

MED<sup>9</sup>EL

EXPLORE MUSIC  
01/2014

## Sonic tonic

Is music proving as powerful as a pill?

## Building in acoustics

Concert halls as star performers

## We will, we will rock you

The vital need to sing to your child

Meet the editorial team



Verena Ahne

Verena Ahne completed her studies in ethnology, then took a year off travelling the world. After that she worked for several NGOs before starting to write professionally. She is now based in Vienna, Austria where she works as a science and medical journalist.



Bettina Benesch

Bettina Benesch is a freelance journalist and editor, who lives and works in the Vienna area of Austria. She is editor of the German edition of EXPLOREMAGAZINE. Benesch has one daughter and believes that 'life is too good not to write about it'.



Marian Blaikley

Marian Blaikley is a journalist and consultant, who writes about the arts and education. Her special interest is music. Before turning freelance, she worked for a number of years as director of marketing at the Royal Northern College of Music in Manchester.



Christian Duffin

Christian Duffin is a freelance journalist who has written extensively on health issues. His work has been published in the UK in national newspapers and journals including The Guardian, The Times, The Daily Mirror, Nursing Standard and Pulse. Christian has covered subjects such as cancer, mental health, diabetes and asthma. He lives in Walthamstow, East London UK.



Susan Mayor

Susan Mayor has twice won the 'UK Medical Journalist of the Year' award from the Medical Journalists' Association, as well as a Communiqué award for her book on new drug development. Following a PhD from University College Hospital London, post-doctoral research and several years as a university lecturer, she trained as a journalist and editor for a leading publisher, before becoming news editor of the British Medical Journal.



Rachel Pugh – Editor

Rachel Pugh, who is editing the UK edition of EXPLOREMAGAZINE, is an award-winning health journalist, who contributes to The Guardian, The Independent, The Times Educational Supplement and The Daily Telegraph. She has worked in strategic communication roles for the UK's National Health Service, for the BBC and for pharmaceutical companies. Her passion is for health issues and their impact on society and equality.



Sigrun Saunderson

Sigrun Saunderson is a freelance journalist and copywriter based in Eastern Austria. Her focus is on health and popular science topics. Her work has been published in newspapers and magazines such as the Universum, EMMA and the Austrian Medical Journal.

# HEARING FROM THE HEART

*Thousands of years ago, mankind identified, and began to harness, the power of music – a force which the English 17<sup>th</sup>-century poet William Congreve famously said “has charms to soothe a savage breast”*

For many people today, rhythm and sound are as important as the food they eat. People need music. We live in a world of sound and noise, full of rhythm and melody. We even produce our very own rhythms and sounds. Every day our hearts beat 100,000 times, we breathe 23,000 times, we laugh, we chat and we have ideas. Communication is our common bond – we are born to do so – and what makes this possible is our ability to hear. That is why this magazine has been set up – with hearing at its heart.

It was a passion for hearing that originally motivated Ingeborg Hochmair to found her company MED-EL. For more than 20 years MED-EL has produced hearing implants and researched new technologies from its home in Innsbruck, Austria.

The mission – then as now – was to overcome hearing loss. Two decades on, far too many people are still unaware of what hearing loss actually means. People suffering from a hearing loss tend to avoid company, speak less and generally find life more difficult than they would if they could

hear properly. Deaf children do not learn to speak as well as they should.

Our ultimate goal is to overcome hearing loss – hence this magazine, which focuses a spotlight on hearing.

MED-EL wants to raise awareness of the value to us all of hearing – not by using brochures and websites – but this time by exploring different aspects of our sound world through this magazine.

We invite you to join us for this first edition of EXPLOREMAGAZINE. The current topic is music. Immerse yourself in it. ■

**Best wishes from the editorial team**

# 90

90% of all deaf children are born to hearing parents.

By the end of secondary school, more than 3 out of every 1000 children in Australia will require assistance because of hearing loss.

# 3

# 23

Multi-instrumentalists rule in the rock band Gentle Giant. The founding Shulman brothers played about 23, and the rest of the members at least three different instruments.

# 6

188,000

Approximately 188,000 people worldwide have received cochlear implants. In the United States, roughly 41,500 adults and 25,500 children have them.

Gemini 6 astronauts M. 'Wally' Schirra Jr and Thomas P. Stafford, made musical history in 1965, by performing Jingle Bells in the capsule – the first music to be performed in space.

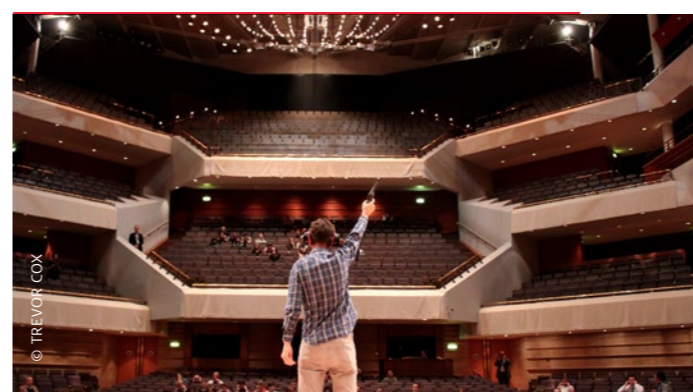
**8** We will, we will rock you!  
Marian Blaikley sees how lullabies and nursery tunes are faring today



**18** The quickening art  
Susan Mayor looks at how older people can benefit from musical input



**25** Building in acoustic perfection  
Susan Mayor talks to acoustics experts about concert halls



# CONTENT

**Hear, here!** 6  
*News in short*

**A vital part of life** 7  
*Student Rosa MacMullen on her passion for music*

**Sonic tonic** 13  
*Rachel Pugh explores the therapeutic power of music*

**Building bridges through music** 17  
*Vérena Ahne talks to psychiatrist Thomas Stegemann about music therapy*

**United in harmony** 22  
*Marian Blaikley reviews the all-inclusive art form*

**Technology in tempo** 28  
*Christian Duffin on the science helping implant users with a thirst for the pulse*

**From words to music** 32  
*Enjoying music with an implant*

**An Osmond finds his own voice** 34  
*Justin Osmond talks to Rachel Pugh about growing up deaf in a family of rock idols*

**Too loud, man!** 36  
*Christian Duffin looks at what happens to hearing when the volume goes up*

**40** Built-in stereo  
*Bettina Benesch finds out the benefits of two ears rather than just one*



# HEAR, HERE!

## 'Rampant' discrimination

Research by the National Association of the Deaf (NAD) in the USA has revealed 'rampant' discrimination by housing associations against hearing impaired individuals seeking rented accommodation in apartment complexes. Of the 715 housing organisations, 86% provided less information to deaf individuals, 56% informed deaf individuals that further background and financial checks would be necessary to determine qualification (even though they are not necessary for hearing individuals), and 40% hung up on deaf callers at least once.

## Feel the vibe

A three-year UK project has been investigating the potential for vibrational feedback to help ensembles of musicians with hearing impairments, who would otherwise rely primarily on visual cues, to play together. The research was led by Dr Carl Hopkins of the University of Liverpool, UK and Professor Jane Ginsborg at the Royal Northern College of Music, Manchester, UK in partnership with the charity, Music and the Deaf. The aim is to open up new opportunities for deaf people of all ages to enjoy making music together.

## Cubist approach

An eight-inch wooden cube may be an unlikely spark for a musical revolution – but that's the hope of a collaboration of electronic engineers and musicians working towards hackable electronic instruments that performers can easily modify to produce sounds in surprising new ways. The deliberately simple cube – which contains a sensor, computer chip and speaker to transform touch into sound – is the creation of Dr Andrew McPherson, whose work on 'hackable instruments' progresses at Queen Mary University of London (QMUL), with input from London Music Hackspace.

For more information see [www.qmul.ac.uk/media/news/items/se/122515.html](http://www.qmul.ac.uk/media/news/items/se/122515.html)

## How many?

More than 250,000 people live with cochlear implants world wide – 12,000 of them in the UK.



Rosa MacMullen

Rosa MacMullen  
Age: 19  
Gap year student  
From: Hull, UK

# A VITAL PART OF LIFE

»I would rather do without my TV and my computer than without my iPod®. If I could not listen to music, I would feel really excluded from the activities my friends are involved in.«

INTERVIEW BY RACHEL PUGH

## Even though

I was born profoundly deaf, I class myself as hearing, as I received a single cochlear implant in 2000, and a second one in 2010, like my sister did. We are both avid listeners to music and hear it to a very high quality.

Music has always been a part of my life as I have danced since the age of five, and I also did competitive gymnastics. I am now coaching gymnastics until I go to university to study occupational therapy.

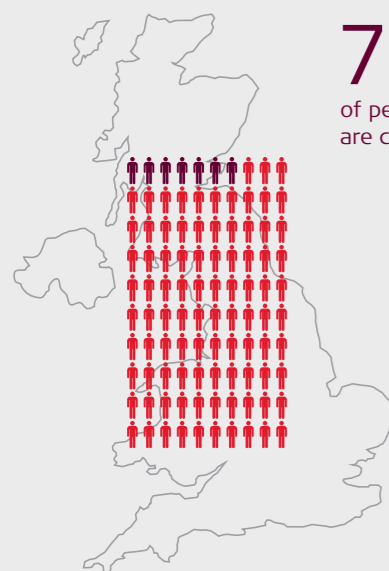
My passion is my old-fashioned record player, which I have in my bedroom. I asked for it and got it for Christmas in 2012. I collect LPs from charity shops, and now own more records than my room can comfortably hold. They are a real mishmash – from Tchaikovsky's 'Nutcracker' to the Pet Shop Boys. I think there's a certain magic atmosphere in the sound of a record player, which you do not get from an iPod or from the radio.

