

# WELCOME MESSAGES

## MESSAGE FROM THE CHAIR OF COORDINATORS

Welcome to ICSLP '98 in Sydney, Australia. All those involved in the organisation of this conference are delighted that we, together with our colleagues around the southern globe, can welcome all northerners to the first ICSLP in the southern hemisphere. We hope that you will enjoy the brief change of climate and some of the unique aspects of our life “down-under” while you are here.

We meet together within a tradition begun in 1990 by Hiroya Fujisaki in Kobe, and given innovative twists of implementation in three successive ICSLP conferences in Banff, Yokohama, and Philadelphia. This now well-established conference series continues to enjoy increasing patronage from the worldwide scientific community which recognises the value of a broad-based multidisciplinary focus on matters related to the processing of spoken language by humans and machines.

I also welcome you here on behalf of the Australian Speech Science and Technology Association, the host of this conference. When ASSTA was formed in 1988 it was riding the crest of a wave resulting from an initiative in 1986 to launch what appears to have been the first international conference focused entirely on a multidisciplinary appreciation of the phenomenon of speech. So your host society was founded in the environment of the broad-based study of speech and has continued that tradition with its biennial SST conference series, seamlessly incorporating its 7th SST conference with this 5th ICSLP conference.

In designing ICSLP '98 we have sought to involve a broad mix of local talent which reflects the ethos of the series but have also been most aware of the worldwide support through our International Advisory Board many of whom have been very active. In constructing a technical program committee comprising a computational linguist, a psychologist, a computer scientist, and an electrical engineer, we set the tone for a broad disciplinary appreciation of what we wished to achieve.

Australia is a vast continent, whose sparse population includes migrants from all of the countries from which our delegates have come. It is a land of grand challenges: from those of survival in a harsh terrain to those of advancement in the domain of ideas and invention. We translated this national theme into encouragement to our keynote speakers to lead us to appreciate more deeply the implications of the grand challenges of our field. Graeme Clark has faced the challenge of providing speech perception via artificial neural stimulation, and has led an Australian multidisciplinary team to realise his dream. He can examine that process by both looking back and looking forward. Stephanie Seneff has developed an awesome multidisciplinary breadth in her career as a speech scientist. She is more aware than most of the nature of and possible solutions to the grand challenges that lie ahead. Another grand challenge arises in the area of communicating our scientific awareness to all our stakeholders. We look forward to a lively and instructive time as a broad-based panel discusses just how we should be communicating our science so that our field can receive optimal levels of financial support.

On behalf of my fellow coordinators, Peter Blamey and Julie Vonwiller,

Bruce Millar  
(Chair of Coordinators and President of ASSTA Inc.)

