



# The Ear Drum

Virginia Lions Hearing Foundation & Research Center, Inc.  
Box 800477 UVA Health System  
Charlottesville, VA 22908-0477  
434-296-5466

2012

## Message from the President

I want to thank our Secretary Grover Jaeger and the other board members who helped me in October when I began to serve as President after the resignation of our President.

I am always impressed and in awe of the doctors whom we support in their ongoing research in the areas of Hair Cell Regeneration, Balance Disorders, Audiology Research, and Meningitis. Drs. Hashisaki, Corwin, Gardner, Gleason, Kesser, and Mason are to be commended on their ongoing efforts in their efforts to find solutions to cure or treat deafness.

I am especially pleased to state that this year the VLHF is beginning to make some great strides in our efforts to educate public school children in the fourth grade on Noise Awareness. We now have the use of a curriculum developed by the Farmville Lions Club and Longwood College. We are very grateful to both Farmville Lions Club and Longwood College for allowing us to use this curriculum.

Our partner doctors at UVA and the Lions board members continually ask for your donations to support our foundation. I ask each club to make a special effort to add the Virginia Lions Hearing Foundation to your Lions Club's budget this year.

Another goal this coming year, as I serve my full term as your President, is to encourage each Hearing Chairperson in all six Districts as well as Foundation directors and advisors to get the VLHF message out into your Districts, providing club programs and encouraging monetary support for the outgoing research of the Virginia Lions Hearing Foundation.

Our Executive Director, PCC Don Colley, will again visit each Fall Conference with a message and display showing the importance of the Foundation and the ongoing research at University of Virginia.

I invite each Lion to attend one of our board meetings. At each meeting, our Medical Director Doctor Hashisaki either provides a program of interest in the hearing-related field or has one of the other doctors give a program in their area of expertise. This Lions year, Dr. Hashisaki presented a program on Vesibular Physiology, Dr. Corwin spoke to us about his research activities, and Dr. Gleason presented a program on how humans stood and balanced themselves while standing or walking.

Finally, I would also like to encourage all Lions Clubs to award an E.G.Gill Fellowship to a deserving Lions member or supporter who has performed some outstanding work in the hearing conservation area.

Yours in Lionism,

*Doug*

Lion Douglas Cross, PDG  
*President, VLHF*

# Hair-Cell Regeneration

Jeffrey T. Corwin, Ph.D.  
Professor of Neuroscience  
University of Virginia

"I would like to thank the Lions of Virginia for allowing me to share with you my story. The Lions have done so much as far as helping the people who are hearing impaired that I think you need to find out just what you are doing." Those are the words of a grateful patient who received a prosthetic cochlear implant in an operation at the University of Virginia some years ago. The operation was paid for by the Virginia Lions Hearing Foundation, and the operation together with the subsequent work that the patient and healthcare providers did at UVA restored hearing for that patient who had become deaf about 20 years before. Those words have been heard by every first-year medical student who has trained at the University of Virginia for at least 10 years because each year I show a video at the start of the lectures about the ear and the auditory system that I give to the medical students. In that video segment the patient explains how devastating it was for her to lose her sense of hearing and to lose the connections with nature, the connections with our environment, and most importantly the connections with other people that we make through our sense of hearing.

For those of us who are blessed with good hearing, it is difficult to imagine life without the sound of a spoken word, the pleasure of music, the song of a bird, or the warning of a siren. But many people exist in a world without hearing, either from birth or through loss of their hearing later in life. Deaf persons who have learned sign language at a young age have an effective substitute for spoken communication, but people who lose hearing later in life often suffer devastating feelings of isolation from loved ones and from society. The most frequent cause of permanent hearing impairment is loss of tiny sensory hair cells that transmit hearing and balance signals from our internal ear to the brain. We begin life with a relatively small number of sensory hair cells, and the death of any of those cells can diminish our sense of hearing or our balance.

For many years it was thought that all the hair cells that would exist in the ears of animals were produced during embryonic development. Production of these

cells was believed to cease before birth so any loss of hair cells later in life would be irreversible. Unfortunately, it is still the case that many forms of hearing and balance dysfunction are clinically permanent, but recent research has expanded knowledge and provided hope for the eventual development of therapies that may be effective in reversing common forms of hearing and balance loss that are currently permanent.

