Pedersen M (2008). Register measurements in puberty. Deutsche Gesellschaft für Akustik e.V. *Congress report 2nd workshop COST 2103 Aachen*.

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WG 5

Aachen 2008

Register measurements in puberty

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By:

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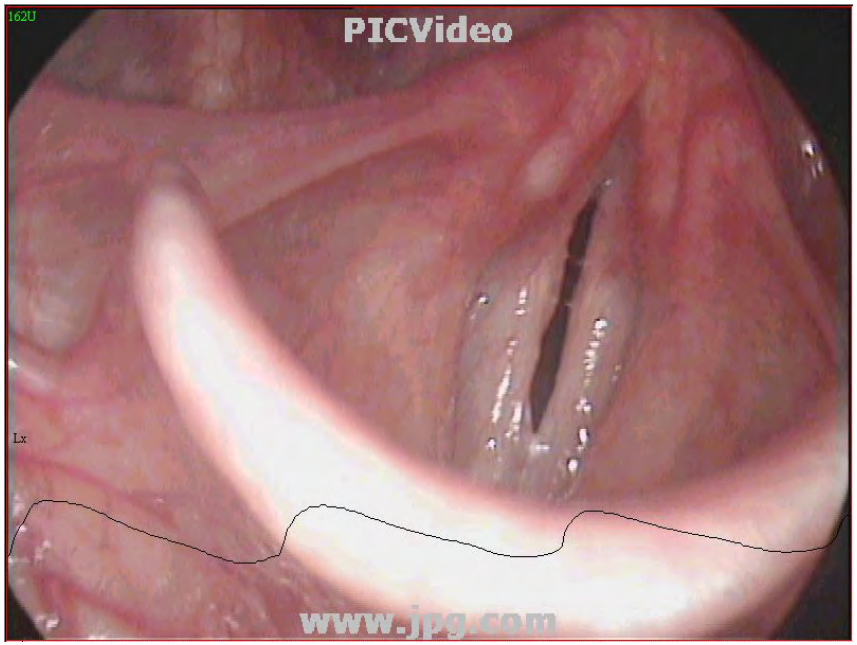
A Cost 2103 research study Aachen 2008

Stroboscopy

- It is hardly possible to see register shifts in pubertal boys even if there is a very clear acoustical change of a whole octave, as demonstrated in a video film at the Voice symposium 1988 in NY, USA (1).



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Phonetography

- is a valuable tool to measure the tone range and the dynamic range in puberty. An example of pre-pubertal and post-pubertal boys' voices is shown (longitudinal investigation in The Royal Danish Boys Choir).
- In that study the phonetograms were compared with hormonal and pubertal development, a pubertal boy having a serum testosterone level of more than 10 nmol/l.
- Many other studies have been made on the development of voice where phonetography seemed to be the best tool.

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Phonetography

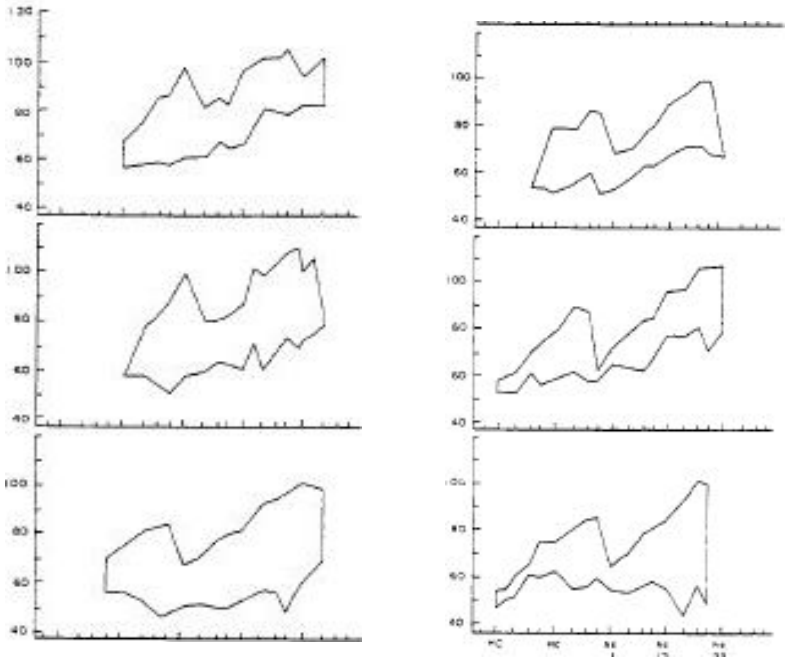

Figure 1. Six phonetograms with 2 months interval of one prepubertal boy from age 13 7/12 to 14 6/12 years. The third phonetogram (in December) was best. In January the boy was excluded from the choir (cl. 262 Hz). M Pedersen Thesis 1997