## **TECHNICAL TOPIC MODERATORS AND ORGANISERS**

Human Speech Production, Acoustic-Phonetics and Articulatory Models

Gerry Docherty

Laura Tollfree

Human Speech Perception

Robert Remez

Denis Burnham

Language Acquisition: First and Second Languages

Jean Vroomen

Roger Wales

Spoken Language and Dialogue Modeling; Dialogue Systems

Susanne Luperfoy

Sandra Williams

Isolated Word Recognition

Li Deng

Kuldip Paliwal

Large Vocabulary Continuous Speech Recognition

Sadaoki Furui

Robin King

Utterance Verification and Word Spotting

Harald Hoeg

Peter Kenne

Speaker Adaptation and Normalisation in Speech Recognition

Rick Rose

Michael Barlow

Speaker and Language Recognition; Dialects and Speaking Styles

Marc Zissman

Ara Samouelian

Multilingual Perception and Recognition

Valerie Hazan

Duncan Markham

Signal Processing, Speech Analysis and Feature Extraction

Shuichi Itahashi

Frantz Clermont

Robust Speech Processing in Adverse Environments

Douglas Reynolds

Sridha Sridharan

Hidden Markov Model Techniques

Mari Ostendorf

Roberto Togneri

Artificial Neural Networks, Fuzzy and Evolutionary Algorithms

Zheru Chi

Tuan Pham

Spoken Language Understanding Systems

Michael Scordilis

David Grayden

Text-to-Speech Synthesis

Nick Campbell

Janet Fletcher

Prosody and Emotion; Focus, Stress and Accent

D. Robert Ladd

Jeff Pittam

Speech Coding

Barry Cheetham

Harvey Holmes



# CONFERENCE COMMITTEES

## PERMANENT COUNCIL OF THE ORGANISATION FOR ICSLP

- Souguil J. M. Ann, Seoul National University, Korea
- Roberto Billi, CSELT, Italy
- Jens P. Blauert, University of Bochum, Germany
- H. Timothy Bunnell, University of Delaware, USA
- Anne Cutler, Max-Planck-Institute for Psycholinguistics, The Netherlands
- Renato De Mori, University of Avignon, France
- Gunnar Fant, Royal Institute of Technology, Sweden
- Adrian J. Fourcin, University College London, UK
- Hiroya Fujisaki, Science University of Tokyo, Japan
- Sadaoki Furui, Tokyo Institute of Technology, Japan
- Wolfgang J. Hess, University of Bonn, Germany
- Julia Hirschberg, AT&T Bell Labs, USA
- John Laver, University of Edinburgh, UK
- Lin-Shan Lee, National Taiwan University, Taiwan
- Joseph Mariani, LIMSI - CNRS, France
- J. Bruce Millar (Secretary), Australian National University, Australia
- Roger K. Moore (President), DERA Speech Research Unit, UK
- John J. Ohala, University of California Berkeley, USA
- Louis C W Pols, University of Amsterdam, The Netherlands
- Patti Price, SRI International, USA
- Larry R. Rabiner, AT&T Bell Labs, USA
- Mario Rossi, University of Provence, France
- Stephanie Seneff, M.I.T, USA
- Katsuhiko Shirai, Waseda University, Japan
- Christel Sorin, C.N.E.T, France
- Kenneth Stevens, M.I.T, USA
- Yoh'ichi Tohkura (Vice-President), ATR, Japan
- Victor W. Zue, M.I.T, USA

## AUSTRALIAN CONSULTATIVE COMMITTEE

- Yianni Attikiouzel, The University of Western Australia
- Robert Bogner, The University of Adelaide
- John Clark, The University of Western Sydney
- Mary O'Kane, The University of Adelaide
- Roger Wales, The University of Melbourne

## INTERNATIONAL ADVISORY BOARD

- Souguil J. M. Ann, Seoul National University, Korea
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- Louis C W Pols, University of Amsterdam, The Netherlands
- Christel Sorin, C.N.E.T, France
- Yoh'ichi Tohkura, ATR, Japan
- Jialu Zhang, Academia Sinica, China
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## **ICSLP '98 ORGANISING COMMITTEE**

ICSLP has been organised by three coordinators and associated managers and committees reporting to them.

### **Finance**

- Peter Blamey (Coordinator)
- David Grayden

### **Organisation**

- Julie Vonwiller (Coordinator)
- Karen Croot
- Karsten Kumpf
- Helen Fraser
- Marija Tabain
- Jan van Doorn

### **Technical**

- Bruce Millar (Coordinator)

### **Technical Program Committee**

- Robert Dale (Chair)
- Roberto Togneri (Deputy Chair)
- Denis Burnham
- Michael Wagner

### **SST Student Day Committee**

- Frantz Clermont (Co-Chair)
- Michael Barlow (Co-Chair)
- Ingrid Ahmer
- Robin King
- Parham Mokhtari

### **Technical Publications Committee**

- Robert Mannell (Chair)
- Jordi Robert-Ribes

### **Technical Services Committee**

- Ray Robinson (Chair)
- Jack Parry

## **CONFERENCE ORGANISER**

- Tour Hosts Conference and Exhibition Organisers

## A WORD FROM THE TECHNICAL PROGRAM CHAIR

A great deal of important activity goes on in a conference like ICSLP during tea and coffee breaks, around tables at lunch and dinner, and on later into the evenings in local hostleries. But the technical and scientific program is important too, and of course without it, the conference would not exist.