When I was younger, I found it difficult to listen to 'modern' music as the lyrics were unclear and it just sounded like noise to me. So I really got into singers from the 20s to the 60s. Since primary school, Judy Garland has been my favourite artist – I can always find something in her repertoire to correspond to my mood. As my hearing progressed, so did my love for all different kinds of music.

During my gap year I went off travelling to the Far East for three months on my own. An unforgettable moment was in Thailand, when a family befriended me and invited me to their home. They tried to teach me Thai dancing, to music playing on their mobile phones. The hand positions were really difficult. That was a moment when I really treasured my hearing. Another was when I heard the sound of the gecko (lizard) for the first time. What a massive and impressive sound! ■

## HEARING LOSS TREATMENT

United Kingdom



7%

of people with hearing loss are currently receiving treatment

93%

of people with hearing loss have never received treatment

Source: 2008, Organisation for Economic Cooperation and Development, [www.oecd.org](http://www.oecd.org)

# WE WILL, WE WILL ROCK YOU!

*If parents sing their little ones to sleep at all, it is more likely to be Rihanna than Twinkle, Twinkle, Little Star. Does that matter?*

*Marian Blaikley discovers the importance of music to a growing child*

## In their introduction

to their 'Oxford Dictionary of Nursery Rhymes', UK nursery rhyme gurus, Iona and Peter Opie, quote a Roman lullaby, more than 2,000 years old – Lalla, lalla, lalla, aut dormi aut lacte (literally 'Lalla, lalla, lalla – either sleep or feed') – whose sounds alone sum up the ageless frustration of parents trying to settle a fretful baby.

Back in the 1950s, when their dictionary was published, the Opies were confident in stating that 'wherever the English word is spoken, children become joyful and wise listening to the same traditional verses', such as 'Sing a Song of Sixpence' and 'Pat-a-cake, pat-a-cake'.

If however the Opies were conducting their studies today, they would uncover a very different story. Research recently commissioned by toy firm John Crane Ltd, reveals that parents are rejecting traditional lullabies to sing their children to sleep, in

favour of chart-topping pop songs. Half of the 2,000 parents interviewed admitted their children preferred singing along to contemporary hits, with songs by Bruno Mars, Adele, Rihanna and Robbie Williams heading the list.

While some might lament the decline of 'Twinkle, Twinkle, Little Star' (rejected by some parents as 'old-fashioned' or 'silly'), the survey also reveals that eight out of 10 parents still sing to their children. As Jonathan Thorpe, Managing Director of John Crane Ltd, puts it: "Whatever way parents engage with their children over music is a good thing, and it's great that so many do sing to, or with, their children – whether that song is one or 100 years old."

Parents like these have always known that singing to their children helps their offspring to relax, but they may not know that it is also a vital part of their youngsters' cognitive development.





*TAKING TURNS: Music is a fun way a toddler learns and builds social bonds*

### Important tool

Donna Sperandio, Head of Rehabilitation at the hearing implant company MED-EL, is an advocate of music as an important tool in helping very young children in general to gain language and other skills. It's just that for children with hearing problems the need is even greater.

She says: "Music is a wonderful way to build listening and language skills. It is engaging and fun, and really alerts children to sound and then to ways to communicate. Music also helps build auditory memory (the ability to remember a number of items). For example, as a child learns to sing – first a few words, and later some lines from a song or rhyme – they build their ability to remember longer strings of information. But one of the most important aspects of using music with children is the wonderful social connection this provides to the people around them. Bonds

### Find out more:

#### Spitalfields Music and Vital Arts

Listen to music created as part of the Lullabies and other projects – [www.vitalarts.org.uk/spitalfields-music-in-residence](http://www.vitalarts.org.uk/spitalfields-music-in-residence)

#### MED-EL, the hearing implant company, has rehabilitation resources involving music for children with cochlear implants including:

- Music and Young Children with Cochlear Implants – suggestions for parents. Available as a free download in nine languages – [www.medel.com](http://www.medel.com)
- Musical Ears – musical activities for professionals. Order from [Nicole.Haslwanter@medel.com](mailto:Nicole.Haslwanter@medel.com)
- Listening Fun with Music and Song, accessed via the website at [www.medel.com/uk/soundscape-listening-fun-with-music-and-song](http://www.medel.com/uk/soundscape-listening-fun-with-music-and-song)

#### Music and the Deaf

The charity has produced two early years resources. See publications at <http://matd.org.uk/publications/>

between parents and children, and later amongst cultural groups are built and strengthened through the shared experience of music."

Sperandio emphasises the importance, for children using cochlear implants, of the way music exaggerates the rhythm and pitch of speech. She says: "It helps them to develop natural-sounding speech."

Catherine Berry, a consultant advisory teacher of the deaf, who works with hearing-impaired children and their parents in Oxfordshire, UK, reinforces this point: "Even hearing people find sentences rather than single words easier to follow, because they have a natural shape – up and down. Music has even more shape and that helps with the meaning. Music really helps children to listen carefully, because it engages their attention, and that is the first step towards learning to listen."

### Fast and slow

In their work with the parents of hearing-impaired children, Berry and her colleagues introduce songs and music to convey concepts such as fast and slow, high and low, sound and silence. Music can also be used to highlight routine activities, so that babies start making connections between events and songs – such as bath-time with a 'rub a dub dub' song. "It adds an extra dimension," says Berry. "Parents make their own songs up, or we encourage them to tap into their own interests. Some parents sing Rihanna to their children, because that's what they like." For those reluctant to sing to their toddlers, scientists have come up with new proof that lullabies make children feel better. A study of children at Great Ormond Street Hospital (GOSH) in London has produced scientific evidence that lullabies help to soothe those who are poorly and reduce their perception of pain.

Results of the study published by the journal, *Psychology of Music*, show that a group of child patients experienced lower heart rates, less anxiety and reduced perception of pain after having lullabies sung to them.

GOSH music specialist, Dr Nick Pickett, who oversaw the study, said: "The findings show that it's not simply attention from an adult that soothes children, because the children did not experience the same benefits when they had stories read to them. There is something inherently special about music and singing to a child."

Spitalfields Music, in partnership with Vital Arts (a groundbreaking arts and health organisation), have undertaken a number of pioneering initiatives with babies and very young children at the Royal London Hospital. This work demonstrates music's importance in advancing the cognitive and physical development of children in extreme situations – like serious illness.

### Giving babies and toddlers a musical head start

- Music classes for pre-schoolers: [www.kindermusik.com](http://www.kindermusik.com)
- Orchestra-run programmes: London Symphony Orchestra's Shake, Rattle and Roll programme for 1 – 5 year olds <http://lso.co.uk/early-years-workshops>.
- Manchester Camerata (UK): Lullabies projects [www.manchestercamerata.co.uk/learning/earlyyears](http://www.manchestercamerata.co.uk/learning/earlyyears)



*INVOLVED: A child learns more by playing music than listening*



COOL JAZZ: Melody and rhythm is a good way of sharing

In their Lullabies project, three musicians from different cultural backgrounds, visited postnatal wards and shared lullabies from all over the world with families. The sessions were welcomed – as one nurse put it: "The music was so soothing, while also being uplifting. I am sure the babies enjoyed it too, as there was a noticeable lack of beeps while musicians were in the nursery!"

A more recent project, Baby Bird's Journey, aimed to help babies in long-term care meet their developmental milestones. Some of them had not been home for three years. Working with children in the ward alongside play specialists, paediatric physiotherapists and occupational therapists, musicians developed an extensive repertoire of songs that promoted language, literacy and numeracy, plus co-ordination of fine and gross motor control. The London Symphony Orchestra has also been involved in delivering Shake, Rattle and Roll music workshops to children in the Royal London Hospital.

So whether it is a lullaby or a Rihanna number – get singing! You're probably doing your child good. ■

### Jazz for babies

Michael Janisch is an American bass player who has played with some of the world's greatest jazz artists.

When his wife was expecting a baby, he was curious to see what kind of music was produced with babies and toddlers in mind. Disappointed with what he found, he decided to create his own lullaby versions of the music he had been performing for 20 years.

- Jazz for Babies: Five albums featuring 75 dreamy tracks, played on acoustic instruments by world class musicians. For further information visit [www.jazzforbabies.org](http://www.jazzforbabies.org)



# SONIC TONIC

*Music's feel-good factor is well known, but now the medical world is finding out its effects may be more widespread.*

*Rachel Pugh investigates*

## In a sun-filled

walkway at London's Chelsea and Westminster Hospital, a young woman recovering from serious leg injuries makes her painful way on crutches. "You're doing great," says her physiotherapist, "Only a few more steps to go."

Their destination is a vibrant Brazil-inspired canvas by artist Richard Smith. Once there, the patient puts on headphones and, with a growing smile, begins to move to the Latin American rhythms she is hearing. Then the pair continue their painstaking journey – this time towards a huge sculpture.

### Take note:

- Chelsea and Westminster Health Charity [www.cwhc.org.uk/](http://www.cwhc.org.uk/)
- MED-EL information about importance of enhancing musical appreciation for hearing impaired people [www.medel.com/uk/music/](http://www.medel.com/uk/music/)
- Arts and Music in Healthcare: An overview of the medical literature: 2004-2011, Rosalia Staricoff & Stephen Clift [www.canterbury.ac.uk/Research/Centres/SDHR/DocumentsStaricoffandClift2011ArtsandMusicinHealthcare.pdf](http://www.canterbury.ac.uk/Research/Centres/SDHR/DocumentsStaricoffandClift2011ArtsandMusicinHealthcare.pdf)



© MIRIAM REITHER

"I could still feel the pain," says the patient, visibly more relaxed, "But it helped to blank it out when the music was dramatic."