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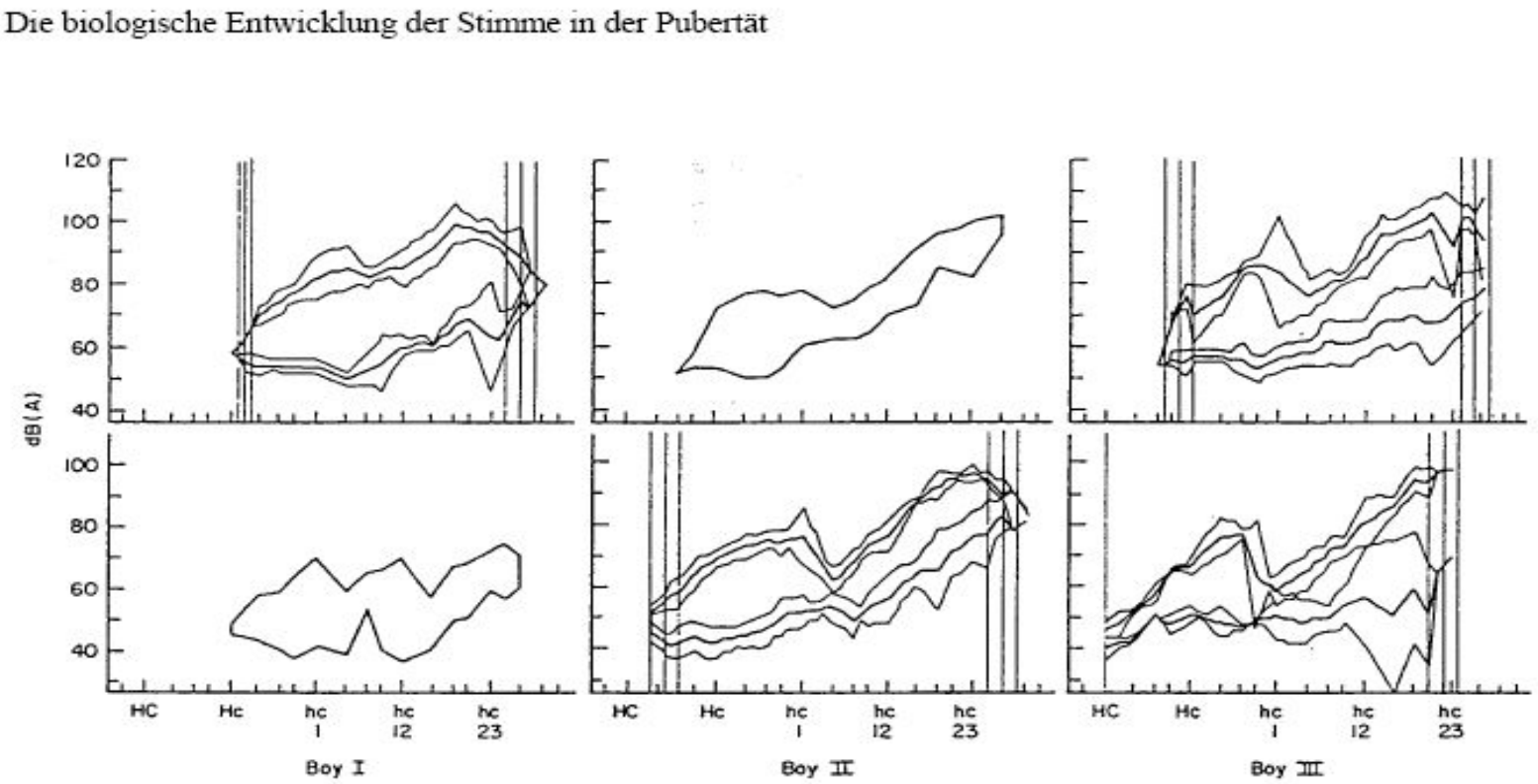
Phonetography

Three boys: boy one has 1 pubertal phonetogram and 5 prepubertal phonetograms, boy two has 1 prepubertal and 5 pubertal, boy three has 3 prepubertal and 3 pubertal phonetograms. The prepubertal boys were still singing in the choir.