Planning a conference in Australia is always somewhat like crystal-ball gazing: the distances and consequent costs involved for most potential delegates make it very hard to predict the likely numbers of submissions. We were pleasantly surprised, then, by the extremely strong worldwide response to the Call for Papers; married with the high-quality assessment of the reviewers, this has allowed us to put together a proceedings that contains in excess of 800 papers to be presented at the conference, either in oral sessions or poster sessions. Space and time constraints mean that only just under half of the accepted papers could be presented orally. The reviewing process involved a very large number of people across the globe, structured into 25 topic area teams managed in each case by an Area Moderator (typically outside of Australia) and an Area Organiser (typically in Australia); this structure often meant that someone was available to resolve issues at any time of day or night.

For this ICSLP, we made a very conscious attempt to bring to the conference those who work with the computational processing of aspects of language beyond the consideration of speech itself: to this end, our call for papers contained a number of topic areas which have resulted in the various sessions that happen on the first day of the conference, thus overlapping with the International Symposium on Spoken Dialogue. We are also very fortunate to have two internationally distinguished researchers in aspects of spoken language processing as our plenary speakers: Professor Graeme Clark, the leader of the Australian Bionic Ear project, and Dr Stephanie Seneff, a major player in speech processing in the US. A third plenary session is given over to a topic which we are sure will strike a chord with many present at the conference: in a time when increasingly powerful speech processing products are appearing on the desktop, research funding bodies are questioning the need to continue funding work in speech recognition, with some in the US and Europe taking that view that speech is a "solved problem". Our panel aims to examine and strengthen the robustness of the arguments that we might make to the contrary.

Assembling a program of this size is no simple task. As already noted, the Technical Program Committee have been helped immeasurably in this by the 25 topic area teams that made up the Scientific Review Committee; as a small recognition of their considerable effort, their names are listed elsewhere in this volume. As chair of the Technical Program Committee, my job was made so much easier by the cooperation of these individuals, but also in particular by the other members of the TPC who invested many long hours in putting together the conference. Roberto Togneri was responsible for arranging the plenaries, as well as managing the huge operation of ensuring that all 1100 summaries ended up with the most appropriate reviewers; Denis Burnham and Michael Wagner carried out the vast logistical exercise of shoehorning all the papers into the available sessions, minimising conflicts and ensuring that those speakers who were presenting more than one paper did not have to be in two places at once. Invaluable administrative help was provided by Debbie Whittington and Philip Chan at the Microsoft Research Institute in Sydney. As is so often the case, the hard work behind the scenes is invisible; but without the help of all these people, this technical program would not have been possible.

Robert Dale  
(Chair of Technical Program Committee)

## **SATELLITE MEETINGS**

The following symposia will be held in conjunction with ICSLP '98.

### **ISSD - INTERNATIONAL SYMPOSIUM ON SPOKEN DIALOGUE**

Sydney Convention and Exhibition Centre, Darling Harbour  
30 November - 1 December, 1998  
0900-1700 in Meeting Room 3

Contact persons at ICSLP '98: Hiroya Fujisaki, Michael Wagner, and Tuan Pham

The 3rd International Symposium on Spoken Dialogue will be held in conjunction with ICSLP '98 at the Sydney Convention Centre.

The purpose of the Symposium is to facilitate the discussion on the state of the art of spoken dialogue methods and systems among those participants of ICSLP '98 who work in the field of spoken dialogue.

A workshop on spoken dialogue will be held on Monday 30 November, followed by a day of ICSLP conference sessions on spoken dialogue on Tuesday 1 December.

### **SPEECH SYNTHESIS WORKSHOP**

Jenolan Caves House, Jenolan Caves, Blue Mountains  
28 - 29 November, 1998

Contact Person at ICSLP '98: Nick Campbell (Workshop Chairman)

This Tutorial and Research Workshop is intended to attract an international audience and will focus on the application of novel and theoretically interesting techniques to speech synthesis systems. A feature of this workshop will be a special session devoted to evaluation. Participants of the workshop are invited to participate both as listeners and as providers of TTS systems.

### **ISCSLP '98**

National University, Singapore  
7 - 9 December, 1998

Contact person at ICSLP '98: Jia-Lin Shen, Academia Sinica, Taipei

International Symposium on Chinese Spoken Language Processing (ISCSLP) is a forum to promote R & D and to explore new horizons in Chinese spoken language processing. The technical sessions, keynote speeches and tutorials will provide latest information you need now and in the future. A SIG will focus on the development of international collaboration in the design, collection and description of Chinese speech and linguistic data corpora and the assessment of the performance of speech technology. ISCSLP '98 is hosted by COLIPS in Singapore.

