

# Expanding Phonetics

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## Abstract

The *optimistic title* of my contribution to this Festschrift is supposed to underline the substantial growth in Phonetic Sciences as for instance reflected by comparing the program size and the number of participants of the 1<sup>st</sup> International Congress of Phonetic Sciences (ICPhS) organized in 1932 in Amsterdam with that of the 10<sup>th</sup> ICPhS that was again organized in the Netherlands, this time in Utrecht in August 1983, and then with that of the 15<sup>th</sup> and most recent one in September 2003 in Barcelona. It is also meant to be a somewhat *cynical title*, reflecting the fact that the Chair of Phonetics in Utrecht, that was so capably occupied by prof. Antonie Cohen and then by prof. Sieb Nooteboom, will not automatically be continued after Sieb's retirement. Worldwide, the multidisciplinary field of Phonetics is expanding in many directions, whereas in the Netherlands the number of students that choose this specialization is declining. However, optimists emphasize that perhaps only the name tag differs and that actually Phonetics is an indispensable element in the web of interdisciplinarity surrounding Linguistics, Experimental Psychology, Speech and Language Technology, Signal processing, ENT, Audiology and the like.

## 1 Introduction

The retirement of Sieb Nooteboom as full professor in Phonetic Sciences at Utrecht University is a suitable occasion to talk about growth and decline of Phonetics. As players in this field, we all see that worldwide there is a strong upsurge of activities in Phonetics and Speech Communication, as least if we consider the number of conferences and workshops, and the variety of participants in those events, as well as the variety and multitude of ongoing research projects, and the many scientific journals and books in our field, as proper indicators of that. However, it is also realistic to acknowledge that the actual situation in the Netherlands is not so promising at all. Retiring professors are not replaced, the independence of Phonetics as a discipline is under siege in the new bachelor-master system, and students study (General) Linguistics or Informatics, rather than Phonetics. Phonetics is at best just a (small) part of those bachelor programs. We can only hope to attract a sufficient number of students in the future to our master specializations like speech communication, speech and language technology, or speech and language pathology.

## 2 Growth in Phonetics according to ICPhS and otherwise

A strong indication of the liveliness of the Phonetics community, and actually of any scientific community, is the way its members meet and work together internationally, publish in the open literature, train their students and contribute to the needs of society. This is why I first of all will give some qualifications of the 1st, the 10th and the 15th International Congress of Phonetic Sciences (ICPhS).

## 2.1 First ICPHS in 1932 in Amsterdam

With Jac. van Ginneken as President and Louise Kaiser as Secretary, the first ICPHS was organized in July 1932 in Amsterdam. According to the 221-pages proceedings book, the topics supposed to be covered at that congress were:

- physiology of speech and voice (experimental phonetics in its strict meaning);
- study of the development of speech and voice in the individual; their evolution in the history of mankind; the influence of heredity;
- anthropology of speech and voice (racial differences in the articulation basis and the pitch of the voice in different peoples);
- phonology;
- linguistic psychology;
- pathology of speech and voice (clinical experimental phonetics);
- comparative physiology of the sounds of animals;
- musicology.

There were 136 participants from 16 different countries. The program contained 43 plenary papers and 24 demonstrations. Some of the famous people present there were Daniel Jones (London) 'The theory of phonemes, and its importance in Practical Linguistics', Sir Richard Paget (London) 'The Evolution of Speech in Men', R.H. Stetson (Oberlin) 'Breathing Movements in Speech', Prince N. Trubetzkoy (Wien) 'Charakter und Methode der systematischen phonologischen Darstellung einer gegebenen Sprache', and E. Zwirner (Berlin-Buch) 'Phonetische Untersuchungen an Aphasischen and Amusischen' and 'Quantität, Lautdauerschätzung und Lautkurvenmessung (Theorie und Material)'.

## 2.2 10th ICPHS in 1983 in Utrecht

After 2. London (1935), 3. Ghent (1938), 4. Helsinki (1961), 5. Münster (1964), 6. Prague (1967), 7. Montreal (1971), 8. Leeds (1975), and 9. Copenhagen (1979), the 10th ICPHS came again to the Netherlands in 1983, this time to Utrecht, under the presidency of Antonie Cohen. The organization of this conference was a truly national endeavor with an organizing committee consisting, next to the president, of Marcel van den Broecke as secretary general, and Florien Koopmans-van Beinum, Sieb Nooteboom and Louis Pols as members. There were some 570 participants from 44 countries, with no fewer than 121 participants from the organizing country. At this 5½-day conference, with one day for excursions, 22 sections were distinguished, from 'Acoustics of Speech' and 'Speech Synthesis' to 'Perception of Phonemes' and 'Prosody'. Each section had one to four sessions during the week, with each time up to eight papers per session. During the conference up to 20 sessions could take place in parallel! People that participated still vividly remember the crowds moving up and down the escalators between sessions. There were also two working groups and six plenary morning sessions plus six symposia (from 'Semantics, Syntax, and Prosody' to 'Speech Recognition') and only one poster session with demonstrations over lunch. Eli Fischer-Jørgensen and Gunnar Fant gave the opening lectures. A book with all abstracts was already available well before the start of the congress. Full proceedings were not yet published, but only a book with a selection of individual contributions (van den Broecke & Cohen, 1984).