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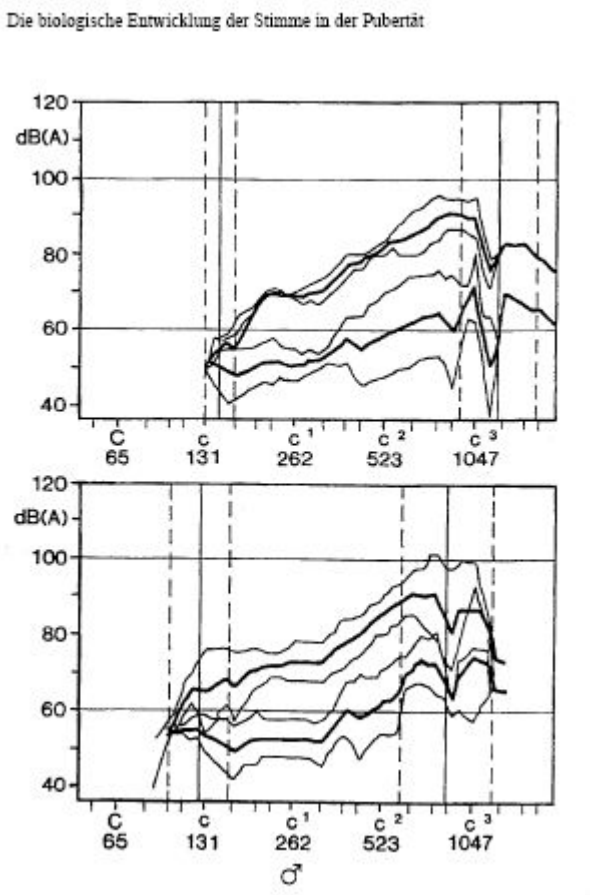
- Electroglottography is another valuable tool. The method has been used already by us in the Thomaner choir in Leipzig.
- This is underlining the register shifts seen in the phonetograms.



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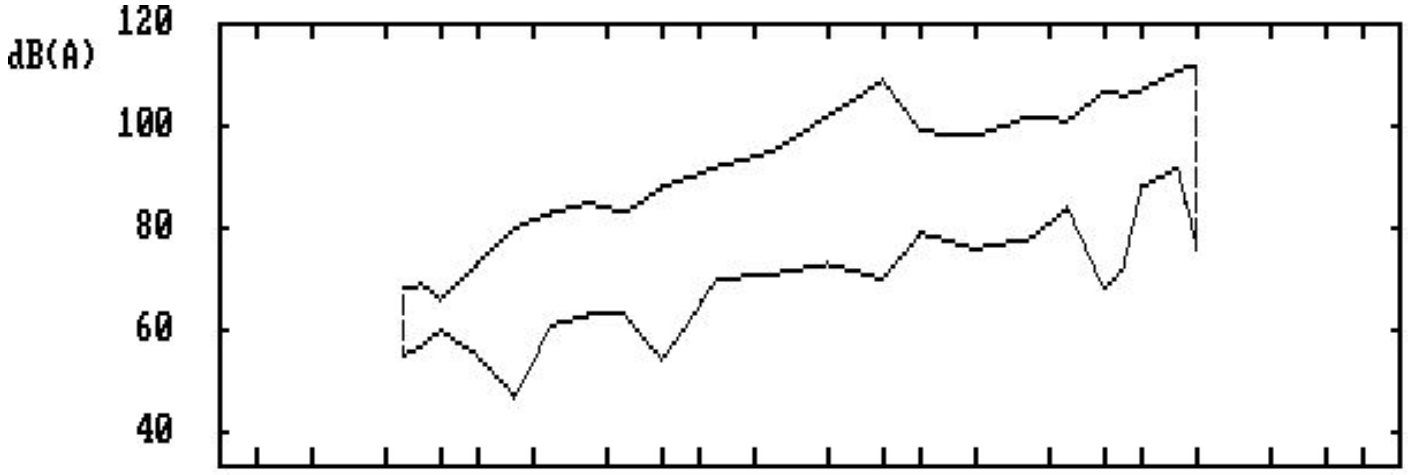
This is a phonetogram of a 17 year old male singer



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2. Print recording as chart.
3. Print recording in table.
X. Return to main menu.
_ Select function.

Name
Area 1069 dB x semitones
Dynamic range 0039 dB
Lowest tone F = 87.3 Hz
Highest tone c3 = 1047 Hz
Identification A:010890.01