## **COCOSDA-98**

Sydney Conference and Exhibition Centre, Darling Harbour  
30 November, 1998  
0900-1700 Meeting Room 5 and 1/3 Auditorium

Contact person at ICSLP '98: Steven Bird, University of Pennsylvania

This workshop will focus on the development of international collaboration in the design, collection and description of speech data corpora and the assessment of the performance of speech technology. The morning session will include reports on recent developments around the world. The afternoon will feature working groups, including one on the topic "Tools, formats and data models for annotation of linguistic signals."

## **AVSP '98 - AUDITORY - VISUAL SPEECH PROCESSING**

4 - 6 December, 1998  
Terrigal, Central Coast NSW

Contact person at ICSLP '98: Denis Burnham, University of New South Wales

Auditory-visual speech processing is a rapidly growing and highly interdisciplinary field of research, concerned with the contribution of both auditory and visual information to speech processing by humans and machines. AVSP '98 gives a good sampling of current work in this exciting area with papers on audiovisual synthesis, analysis and recognition, auditory-visual speech perception and the McGurk effect, visual linguistics and phonetics, and sensory impairment.

## **FIRST INTERNATIONAL WORKSHOP ON WRITTEN LANGUAGE PROCESSING**

The University of New South Wales, Sydney  
7 - 9 December, 1998

Organiser: Marcus Taft, University of New South Wales  
Tel: +61 2 9385 3026

The aim of this workshop is to bring together researchers from around the world who are interested in the cognitive processes involved in reading. The emphasis will be on the empirical study of orthographic, phonological and semantic processing in reading words and sentences. It is hoped that the research reported throughout the workshop will include analyses of a broad range of languages and types of script.