The physiotherapist is equally positive: "We are using the incentive of the music to go a bit further off the ward every day." This is one of 15 artworks – each linked to a specially-composed piece of music – rather like an audio guide in a gallery. The Rhapsody Project, commissioned by the hospital trust's health charity, uses music's powerful therapeutic powers, not only to promote healing in the patients, but to help health practitioners to do their job more effectively and to relax carers.

Professor Mark Bower, at the National Centre for HIV Malignancy at the hospital, is impressed. He says: "It is a valuable tool, aiding patient rehabilitation. Most of my patients are living with both cancer and HIV, and their treatment is often followed by prolonged recovery. The audio guides can be used to encourage their progress and spur them on to the next goal."

The guides are part of a raft of music-related projects at the Chelsea and Westminster – where music is an integral part of

healthcare, not an add-on. The multi-million-pound upgrade of its accident and emergency (A&E) department making it London's flagship department, incorporates an innovative programme of digital music. This is designed to support patients, families and staff, and reduce aggression, in one of the most stressful areas of the hospital.

### *Better lung function*

"Everything we do here comes from research," explains Daisy Fancourt – who manages the performing arts programme at Chelsea and Westminster Health Charity. "We engage in full consultations with staff and align all initiatives to health systems inside the hospital."

London is not alone in this. Clinicians and medical establishments round the world are waking up to the fact that music's power is not just about the feel-good effect described by English playwright William Congreve in 1697, when he said, "Music has charms to sooth the savage breast". Music can have measurable therapeutic effects on health.

---

*"I believe that music needs to be in the same category as medication when treating seriously-ill patients."*

---

The simple physical act of taking part can be therapeutic, as has been proved by teaching wind instruments to asthmatic children, in the UK-based Bronchial Boogie scheme. This boosted lung function, leading to a drop in asthma-related school absences from 35% to 5%.

Access to music is certainly recognised by professionals in the hearing impairment field as providing an emotional connection for a deaf person to their families and communities – the ability to hear a wedding song, or for teenagers to be part of 'the scene'. As such, it is a vital factor in psychological well being.

For this reason MED-EL, the hearing implant company, invests heavily in improving its devices for music listening and performing purposes. Head of Rehabilitation, Donna Sperandio says: "Music is a key and integral part of the hearing experience, which helps develop listening skills and auditory memory, in both adults and children. We know it provides a direct bond between people, and we want to restore that bond."

### *Slows heart*

But growing evidence is showing that access to music may also have an effect at a deeper biological level. Abraham Kocheril, MD, at Carle Heart Center in Urbana, Illinois, USA has demonstrated that classical music played on a harp may slow the heart rate of patients sedated for electrophysiological examinations.

Says Kocheril: "What's amazing is, we are seeing an effect, and it's consistent from patient to patient." His study also found that diseased hearts acted more normally under simulated stress, if music was played before the stressor.

Powerful effects are not just specific to the harp, but exist across the range of music genres, according to another passionate advocate of its clinical use, Claudius Conrad – He is a surgeon specialising in diseases of the pancreas and liver at The University of Texas MD Anderson Cancer Center – and also a trained concert pianist.

Whilst working at Massachusetts General Hospital in Boston, USA, he used musical material from rap to classical – personalised to individual taste – with critically-ill patients in A&E, and showed that it could decrease key hormone responses, blood pressure and heart rate.

He has also published research, using recordings of slow movements from Mozart piano sonatas played to very sick patients, to demonstrate that music significantly reduced the amount of sedative drugs needed to achieve comparable levels of sedation, compared with controls.

*HEAVENLY: Harps seem to have powerful effects on the body as well as the emotions*



© MIRIAM REITHER



*Surgical patients needed less anaesthesia in the presence of music, and levels of the stress hormone cortisol were 48% lower*



*JAMMING: Volunteer musician Charlie Hole (left) has a jam session with a young patient at Chelsea and Westminster Hospital*

### Medication

Conrad says: "I believe that music needs to be in the same category as medication when treating seriously-ill patients."

If results such as these are coming forward, why aren't all hospitals embracing the power of music as a cost-effective (and pleasurable) aspect of health care?

Evaluating music using scientific and medical criteria, seems to be the key. How does one put an art under the medical microscope in the same way one does a drug? It is an argument that needs to be won, to begin to persuade health economists and providers. In this, Chelsea and Westminster Hospital has been a leader.

Work by medical researcher Dr Rosalia Staricoff, at the hospital in 2004 suggested a range of positive effects across a range of different clinical areas, including oncology, maternity and trauma services (see 'What music can do', right). Her 2011 review of these results with Steven Clift at Canterbury University UK, based on 103 studies, only underlined the benefits of musical interventions in clinical areas.

Harcourt says: "The key is to understand the impact of music. Some people 'get it' straight away, but for others, we need to get the evidence and the statistics." ■

### What music can do

#### Chelsea and Westminster's top music findings:

- In maternity, labour was 2.1 hours shorter for women in the presence of art or music
- Chemotherapy patients showed a 32% decrease in the stress hormone cortisol when listening to music, and reported a 31% decrease in feelings of depression
- Surgical patients needed 0.83mg per kg less anaesthesia in the presence of music, and levels of the stress hormone cortisol were 48% lower
- The length of hospital stay was one day shorter on average for surgery patients in the trauma unit in the presence of live music and art
- HIV patients showed an increase in the number of CD8 cells (an important type of white blood cell) following live music
- Two thirds of staff said that the arts influenced their decision to apply for a job at the hospital, or to remain in their current position

# BUILDING BRIDGES THROUGH MUSIC

*Verena Ahne speaks to psychiatrist and music therapist, Thomas Stegemann, about the power of harmony*

TRANSLATION BY CHAD HARRIS



© 2011 INSTITUT MBM

#### What is so special about music therapy?

Music speaks to many areas of the brain at once – activating the reward systems at the same time as reducing fear. It therefore has a range of applications.

#### How is music used therapeutically?

One can receive music therapy just by passively listening to music. This can be just as effective as drugs like tranquilisers. The clinical settings where this form of music therapy is most often used, are intensive neonatal units, or surgical units in the run up to an operation. Active music therapy is however, primarily orientated towards psychotherapy. Through making music themselves, people can gain fresh insight into themselves and their suffering. The main therapeutic goal is to give a person a means of expressing what is happening to them through music, and for the therapist to develop this theme further with the patient. For example – a woman suffering chronic pain might be invited to find a sound which expresses her headache. Then she may be encouraged to transform her sound. In this way the woman may discover that she herself can exert influence on the sound and that this can even change the way she feels. She is then able to play her own 'healing' music.

#### There are many different types of music therapy. What works best?

We now know that the individual's own choice of music is the most effective. This applies in the case of passive, but even more in the case of active, music therapy, which is very individual. The way things are done today is far more patient centred. What does this person need at this time? What can be used to influence which symptoms? For example, people have spent years trying to identify the ideal preoperative music. Sooner or later, all the suggestions have ended up being binned. The approach was wrong. Music has a different effect on every individual, depending on their situation. So 'the right thing' is always different. These days people are expected to bring their own music.

#### Does that even apply to loud, catchy music?

Of course. Quiet, smooth music generally has a relaxing effect, whereas faster, louder music which builds to a climax, tends to have the opposite effect – this can be measured in animals. But this fundamental effect is also influenced by experience, individual likes and dislikes, as well as by social attitudes towards a particular musical genre. To maintain that classical music always has a calming influence is incorrect – some people actually become aggressive when they have to listen to classical music. On the other hand, self-harming youths in Hamburg, Germany found that loud, aggressive music could stop them from harming themselves. In this case the music acts cathartically and they can cool down when listening to this music – chill out. ■

#### Biography:

*Thomas Stegemann (42) is a German physician, child and adolescent psychiatrist and music therapist. He has been professor and head of training for the faculty of music therapy at the University of Music and Performing Arts Vienna in Vienna since 2011.*

# THE QUICKENING ART

*Susan Mayor explores how music can be used to transform the lives of older people*

## Henry has been

in a nursing home for 10 years. He sits slumped in a chair, inert and unable even to recognise his own daughter. The moment he starts listening to music, his eyes fly open, his face becomes expressive and he starts singing. A moving film clip showing his response, went viral when first shared on YouTube.

Henry was part of US social pioneer Dan Cohen's non-profit-making Music & Memory project, to provide older people with personalised playlists, using iPods. The documentary 'Alive Inside: The Story of Music and Memory' was selected for this year's Sundance Film Festival. It follows his work for three years, depicting older people like Henry with memory loss 'awakened' when they hear music from their past.

It vividly illustrates the power of music as the 'quickenning art' – so called by the philosopher Kant, because of its ability to bring people immediately to life – and adds to the increasing number of examples of its benefits in boosting health and wellbeing in older people.

A growing body of evidence suggests music can reawaken memories and connections with other people for dementia patients, improve physical functioning in Parkinson's disease and help restore speech after stroke.

Nursing home residents like Henry, with dementia and other cognitive challenges, seem to be transformed from virtual automatons, into bright-eyed individuals, singing along, dancing and taking part in conversations, as soon as they start listening to music.