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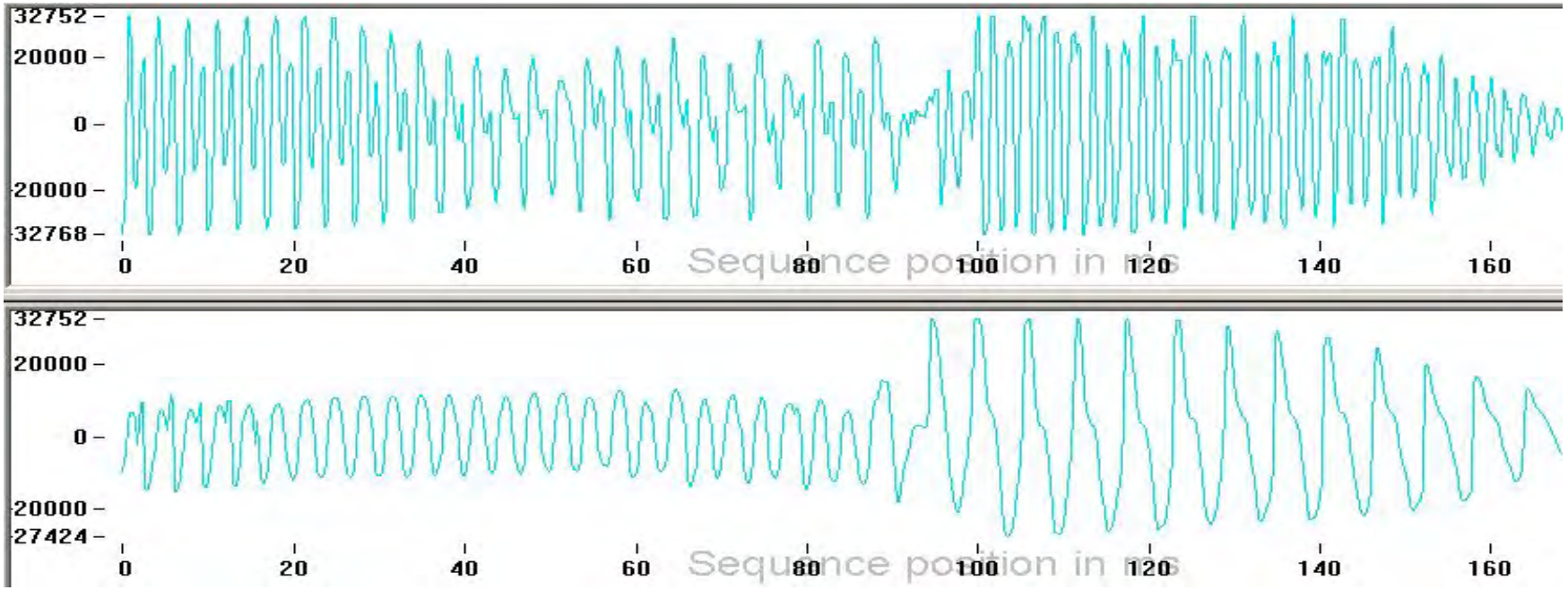
The new tool:

High-speed films

- compared with *acoustical measurements*, *electroglottography and kymography* show very interesting differences between the acoustical and electroglottical measurements in our example.
- **The example with phonetography includes the two upper registers with phonetograms (of childhood), and the two lower registers (of an adult) of a 17-year old boy, and the upper register shift is seen electroglotto-graphically at 500 Hz.**

Acoustically around 10 cycles are changed before the electrglottographic register shift.

- The analysis were made in the middle of the vocal cords with 4000 pictures/sec. (Wolf inc.). The acoustical change is related to the tuning of the upper vocal tract.



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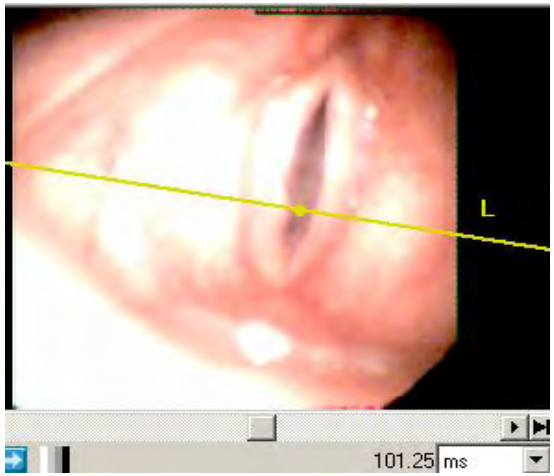
The kymographic film corresponds to the electroglottographical picture.