## ICSLP'98 Technical Program at a Glance

Tuesday 1 December	Wednesday 2 December	Thursday 3 December	Friday 4 December
<p><b>0930 - 1000 OPENING CEREMONY</b></p> <p><b>1000 – 1100 PLENARY SESSION</b> Tu2A: Cochlear Implants in The Second &amp; Third Millennia Keynote Speaker: Graeme Clark</p> <p><b>1100 – 1130 MORNING TEA</b></p> <p><b>1130 – 1230 ORAL SESSION</b> Tu3A: Text-to-Speech Synthesis 1 Tu3B: Spoken Language Models &amp; Dialog 1 Tu3C: Prosody &amp; Emotion 1 Tu3D: Hidden Markov Model Techniques 1</p> <p><b>1130 - 1430 POSTER SESSION</b> Tu3P: Speaker &amp; Language Recognition 1 Tu3Q: Multimodal Spoken Language Processing 1 Tu3R: Isolated Word Recognition</p> <p><b>1230 –1330 LUNCH</b></p> <p><b>1330 - 1500 ORAL SESSION</b> Tu4A: Robust Sp. Proc. in Adverse Environments 1 Tu4B: Spoken Language Models &amp; Dialog 2 Tu4C: Articulatory Modelling 1 Tu4D: Talking To Infants, Pets &amp; Lovers</p> <p><b>1500 – 1530 AFTERNOON TEA</b></p> <p><b>1530 - 1700 ORAL SESSION</b> Tu5A: Robust Sp. Proc. in Adverse Environments 2 Tu5B: Spoken Language Models &amp; Dialog 3 Tu5C: Speech Coding 1 Tu5D: Articulatory Modelling 2</p> <p><b>1530 - 1800 POSTER SESSION</b> Tu5P: Prosody &amp; Emotion 2 Tu5Q: Neural Nets, Fuzzy &amp; Evolutionary Meth. 1 Tu5R: Utterance Verification &amp; Word Spotting 1 / Speaker Adaptation 1</p> <p><b>1700 - 1800 ORAL SESSION</b> Tu6A: Text-To-Speech Synthesis 2 Tu6B: Spoken Language Models &amp; Dialog 4 Tu6D: Human Speech Perception 1</p>	<p><b>0900 - 1000 ORAL SESSION</b> We1A: Robust Sp. Proc. in Adverse Environments 3 We1B: Speech &amp; Hearing Disorders 1 We1C: Prosody &amp; Emotion 3 We1D: Spoken Language Understanding Systems 1</p> <p><b>0900 - 1130 POSTER SESSION</b> We1P: Signal Processing &amp; Speech Analysis 1 We1Q: Spoken Language Generation &amp; Translation 1 We1R: Spoken Language Models &amp; Dialog 5</p> <p><b>1000 – 1030 MORNING TEA</b></p> <p><b>1030 – 1130 ORAL SESSION</b> We2A: Segmentation, Labelling &amp; Speech Corpora 1 We2B: Multimodal Spoken Language Processing 2 We2C: Prosody &amp; Emotion 4 We2D: Neural Nets, Fuzzy &amp; Evolutionary Meth. 2</p> <p><b>1135 – 1235 PLENARY PANEL</b> Automatic Speech Recognition Is A Solved Problem: A Fact Or Convenient Fiction?</p> <p><b>1235 –1330 LUNCH</b></p> <p><b>1330 - 1500 ORAL SESSION</b> We4A: Large Vocabulary Continuous Sp. Recog. 1 We4B: Speaker &amp; Language Recognition 2 We4C: Signal Processing &amp; Speech Analysis 2 We4D: Prosody &amp; Emotion 5</p> <p><b>1330 - 1700 POSTER SESSION</b> We4P: Robust Sp. Proc. in Adverse Environments 4 We4Q: Segmentation, Labelling &amp; Speech Corpora 2 We4R: Speech Technology Applications &amp; Human-Machine Interface 1</p> <p><b>1500 – 1530 AFTERNOON TEA</b></p> <p><b>1530 - 1700 ORAL SESSION</b> We5A: Large Vocabulary Continuous Sp. Recog. 2 We5B: Text-To-Speech Synthesis 3 We5C: Language Acquisition 1 We5D: Acoustic Phonetics 1</p> <p><b>1700 - 1800 ORAL SESSION</b> We6A: Speaker Adaptation 2 We6B: Speech Coding 2 We6C: Hidden Markov Model Techniques 2 We6D: Multilingual Perception &amp; Recognition 1</p>	<p><b>0900 - 1030 ORAL SESSION</b> Th1A: Large Vocabulary Continuous Sp. Recog. 3 Th1B: Articulatory Modelling 3 Th1C: Language Acquisition 2 Th1D: Speaker &amp; Language Recognition 3</p> <p><b>0900 - 1230 POSTER SESSION</b> Th1P: Text-To-Speech Synthesis 4 Th1Q: Spoken Language Understanding Systems 4 Th1R: Human Speech Perception 2</p> <p><b>1030 – 1100 MORNING TEA</b></p> <p><b>1100 - 1230 ORAL SESSION</b> Th2A: Large Vocabulary Continuous Speech Recognition 4 Th2B: Spoken Language Understanding Systems 2 Th2C: Signal Processing &amp; Speech Analysis 3 Th2D: Human Speech Perception 3</p> <p><b>1230 –1330 LUNCH</b></p> <p><b>1330 - 1500 ORAL SESSION</b> Th4A: Speaker Adaptation 3 Th4B: Spoken Language Understanding Systems 3 Th4C: Multimodal Spoken Language Processing 3 Th4D: Acoustic Phonetics 2</p> <p><b>1330 - 1700 POSTER SESSION</b> Th4P: Large Vocabulary Continuous Sp. Recog. 5 Th4Q: Speech Coding 3 Th4R: Language Acquisition 3 / Multilingual Perception &amp; Recognition 2</p> <p><b>1500 – 1530 AFTERNOON TEA</b></p> <p><b>1530 - 1700 ORAL SESSION</b> Th5A: Segmentation, Labelling &amp; Speech Corpora 3 Th5B: Text-To-Speech Synthesis 5 Th5C: Spoken Language Generation &amp; Translation 2 Th5D: Human Speech Perception 4</p>	<p><b>0900 – 1030 ORAL SESSION</b> Fr1A: Robust Sp. Proc. In Adverse Environments 5 Fr1B: Text-To-Speech Synthesis 6 Fr1C: Sp. Tech. Applic. Human-Machine Interface 2 Fr1D: Prosody &amp; Emotion 6</p> <p><b>0900 – 1230 POSTER SESSION</b> Fr1P: Hidden Markov Model Techniques 3 Fr1Q: Speech &amp; Hearing Disorders 2 / Sp. Proc. for the Speech Impaired &amp; Hearing Impaired 1 Fr1R: Human Speech Production</p> <p><b>1030 – 1100 MORNING TEA</b></p> <p><b>1100 – 1230 ORAL SESSION</b> Fr2A: Segmentation, Labelling &amp; Speech Corpora 4 Fr2B: Speaker &amp; Language Recognition 4 Fr2C: Speech Technology Applications &amp; Human-Machine Interface 3 Fr2D: Utterance Verification &amp; Word Spotting 2</p> <p><b>1230 –1330 LUNCH</b></p> <p><b>1330 – 1430 ORAL SESSION</b> Fr4A: Large Vocabulary Continuous Speech Recognition 6 Fr4B: Neural Networks, Fuzzy &amp; Evolutionary Methods 3 Fr4C: Speech Processing For The Speech-Impaired &amp; Hearing-Impaired 2 Fr4D: Prosody &amp; Emotion 7</p> <p><b>1440 – 1540 PLENARY SESSION</b> Fr5A: The Use Of Linguistic Hierarchies In Speech Understanding Keynote Speaker: Stephanie Seneff</p> <p><b>1545 – 1615 CLOSING CEREMONY</b></p>

