



**23rd UK AES conference 9,10 April 2008:
'Music Everywhere'**
New Hall College, Cambridge

You never know what to expect from these conferences for stereo audio but Editor Paul Messenger and I both attended and found much of interest. It was a beautiful spring morning before the conference opened, Kings College looked particularly fine.



There was clear and present confirmation of the ongoing revolution in the delivery of music to listeners, one which is challenging sectors of the music retail and Hi Fi component business. While the rumours of the death of CD have been much exaggerated, there is no doubt that the CD singles market is now dominated by download and by the acknowledged market leader iTunes. In fact for both single and music sales as a whole

iTunes dominates making it harder for retail chains to make necessary returns on physically packaged audio, and while DVDs have been something of a lifesaver, this too is rapidly expanding in the download scene, taking sales from high street stores.

The huge catalogue of CDs, new and second hand will persist for decades but the new business is elsewhere. It is unlikely that the high quality audio potential inherent in Blu-ray will be significantly realised owing to the high costs of mastering, including the royalty issues. In addition this remains a physical media and object to be made and stocked and stored, and for such things, their days are numbered. Blu-ray is now not expected to come close to the historic market penetration of DVD, even after a future decade of sales.

It is not news to relate that downloads are moving from the stage where we and our like took a snooty attitude to what was available, 128k MP3 and similar lossy compressed material, judging it unsuitable for high fidelity reproduction. Data rates are improving, storage is rapidly becoming cheaper and cheaper and there is no longer any disincentive to get high quality music, via purchase of course.

At last the audio business is waking up to the idea that music will no longer be only physical discs on a shelf but may be present in a number of locations including streaming net access, but also on an enthusiast's computer, media server, on one or more iPods or similar portable devices, and additionally dedicated Hi Fi storage devices which are rapidly moving from networked computers sporting Windows Media Player to custom designed unitary 'audio drives' with audiophile output potential. Such are exemplified by the new Naim HDX.

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John Bird of Understanding and Solutions gave the Keynote Address, aptly titled '*What is Happening to the Global Hi Fi Industry?*' Packed with facts and figures, some aspects I felt relevant included his view that the long term trend decline in the sales of stereo separates had at last come to an end and that now a small but continuing growth was to be expected.

It seems that the continuing meteoric growth in portable music players has produced fallout of more discerning quality conscious customers who see separates as the means to improve the performance of the investments in their player hardware, and not least the music loaded into them. Such development is also fuelling the growth of still better loudspeaker docks where the demand for still more power and higher quality is evident and could be supplied in part by well known audio brands. We have already seen evidence of this activity with product from Monitor Audio, Meridian, B&W, T&A, and not least Bose.

John explained that for consumer electronics spending the 'Home Audio' market had fallen from 15% of the total in '88 to just 6% by 2007. At the same time the whole CE, Consumer Electronics market had doubled from Euro 33bn to 66bn, not accounting for inflation.

'Audio' has transformed into 'A/V' over this period, of which 'loudspeakers and separates' are only 22% of the total, and with DVD players dominating by value with

24%. For the US the audio separates market has remained steady at \$1.5bn, on trade values. The MP3 and equivalent player world market reveals some extraordinary figures. From 3 million shipped in 2002, it grew 200%, 240%, 165 % and 34% in successive years with another 18% growth expected for 2007 to perhaps 120 million players sold in that year!

Money spent globally on music is stable at around \$37bn annually but the packaged physical entity, CDs peaking at \$34bn in 2004, is expected to decline to half by 2011. This shortfall will be replaced by download to mobile telephone, and the internet delivery respectively.