My own entry into this field occurred in 1974 when, as a graduate student, I discovered that the ears of sharks continue to produce hundreds of thousands of new hearing hair cells throughout life. The obvious implication was that their ears might be able to replace lost or damaged hair cells through regeneration. I set out to look for the possibility of hair cell regeneration in cold-blooded vertebrates like sharks, toads and salamanders, and I proposed that we might be able to learn to stimulate hair cell regeneration in the ears of warm-blooded animals and humans. Fortunately, the senior scientists who reviewed my first application to the U.S. National Institutes of Health (NIH) were willing to take a chance on what some others saw as a crazy idea, and my laboratory has been funded now for over 30 years by that same grant titled, "Growth and Regeneration in the Inner Ear."

For nearly 24 years, the Virginia Lions Hearing Foundation has been another important and even more dependable source of funding for my laboratory's efforts to find out how to trigger the production of new cells in the ear and unlock the potential for regeneration of hair cells that should eventually contribute new therapies to allow recovery from forms of hearing loss and balance disorders that are now permanent. A byproduct of the research support that has been provided by the Virginia Lions Hearing Foundation has been the training of the number of Neuroscience students and resident doctors in Otolaryngology-HNS who have gone on to start and build their own successful and productive laboratories and clinical practices at other universities and research centers such as the National Institute on Deafness and other Communication Disorders in Bethesda, MD.

With the help of funding from the Lions of Virginia we have made great strides towards the day when balance and hearing problems that are now permanent, may become reversible under a doctor's care. Some years ago we discovered that birds have hair cell

replacement capabilities that spontaneously bring back hearing and balance cells within days of injury. That regeneration even restores full inner ear sensitivity within a matter of weeks.

We have learned which cells act as stem cells to give rise to the replacement hair cells and have found that the equivalent cells in the balance sensors from the ears of patients and mice are able to respond to damage by undergoing the first steps in the regeneration process. We have also identified drugs that can stimulate those first steps of regeneration in mammalian ear tissue when that tissue is grown "in a test tube" (actually it's grown in a specialized type of tissue culture dish) in the laboratory. But for years our number one question was, "What keeps the ears of humans and other mammals from having the kind of regenerative recovery that occurs automatically in birds, sharks, frogs, and salamanders?"

We have finally come up with what appears to be an answer to what normally prevents our ears and those of other mammals from responding with the kind of regenerative recovery that restores sensitive in birds and cold-blooded animals. This year we even were able to perform the first test of our tentative answer to that question and last month we published the good news from that test in an article that thanks the VLHF for funding of the research. The apparent answer is a bit complicated. It has to do with specializations that develop in cells in our ears and the ears of mice, but do not develop in the same types of cells in the ears of birds, sharks, or frogs. Our test of that answer involved the use of genetically engineered strains of mice, where we were able to trigger the death of hair cells either before or after the specializations in those cells had developed. When we triggered hair cell death before the specializations developed new hair cells were regenerated, but when we waited just a few days longer, so that the specializations had time to develop, then the ears of the mice no longer were able to replace the hair cells that we caused to die off.

Now, we are very excited about experiments that are focusing in on those regeneration-restricting cellular

specializations. Thanks to special funding we received from the VLHF this year we are able to perform these vital experiments in which we are using information gained through offshoots from the NIH's Human Genome Project and over twenty different strains of genetically engineered mice. It was thrilling to us to see that we could stimulate real hair cell regeneration for the first time in young living mice this year, and the new work supported by the Lions of Virginia should allow us to take this research to our goal of discovering how to stimulate hair cell regeneration even in older ears.

As I wrote in quoting that grateful patient - The Lions of Virginia have done so much! I hope this short article has helped to let you know about some of the things you are doing as supporters of the Virginia Lions Hearing Foundation. For me it has been a pleasure and an honor to serve on the Foundation's Board of Directors for the past six years. I look forward to years of working with you as we advance together towards the day when currently permanent forms of inner ear damage will become reversible.

**Virginia Lions Hearing Foundation and  
Research Center, Inc.  
Box 800477 UVA Health System  
Charlottesville, VA 22908-0477**