## More information

- *Music & Memory project* – [www.musicandmemory.org](http://www.musicandmemory.org)
- *Alive Inside* – [www.youtube.com/watch?v=5FWn7JB2YLU](http://www.youtube.com/watch?v=5FWn7JB2YLU)

*Brought to life*

Oliver Sacks, Professor of Neurology at the NYU School of Medicine, New York, USA, explains the dramatic effect: "Henry has been quickened – he's been brought to life. In some sense, Henry has reacquired his identity for a while, through the power of music."

He notes that the benefits continue for some time after listening to the music, so people who do not usually communicate, are able to participate in conversations and answer questions.

Research studies show that music therapy can reduce the behavioural and psychological symptoms of Alzheimer's disease and other forms of dementia, and improve social skills and quality of life. A UK study recently demonstrated that participatory singing sessions noticeably improved the mood and wellbeing of patients, staff and visitors to a ward for older people.

Use of a device called a Silver Song Music Box – which plugs into a television or speakers to provide piano accompaniment for well-known songs – halved instances of challenging behaviour. The programme has also produced improvements in breathing and physical health in people with chronic obstructive pulmonary disease (COPD).

Generating an internal musical rhythm has been shown to help people with Parkinson's disease to improve their co-ordination of movements, walking and tasks they previously found difficult. More recent research has demonstrated that stroke patients, unable to speak after damage to language areas of the their brains, can relearn to say phrases by singing them first.

**ADDED VALUE:**  
*Singing in a choir is fun and helps to keep you healthy*

Gottfried Schlaug, Director of the Music, Neuroimaging and Stroke Recovery Laboratories at Beth Israel Deaconess Medical Center, Boston, USA, suggests: "Music might be an alternative medium for engaging parts of the brain that are otherwise not engaged."

*Escaping hardship*

Music can also play an important role in sustaining healthy ageing. The first controlled evaluation of the health benefits of a community singing programme in the UK has just reported, that measures of health are consistently higher in older people taking part in singing groups, compared with those that do not.

"We wanted to know if singing in a group made a difference to older people's physical and mental health, compared with their usual activities," explains Stephen Clift, Professor of Health Education and Director of the Sidney De Haan Research Centre for Arts and Health at Canterbury Christ Church University, Kent, UK.



more than 200 healthy volunteers (aged over 60), either to 12, weekly Silver Song Clubs led by experienced musicians, or to continue with their usual activities. Questionnaires showed significant and sustained improvement in self-rated measures of mental health among singers, compared with the control group. Singers had reduced anxiety and depression and their physical health scores also improved. They enjoyed the social element of taking part in singing clubs.

Says Professor Clift: "When people sing together, it produces something no one alone can produce, and has a kind of transcendent aspect."

Music makes an important contribution to positive aging, agrees Terrence Hays, Lecturer in Music Education at the University of New England in New South Wales, Australia.

*New understanding*

His findings revealed that music provides older people with ways of understanding and developing their self-identity, and provides strong associations with memories. It also helps maintain wellbeing, enables people to experience and express spirituality and provides an important focus for socialising.

Says Dr Hays: "This may explain music's particular value in older people, as it is the social aspects of life that can be most affected by old age. Older people describe how music allows them to engage in imaginative play and to escape from some of the hardships experienced in later life." ■

*If you stop playing music the brain continues to profit into older adulthood – 40 years after music lessons stop*



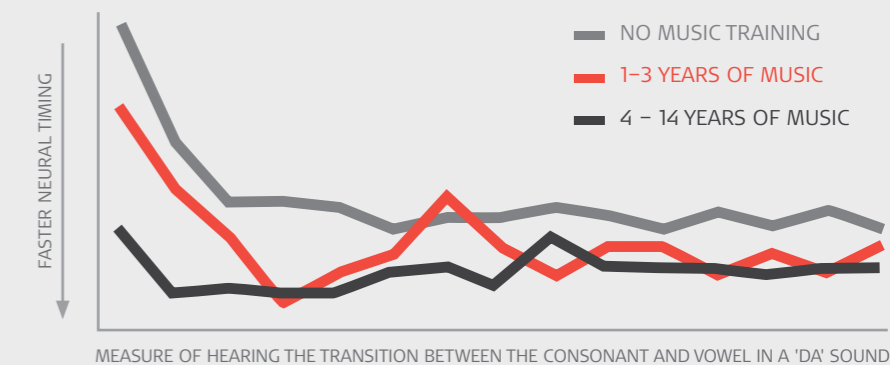
**Reaping the benefits of childhood music**

**Intriguing research shows that childhood music lessons can carry benefits into older age.**

A US study showed that older adults who took lessons when young – even just for a few years before discontinuing – can process the sounds of speech faster than those who did not and are better able to hear targeted sounds in a noisy environment.

Lead researcher Nina Kraus, Professor of Neurobiology at Northwestern University, Illinois, USA, explains: "Aging results in pervasive declines in nervous system function. In the auditory system, these declines include neural timing delays in response to fast-changing speech elements. This causes older adults to experience difficulty understanding speech, especially in challenging listening environments. Our study suggests the importance of music education for children today and for healthy aging decades from now."

**People with moderate music training show faster neural timing**



Redrawn from White-Schwoch et al. • Long-Term Effects of Early Music Training, Journal of Neuroscience, November 6, 2013 • 33(45):17667-17674 • 17667



# UNITED IN HARMONY

*The 2012 Olympics saw music, as well as sport, breaking down barriers. **Marian Blaikley** looks at music's ability to build bridges and open doors*

## One of the

most electrifying moments in the spectacular opening ceremony for the 2012 London Olympics occurred, when a choir of deaf and hearing children performed the British National Anthem. The exuberance of the children summed up all the excitement, pride, and the hopes of the weeks to come. But they also stood for something more – the power of music to include.

This was not the only musical beneficiary of the Olympics' slip-stream. Compositions created as a result of New Music 20x12 – a UK-wide commissioning programme – included an extraordinary piece entitled 'Technophonia'. Composed by Oliver Searle, it was delivered by Drake Music Scotland, a leading arts organisation providing music-making opportunities for people with disabilities.

'Technophonia' was performed by young musicians with and without disabilities, at venues in Glasgow, Edinburgh and London. It is scored for traditional orchestral instruments playing alongside three cutting-edge instrument, technologies – Soundbeam, Skoog and Brainfingers. Brainfingers is a system which enables people with very limited motor control to access computer technology through muscle movement and brain activity, via a headband fitted with sensors. To highlight the demands his highly collaborative piece makes, Searle highlights Chris Jacquin – a young musician with severe cerebral palsy already making a name for himself as a composer and performer. Chris, who performed in 'Technophonia' using Brainfingers, accesses it by clicking his jaw.

### *Herculean effort*

Says Searle: " 'Technophonia' had Olympian elements in it in more ways than one. It required a Herculean effort for someone like Chris to participate in a performance like that. It tested people to their limits, which is what I wanted. People with impairments are not often pushed, but this

kind of project presents everyone with something they have to work really hard to bring off."

Their efforts and the quality of the results were rewarded, since 'Technophonia' was nominated for two important awards – the Royal Philharmonic Society and the British Composer Awards.

"We didn't win," says Searle, "But getting to the stage of being nominated was very important for music making by people with impairments. There was no one else in a wheel chair at the ceremony."

A high-tech instrument also plays its part in the visits that the Orchestra of St John's (OSJ) in London and their artistic director John Lubbock make, 50 days a year to specialist schools and day care centres. To give his musicians a break during these sessions, John often introduces Soundbeam – a sensor technology which translates movement into sound. It is so sensitive that even the blink of an eyelid can produce a sound, to the delight of a child who has never, perhaps, had control over anything before.

OSJ and John Lubbock are particularly known for their work with people with autism. Lubbock is the founder of Music for Autism and, as the father of an autistic son, speaks movingly about the condition and what music can do for those who have it.

### *Anxiety melts*

"I think that under music's influence people with autism all become a little less autistic – so that much of what makes them anxious just falls away," says Lubbock. "Music seems to make the children get in touch with the best bits of themselves. I've not seen anything else, apart from music, that can do it."

OSJ make no compromises in the music they play to these audiences. A typical programme might include Mozart and Brahms, despite a mesmerised child standing only inches away or attempting to start up a conversation. But, as Lubbock says: "The players love it – it's deeply moving."

## Music and the Deaf

Music and the Deaf was founded in 1988 by the profoundly-deaf musician Dr Paul Whittaker OBE, to help deaf people, and those who live and work with them, to access and enjoy music.

Based in the North of England, the organisation holds regular music clubs for young deaf people, aged 8 to 20, in Yorkshire, Manchester and London, and has plans for further expansion. Music and the Deaf also runs workshops for all ages and all degrees of deafness, and is well known for its training materials and publications. Its partners and supporters include Arts Council England, local councils and music organisations, and MED-EL, the hearing implant company.

**EMPOWERED:**  
A disabled teenager can take  
part through music



Music for Autism also operates in the United States. The focus there is on free concerts held at their centres in New York, Washington, Los Angeles and Houston. The emphasis on musical quality is the same – all their performers are professional and the range of genres is wide.

### Useful links

Oliver Searle  
[www.nmcrec.co.uk/composer/searle-oliver](http://www.nmcrec.co.uk/composer/searle-oliver)

Drake Music Scotland  
[www.drakemusicscotland.org/](http://www.drakemusicscotland.org/)

John Lubbock and Music for Autism UK  
[www.osj.org.uk/about-us/about-john-lubbock/](http://www.osj.org.uk/about-us/about-john-lubbock/)

Music for Autism in the U.S.  
[www.musicforautism.org/](http://www.musicforautism.org/)

US founder Robert Accordino says of their first concert in New York in 2014: "We were thrilled to have Broadway performers from Rodgers and Hammerstein's 'Cinderella' here. It was possibly the most interactive and inclusive concert we have ever had!"