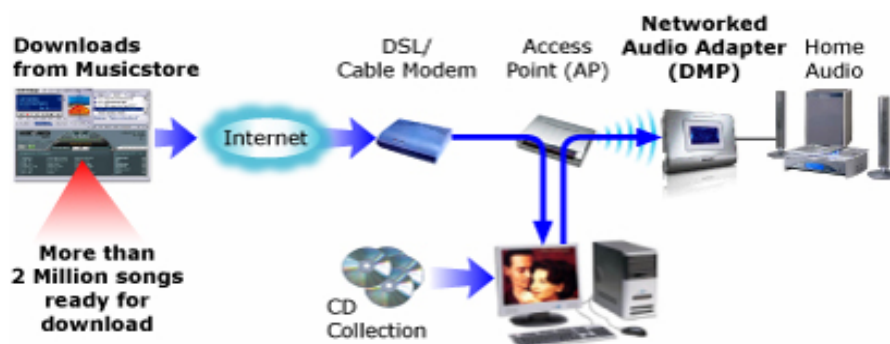
Apple increasingly dominates both the hardware and software to the detriment of traditional audio brands, eg Sony, JVC, Panasonic, Hitachi and the like. Digital music is powerfully driving innovation and product design for example for music servers and related audio drives.

Perhaps unexpectedly, video games of increasing quality are pushing demand for better sub woofers and accessory speakers to improve the Hi Fi experience beyond that possible from a console television with its impossibly small speakers, these emasculated in the name of styling.

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Several conference speakers provide fascinating background on a range of pro audio issues, for example using the IP network for broadcast applications, e.g. linking studios and radio transmitters, and safeguarding the performance and quality of the network connection for higher rate streamed media traffic.

Steven Harris of **BridgeCo AG** specialised on the subject of home networking, premium audio services, including databases, for example to help you find what you want to listen to. This aspect is now considered vital to a competent offering. Much of this relies on interfacing where the chips (e.g. the DM 850 media networking processor) and related software take care of the communication access and format issues making operation simple and transparent. UPnP has become the key feature (universal plug and play). With 40 million iPods sold in the US alone, replay of 'pod content has become mandatory for home audio systems, and more recently access to the digital data is often provided via the USB interface and not the more common headphone and line output terminals. In the US the subscription model for music delivery is strong with many providing lossless content including Music Giants, the Onkyo Music Library, Linn Online, iTracks, and Chesky.

www.bridgeco.com



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Mike Smyth, pronounced ‘Smith’, of **Smyth Research**, gave a talk on a virtualisation algorithm dubbed SVS, which looked intriguing, and unquestionably had a stunning auditory impact when auditioned. I think that it has relevance to home stereo and I will try to briefly explain what it is and what it is for. Initially the algorithm forms the heart of a portable studio monitoring system including for multiple channel surround sound. The ‘monitoring system’ may nevertheless be packed in a bag or two, and comprises a clever box incorporating the vital algorithm and a pair of top quality, open backed Stax electrostatic headphones.

We have all played with binaural for years and then the industry has gone farther with more sophisticated HRTF syntheses, leading to higher performance spatialisers both for loudspeaker stereo and for headphone reproduction. For Smyth, the objective is not simply clever tricks, but to try to replicate the ‘sound’ of a full free space loudspeaker monitoring system in its natural studio environment yet reproduced on portable headphones. It is done by placing the engineer in the chosen environment and permitting ten or so minutes of precision HRTF measurement including the use of point microphones placed at the subject’s ear canal entrance. The SVS algorithm is created from the acoustic measurements.

In operation incoming stereo and multi channel audio signal is computed, convolved with the SVS algorithm to create a two channel signal to the headphones, this the complex sound pressure field which would have arriving at the listeners’ ears if he or she were present in the original sound field. In theory the listener then hears the raw music tracks, via the mix down process for which there is also a local mixer, e.g. Sonic Solutions or whatever, and the sound of the aimed for mix down in a real studio is virtualised, recreated for the user. One of the primary features considered important for maintaining a sense of reality is to somehow master the movement of the sound field such that when the monitoring engineer moves his head the orchestra does not follow round unnaturally like a dizzy carousel, as it usually does. Thus a head movement tracker is included and as you move your head to face a virtual source that source remains naturally fixed in position, and moreover the sound character of the virtual source is

automatically corrected for the head angle concerned. This has to be done in real time and is seamless.



