The starting signal came in November 2012 - five years of funding for the Cluster of Excellence Hearing4all. Mr. Kollmeier, you are the Cluster’s coordinator. Where does Hearing4all stand at the half-way mark?

Kollmeier: It’s always hard to make an interim assessment. The sheer number of tasks involved was and still is overwhelming. But after two-and-a-half years we are able to say that the majority of the problems we wanted to tackle, we have indeed tackled - and in most cases we have already achieved substantial success.

Hearing research in the Cluster of Excellence can be roughly divided into three fields: improving hearing aids, basic research for assistive audio technology and improving diagnosis to provide better individual treatment. What have you achieved in diagnostics, for example, and in what direction is it headed?

Kollmeier: We are looking into how sound is actually processed – from the perspective of neurobiology, psychophysics and neuropsychology for example. Building on this we have developed new ways of tying up the basic research with clinical requirements, the treatment side of things, in other words. We have developed diagnostic methods which already establish international standards, the “Oldenburg Sentence Test”, for example, which exists in 21 languages.

Can you give a specific example of how you have improved treatment through diagnostics?

Kollmeier: Something that has come on in leaps and bounds recently is combining cochlea implants and hearing aids. Either on one ear so that the person hears high frequencies with the implant and low ones with the hearing aid. Or they have a cochlea implant in one ear and a hearing aid on the other. These therapeutic possibilities have only been developed in the past three years - and we have provided the underlying diagnostic basis and criteria for this. However it is not yet possible to develop the right therapy for each and every patient at the flick of a switch or even for this to be implemented globally as a software solution.

Is this a long-term goal?

Kollmeier: Absolutely. We want the standards we have developed here to be used internationally. Our internationally compatible language tests are particularly important in this respect. By using them other scientists and partners worldwide draw on our experience and we can distribute our standards internationally.

Ms Thiel, you are not involved with the Sentence Test specifically, but as one of the Cluster’s principal investigators you also work in diagnostics. What is your approach there?

Thiel: Our goal is to individualise diagnostics. So are there factors, beyond simple hearing loss, that can help you achieved in diagnostics, for example, and in what direction is it headed?

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plain why the quality of hearing in patients varies so much? Not everyone benefits from a hearing aid or a cochlea implant. Not just auditory but also cognitive factors may well play a role, as a scientific location, even beyond the institution's Award for Technology and Innovation. Kollmeier has received a number of prestigious awards, including the International Award of the American Academy of Audiology and the German President's Award for Technology and Innovation.

How has your field developed since the Cluster of Excellence began? How have the possibilities for your research expanded?

Kollmeier: One thing that makes a huge impact at this location is our two brain imaging devices – few institutions have both in one place, and they open up exciting questions for us. The MRI scanner that I work with allows us to localise processes in the brain. And the magnetoencephalograph provides us with the temporal resolution. This means we can examine the same patient in both machines and gain an optimal comparison of the temporal and spatial dimensions. That is one aspect which substantially strengthens Oldenburg as a scientific location, even beyond the Cluster of Excellence. Kollmeier: And as well as about the machines it is also above all about the people. We have a very good mix of cooperating scientists who share the same methodology but approach the matter with very different research interests. In recent years, for example, the cognitive neuropsychology aspect has very much come to the fore. We were blind to this aspect before. Ms Thiel and the other scientists have classified our test subjects also according to central functions so that internationally we now have the best characterised stock of test subjects. This means we can run studies in Oldenburg that simply don’t exist in any other locations.

The second field of research is better hearing devices. What is the current status here? Kollmeier: We set out to demonstra-te the principle feasibility of better hearing devices and to improve the systems technology. Our vision is to have a bit of Oldenburg in all hearing systems in ten years’ time. The prototype development is highly successful. Using demonstrators we can show the advantages of binaural – or two-ear – hearing and of scalable algorithms. The first patent has just been registered for a device that may be turned from an assistive listening system for very slight hearing impairments right into a fully functional hearing aid by button press. There have also been technologi-cal advances in cochlea implants.