### *Tears in our eyes*

Other recent performances have included La Familia Afro Caribbean jazz sextet and previous concerts have introduced youngsters with autism to classical music.

Also in New York, where 30% of the audience is Spanish speaking, publicity materials are now in Spanish as well as English and the concerts are presented bilingually in real time. Over in Houston, programme co-ordinator Jade Simmons, is pushing the

envelope in terms of types of music – a recent performance by flamenco group Solero Flamenco was enthusiastically received by its audience.

It is the families as much as the participating children, who appreciate the liberation – albeit fleeting perhaps – that such programmes deliver. A New York mother of Ethan, aged 7, gives her heart-felt tribute to the power of music.

"My husband and I have never been able to go to an event and sit back and watch Ethan from afar like that," she says. "And there he was – participating and being himself and it was okay. Outings are usually filled with stress and trepidation (on my part) and often it's too hard for Ethan (like most recently when we went to a performance of Frosty the Snowman and had to leave the theatre at the intermission).

"So it was really something for us to watch him in a concert – my husband and I had tears in our eyes. Afterwards, Ethan looked at me and said, "happy!" That was really incredible." ■

# BUILDING IN ACOUSTIC PERFECTION

*Concert halls may have to cater for a rock band one day and a symphony orchestra the next. Susan Mayor talks to the experts about how they go about designing the perfect acoustic*



## The concert hall

itself plays an important supporting role in ensuring that the music you hear sounds beautiful, according to Professor of Acoustic Engineering at the University of Salford, UK, Trevor Cox.

"Music at an outdoor concert often sounds rather thin and distant," explains Cox. "What are missing are the thousands of sound reflections that bounce off the walls and ceiling in a good concert hall, reaching our ears from different directions, and spreading out slightly in time, so we feel immersed in the music."

The first step in designing the acoustics for a concert hall is to get the right strength of sound. Ned Crowe, Senior Acoustic Consultant with engineering company Arup, outlines the challenge: "We want a concert hall that can carry a sound that is loud enough to feel impressive, but that is also quiet enough to distinguish really quiet sounds."

"We also need the right balance between reverberance and clarity," continues Crowe. Reverberance is important in achieving a fullness of sound and affects people's overall perception of the space. The reverberation time – how long sound reverberates around a hall before becoming inaudible – is one of the oldest measures of a good concert hall, with an ideal value of just over two seconds in an empty hall.

### Designing acoustics

If the reverberation time is too short, music sounds dry and insubstantial. Too long, and the notes run into each other during fast passages of music. Clarity comes from the early reflective sound, which arrives at the ear within the first 15 milliseconds, and

*TESTING: A pistol is used to check the acoustics in the Bridgewater Hall, Manchester, UK*

is essential for clear definition between different notes. Warmth and brightness are also important for the tonal quality of the overall sound.

The starting point in acoustic design is calculating the volume of the concert hall – usually based on about 10 cubic metres per audience seat.

Most concert halls are 'shoe box' shaped – a narrow but tall space – so the sound energy reflecting off the side walls does not take too long to reach the audience. The Boston Symphony Hall is a classic example of this design. Completed in 1900, it was the first place in the world where acoustic science was successfully used to design a concert hall, and is regularly listed in the top three classical music venues in the world.

Another way of maximising reflections from the side walls, is by partitioning audience seating with walls between different blocks, to form what is called 'vineyard terracing'. The Berliner Philharmonie, opened in 1963, was the first concert hall to use this approach, in a pentagonal design that wraps audience blocks around the central orchestra. Many concert halls, such as the Bridgewater Hall in Manchester, UK (1996), are a mixture of the two designs.

### Concrete blocks

The material used for the walls and ceiling also determines the sound reflection. Large areas of plain, flat surface are avoided, because they can give off harsh sound reflections – relief or texture is better. The heavier the material, the better too.

Says Crowe: "For an orchestral hall, we tend to use concrete or concrete blocks with something like timber finishes bonded directly to it."

Designers also have to get the sound right for musicians and other performers, so they can hear each other and get a sense of the hall and the audience. This is achieved by hanging reflectors above the orchestra. The usual approach is to have a series of reflectors covering about 50% of the area above the musicians, so half the sound gets reflected back to them and the other half goes into the volume of the space to create reverberance.

Acoustic design leaves nothing to chance. Traditionally, designers checked the acoustics before building concert halls, using scale models. Crowe designed the 1:50

scale model used to test the acoustics for the Nytt Operhus in Oslo, completed in 2007 (also home to the Norwegian Opera and Ballet). Designers also now use computer models, as these are more reliable and faster.

The most recent generation of modeling, such as Arup's SoundLab, uses a library of sounds – including music or speech recorded in a completely dead environment – combined with key acoustic measures from a hall's design. This enables people to 'listen' to the acoustics of a building before it has even started.

### Flexible spaces

Designers used this technology to achieve the full orchestral sound that the Nytt Operhus wanted, with a novel auditorium cross-section, that is narrow at low level and wider above.

Concert halls are increasingly being designed as flexible spaces, to accommodate rock music, or even theatre, as well as classical music. New venues are designed around primary use – as 'live' spaces with long reverberation times for acoustic music, or as 'dead' spaces with less reverberation and greater clarity for rock bands or spoken performances.

But they can be adapted. To adapt an acoustically lively concert hall for a stand-up comedian or rock band, the sound is deadened using sound-absorbing material, such as horizontal drapes along wall surfaces or hinged or sliding panels. In a hall designed for rock or pop music, where the acoustics are produced electronically using microphones and speakers in a dead space, electric sound enhancement systems are used to create early sound reflections and reverberance for an orchestral performance.

Audio induction loop and infrared systems are used in concert halls, to help people with hearing impairments listen to electronically amplified music and performances. They are designed to carry the sound of the performance to the listener, free from other noise.

There is currently no natural acoustic technology to enable people with hearing impairments, to improve what they hear. The BBC National Orchestra of Wales put on a series of concerts last year to help hearing-impaired children, young people and adults to experience orchestral music. They did this by feeling the vibrations from instruments as they sat among the musicians, or by seeing a large visualisation of a concert on a big screen during the performance. ■



### More information

- **University of Salford Manchester.**  
Concert Hall Acoustics: Art and Science.  
An online version of an exhibition that originally appeared at the South Bank Centre, London and the Aldeburgh Festival in 2000.  
[www.acoustics.salford.ac.uk/acoustics\\_info/concert\\_hall\\_acoustics](http://www.acoustics.salford.ac.uk/acoustics_info/concert_hall_acoustics)
- **The Sound Blog.**  
Dispatches from Acoustic and Audio Engineering.  
Professor Trevor Cox  
<http://acousticengineering.wordpress.com/trevor-cox/>

# TECHNOLOGY IN TEMPO

*Christian Duffin finds out how scientific research is opening up new worlds of music for cochlear implant users*

*LOVE: Will Ogden feels the music with his band The Deafness*

## Will Ogden

used to be the guitarist in a band called The Deafness. During their brief career they played on the same bill as Paul Weller and KT Tunstall – quite an achievement for a group of teenagers, all of whom were hearing impaired.

Ogden, 26, was born profoundly deaf, but at three received a cochlear implant (CI) which changed his life. These electronic devices typically include a microphone and speech transmitters on the outside of the skull, plus a receiver and stimulator placed surgically inside the ear. They help people with severe or profound hearing loss to have a real sense of sound.

He remember hearing his first song in the late 90s when he was six: "It was called 'Song Two' by Blur and it had this great 'woo-hoo' singing bit in the chorus. It really captured me, and I fell in love with music."

Inspired by his father, and the pop groups Oasis and Blur, he took guitar lessons and was soon writing songs. The Deafness split up three years ago, but Ogden's love for music remains, and technological advances in CIs have increased the quality of what he hears.



*Cochlear implant designs have been successful in helping people hear speech, but music has presented manufacturers with greater challenges*

*SHARING: Hearing impaired musicians from The Deafness take the stage*

### More complex

Cochlear implant designs have been successful in helping people hear speech, but music has presented manufacturers with greater challenges. Johanna Pätzold, a music topic manager who works for cochlear implant producers MED-EL, and herself a CI user, explains: "Music is much more complex than speech, with a wider range of frequencies and a bigger dynamic range." MED-EL has worked to create more sophisticated implants using 'fine hearing' technology and soft, flexible electrodes to cover the entire cochlea, which results in an enhanced perception of pitch and tone across all frequencies.

### Full and accurate

Pätzold adds: "With these techniques, cochlear implant users can improve their perception of music, because the musical signal is represented more fully and accurately."

This has enabled MED-EL to address common issues CI users face as they learn to hear again – such as distinguishing between certain individual instruments when several are playing together, or between acoustic and electric sounds. Some individuals have tuning issues. Vocal and instrumental vibrato can also cause CI users difficulty, because the brain struggles to process rapidly varying pitches when it interacts with the implant.

University of Washington researchers are also working on techniques to create better designs. Les Atlas, a professor of electrical engineering, believes that the key may be to help them hear speech in noisy settings. His team has developed a new way of processing signals, enabling implant users to distinguish between different instruments and to hear music better. The researchers are also working on techniques to give implant users a better perception of pitch and melody.