The Cambridge demonstrations involved direct comparison of the generated surround sound field heard via headphones with a test 5.1 monitoring system built from the larger and high quality KEF Reference 200 series loudspeakers. Even though I had not had my own HRTF uniquely calibrated for this session, which can add considerably to the sense of realism, my impression of sound field reality was so convincing that initially I was sure that the headphone simulation was in fact inoperative and that I was still listening to the real speaker system audible through the largely acoustically transparent open back electrostatic headphones. But taking off the headphones resulted in the effect of the whole one ton virtual sound system coming off with them and thus the merit of the technique was well proven. I made further more careful comparisons, A/B ing the real and virtual systems at will and found the fidelity of the headphone driven system to be high, showing the faults as well as the virtues of the prime replay system. In this it was substantially faithful to the physical sources, foibles and all. In particular that crucial test of virtualisation, namely the sense of stability and presence for the wholly virtual centre channel was passed with flying colours. By definition it cannot improve on the reality originally present. But of course that is the whole point. By so doing the monitoring system for which the engineer is wholly familiar, is the one he or she can take on location.



Steve Harris of AudioPlus experiencing the SVS 5.1 simulation

So for home stereo, and not excluding home theatre, you have the possibility of encoding your system to the virtualiser and then listening at virtually any volume, perhaps late at night, to the experience of your system and room operating 'live', this while on headphones.

For HT the whole surround experience, save body pressure response to low bass (for which there is a vibration simulator), is also provided while several listeners with several headphones may share the optimum experience; each is allowed to experience the ideal 'sweet spot for surround sound balance and focus.

But there is yet another seductive possibility. Since the system is essentially self calibrating, an enthusiast could visit, with the box of tricks, other high end audio and home theatre systems and have those encoded and memorised, ready to be experienced for years afterwards and with any music you choose.

The gulf between stereo on headphones, pleasant but manifestly an auditory compromise, and the spatially completely convincing surround reproduced by SVS, with full out of head localisation, multiple spaced sound sources, image depth and focus, has to be heard to be believed. The technique will presently cover 7.1 while full three-dimensional

simulation is already possible using a synchronised pair of processors. I cannot wait too long to hear a fully immersive sound field reproduced this way.

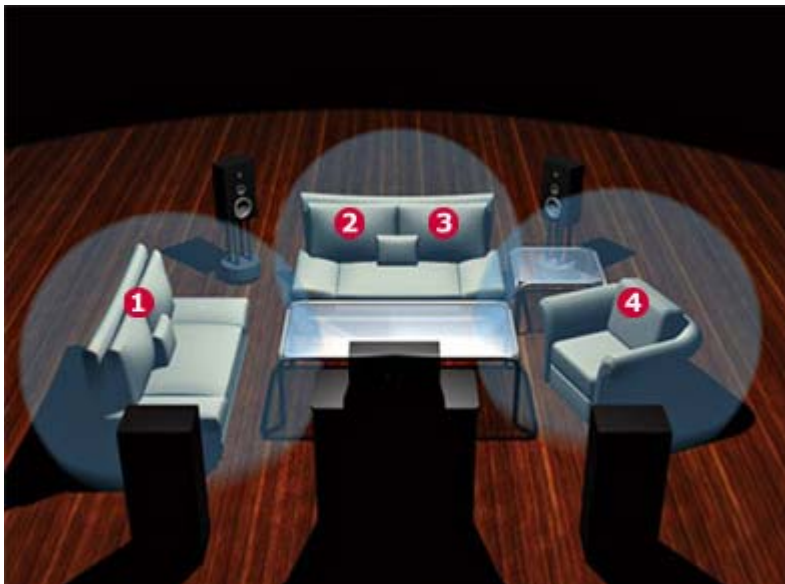
This product will remain in the PRO domain for probably this year while they gain production experience before moving on to a domestic HI FI version. We hope to review the system concept later this year.

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Another interesting lecture, which was matched by a fine demonstration, was by **Chris Kyriakakis** of **Immersive Audio Laboratory** and **Sunil Bharitkar** of **Audyssey Laboratories**.