## 2.3 15th ICPHS in 2003 in Barcelona

The series continued with 11. Tallinn (1987), 12. Aix-en-Provence (1991), 13. Stockholm (1995), and 14. San Francisco (1999), whereas the 15th and most recent one took place in August 2003 in Barcelona. Number 16 will take place in Saarbrücken in 2007. In Barcelona the number of participants was about 950 from 51 different countries (36 participants from

the Netherlands). At this six-day conference, with still one day for excursions, there were five invited plenary lectures, 22 thematic symposia organized by convenors, and 55 oral (337 papers) and 18 poster (427 papers) sessions. On a typical conference day there were six time slots of one and a half hour each. At 9 o'clock the day started with a plenary lecture or five oral sessions in parallel, then after the coffee break again five oral sessions, then two big poster sessions in parallel over lunch. After lunch the program continued with five oral sessions or symposia, then again two big poster sessions, followed by five oral sessions or a plenary lecture. The growth in number of posters (427) is astounding. The actual number of papers was around 815, of which 31 had a first author from the Netherlands. The printed proceedings (three volumes) contained over 3200 pages. Fortunately, all this information is now also available on CD-ROM, and in a searchable form as well! This was probably the last ICPhS where (only) extended abstracts were reviewed, the Permanent Council of ICPhS decided that in Saarbrücken a full-and-final paper review procedure will be applied, as is customary nowadays with most major speech conferences. Since the biennial series of Eurospeech (odd years) and ICSLP (even years) conferences have started in 1989 and 1990, respectively, attention for speech technology has diminished at ICPhS.

It is my impression that the growth in terms of number of papers and number of participants at ICPhS has stabilized, also for practical reasons. Conferences with more than 1000 participants become unpractical and unmanageable, and together these participants will produce over 800 papers, which again is a lot to consume. Furthermore, specialized workshops become more and more popular, and many scientists prefer this style of discussing a specialized topic with a smaller and more homogeneous audience. This, of course, does not imply that the number of phoneticians and/or speech scientists has stabilized as well. The International Phonetic Association (IPA), which is now also responsible for organizing ICPhS had, according to the written report of the most recent General Meeting in Barcelona (JIPA 33(2), 2003, 275-277), by the end of 2003, slightly more than 1000 members. Also, the International Speech Communication Association (ISCA) presently has about 1350 members. I guess that the number of speech scientists worldwide is at least ten times larger. This does not yet make it a big community, but still a rather influential one. The number of serious books published in Phonetics and related fields must be at least 25 yearly. The membership list of the Netherlands Association of Phonetic Sciences contains about 140 names (including some from Belgium). In the Netherlands about seven doctoral theses in Phonetics and related fields are produced every year; the actual list for 2001 to 2003 is presented in Table 1.

### **3 Growth in Phonetics as a multidisciplinary science**

In 1983 the Dutch Ministry of Education decided in the Academic Statute that only at Utrecht University there could be a Department of Phonetic Sciences. Nevertheless several regular chairs in Phonetics continued to exist in the Netherlands (Utrecht: Cohen and later Nooteboom; Leiden: first Nooteboom, then nobody, now Van Heuven; Nijmegen: Vieregge (who retired in 2000), later also Boves (Language Engineering) and Rietveld (Speech Pathology); Groningen: Graham Stuart for a while; Amsterdam: Pols and Hilgers (Speech Pathology)). In inventive ways slightly different names were used in the curriculum, for instance in Amsterdam the study was called Speech Communication, in Nijmegen they had Speech Pathology and Speech Technology as specializations, and in Leiden there was (and still is) a Phonetics Laboratory as part of the Linguistics Department. At least since the introduction of the bachelor-master system, the situation is totally different again. Now Phonetics is part of (General) Linguistics everywhere, and specialization in Phonetics or Speech Technology is possible in the Master phase only, if at all. Furthermore, there is a

