

**RESEARCH UNIT FOR EXPERIMENTAL PHONOLOGY**

**UNIVERSITY OF STELLENBOSCH (RUEPUS)**

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*"The central issue in laboratory phonology, however, is and remains the long-standing problem of the relation between phonetics and phonology. Where does the one end and the other begin - or, to be more specific, can phonetics be attributed entirely to neuromotor aspects of the vocal mechanism, or is there a case for inclusion of a phonetic implementation component in the grammar?" (Docherty & Ladd, 1992:3)*

## 1 INTRODUCTION

RUEPUS was established with the following core research programme in mind:

**"Experimental phonology: explaining phonological and phonetic phenomena in selected languages of Southern Africa."**

RUEPUS **focuses** on

1. Empirical testing of predictions of contemporary phonological models at articulatory, acoustic and perceptual levels (i.e. in the physical domain);
2. The development of integrated methodological approaches to address diverse speech phenomena;
3. The application of these models to speech phenomena in languages such as Xhosa, Zulu, Northern Sotho, Sesotho, Setswana, Afrikaans and South African English.

The founding memorandum (pp. 3, 4) envisaged studies in the Unit to be "... of particular **scientific relevance** for

1. **Linguistic theory in general**, as such studies will not only evaluate the predictive power of contemporary phonological models in their applications internationally, but will also assess the viability of an integrated approach towards explaining problematic speech phenomena,
2. **Language studies in Southern Africa in particular** as far as they concern the description of African languages, as well as aspects of Afrikaans and South African English, including phonetic and phonological aspects of language transfer between all of these languages,
3. **Applications in man-machine communication systems** as acoustic and perceptual speech data become available as spin-offs for use in computerised text-to-speech systems and automatic speech recognition systems applied to languages spoken in Southern Africa,
4. **Speech pathological and remedial purposes**, in so far as it presents experimentally verified data that may be utilised clinically. It needs to be pointed out that experimental phonetic and phonological data on the indigenous languages of Southern Africa are extremely limited."

Seen from a long term perspective the following academic and applicational aims are set:

- (i) At academic level it is aimed to develop a theory of human communication conceptually integrating phonetics and phonology in Long term

This report covers activities for the period 1 June 1994 to 31 March 1995.

## 2 PROJECTS

Four **projects** were proposed for the initial 4-year cycle of activities:

- Project 1:** Laboratory phonology: Theoretical foundations and applications. (Duration: 4 years: 1994-1997) (Core project.)
- Project 2:** Preferred syllable structures in Nguni and Sotho: An application of acoustic-articulatory modelling. (Duration: 2 years, 1994-5.)
- Project 3:** Phonological and phonetic interference of Setswana and Xhosa in Afrikaans and English, respectively. (Duration: 2 years, 1994-5.)
- Project 4:** Phonological processes in Nguni involving place of articulation features: An electro-palatographic (EPG) investigation. (Duration: 2 years: 1996-7.)

During the first year (1994-5) attention was focused on the first three projects as will be reflected by the following individual reports:

### 2.1 **Project 1: Laboratory phonology: Theoretical foundations and applications.**

In line with the nature of "laboratory phonology" this core project focuses on the nature of the phonetics-phonology interface in order to develop a theory of human communication that conceptually integrates phonetics and phonology. In this process research is directed towards two domains:

- (i) Normal speech phenomena (including language/speech acquisition and interference).
- (ii) Pathological speech phenomena.

The study of pathological speech is necessary as it provides invaluable insight into various processes functioning in the "normal" speech communication act.

A number of **sub-projects** were identified and assigned to researchers in order to contribute in a systematic way to the project as a whole. In these projects an assessment is made of the ability of current phonological and phonetic models implicitly supporting a phonetics-phonology dichotomy to account for speech phenomena in the mentioned languages in a credible way. These sub-projects are conducted for non-degree as well as for degree purposes with the ultimate goal being the dissemination of results through academic publications.