### Helpful app

A team at the University of Southampton, UK called The Music Focus Group, has been examining ways to help people with CIs to get more out of listening to and making music. The team has produced an app called Mixer, containing 11 songs in which listeners can adjust the volumes of each instrument. Among them are Cliff Richard's We Don't Talk Anymore and 10cc's Dreadlock Holiday. Another app allows a listener to tap along to different rhythms that they hear.

### Flippers and shells

Ben Oliver, a lecturer in composition at the University of Southampton and member of the Music Focus Group, has also composed new music specifically aimed at CI users, often using everyday objects. He says: "I've done one called By the Sea, where the performers play beach equipment like

Compared with music, speech tends to be well controlled, with well-established and predictable perceptual characteristics. By contrast, music contains much variation and the perceptual requirements can vary, based on the musician and the instrument being played

deck chairs, flippers and shells. It shows that you don't need musical instruments to create sounds. A lot of people with cochlear implants write off their chances of enjoying music, but the more they listen to it, the easier it can become."

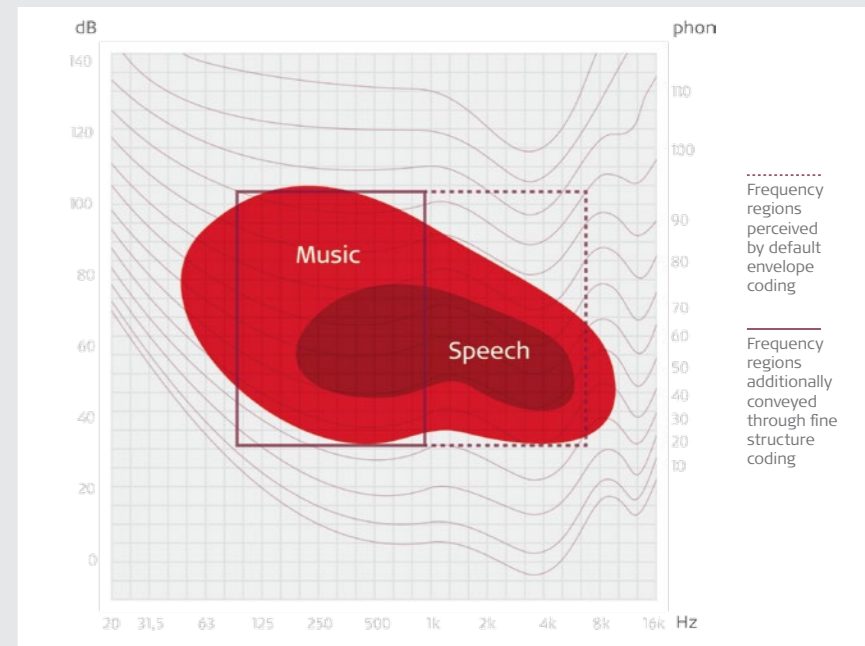
Composer Oliver Searle has also written music especially for people with cochlear implants. In 2008 his 'Noise Carriers' show was performed at the Royal Conservatoire of Scotland, mainly featuring well-known pieces such as 'Auld Lang Syne'. He says: "We choose low-sounding instruments such as trombones, double basses, and saxophones – which helps people with CIs because they can pick up the rhythms."

### Easy to listen

He devised 'Noise Carriers' after consulting people with implants, to find out their preferences on instruments and musical styles. Although he discovered that a lot of people with CIs struggled with clarinets and opera because of their timbre and the fluctuating vibrato and pitch, there were classical music fans, as well as pop lovers. Pop music tends to be easier to listen to because there are repetitive rhythms.

Ray Glover, 65, a retired university lecturer and secretary of the UK's National Cochlear Implant Users Association, sings in an

### Music and Speech Frequencies (Fellbaum, 1994)



a capella choir in services at cathedrals. "The cochlear implant has enabled me to continue to appreciate music, particularly after a period of retraining, having given feedback to the audiologist about what I can hear." Progress is being made so that cochlear implant users can hear music to a high quality. A major advance is the ability to plug music players like iPods directly into the CI, which blocks out all other competing sound. Technological advances and the work of researchers are opening up new worlds for music lovers.

"I had not heard the birds sing for nearly 40 years before I had an implant," says Glover, "But now I can recognise their songs from memory." ■

### What does it sound like?

Find out what 'Under Pressure' by Queen and 'Park Life' by Blur sound like for a CI user by listening to excerpts on the Music Focus Group website [www.southampton.ac.uk/mfg/music\\_info/adults.html](http://www.southampton.ac.uk/mfg/music_info/adults.html)





© MED-EL/THOMAS SIMETANA

## FROM WORDS TO MUSIC

*Implants can considerably improve the quality of life for hearing-impaired people – with music a clear part of that too, given the right technology.*

*MED-EL is the world's leader when it comes to hearing music through implants*

TRANSLATION BY: CHAD HARRIS

### Hearing implants

were originally designed solely for the understanding of speech, which today works almost flawlessly. Now it is music's turn to come under the spotlight. Hearing music properly requires sophisticated technology, because of the abundance of subtle details contained in it, as compared with speech.

MED-EL produces two implant systems that supply the best-possible perception of both speech and music – the classic

cochlear implant and the Electric Acoustic Stimulation (EAS).

Director of Product Management for MED-EL, Gregor Dittrich, explains: "The cochlear implant substitutes for natural hearing in people with severe or profound hearing loss, once a hearing aid cannot improve hearing anymore."

The Electric Acoustic Stimulation (EAS) combines both an implant and a hearing aid.

#### *Implant: Electric impulses*

The MAESTRO cochlear implant (CI) consists of two parts – the actual implant (which is placed under the skin behind the ear) and the external removable processor with its software and microphone. The implant has a flexible electrode array, which looks like a very thin cable. It is fed deep into the cochlea inside the inner ear, where it does the work of inactive

#### Enjoying music with an implant

An implant needs to be able to do four things to convey music well:

1. Low frequencies are only reproduced well when the electrode array is long enough to employ the whole cochlea. Because low frequencies support the detailed structure of sound, speech and music are perceived more richly.
2. It is vital that the implant sends the incoming sound information to the specific location inside the cochlea where this particular frequency is processed. Only then is it possible to distinguish between pitches of notes.

3. The implant should also stimulate the nerves corresponding with the correct frequency. When a sound with a frequency of 100 Hertz comes in, the electrode pulsates exactly 100 times per second, in the area naturally corresponding to this specific frequency. This allows the complex and detailed structure of sound to be transmitted – a prerequisite for sound that seems natural.

4. Any remaining natural hearing should be preserved, because it contributes to a richer sound. It can be protected by using soft electrode arrays and gentle surgical techniques.

Says Dittrich: "Implants by MED-EL fulfil all these requirements, so that not only does speech sound almost natural, but music does too."

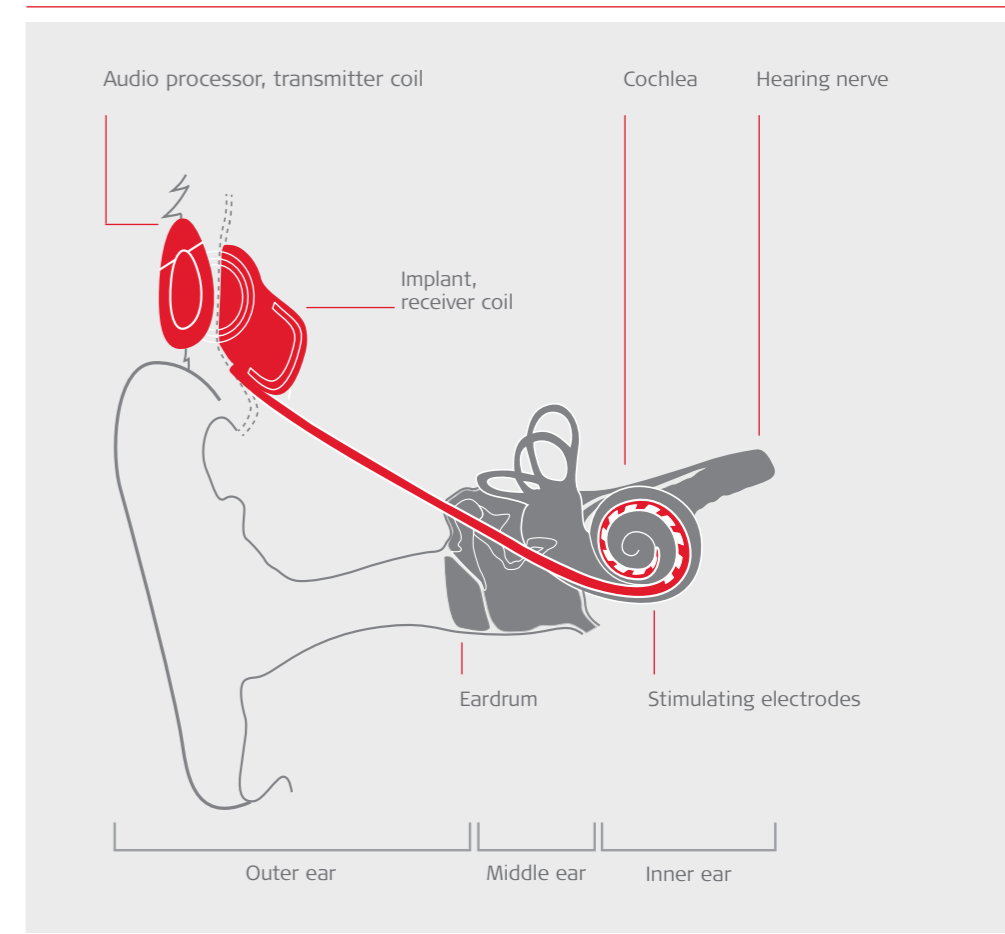
auditory cells. The external processor converts incoming sound into digital signals and sends them to the implant. From here, the signals are sent via the electrodes inside the cochlea, to the acoustic nerve. The brain receives the sound information and the implant user is able to hear.

