, especially when it is out of context. However, there are some good examples of artistic soundscapes now altering crowd behaviour (e.g. 'Sounding Brighton' - ref. Noise Abatement Society website).
- ↳ It is also a matter of economic sustainability whether we can

maintain the finances for music making and celebration of this part of our heritage and culture. Terms of employment for musicians are a central example. Access to music for social inclusion may also be an economic issue.

- ↳ It is not just in Desert Island Discs that the central importance of music to our well being and survival is recognized. The sharing of the pleasure of music and its universal offerings provides scope for a special contribution to hand to the next generation.

We would like to understand the specific ways in which we can support MAG in its work to, on the front line with its members, in exploring and enhancing sustainable design. The sustainability of MAG has recently been tested and the current rejuvenation of the Group is very encouraging. We would like to help with a new stage of development and hope that this dimension can add further interest. We anticipate the careful assembly of supportive information and references tailored to the priorities of MAG, and aim to encourage collaboration with other disciplines inside and outside the Institute to build up holistic approaches to the various issues. That, however, depends on getting a good understanding from you of what forms of help we might be able to give you.

Please let Mike Wright have your thoughts, large or small to help this consultation, and to let us find the best ways to provide you with our support.

Richard Cowell FIOA

Dear MAG,

You will all probably be aware from my introduction in MAG MAG issue 1 that the Musical Acoustics Group were in fact the first specialist group within the IOA. On formation of the Institute in 1974,

musically inclined members of the Acoustics Group of the Institute of Physics and the British Acoustical Society had already formed what later became known as the MAG. I am pleased to note that we

still have some members of our Group who were around when the Institute came into existence. However, memories can fade with time, and from experience, these 'senior moments' crop up from time to time! The fact that IOA is approaching its 40th year has inspired some of our long-standing members, including Ralph Weston and Geoff Kerry to compile a history of the Institute for publication as part of the anniversary celebrations next year. I was asked some time ago to find volunteers to send information so that it would be possible to write something on the history section covering the Musical Acoustics Group. The efforts of revitalising the Group have meant that efforts on searching out history took second priority. I am aware that historical stuff from Council minutes, Annual reports and Bulletins are presently being converted to electronic format. Whilst the output from these after sifting through may help form a brief overview, memories of relevant events etc may be better highlighted as separate anecdotes These could include

Mike Wright

photos etc which will help enormously. I understand that the plan by Geoff is to produce an A4 size booklet with two columns per page. Photographs and charts may be included and "text boxes" may be used for detail, anecdotes or ancillary information. The style will, in general be similar to the Bulletin.

Being a recent incumbent to the MAG, I am urgently looking for past 'memories' to include in our section on the history of the IOA. It would also seem that the archives also have some 'senior moments'. Old notes and records are not always readily to hand and what I have so far is limited. I only have the first five editions of 'Notes', Peter Dobbins original newsletter from the early 90's. Copies of later editions would be most welcome as they do not exist in electronic form. I am also particularly looking for pre 1992 stuff which will almost certainly be in hard copy only. All contributions including 'anecdotal evidence' would be most welcome and I will look at all.

LinkedIn Roundup

The IoA MAG has a LinkedIn group where our members can discuss aspects of Musical Acoustics without waiting for the next publication of MAG MAG. You can join it here:

<http://www.linkedin.com/groups/Institute-Acoustics-Musical-Acoustics-Group-51149>

The group has taken a while to get going, but it is now up and running with some interesting discussions.

Professor Christian Onyeji posed the question "*Is it possible that indigenous African musicians considered aspects of acoustics in their music and instrument making?*" The consensus from the members is "Yes", but an interesting discussion of how African musicians have used acoustics and what else might have influenced them is ongoing.

Another question on African instruments comes from **Fred Onovwerosuoke**. He asks to what extent considerations of performance space and ensemble size influenced African makers.

James Wong asks whether anyone has done any work linking Musical Acoustics to Town Planning. Nobody has claimed to yet, but it links in nicely with discussions of Soundscapes, a future meeting about which is in the pipeline.

Resources

There are various online resources on Musical Acoustics of which members may not be aware. If you find a useful website then please do email the editor and it will appear in the next edition.

Catgut Acoustical Society Journal - This journal, sadly now no longer being issued, has a wealth of information on mostly stringed instrument acoustics. The Catgut Acoustical Society (<http://catgutacoustical.org/>) in collaboration with Stanford University has now put all of the published journals and newsletters online for free. To access them go here:

<http://www.oac.cdlib.org/findaid/ark:/13030/c8gt5p1r/dsc/#ref1>

Acoustics in Practice - A new European Acoustics journal has been launched, which welcomes papers on Musical Acoustics. Raf Orłowski has a paper in the inaugural edition on the same project which he spoke about at the recent MAG meeting (see page 7). For more details see here:

<https://www.euracoustics.org/activities/acoustics-in-practice>

NEMO Online - For those (like me) interested in the unending problem of temperaments in music, this is an excellent resource. Those interested in this may also be interested in the SW Branch meeting where the group chair will be presenting on just such a topic (see page 4). NEMO Online's temperaments pages can be found here:

<http://nemo-online.org/bibliography/musical-scales-acoustics-temperament-and-tuning>

University of New South Wales - The UNSW website has some interesting resources on musical acoustics. Neville Fletcher (co-author of "The Physics of Musical Instruments") is an emeritus professor and their acoustics lab has done some very interesting work. Read about it here:

<http://www.phys.unsw.edu.au/music/>

Ears - Of especial interest to those involved with the Electroacoustics Group, this website also has some interesting resources on musical acoustics. See it here:

<http://www.ears.dmu.ac.uk/spip.php>

Picture on the Cover



This unusual looking instrument is a Bolivian Charango. From this view it looks rather similar to a guitar, but the picture at the bottom of this page shows the characteristic rounded back. The carved wooden back and neck imitate one particular traditional form of the instrument, which has a back constructed of an armadillo shell. The legend goes that if it is a good Charango, the hairs on the shell will continue to grow.

There are no plucked stringed instruments in South America that did not ultimately originate with Europeans. Before the Europeans came to the continent, music was confined to wind instruments and percussion. Gradually though, Spanish customs and instruments gained influence on the native peoples. The Charango is one of the results and is found all over the Andes.

In its most traditional form, it is strung with metal strings and is very small and often roughly made. It is a seasonal instrument and used for courtship. A young male would carry a Charango and regail the object of his desire with song. The instrument is well fit for purpose then, as it is small, light and very loud!

The Charango is a very important instrument in terms of Bolivian national identity. When South America gradually won independence from Spain, the inhabitants started to think of themselves as South American, rather than Spanish. This led to an embracing of the traditional culture of the area. Charangos were discovered and brought down from the mountains to the cities. The city dwellers though didn't fancy the rather harsh sound of the traditional instrument and so altered the construction to suit their own musical ideas. They increased the size of the body and neck and strung it with nylon strings. This made it more compatible with guitars and easier for guitar makers and players to adapt to.

The Charango then is an excellent example of how an instrument is altered by different peoples at different times to suit their own musical preferences. I did some acoustical analyses on various Charangos a few years ago and found a clear familial relationship between traditional and modern forms. This research is published in the Proceedings of the Stockholm Music Acoustics Conference 2013. Thanks to Dr Henry Stobart of Royal Holloway in the University of London for lending me this instrument.