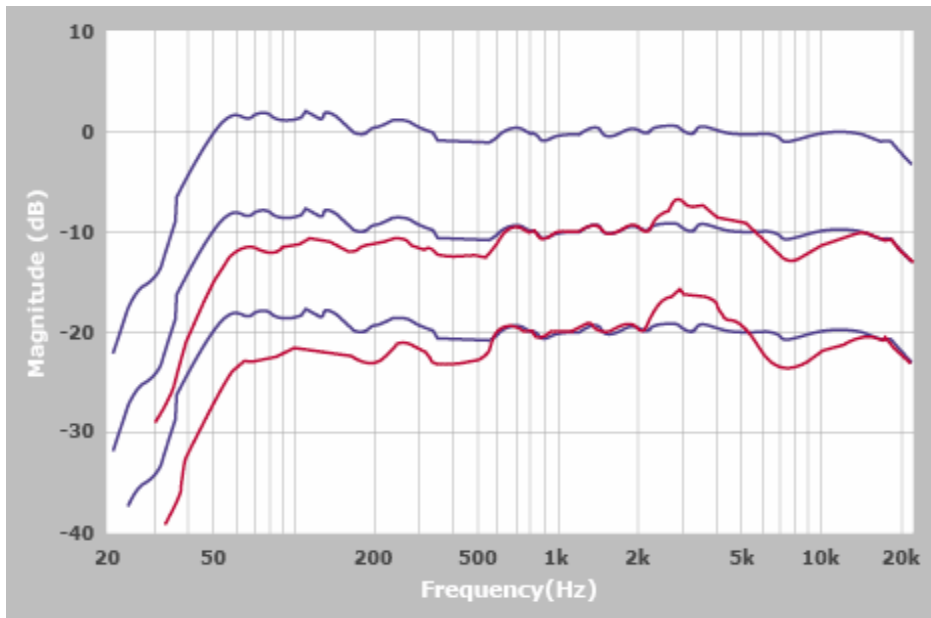
Audyssey DSP loudspeaker correction technology has been making great progress in recent years and has become an almost standard feature in many Home Theatre receivers even the least expensive. In contrast to the high resolution 'fix every glitch' approach which introduced the DSP technique to the loudspeaker world, Audyssey have long been aware that such perfectionist correction makes ill judged demands on the amplification while dismally failing to correct for other listener speaker locations. For me a key feature is their use of correction in both frequency and time domains, which I think greatly improves the naturalness of the correction especially in respect of the driven room acoustic.

Continuing research is directed to improved statistical sampling of the acoustic drive from the speakers to the listening space together with the use of spatial weighting with pattern recognition to reduce the error function (response deviation) for a combination of perceived response evenness and locations. Individual lower Q correction is applied to channels of the loudspeaker array, e.g. for Home theatre, both for individual speakers and in respect of the overall summed acoustic.



The beneficial result of such correction was shown graphically and by demonstration.

In addition we were shown a more advanced development designed to help scale the movie soundtrack, which has been optimised for cinema reproduction, to the reduced dynamic headroom and lower sound pressure levels available in the home. This employs dynamic adaptation and dynamic, sound level referenced, advanced loudness correction. You might be forgiven for doubting the efficacy of such complex frequency and amplitude processing but the results spoke for themselves, increasing realism while maintaining the information content and avoiding system overload. Improved HT sound reproduction in the home is clearly on the cards though I do not see it directly applicable to audiophile stereo.



Audyssey dynamic loudness compensation tracks perceived frequency response with volume from a calibrated in-situ sound level reference. The red trace shows the subjective effect of omitting the compensation

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Improbable perhaps, but viable through development, **Oliver Haffenden** and **Andrew Murphy** of **BBC Research** gave a presentation on **DRM**, no, not Digital Rights Management, but **Digital Radio Mondiale**, a way to put mono and even stereo, wide bandwidth digital audio onto the Long, Medium and Short Wave bands and they included data from a recent working trial with Radio Devon. Long distance propagation was also covered together with new techniques for expanded country coverage using ionospheric scatter, more correctly skywave reflection, NVIS.