#### *EAS: Two in one*

Dittrich explains: "The EAS system was developed especially for people with partial hearing loss."

EAS (like the CI) also consists of an external processor and an implant placed under the skin. It differs from the cochlear implant in the way it processes sound. Where a certain amount of natural hearing remains, the sound is simply amplified. Where sounds are inaudible for that individual, the implant steps in.

Says Dittrich: "This combination of implant and hearing aid makes it possible for EAS users to hear sounds that appear very close to natural, because use is made of their partial hearing." ■



# AN OSMOND FINDS HIS OWN VOICE

*From birth, Justin Osmond's life was defined by music, but the son of a music legend had been born deaf. He talks to Rachel Pugh about growing up in the shadow of The Osmonds and his battles to find his voice*

## What was it like growing up deaf as a son of Merrill, the lead singer in The Osmonds?

It was hard. I remember seeing Father on stage and not having any idea what he was singing about. I have to go on Google to find out the words to my own father's songs. His whole life is music, so he expected his children to play instruments, and well. And that included me.

## How did you learn music with that degree of hearing loss?

Beethoven placed a stick against the piano and leant it against his jaw to feel the vibrations. That's how I learned to play the violin. Mother started me at four years old. I relied on touch, feeling and sense. Although I could feel the vibrations of the violin through my jaw, it took me a long time to learn. Since my high frequencies are the weakest, I switched to the viola.

## How do you tune a string instrument without hearing?

At first, Father or my brothers Shane, Travis or Troy would tune my instrument. Father helped me with intonation and I learned to tune it myself. With repetition, my brain learned to memorise the sound. I would always stand to the left of Shane. When I had a hard time with the tempo, I'd watch his bow – it was my metronome.

## Most children hate practising – were you one of those?

At times my brothers and I relieved the boredom by having sword fights with the

bows – I broke many that way. I am grateful my parents did not give up on me, as I got pretty good on the viola and the violin. We even formed a little group that, for two years, travelled over the USA, performing at fairs and school events.

## Did you go to school?

Most of my education was at home when I was first diagnosed. I also went to an Alexander Graham Bell clinic, and the John Tracy clinic in Los Angeles. A really good speech therapist trained my mother and she trained me. This allowed me to go to mainstream schools.

## That can't have been easy?

Despite my parents' best efforts, I got picked on regularly. Once after elementary school, an older kid led me round to the back of the building and beat me up, purely because my hearing gear made me look different and I talked differently from the other kids too. When my brother Travis found out, he gave the kid a bloody nose.

## What got you through?

I would not have been able to do what I have done without all those years of intensive speech therapy. Every day my mother would work with me before school to make sure that I learned to speak well, and she insisted I read alone for 30 minutes daily.

## What sort of hearing equipment do you use?

I have always worn behind-the-ear aids with a big box, but when I was an adult –



## 10-second tour

Justin Osmond, the second son of Mary and Merrill (lead singer in the 70s band The Osmonds), was born with a profound hearing loss, only diagnosed at the age of two.

He is now an inspirational speaker. Justin's uncles, Virl and Tom Osmond, had also been born deaf. Their combined experience persuaded Justin to seek a career for 11 years with the Starkey Hearing Foundation. In 2010 he launched the Olive Osmond Hearing Fund in honour of his late grandmother, followed a year later by The Hearing Fund UK



© OSMOND FAMILY

## The Osmonds

The legendary American family music group, made up of siblings, was idolised in the 1970s.

At the height of Osmondmania in the early 1970s, the Mormon group had more gold and platinum-selling hits in one year than The Beatles and The Jackson Five had.

since I have big canals – I was able to have a double-receiver, in-the-canal hearing aid. As a child, I would flush my aids down the toilet and feed them to the dog.

## Would you consider a cochlear implant?

I am a candidate for them. My right ear is getting worse. I have a mentor who is making sure that I have the best-possible solution for me. A really good device enables you to be part of the human race.

## Does anything about your life surprise you?

Yes it does! Who would think that a man with my level of hearing loss would ever speak fluently, let alone become a professional public speaker?

## But not everyone has your amazing family backing do they?

No, the reason why I am involved [as CEO of Hearing Fund UK and the Olive Osmond

Hearing Fund] is because I was given the chance to hear, speak and understand what is going on around me, and that should be there for everyone. I've dedicated my life to this very purpose. If we don't intervene and help these young kids at an early age, they won't be able to function in a hearing world.

## You must have had some magic moments working with your charity in developing countries?

There was a 40-year-old deaf and blind woman. We put some hearing devices on her and for the first time in 40 years, she heard a family member say the words, 'I love You'. Life changing!

## Do you remember your first sound?

I have a hard time remembering it, but every time I see a little child hear for the first time, I can only speculate at how it must have been for me.

## What sounds do you treasure most?

I love hearing my wife Kristi – we got married on August 29, 2013. I also love the sound of an elk bugling in the mountains.

## Is there any type of music that is easier for you to listen to?

I love classical music, where I don't have to worry about the lyrics, and music with a good beat.

## How do you stay so positive?

I may have a hearing loss, but that hearing loss does not have me. ■

Justin Osmond's autobiography is called *Hearing With My Heart* (ISBN:978-0-9830503-0-8)

# TOO LOUD, MAN!

*Losing oneself in a wave of sound is what music is all about for many people, but is it damaging our hearing?*

CHRISTIAN DUFFIN INVESTIGATES

## The 1984 film

satirising hard rock music, 'This is Spinal Tap', contains a joke about the titular band creating a top-volume setting on their amplifiers of 11, rather than the standard 10 – so that they can go 'one louder'.

It is a reference to the music scene of the 1960s and 1970s, when playing very noisily became synonymous with rebellion. British rock band Deep Purple bumped up the volume to 117 decibels (dB) – the level of a sandblaster – for a 1972 show at London's Rainbow Theatre, and made the Guinness Book of Records. Is it only coincidence that The Who's guitarist Pete Townsend is 'almost stone deaf', according to the band's singer Roger Daltrey, while Phil Collins, will.i.am, and Ozzy Osbourne all have hearing problems?

Professor Chris Plack, an audiology expert at the University of Manchester, is convinced that auditory nerves can be damaged by long-term music listening, because of similar results on mice in a Harvard University study. He is part of a research team that will analyse the long-term impact of recreational music listening on humans – at clubs and gigs, and through MP3 players.

Part of the appeal of loud music, is that it can actually feel enjoyable. Plack says: "There can be an enormous stress response in the body and the result can be a visceral, pleasurable experience."

His team – funded by the Medical Research Council (MRC) – will study 180 people aged 18-30, with and without a history



*UPWARDS: If sound levels get too loud, a person's hearing threshold can be shifted up by as many as 40 dB, experienced as temporary deafness*

of noise exposure, to see their how their brains and auditory systems respond to a series of tests. Sophisticated imaging techniques will be used to try to detect deafness before it shows up on a conventional audiogram, and reduced neural response caused by damage to auditory nerve fibres.

The researchers hope to prove that a history of recreational noise exposure reduces the ability both to hear speech in noisy environments and to perceive musical pitch. This will put pressure on companies and venues to control noise levels.

### Hidden deafness

Another ongoing MRC-funded study involves the first 'mass participation' investigation into the effects of music listening. It features an online survey asking how often participants have been to gigs since their teens, and a test of number recognition above noise.

The MRC wants to investigate whether amplified music causes hearing problems, or whether hearing loss is just an unavoidable

part of growing old. Its lead researcher, Dr Michael Akeroyd, from the MRC Institute of Hearing Research in Glasgow, said: "In the early twentieth century we listened to music on horn gramophones, but we can now play music for hours at levels which are potentially damaging." The Health and Safety Executive, in partnership with representatives from the music industry in the UK, provides guidance on noise levels, via the Sound Advice website. It urges concerts halls, pubs and clubs to have screens, drapes and floor coverings to keep down noise levels.

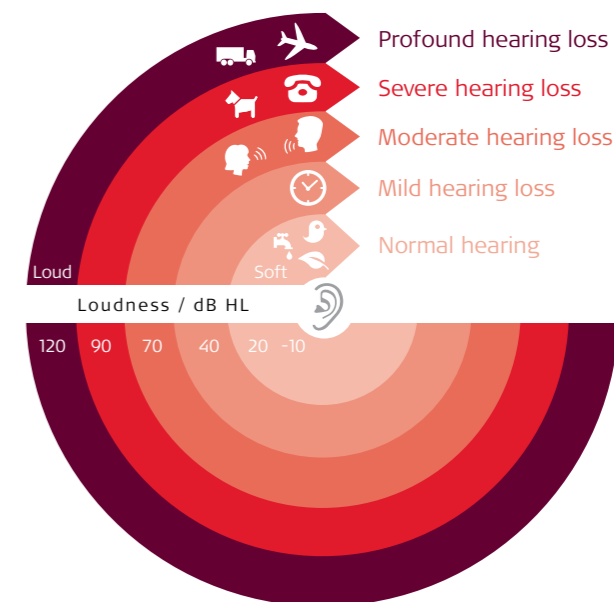
European Union legislation on noise reduction is contained the General Applications Regulations of 2007, focusing on employers' obligations to protect workers. For sound at 80 dB – above which it is difficult to hear normal speech at two metres – employers have to provide workers with ear protection. These rules do not apply to audience members.