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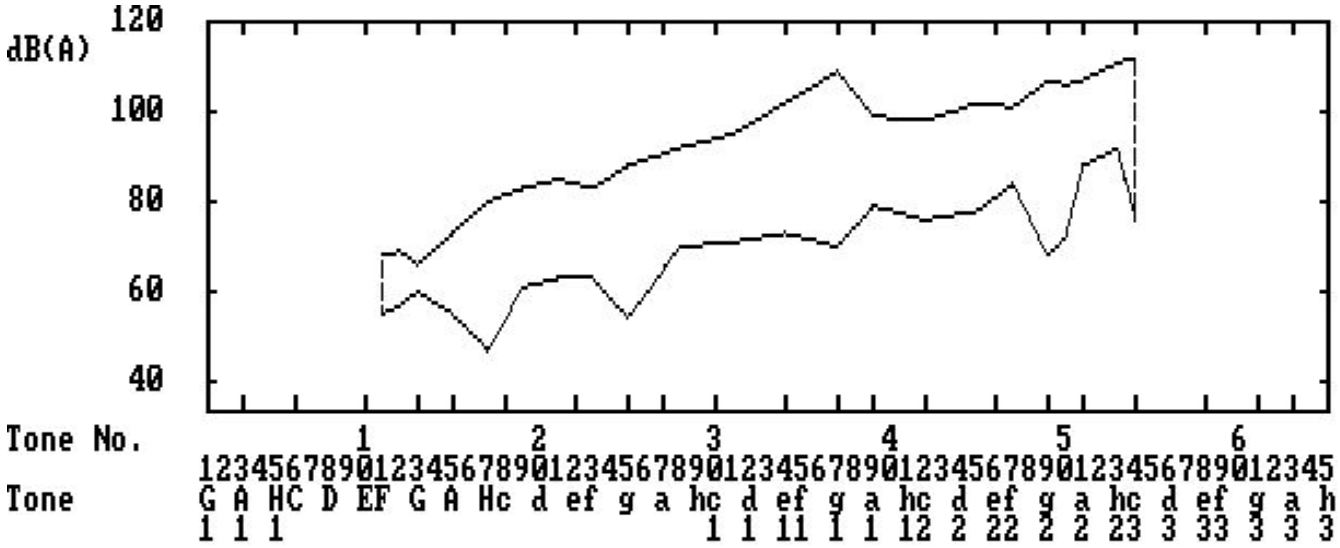
The earlier shown register shift of the male singer was at 502 Hz. We now present some data from the low register shift at 186 Hz.



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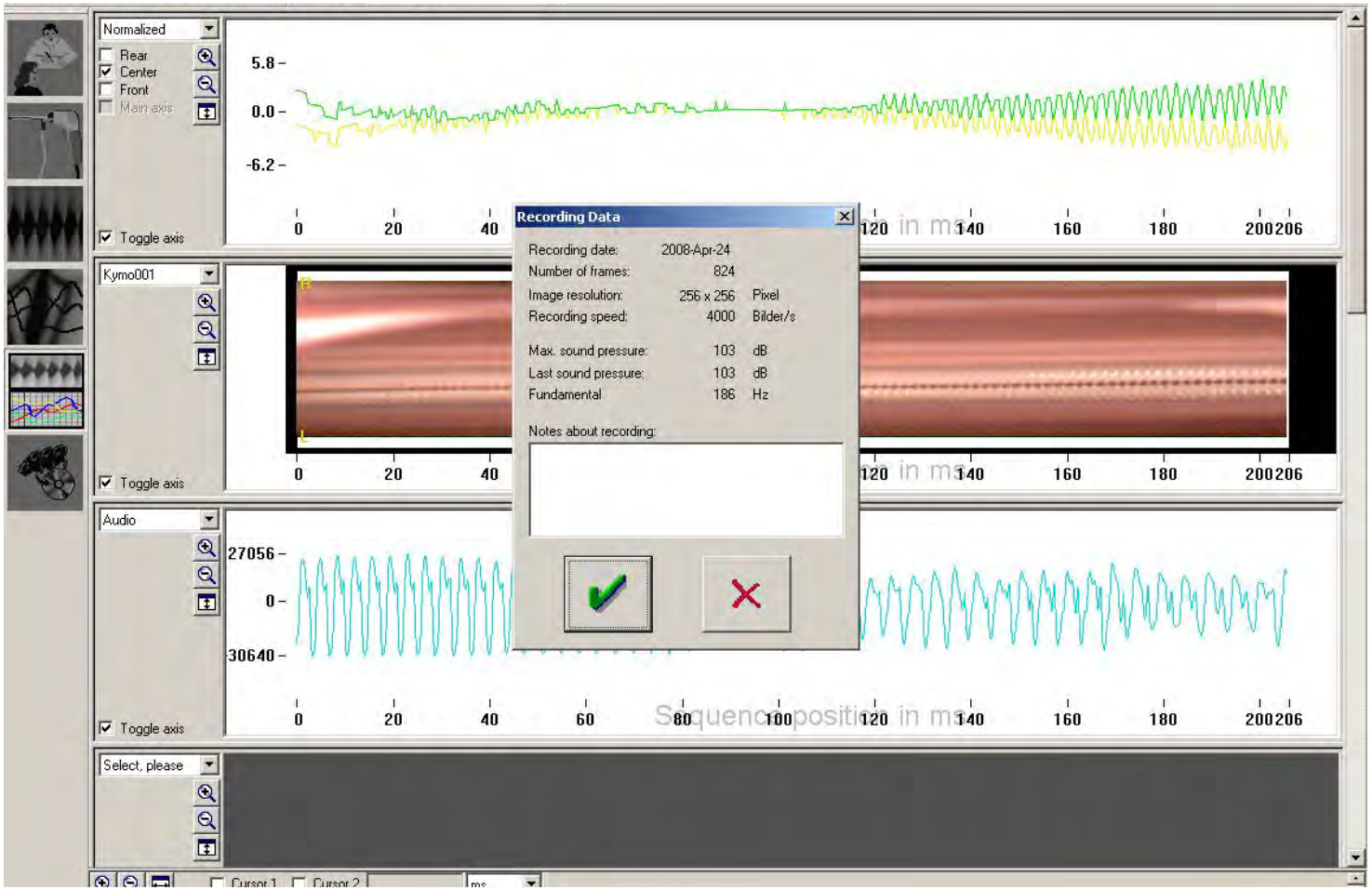
3. Print recording in table.
X. Return to main menu.
_ Select function.