#### 2.1.1 **Non-degree purposes**

##### 2.1.1.1 **Normal speech**

1. The phonetics and phonology of click articulations (JC Roux & G Dogil, Institut fuer Maschinelle Sprachverarbeitung, University of Stuttgart).
2. Acoustic-perceptual aspects of Zulu intonational structures (JC Roux & B Shongwe).

##### 2.1.1.2 **Pathological speech**

3. Non-linear phonology and the acoustic interpretation of the speech of cochlear implant patients (AMU Muller, M-A Kemp, JC Roux):
4. Vowel production of cochlear implant patients (M-A Kemp).
5. The loss of click sounds by Xhosa aphasics (JC Roux, PW Lewis).

#### 2.1.2 **For degree purposes**

### 2.1.2.1 Normal speech

1. Phonetic and phonological aspects of homorganic nasal assimilations in Xhosa (**B Ntlabezo** & JC Roux) (**MA** Stellenbosch).
2. Vowel raising in Sesotho: An acoustic-perceptual analysis (**Z Selebeleng** & JC Roux) (**MA** Stellenbosch).
3. Aspects of the acquisition of Xhosa tone (**C Nkopo** & JC Roux) (**MA** Stellenbosch).
4. An autosegmental tonal analysis of Xhosa nouns (**JN Mdekazi** & JC Roux) (**MA** Stellenbosch).
5. An autosegmental tonal analysis of Zulu verbs (**A Radebe** & JC Roux) (**MA** Stellenbosch).
6. A metrical interpretation of selected phonological processes in Xhosa (**T Maxela** & JC Roux) (**MA** Stellenbosch).
7. Xhosa intonational structures: An acoustic-perceptual study (**JJ Jones** & JC Roux) (**DLitt**, Stellenbosch).

### 2.1.2.2 Pathological speech

8. Aphasic production of Zulu tonal sequences (Z Ndlela, JC Roux) (MA, Stellenbosch).
9. Die verband tussen segmentele spraakveranderlikes en spraakverstaanbaarheid van Afrikaanssprekende gehoorgestremdes: 'n Akoesties-perseptuele studie (A Olivier, AMU Muller & JC Roux) (B Speech Therapy & Audiology, Stellenbosch).

## 2.2 Project 2: Preferred syllable structures in Nguni and Sotho: An application of acoustic-articulatory modelling.

### 2.2.1 Non-degree purposes

1. Preferred syllable structures in Xhosa: Experimental phonetic considerations (JC Roux & P Lewis).

## 2.3 Project 3: Phonological and phonetic interference of Setswana and Xhosa in Afrikaans and English, respectively.

### 2.3.1 Non-degree purposes

1. Speech interference in the Afrikaans and English of speakers of Setswana and Xhosa respectively (DP Wissing & JC Roux).

### 2.3.2 Degree purposes

2. The perception of English vowels by Nguni and English listeners as spoken by each group (**R Glaser**, S Tuomi & JC Roux) (**B.Sc. Logopaedics**, University of Cape Town).
3. Fonologiese en fonetiese aspekte van slotkonsonantontstemming in die Engels van Afrikaans- en Tswanasprekendes (**A van Rooij**, DP Wissing) (**MA** University of Potchefstroom).
4. Acoustical features of vowels and diphthongs in Afrikaans (**H Raubenheimer**, DP Wissing) (**PhD**, University of Potchefstroom).
5. Phonetic and phonological interference in the acquisition of Xhosa as a second language (**P Lewis** & JC Roux) (**DLitt**, Stellenbosch).

## 3 PUBLICATIONS

### 3.1 Publications accepted

1. Roux, JC. 1994

**Aspects of tonal perception in Nguni.** To be published in **Proceedings of the First World Congress of African Linguistics**, Kwaluseni, Swaziland.