While the data rate is low, under fair to good condition MPEG AAC coding can be used and while not of full FM quality it is not too distant from DAB and is much better than noisy and fading medium and long wave reception for very many distant listeners. It also

provides a means for transmitting enriched material, graphics, breaking news, programme data etc, a much enhanced RDS if you like. This could be very valuable in out of the way remote regions of the world.

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Simon Mason of **Mobile Media** ‘got under the bonnet’ for DAB, nicely illuminating the subject. For me he also explained why the sound quality would never quite satisfy audiophiles or match good reception FM stereo, an issue we reported on in the Arcam Solo review in Issue 1 Jan Feb 2007.

It is because the DAB international standard was defined in the late 1980’s when the only viable data reduced coding was MPEG 1 Layer 2. While AAC and better ‘layers’ have since become available, existing receivers and infrastructure must be kept working and we are stuck with it, said to be good enough for 95% or customers, and providing a much improved radio service for more difficult reception areas, never mind those additional stations which simply cannot be fitted into existing bands. DAB allows listeners to access these services.

It is easy to see now that it could have been designed so that software driven upgrades to receiver codecs could be have been upgraded, over the air, almost as the customer sleeps, but when DAB began the hardware was much more difficult to execute and thus the decode instructions are permanently written into the receiver chips.

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Another ‘radio’ lecture was given by **Nick Sharwood-Smith of Wave Science Technology, London**. Here the subject of broadcast programme delivery is the internet. Entitled **Lighthouses, Pilots and Bitrates Riding the Waves of Internet Radio** and concerned live streaming, not downloading or Podcasts. With up to 10,000 internet radio stations, some do have better quality and even good quality stereo. There is no reason why using broadband FLAC material at top quality, lossless 900kbps material cannot be provided for live internet broadcast. Issues of coder incompatibility will need to be addressed, once again the issue of interoperability is paramount for the future.

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Tim Nind of **Harman/Becker** briefed us on the more sophisticated design aspects of modern car audio, now embracing 5.1 replay and additionally 7.1 via the Windows Media Player version of Logic 7. An interesting point was the observation that the differencing L-R signal used in Logic 7 synthesis was not effective on MP3 lossy compressed material. This suggests that it could be a useful test for assessing relative impairment of coders in this respect. Loss of quality for this difference channel has not been a coder design issue far.

He examined that prototype vehicles are no longer made to provide a platform for in-car audio development and full modelling of the interior is now done to predict the performance in concert with the proposed sound systems. The resulting synthesis is fully

'fluid coupled' and has specifically led to many improvements, for example resulting in the ultra compact under-seat subwoofers now standard in BMW vehicles. Two channel audio has now moved on to a full AVR platform with a range of media material and formats accepted. This can provide more stable localisation over the vehicle environment. Full DSP allows for precise correction for local acoustics and good voicing of the entire vehicle. The 5 Series BMW demonstrator provided at Cambridge played stereo material at a standard as close to genuine Hi FI as I have heard to date, with very little coloration signature of the vehicle remaining. It sounds dynamic and neutral, highly detailed, with deep crisp bass, though the vehicle was static which always helps. This was prepared and demonstrated by Arndt Hensgens. Thanks also to both the human demonstrators in the Beemer and the Range Rover, by Harman/Becker.

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E R Toulson, rob.toulsen@anglia.ac.uk, looked at the wider participation in music and music production, citing some surprising statistics. For example US guitar sales for 2006 were 260% greater than 1998 at a massive 3 million, aided no doubt by a continuing fall in numeric price, despite inflation. Thus many more people have access to guitars and this reflects increasing participation in music making. Likewise music production and recording has become inexpensive via low cost computers and for that matter the digital mixer software and hardware. US retail sales of soundcards and related software has gone from \$170m for 2000 to \$411m for 2006. (How we could wish for such growth in stereo separates!)