tendency not to maintain specializations, like Phonetics, everywhere, but only at a few places. Also at the Institute for Perception Research (IPO) in Eindhoven a lot of speech research was done until the institute was dismantled. In May 2004 the very last doctoral thesis in the IPO synthesis tradition was defended (van Herwijnen, 2004). For a while there were also individual phoneticians throughout the various Dutch universities working in the Departments of Modern Languages (e.g., Peeters, 1991; van Buuren, 1999). Also outside the Faculty of Arts, phonetic research may be found in Education Research (e.g., van Gelderen, 1992), in the Ear, Nose and Throat clinics (e.g., Verdonck-de Leeuw, 1998; Jansonius-Schultheiss, 1999; van As, 2001) and in the Departments of Audiology or Pediatrics Neurology (e.g., Nijland, 2003) of the academic hospitals. Also in psycholinguistics there is a certain interest in phonetics, most clearly reflected in some of the work done at MPI, Nijmegen (e.g., van Alphen, 2004; Kamps, 2004). Finally, speech and language technology gets some attention in Departments of Computer Linguistics, Informatics, Artificial Intelligence, or Technology Management, also at Technological Universities (e.g., Andringa, 2002; Dinther, 2003; Ordelmans, 2003). On the one hand, this short survey indicates a reduction in clearly labeled Phonetics settlements; on the other hand, it shows how strongly Phonetics and phoneticians are involved in many aspects of science and technology.

*Table 1.* Doctoral theses in Phonetics and related fields, defended in the Netherlands over the years 2001 to 2003.

| Name             | Univ. | Year | Promotor(es)                       | Topic                                       |
|------------------|-------|------|------------------------------------|---|
| P. Adank         | KUN   | 2003 | van Hout                           | prevoicing in Dutch                         |
| T.C. Andringa    | RuG   | 2002 | Duifhuis                           | continuity preserving signal proc.          |
| C. van As        | UvA   | 2001 | Pols                               | tracheoesophageal speech                    |
| O.A. Crasborn    | UL    | 2001 | Ewen/ van Heuven/<br>van der Hulst | sign language                               |
| J. van Dijk      | UvA   | 2001 | Pols                               | ear modeling                                |
| R. van Dinther   | TUE   | 2003 | Kohlrausch/<br>Liljencrants        | voice source                                |
| A.M. Elgendy     | UvA   | 2001 | Pols                               | Arabic pharyngeals                          |
| E. Gerrits       | UU    | 2001 | Nooteboom                          | categorical perception                      |
| J. Haan          | KUN   | 2002 | van Heuven/<br>Gussenhoven         | Dutch question intonation                   |
| S.R. Hamann      | UU    | 2003 | Hall (Leipzig) /<br>Zonneveld      | retroflexes                                 |
| E. Janse         | UU    | 2003 | Nooteboom                          | fast speech                                 |
| J.M. Kessens     | KUN   | 2002 | Boves                              | pronunciation variation in ASR              |
| E. Konst         | KUN   | 2002 | Kuijpers-Jagtman                   | babbling with infant orthopaedics           |
| E. Marsi         | KUN   | 2001 | Gussenhoven                        | intonation in spoken language<br>generation |
| L. Nijland       | KUN   | 2003 | Kraaimaat/ Gabriëls                | developmental apraxia                       |
| R.J.F. Ordelman  | TUT   | 2003 | de Jong                            | speech recognition                          |
| A.C.L. Remijnsen | UL    | 2001 | van Heuven/ Stokhof                | word prosody                                |
| B.M. Streefkerk  | UvA   | 2003 | Pols                               | prominence                                  |
| J.M. de Veth     | KUN   | 2001 | Boves                              | speech sound model accuracy                 |
| M. Wester        | KUN   | 2002 | Boves                              | pronunciation variation in ASR              |
| F. de Wet        | KUN   | 2003 | Boves                              | ASR in adverse conditions                   |
| S. v Wijngaarden | VU    | 2003 | Houtgast                           | intelligibility of non-native speech        |

#### 4 State of affairs of Phonetics in the Netherlands

It does not happen very often that the Dutch chair holders in Phonetics individually or jointly express themselves about their vision of the field, apart from their inaugural addresses at the start of their professorship (Boves, 1993; van Heuven, 2002) or when they retire (Cohen, 1987; Vieregge, 2000; Nootboom, 2004). Still, there was such an occasion in 1997 when the Netherlands Association of Phonetic Sciences celebrated its 65th anniversary in Amsterdam with a special theme meeting about the personal visions of all four professors in Phonetics at that time.

Boves presented himself as the representative of speech and language technology. He blamed phonetics and linguistics for not giving enough attention to testable hypotheses. He said to be an advocate of knowledge to be applicable. He preferred simple models and workable approaches, like the use of LPC and concatenative synthesis, rather than models that are too complex, like ARMA. The probabilistic approach in ASR may be simplistic, but it works. Still he would like to develop more robust recognition, for instance by taking into account pronunciation variation. In the discussion the audience questioned whether the probabilistic approach would still be our best option for more complex problems in the near future.