# SST STUDENT DAY

Sydney Convention and Exhibition Centre, Darling Harbour  
30 November 1998  
0930-1700 in Meeting Room 4

Co-Chairs: Michael Barlow and Frantz Clermont  
Committee: Ingrid Ahmer, Robin King, Parham Mokhtari

Two anonymous quotations summarise the philosophy of this innovative program:

***"The future belongs to the young. Today's students are tomorrow's leaders in the field"***

***"We stand on the shoulders of those who have gone before us. All we create, builds on what has gone before"***

The SST Student Day is an innovation derived from the history of the biennial Australian Speech Science and Technology conferences and contributing to the presence of the 7th Australian International Conference on Speech Science and Technology (SST-98) which is incorporated within ICSLP '98. The Student Day seeks to provide a fraternal and nurturing environment in which young researchers may present their work to their peers and to a group of experienced and interested mentors.

The Student Day is a less formal and more personal workshop or one day conference in which the participants, mingle, share and interact. It is expected that such an environment will provide a number of opportunities for students: they may share their insights, enthusiasms, and problems with others in a similar situation; while also being exposed to and potentially guided by senior members of our community interested in helping the "next generation" of researchers establish themselves.

With the goal of striking a balance between student and mentor input, attendees will present their work in two poster sessions during the day. These sessions will be interspersed with oral presentations by the invited Mentors as well as informal discussion sessions. The day will conclude with a lively debate on the future of speech research.

A small number of senior, established, speech researchers have been invited to act as Mentors: to provide constructive feedback to all presenters, be available to answer questions on a range of topics, and effectively to act as "benevolent supervisor for the day".

While the day is specifically designed with student attendees in mind, the poster sessions are open to all members of the speech research community who are willing to attend in the spirit of the day. These poster sessions begin at 1100 hours and 1400 hours and last for ninety minutes.

## **The schedule of sessions for students and mentors is:**

08:30 - 09:30 Registration  
09:30 - 09:45 Welcoming Address  
09:45 - 10:00 Morning Tea / Meet the Mentors

10:00 - 10:45 Mentor Presentation  
11:00 - 12:30 Poster Session 1  
12:30 - 13:30 Lunch Break  
13:30 - 14:00 Mentor Presentation or Discussion  
14:00 - 15:30 Poster Session 2  
15:30 - 15:45 Afternoon Tea  
15:45 - 16:45 Debate  
16:45 - 17:00 Close

As indicated above, the poster sessions are open to all members of the speech research community who are willing to attend in the spirit of the day.



## Host:

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Speech  
Science and  
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