“Our advantages: entrepreneurial spirit and unpretentious collaboration” Birger Kollmeier

What role does individualisation play? Thiel: The goal is to adjust the function of the hearing device on the basis of individual diagnosis. For example researchers have found out that when hearing-impaired patients use a hearing aid for both ears simultaneously, loud volumes in particular are heard much louder than was previously assumed. Up to now this binaural accumulative effect was not taken into account when adjusting hearing aids. They were adjusted to each ear individually, which meant patients would find the volume too loud. So then the whole hearing aid was turned down – making it too quiet at lower volumes. Studies carried out here in Oldenburg have demonstrated that binaural hearing must be taken into account to a far greater extent than it has been in the past. It may be possible to lay the foundations for this in the next two years.

And how are things going in the third field of research, basic research into assistive audio technology? Kollmeier: On the one hand we are trying to find solutions for people for whom a hearing aid is too much but no hearing aid at all is too little – and in general to integrate human-machine interfaces into audio systems. In the area of speech recognition, for instance, we have been very successful. But we are also moving in the direction of brain-computer interfaces, where we are trying to use EEG signals to help control hearing devices. Once again neuropsychology plays a key role here.

Thiel: That’s Professor Stefan De bene’s research group, which has developed very interesting measuring techniques. Basically we’re talking about mobile measurement of electrical brain activity – but in practice no one would want to walk around campus wearing a conventional EEG cap. So the group is trying to make these devices smaller and smaller and has reduced the electrodes to the point where they can simply be stuck behind the ears. This makes them completely unobtrusive, but they can still measure brain activity. Kollmeier: With that innovation Stefan Debener and his team have taken the global lead within just two and a half years. It’s very impressive to think that in the future we may be able to operate hearing aids and similar devices on the basis of such mobile EEGs.

What is your vision for this field of research? What do you want to achieve? Kollmeier: Basically we want both technological and systems competence. Systems competence also means knowing how humans function and what they need, so in the future we can radically improve and support user-friendliness and practicality in hearing-related solutions. That means creating and controlling all the prerequisites for us being able to find solutions that are not possible today, but are already visible on the horizon.

Can you name an example? Kollmeier: Hearing devices combined with smartphones for example. Our vision is that in a few years’ time every smartphone will contain Oldenburg technology, in the form of an app, say, that helps the user to hear specific things more precisely.
Several members of Volker Hohmann’s research team recently once again spent a large part of their working week in the university cafeteria. Hohmann made no attempt to stop them – quite the opposite in fact. Hohmann, Professor for Psychoacoustics and one of the leaders of the Oldenburg Research Unit “Individualized Hearing Acoustics” funded by the German Research Foundation (DFG), actually seems delighted. Because the cafeteria on Wechloy Campus – in the form of a virtual three-dimensional model, please note – belongs to the team’s research territory. “Every added detail brings reality a little bit closer,” Hohmann says.

So what makes the cafeteria between the Maths and Physics wings so interesting for hearing research? It is a complex audio environment with diverse sound sources from different directions. To have a conversation there – potentially with a group of people – amidst the clatter of cutlery and mobile phone calls, requires excellent hearing. But as long as they function properly almost no one thinks about hearing impairment. Yet almost one in six people has limited hearing – and plenty of people who have normal hearing now will be confronted with hearing impairment in the future. They all stand to benefit from Hohmann’s work. Together with his team he divides his time between developing virtual realities (VR) that simulate environments like the aforementioned cafeteria or a busy train station with both images and sound in the laboratory, and following on from this, developing smart hearing devices that are able to analyse complex acoustics and also identify what their wearers wish to hear.

On a Monday morning in May we meet at NeSSy, the new research building on Wechloy Campus. In his office on the third floor Volker Hohmann, who is also the leading researcher in the Cluster of Excellence “Hearing + Gaall”, lays his cycling helmet on the windowsill. One of the walls is lined with boxes of books and folders. There has been little time to unpack them in recent months, as research and setting up the new laboratory rooms have taken priority. A visit to the new building provides a glimpse of the technical