In February 2013, the European Union brought in a default sound limit of 85 dB on all personal music players sold in member states, although users can override it to 100.

## The Audiogram

The audiogram provides a picture of how well a person hears. The volume of sound is measured in units called decibels (dB).

Zero decibels is a very low-level sound. Normal conversation has a volume of around 70dB. A person with normal hearing can perceive birdsong (10–20dB). Severe hearing loss has occurred, when a person can no longer hear the ringing of the telephone (90 dB).



The UK-based charity, Action On Hearing Loss – which supports people with hearing problems – is concerned that listeners are unaware of the dangers of overriding the default.

### Chill out area

The charity's audiology specialist Gemma Twitchen urges music lovers to wear earplugs at loud events. She says: "You can avoid standing near the speakers, go to a chill out area now and again to escape the noise, or wear ear plugs. There's a misconception that ear plugs block out sound and stop you from enjoying it."

Plenty of pop stars have supported Action On Hearing Loss's stance. Coldplay singer Chris Martin is one. He says: "I've had tinnitus for about 10 years, and since I started protecting my ears it hasn't got any worse. But I wish I'd thought about it earlier. Now we always used moulded filter plugs or in-ear monitors."

Twitchen argues that a culture change towards hearing protection is possible, as has happened with sun protective cream. She says: "Our difficulty is that, although we suspect there's a problem with music from MP3s, festivals, and clubs, we don't have the hard evidence."

Ear protection is not the preserve of rock and roll. Sydney Opera House, Australia is one of several international orchestra to provide acrylic glass shields between musicians, particularly between the woodwind and brass sections.

A Sydney Symphony Orchestra spokesperson called this a necessary evil, adding: "It's a thrilling experience to be sitting in front of a brass section in full flight, but it can be very damaging, because sound levels can rise above 110 dB. It's a profound irony that musicians' hearing, which is integral to the job, can be damaged by the very thing they love to do." ■

### Test your own hearing

Test your own hearing and help with an important research project by taking part of this survey:

The UK's Institute of Hearing Research wants to test the theory that long exposure to amplified music can cause hearing problems. See [www.100yearsofamplifiedmusic.org/](http://www.100yearsofamplifiedmusic.org/)



# BUILT-IN STEREO

BY BETTINA BENESCH  
TRANSLATED BY SIGRUN SAUNDERSON

## TEN SECOND GLOSSARY: BINAURAL

*If someone has two functioning ears, they hear binaurally as opposed to monaurally, with hearing in only one ear. Binaural derives from the Latin, 'bi' meaning 'two' and 'auris' meaning 'ear'. Binaural simply means 'with both ears'.*

*Two ears come as standard equipment. If both are out of action, daily life becomes rather complicated. **Even if only one ear gives out, a crucial 'something' is missing***

## Left or right?

Up or down? For people with normal hearing, locating sound is as easy as kicking a ball is for footballer David Beckham. But for someone who has hearing only in one ear, it is difficult to locate a mobile phone in a room from its sound alone. This is also the case for anyone who suffers from impaired hearing in both ears, but only wears a hearing aid or implant in one of them.

Determining the location of a sound is simple with the joint help of your eyes and ears. With both ears open and your eyes closed, it is still easy to pinpoint it. But close your eyes, put a finger in one ear and ask someone to click their fingers different places around the room, and you will find it hard to know where the sound is coming from.

### *Built-in stereo*

Identifying the source of a sound can only be determined properly with two functioning ears. Experts call this skill 'spatial hearing' or 'sound localisation'. For example, when a sound is generated on our left side, it arrives sooner at the left ear. It is also louder than on the right because the head acts as a buffer, as the sound travels to the other ear. This is known as the 'acoustic shadow'. From all these subtle forms of information the brain identifies the source of the sound and we can orientate ourselves. There are other reasons why we are born with two ears – loudness is almost doubled. While we may be able to hear a sound from 10 metres perfectly with two ears, it can be less easy with only one. This natural amplification is known as 'binaural summation of loudness'.

With two ears, background noise can be filtered and toned down. In this way we can understand each other, even in a packed restaurant with people telling stories, laughing, discussing and ordering food. This can only work because sound waves at varying intensities reach our ears at different times. From this sound cocktail, the brain can determine which message is wanted and which to reject. Music is better appreciated with two ears than with one. The sound is fuller, more spacious and rich. The stereo system works on the basic principle of two speakers generating sound to create a feeling of space. Our ears work in a similar way – acting as our built-in stereo system.

*Origins of speech*

Whilst hearing is important in every adult's daily life, it is even more crucial for infants who are only just beginning to understand what their parents are talking about and how their mothers tone of voice changes when she is cheerful or tired. They learn to distinguish one sound source from another and realises that stamp-

ing on a wooden floor sounds different from on grass, that a feather falls silently, whilst an iron crashes down with a loud bang. The brain learns to perceive information with both ears and to interpret it. With each sound that the developing brain takes in, new neural connections are formed, just as with every other learning process.

The nerve tracts in the brain grow, join and become more stable. All this happens before the child has even spoken a single word.

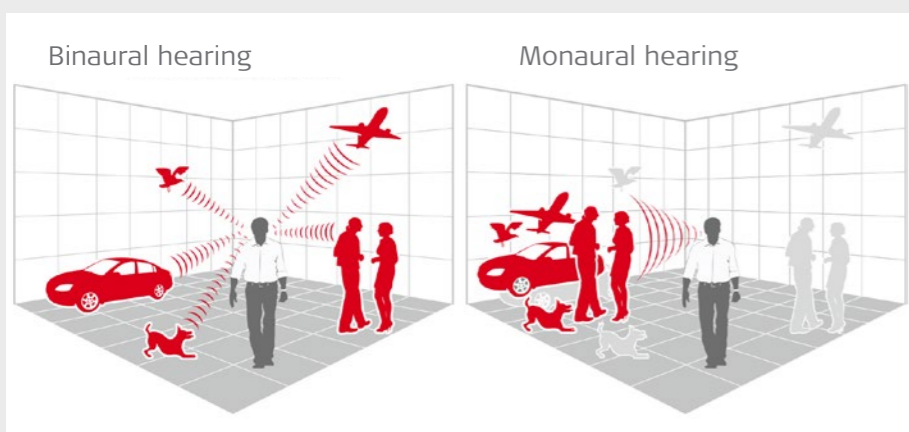
Speaking starts with hearing. Only when we hear can we develop spoken language. Two ears are ideal, but essentially, one is enough, as long as the learning environment is quiet. Later, at school or university, things can become complicated. Classrooms can be loud, and auditoriums large. This can make it difficult to understand the teacher. We can get by with just one ear, but there are good reasons why we were designed with two. The use of both ears means a greater opportunity to take in essential information and have a greater awareness of our world. ■



**Two ears, two aids**

**If a person has hearing problems with both ears, two hearing aids or implants are beneficial.**

In many countries, this is becoming common practice, especially with children. Scientific studies show that hearing-impaired children benefit from a second device. If sound signals come in through both ears, the brain's hearing centre is optimally activated. Children learn to hear in a more natural way than with only one implant. As a consequence, they have an improved understanding of speech and can express themselves better verbally. Using two hearing implants, as opposed to just one, leads to two clear benefits – children understand speech well, even in loud environments, and the localisation of sound is much improved. Parents report that their children are less tired after school, once they have been fitted with a second hearing implant.



**IMPRINT**

MED-EL Headquarters, Fürstenweg 77a, 6020 Innsbruck, Austria | **Editor:** Rachel Pugh | **Writers:** Verena Ahne, Bettina Benesch, Marian Blaikley, Christian Duffin, Susan Mayor, Rachel Pugh, Sigrun Saunderson | **Responsibility for content:** Thomas Herrmann | **Concept and design:** Projekt21:mediendesigngmbh | **Printing:** pri-ma.net | 1st Edition May 2014 | Rights reserved on mistakes, typographical and printing errors. Send comments and questions to: explore@medel.com | You can also use this email address to order more copies of the magazine. For the online version go to [www.medel.com/explore](http://www.medel.com/explore)

**Welcome to... WORLD OF THE INNER EAR**

*The cochlea (Latin for snail) looks like a snail shell*

*Physical vibrations caused by noise are turned into electrical information the brain can recognise as specific sounds*

*The coiled form of cochlea is unique to mammals*

*A watery liquid (the perilymph) moves in response to vibrations coming from the middle ear via the oval window*

*Humans owe their sophisticated hearing to having long coiled cochleas - rather than short, straight ones - giving them a wide range of both high and low frequencies*

*No two human cochleas are the same size and shape*

*16,000 hairs covering the inner walls of the cochlea, each act as vibration sensors, jostling their neighbours, to open potassium channels in cell membranes beneath the hairs*

*The structure is divided into three fluid-filled parts - two canals transmit pressure and the third turns pressure impulses into electrical impulses and sends them to the brain*

**Cochlea World**

**TO THE BRAIN**

©STEVEN COLLINS

# Explore the world of sound

with hearing implant solutions from MED-EL



Our innovative solutions developed using our experience, spirit and the latest technologies, make us your trusted partner for an enhanced quality of life and better hearing – lifelong. For more information, visit us at [medel.com](http://medel.com)



hearLIFE MED-EL