2. Roux JC. 1995a  
Prosodic data and phonological analyses in Zulu and Xhosa. **South African Journal of African Languages**, 15.1, 1-10
3. Roux JC. 1995b  
On the perception and production of tone in Xhosa. Scheduled for publication in **South African Journal of African Languages**, 15.4, page numbers still to be determined.
4. Roux, JC, Dogil, G & Wokurek, W 1995c  
**Click articulations in Xhosa: New perspectives through Wigner Distribution analysis.** Accepted for publication in the **Proceedings of the 13th International Conference for Phonetic Sciences**, Stockholm. International Society of Phonetic Sciences.
5. Wissing, DP & Roux, JC 1995  
**The interrelationship between VOT and voice assimilation.** Accepted for publication in the **Proceedings of the 13th International Conference for Phonetic Sciences**, Stockholm. International Society of Phonetic Sciences.
6. Roux JC (1996a)  
On the prosodics of declarative and question sentences in Xhosa. Adjudicated and accepted for publication in **South African Journal of African Languages**.
7. Roux JC (1996b)  
Xhosa: A tone or pitch accent language? Adjudicated and accepted for publication in **South African Journal of African Languages**.
8. Lewis, P & Roux, JC  
A phonological process analysis of the acquisition and loss of clicks in Xhosa. Presented to the **South African Journal of African Languages** for adjudication on 23/2/1995.

(Items 2, 3 & 6, 7 derive from a previous CSD research project which ended in March 1994; these articles originated as precursors to the current project.)

### 3.2 Publications in progress

(Estimated date of completion indicated in brackets)

1. Raubenheimer, H & Wissing DP (in prep.)  
Production and perception of vowel lengths in conservative SAE and the English of Tswana speakers. To be presented for publication in the **South African Journal of Linguistics**. (July 1995).
2. Roux, JC (in prep.)  
Click articulations in Zulu: An electro-palatographical perspective. To be presented for publication in the **South African Journal of African Languages**. (Experimental phonetic study.) (June 1995).
3. Roux, JC & Lewis, P (in prep.)

Preferred syllable structures in Xhosa: Experimental phonetic considerations. To be presented for publication in **Phonology** (Experimental phonetic study.) (July 1995).

4. Roux, JC & Ntlabezo, BB (in prep.)

**Phonological and phonetic aspects of homorganic labiodental articulations in Xhosa.** To be presented for publication in the **South African Journal of African Languages** (Phonological theory, phonetic detail) (September 1995).

5. Roux, JC & Maxela, T (in prep.)

**The phonetics and phonology of demonstrative pronouns in Xhosa.** (Phonological theory, phonetic detail). To be presented for publication in the **South African Journal of African Languages**. (September 1995).

6. Roux, JC & Selebeleng, Z (in prep.)

**Vowel raising in Sesotho: new perspectives.** (Phonological theory and phonetic detail) To be presented for publication in the **South African Journal of African Languages**. (January 1996).

7. Roux, JC & Dogil, G (in prep.)

**Unresolved issues regarding click articulations in Xhosa.** To be presented for publication to **Journal of Phonetics**. (Phonetic study with phonological implications.) (March 1996).

(A number of completed studies for degree purposes will also be presented for publication in revised form at the end of 1995.)

#### 4 CONFERENCES

1. Roux, JC. 1995, **Aspects of tonal perception in Nguni**. Paper read at the First World Congress of African Linguistics, Kwaluseni, Swaziland.
2. Roux, JC, Dogil, G & Wokurek, W. 1995, **Click articulations in Xhosa: New perspectives through Wigner Distribution-analysis**. Paper accepted for presentation at the 13th International Conference for Phonetic Sciences, Stockholm (August 1995).
3. Roux, JC 1995, **Multimedia applications in African Languages**. Demonstration at a special plenary session of the **8th International Biennial Conference of the African Languages Association of Southern Africa**, University of Stellenbosch. (Demonstration of educational tools derived from phonetic research) (July 1995).
4. Wissing, DP & Roux, JC 1995, **The interrelationship between VOT and voice assimilation**. Accepted for presentation at the 13th International Conference for Phonetic Sciences, Stockholm. (August 1995).

#### 5 CAPACITY BUILDING

Apart from capacity building (with respect to the training of researchers) implicitly taking place within the above-mentioned projects, RUEPUS presents regular workshops and intends publishing a newsletter to share information with the wider public.