Name
Area 1069 dB x semitones
Dynamic range 0039 dB
Lowest tone F = 87.3 Hz
Highest tone c3 = 1047 Hz
Identification A:010890.01

- On the next slide we will show you the center movements of the vocal chords register change (upper curve)
- compared with the kymograms (middle curve)
- and the acoustical registration (lower curve).



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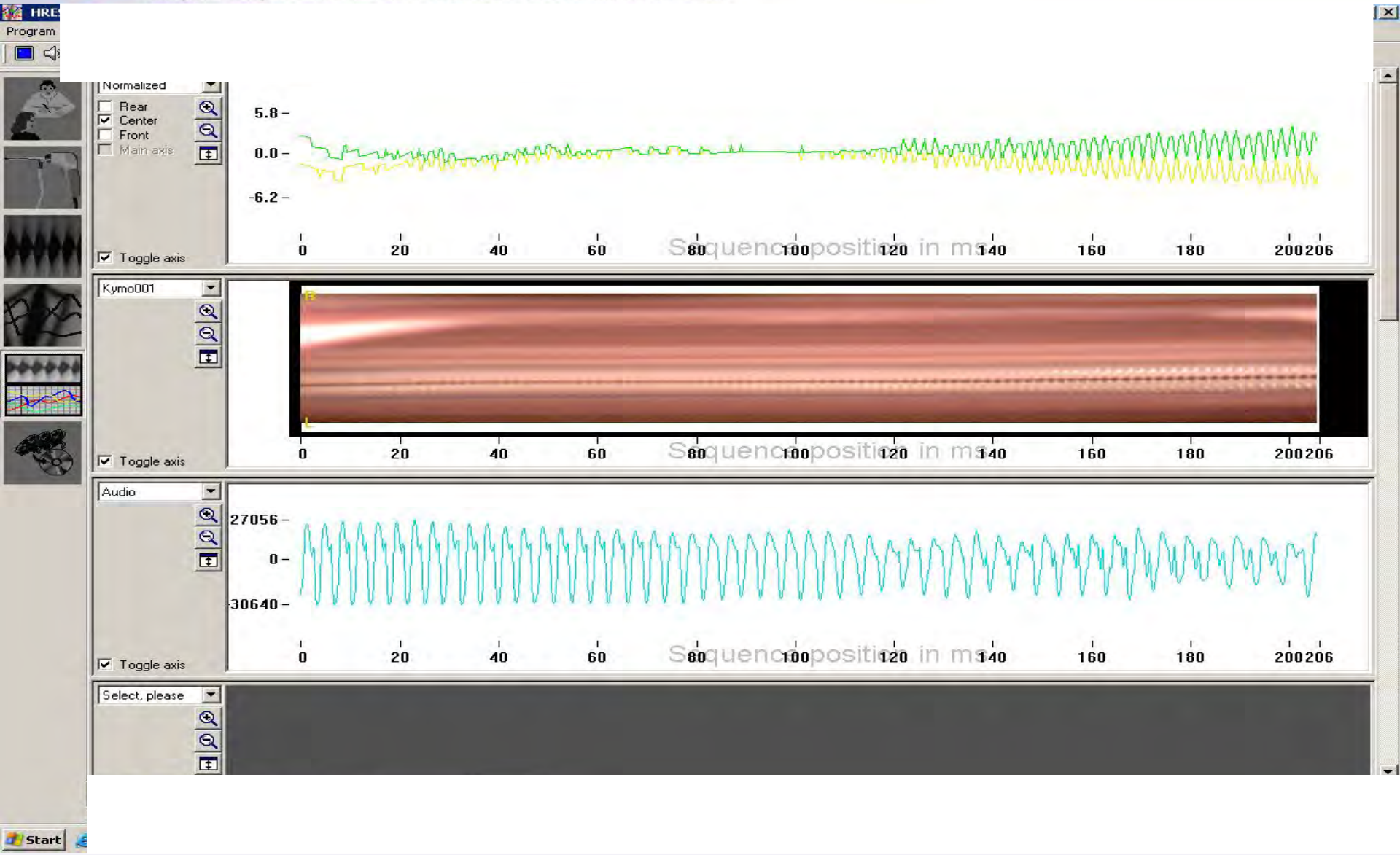