Nootboom expressed an interest in both *matter* (physically measurable objects) and *mind* (mental processes). He asked attention for questions like ‘How many words do we look ahead in preparing our spoken output?’ (e.g., *ik wees wat ik lees* rather than *ik weet wat ik lees*), ‘What are the units in the mental lexicon?’ (morphemes, words, standing expressions), ‘During which phases can previous context influence word recognition?’ (lexical access, selection, integration), and ‘Is recognizing fixed expressions similar to word recognition?’. He claimed that in his head there is a very big lexicon and only very few rules. In the discussion one wondered whether there would be only one (word) lexicon.

Vieregge defended the unification of perception and movement in speech production (Phonetischer Gestaltkreis; Quantal Nature of Speech). Feedback can be tactile/kinesthetic, auditory, and communicative. He distinguished the ‘type of movement’ versus the ‘moving time’. Finding a proper balance between the canonical movement and the time constraints of speech production frequently seems to be a problem with synthetic speech, baby speech, speech of drunkards, foreign accents, and pathological speech. In the discussion it was questioned whether there was any linguistic relevance of the quantal nature of speech.

Pols summarized the work in his group in four main themes: (i) speech analysis and perception (both segmental and supra-segmental); (ii) evaluation of normal and pathological speech and of speech technology; (iii) adding specific knowledge to speech technological systems; and (iv) speech development and pathology. He then proposed to establish a (virtual) Dutch phonetics center for joint research. He also advocated the concept of computational phonetics (Pols, 1999, 2001).

Although these presentations reflect viewpoints from several years ago, they nevertheless quite clearly represent the key research areas of the four groups up to now.<sup>1</sup> Also the topics of doctoral theses completed under their supervision, as can partly be seen in table 1, are proof of that.

Actually, phonetics has quite a record of good cooperation in large joint projects, such as SPIN-ASSP (Van Heuven & Pols, 1993), a five-year strategic research project (1985-1990) towards high-quality text-to-speech generation, under the stimulating leadership of Cohen.

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<sup>1</sup> The fifth group at Universiteit Leiden, headed by Van Heuven, specializes in linguistic phonetics and laboratory phonology.

This project was sponsored by the Stimulation Project Information technology Netherlands (SPIN) that operated under the jurisdiction of the Ministries of Economic Affairs and of Education and Science. Another large project (1995-2000) was the NWO Priority program 'Language and Speech Technology (TST)' (Strik, Russel, van den Heuvel, Cucchiarini & Boves, 1996), which recently got a follow-up in the NWO IMIX project (Interactive Multi-modal Information eXtraction). Another example of joint cooperation is the existence since 1987 of SPEX, the speech processing expertise center that was located for many years in Leidschendam but is now part of the Center for Language and Speech Technology (CLST) at Nijmegen University. Until recently SPEX fell under the responsibility of SST, the Foundation for Speech Technology with Nooteboom as the chairman of the Board. Chances seem to be good for still another cooperative project BLARK (Basic Language Resources Kit, in Dutch BATAVO) (Strik, Daelemans, Binnenpoorte, Sturm, de Vriend & Cucchiarini, 2002). A Belgium-Netherlands bid to ISCA for organizing Eurospeech 2007 in Antwerp has recently been accepted. Over the years various workshops of ESCA, now ISCA, ELSNET and others have been organized in the Netherlands (Speech input/output assessment and speech databases, Noordwijkerhout, 20-23 September 1989; Elsnet in Wonderland, Soesterberg, March 1998; Modeling pronunciation variation for automatic speech recognition, Rolduc, 4-6 May 1998; Multi-lingual interoperability in speech technology, Leusden, 13-14 September 1999; Spoken word access processes, Nijmegen, 29-31 May, 2000; LabPhon7, Nijmegen, 29 June - 1 July 2000; Speech recognition as pattern classification, Nijmegen, 11-13 July 2001).

## 5 Conclusions

Despite all these activities in our field, phonetics as an independent discipline is endangered, especially in the new bachelor-master educational system. There is a serious threat that in the future not enough students will be properly trained in the theoretical and experimental aspects of phonetics. For the moment, the phonetic flavour in many projects seems to be flourishing, but this is only possible because students trained in the old curriculum are still available. Moreover, there is a tendency even now to attract Ph.D. students from abroad. The integration of Phonetics and Phonology is a matter of (historical) ups and downs. Ohala's presentation preceding the farewell lecture of Nooteboom (2004) gave a good overview of that process (Ohala, 2004; see also Cohen, 1987, and Boersma, 1998).

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