

# Chapter 4

## Discussion of the original Moore & von Leden ultra high-speed films

**Amy M. Matson & Krzysztof Izdebski**

### Abstract

This is an interview we conducted with Hans von Leden on June 28, 2013. The purpose was to highlight the ideas behind initiating this research more than 50 years ago.

### Interview

**AMM & KI:** Hans, it is now June 28, 2013 or 56 years after yours and Paul Moore's pioneering work on visualizing glottic mechanics with ultra high-speed filming and simultaneous sound recording. Can you please talk about where you started your research?

**HvL:** We started this research in the Department of Otolaryngology at the Northwestern University Medical School in Chicago Ill.

**AMM & KI:** Who else was on your team?

**HvL:** The principal cinematographer on our team was Professor Paul Moore. Financial support came from two grateful patients of mine, Mr. & Mrs. William and Harriet Gould, who set up a foundation for this purpose. When he died, William Gould donated one of his factories to us. It was supposed to provide us with 2 million dollars income per year, but it did not work out in the end.

**AMM & KI:** What was your background and training and that of Professor Paul Moore? How did the two of complement each other?

**HvL:** I completed ENT residency after graduating from Loyola University in Chicago. Professor Moore was a graduate of Northwestern University in Chicago. We cooperated extremely well. We complemented each other and formed an exemplary duet. Prof. Moore was superbly humble and gentlemanly fellow. I am going to show you now a letter that Paul wrote to me July 2, 1998, not so long before his death. I have never shown this letter to anybody but my wife. In fact if you wish, you can post this letter here as it contains many answers to the question you just asked.

**AMM & KI:** Can you please discuss your inspiration to use ultra-high speed filming?

**HvL:** There were two things I brought from the Navy when I was discharged, the two things that I felt I should apply to my research. The first was the ultra high-speed camera, and the other were my observations of air-flow testing in a chamber that tested air-flow against the airplane wings. Experiencing these two technologies made it so obvious to me, that same conditions were happening in the larynx, and what we now we had to do was to figure it out how to do it in the larynx. *Camera!!!*, and the rest was so exciting.

**AMM & KI:** Can you please talk about your original research goals/motivations.

**HvL:** My first award was for my photography of animals that I took at a zoo of my home town, Breslau in Silesia. So, since early childhood photography was my fascination, motivations and goals were to film motions of the vocal in a live human being.

**AMM & KI:** Hans, it is now June 28, 2013, or 56 years after your pioneering work, from the perspective of over half of the century, is there anything that you would do differently now, or were the two of you on the right track from the beginning?

**HvL:** In 1960 we also studied, air-flow, air pressure and acoustic of phonation and we were very interested to correlate physiology to perception. Paul Moore was the perfect person to put my mind to action. The rest is a history.

**AMM & KI:** What was the most astonishing finding regarding VC behavior that was revealed by HS filming?

**HvL:** The cough!

**AMM & KI:** Why?

**HvL:** The film showed that there was no limit to the range of motions at the glottis in this primary laryngeal protective behavior.

**AMM & KI:** What was the least expected finding regarding VC behavior that was revealed by HS filming?

**HvL:** It was the observations of the action of the arytenoid at the joint.

**AMM & KI:** We now complain that it takes lots of money to obtain HSDI equipment and that it takes lots of time to process an exam. Tell us about what it took you to pay for your equipment then and how long it took to process and to analyze a typical exam?

**HvL:** Haha, the monies! In todays dollars the equipment (cameras, films, lights etc.) would cost approximately \$500,000, and I am underestimating. Processing time? After filming, we needed to develop the reel. This took several days. Then we played it back for eye-and-hand frame-by-frame analysis. So one single film contained more or less 1000 to 2000 frames if filmed at 1000-2000 frames per second. So it took days, working full -time to go through 1 sec of film. So, the HSDI users have no right to complain (haha).

**AMM & KI:** When watching your movie on the "*The Function of the Normal Larynx*" we see a face of a beautiful woman and then her larynx and also a profile of the woman singing. Can you reveal who these "divas" were?

**HvL:** The only person that I would consider beautiful was my wife, and we filmed her larynx many times.

**AMM & KI:** You mentioned in the past, that your ENT colleagues were not thrilled with the technology gains represented not only by UHSC recordings but also by the clinical value of the stroboscope that you and Prof. Timcke of Germany were developing. How do you explain different contemporary milieu?

**HvL:** To begin with, my ENT colleagues realized, that strobe was expensive, took a lot of time to use and analyze. They simply could do without such a time-consuming affair.

Now, we know that stroboscopy provides additional crucial information of how vocal folds act, and fits the modern medical philosophy of basing diagnosis and results on evidence and not of wishful thinking.

**AMM & KI:** You also were one of the first proponents of computer assisted diagnosis (Dx) of dysphonia. Why in your opinion, are we still behind schedule in efficacious application of computers to assist in voice Dx?

**HvL:** I do not understand why! I strongly support this avenue for so many reasons, like precision, time, accuracy, and above all—objectivity.

**AMM & KI:** Now, when you are 95 years of age, and still bright as ever, what words of “vocal wisdom” do you have for a young researcher and/or voice clinician?

**HvL:** Persevere!

**AMM & KI:** Any final statements, Hans?

**HvL:** While Paul and I were the original engine at the Lab and later at the Institute, we benefitted enormously for the many colleagues especially from Japan (Dr. Yanagihara) who contributed so much to the development of pragmatic approaches to the studies of the human voice. And also, I want to mention Prof. Timcke, who at the end is credited with popularization of the laryngeal stroboscopy.

**AMM & KI:** Thank you for your time, Hans, and as you always do, let’s end our conversation with the phrase, “*God bless you.*”

**HvL:** And, God bless the two of you.