##### 5.1 Workshops scheduled for 1995:

###### 5.1.1 Workshop #1: 5-6 May 1995, University of Potchefstroom

Workshop on speech interference in Southern Africa with an optional preceding session on experimental phonetic methods.

###### Programme

**Friday 5 May 1995: 14h00 - 18h00****Training session: Using the KAY Computerised Speech Lab (CSL)**

Many academic institutions already have access to the powerful CSL system used for speech analysis. This hands-on training session presented by an experienced user of the CSL will provide researchers with tips of the trade for optimal use of the system.

**Presenter:** Prof. Daan Wissing (Potchefstroom).

**Saturday 6 May 1995: 8h30 - 16h00****Workshop: Phonetic and phonological interference**

This workshop will focus on phonetic and phonological interference attested in languages spoken in South Africa. Aspects such as the status and acceptability of e.g. Zulu/Xhosa-English or Afrikaans/English-Sotho will be addressed from a theoretical perspective against the background of current national language policies.

8h30 - 9h00: Registration

9h00 - 9h30: Prof. Justus Roux (Stellenbosch): Introduction: Interference studies

9h30 - 11h00: Prof. Monica Jacobs (Zululand): WORKSHOP: Aspects of interference in Zulu-English

11h00 - 11h30: Tea / Coffee

11h30 - 12h00: Prof. Daan Wissing (Potch): Aspects of Sotho-Afrikaans interference

12h00 - 12h30: Mr Philip Lewis (Stellenbosch): Interference in African languages: English-Xhosa

12h30 - 14h00: Sponsored lunch

14h00 - 15h30: Structured discussions

15h30 - 16h00: Summary: proposals. Conclusion

**5.1.2 Workshop # 2: 7 October 1995: Ezikhaweni Teachers' Training College, Durban.**

Workshop for lecturers of training colleges in KwaZulu-Natal teaching Zulu on the relevance of phonetics and phonology in language study. (At special request.)

**6 INTERNATIONAL CONNECTIONS AND CONFERENCES ATTENDED**

The Director spent part of his sabbatical leave in Germany during 1994 and made the following contacts:

1. **August - November 1994 (4 months):** Research on Project #1 at the Institut fuer Maschinelle Sprachverarbeitung (IMS) at the University of Stuttgart as guest of Prof. Greg Dogil. The Alexander von Humboldt Stiftung supported the visit.
2. **September 1994:** Attended the Durham Phonology Conference in England.
3. **September 1994:** Attended CATH 94 Conference in Glasgow, Scotland. Conference on developing courseware for interactive computer-assisted learning and teaching.
4. **September 1994:** Engaged in detailed discussions on possible co-operation between RUEPUS and the Centre for Speech Technology Research (CSTR) at the University of Edinburgh. Director: Dr John Foster. This centre would like to become involved in developmental work in the languages of Southern Africa.

**7 DEVELOPMENT AND IMPLEMENTATION OF RESEARCH TOOLS**

In order to conduct the above-mentioned basic and applied research, a number of instruments are being developed with applications in a wider context.

The following research tools/applications are under development:

- i. **COMPHON:** A computerised interactive multi-media system for learning and teaching phonetics. Version 1: The phonetics of Xhosa. (JC Roux, J Haasbroek & M de Wet) (Demonstration version available).



- ii. **AfriSpeak:** A Text-to-Speech system for African languages. Version 1: Xhosa. (JC Roux, C Coetzer, J du Preez & J Louw) (Proto-type completed.)

These systems are being developed in collaboration with the Language Laboratory Centre and the Centre for Electric and Electronic Engineering at the University of Stellenbosch.

The implementation of these systems is under investigation in the following research project:

- i. **Principles and practice of educational phonetics:** Applications in the South African context. (JC Roux & J Haasbroek) (Long-term project)

## 8 NEWSLETTER

The publication of a newsletter is envisaged. This newsletter will appear every semester and will be circulated as widely as possible. The following sections will be included:

- Ongoing projects;
- Completed projects;
- Squibs and discussions;
- Upcoming events - seminars, etc.