Rob discussed the issues confronting inexperienced users of such versatile and complex systems, the need to be able to identify exceptional talent from the main herd and how to get nearer to a common standard for production quality. Education is an answer with the development of courses which can help teach the skills required.

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Former Corporate Vice President of the Consumer Media Technology Group at Microsoft, **Amir Majidimehr** (amirm@amir-views.com) gave the second Keynote Address envisioning future media content, its purchase and supply, and how it may be accessed in the car, via a mobile and in the home. It was an exciting and almost breathless rapid fire delivery, a torrent which was punctuated by many eddies comprising related stories, facts and anecdotes. I could not even attempt to summarise this content but here are a few highlights. And I hope that I have got the gist.

Much of the content had been made public but was delivered in a way which made sense of the whole and communicated the speed and excitement of growth and technical development in the field.

Music is unquestionably the most popular media type, and its availability and delivery has undergone an incredible transformation, clearly wrong footing the major music labels.

Digital audio started with CD, non-encrypted, this was perhaps unintended, and yet for most users is its best feature. You can rip it to your computer and play it on MP3 and

many other music replay devices. But it led to the unplanned revolution of rampant piracy. Peer to peer copying is illegal yet everyone and their children do it.

Stores cope with perhaps 5 % theft, Microsoft 40 to 50 % at which point the company has to tighten the 'squeeze' a bit, but 9 in10 recorded music tracks are 'stolen'. How is the music business to make a living? Who will pay the performers and studio personnel? Managing delivery of music for the future may be beyond established models, it will need advanced software to keep track of it all.

Is MP3 and the like the end of Hi Fi? Those lossy perceptual coders necessarily had had non linear artefacts which were intended to elude audiophiles. The public generally did not learn to hear the coding artefacts. But now we have a choice. We can download at higher bit rates, and even pay for good quality material; this enabled by versatile replay media software such a Windows Media Player, WMP. Quality subscription libraries are DRM protected, for many suppliers, when you stop paying, your downloads expire. Now valueless, you either re-subscribe or delete them from your hard drive.

CD may have been expensive when it began but it essentially they have not increased in price and the income has declined. With iTunes at 99 cents a track, \$10 a CD, where is the margin for iTunes and the Music House when transaction costs are accounted for? The truth is that iTunes does not really make money and the record company does not really get enough to finance new catalogue. The music is sold at slightly over cost. The larger Music Labels are in decline from their 1999 peak and nothing can save them, the model is simply wrong for post 2005. Independent labels will gain, with leaner operations, and of course internet involvement. Unbelievably 80% of all music bought in the US is now via iTunes, now the dominant music retailer. Potentially there are 80 million tracks available for download. It is suggested that this huge music resource it will be mainly free of copy code, on open format, and they and their ilk but will have invisible watermarks to provide a degree of monitoring of peer to peer activity, to track 'leakage'

Apple operates on the computer marketing model and makes its profit on the hardware, in this namely selling iPods at an amazingly high trade margin of 55 points. The product is such demand that such commercial policy is actually practicable.

DVDA and SACD tried to pitch quality against convenience and failed. Blu-ray has much superior audio interactivity but is fully protected and cannot be ripped; most consumers would find this pretty useless since music purchased could not be copied to or played on anything else. The continuing existence of DVD will prevent Blu-ray video reaching a large market as it is simply too good, with \$25 DVD players barely costing more than the carton and printed instruction manual! Yet the screen images are good quality and the sound isn't bad either.

(I hope this recorded talk will be officially released on the AES UK website)

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Richard Elen of Brideswell Associates (former Editor of Studio Sound) explained the virtual world of Second Life, a 'Metaverse' with several million inhabitants. Clubbing happens here amongst other activities and Richard has looked into the music production and distribution chain within Second Life showing how to maximise audio quality and effectiveness in this virtual environment. The operating system for 'Radio Riel', working in to the Second Life network, was spelled out with helpful advice as how to maintain reasonable quality and thus actually entertain rather than just amuse the participants.

Many thanks to the AES UK Committee for facilitating our attendance.
www.aes.org/sections/uk