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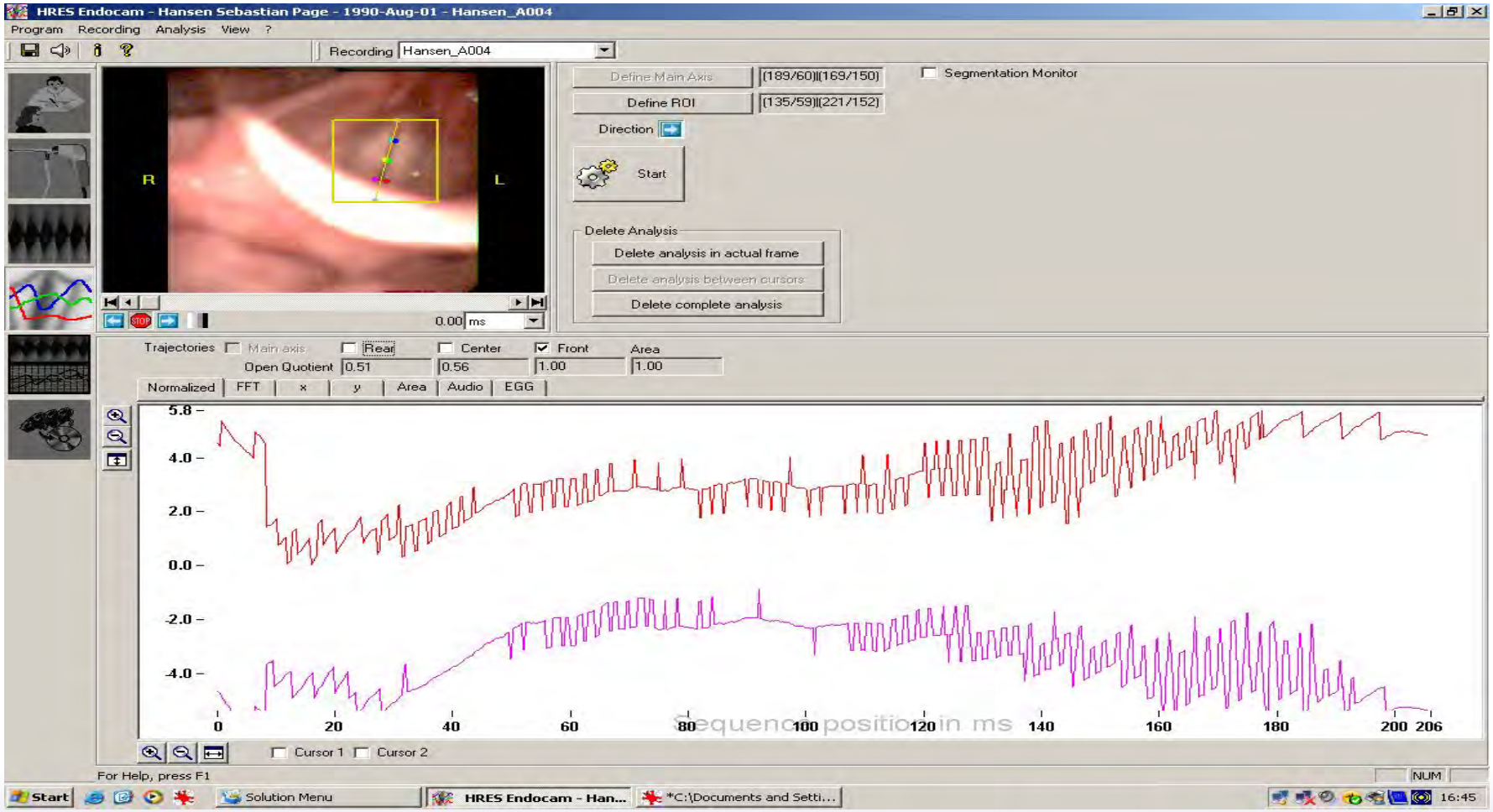
The front part of the high-speed film shows no connection between the vocal chords



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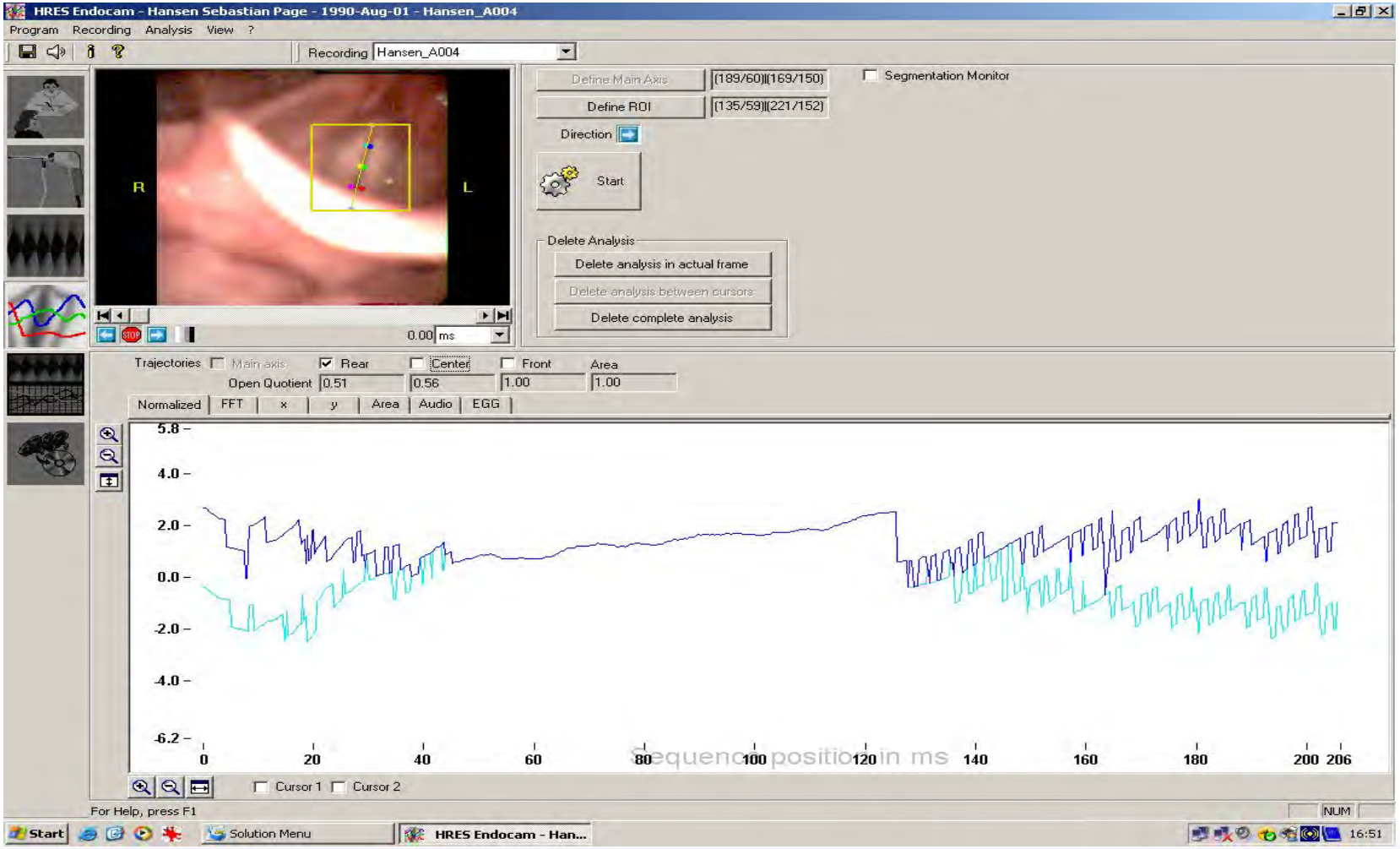
The rear part of the high-speed film shows connection between the vocal chords.



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References

- 1. Pedersen M(F), Hacki,T, Loebell E (1988) Videostroboscopy of choir boys in puberty (film). Ed. Medizinische Hochschule Hannover. Germany.
- 2. Pedersen M(F) (1993). A longitudinal pilot study on phonetograms/voice profiles in prepubertal choir boys. Clin otolaryngol; 18 84-9.
- 3. Pedersen M (1997). Biological development and the normal voice in puberty. Thesis. Univ. Oulu. (http/mpedersen.org)