

Ronald Allan Cole

PERSONAL DATA

Office Address: Boulder Language Technologies
2960 Center Green Court, Suite 200
Boulder, Colorado 80301

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Date and Place of Birth: December 21, 1944, Rochester, New York, U.S.A.

ACADEMIC TRAINING

Institution Degree	Date
Univ. of Rochester	B.A. with distinction in Psychology 1963-1967
Univ. of California at Riverside	M.A. in Psychology 1967-1969
Univ. of California at Riverside	Ph.D. in Psychology, Doctoral Dissertation: "Phoneme Independence in short-term memory" Thesis Advisor: Dr. Terrence Kenney 1969-1971

PROFESSIONAL EXPERIENCE

Feb 2007-Present	President, Boulder Language Technologies Chief Scientist, Mentor Interactive
Oct. 1998 - Feb. 2007	Research Professor, University of Colorado Director, Center for Spoken Language Research, University of Colorado Boulder.
Apr. 1988 - Sept. 1998	Professor, Dept. of Computer Science & Engineering Director, Center for Spoken Language Understanding Oregon Graduate Institute.
Aug. 1988 - Apr. 1992	Associate Professor, Dept. of Computer Science & Engineering, Oregon Graduate Institute.
May 1980 - Aug. 1988	Senior Project Scientist, Department of Computer Science, Carnegie Mellon University.
Jan. 1975 - Apr. 1980	Associate Professor, Department of Psychology, Carnegie Mellon University.
Jan.- June 1974	Visiting Lecturer, Department of Linguistics, Tel-Aviv University, Tel-Aviv, Israel.
July 1974 - Dec. 1974	Associate Professor, Department of Psychology, University of Waterloo.
July 1970 - June 1974	Assistant Professor, Department of Psychology, University of Waterloo.

DOCTORAL DISSERTATIONS SUPERVISED

- Scott, B.L. Speech perception: a theory and application,
University of Waterloo, August 1974.
- Jakimik, J. The interaction of sound and knowledge during word recognition from fluent
speech,
Carnegie Mellon University, June 1979.
- Rudnicky, A. The role of language experience in language perception: An ecological theory.
Carnegie Mellon University, June 1979.
- Muthusamy, Y. A segmental approach to automatic language identification,
Oregon Graduate Institute of Science and Technology, July 1993.
- Hosom, J.P. Automatic Time Alignment of Phonemes Using Acoustic-Phonetic Information,
Oregon Graduate Institute of Science and Technology, May 2000.

MASTERS THESES SUPERVISED

- Scott, B.L. The verbal transformation effect as a function of embedded sounds,
University of Waterloo, September, 1971.
- Freilich, I. Cognitive rigidity and the alpha rhythm of the human electro-encephalogram;
University of Waterloo, 1972.
- Singer, J. The effects of repetition on perception and response,
University of Waterloo, September 1974.
- Raz, I. The extent of invariance for Hebrew consonants,
Tel-Aviv University, December 1975.
- Gopalakrishnan, M. Segmenting speech into broad phonetic categories using neural networks;
Oregon Graduate Institute, August 1990.
- Rooker, T. Formant estimation from a spectral slice using neural networks.
Oregon Graduate Institute, August 1990.
- Zhou, L. Speaker-independent neural network pitch tracker with telephone bandwidth,
speech for computer speech recognition.
Oregon Graduate Institute, April 1991.
- Roginski, K. A Neural Network Phonetic Classifier for Telephone Speech,
Oregon Graduate Institute, November 1991.
- Jain, N. A New Approach to Voice Dialing,
Oregon Graduate Institute, July 1995.
- Hosom, J.P. Automatic Time Alignment of Phonemes Using Acoustic-Phonetic
Information,
May 2000.

COURSES TAUGHT

Undergraduate

Intro to Psychology

Perception and Cognition
Psycholinguistics
Psychology of Consciousness
Research Methods in Perception
Biofeedback

Graduate

Spoken Dialogue Systems
Perception

Psycholinguistics
Time Perception
Speech Perception
Acoustic Phonetic
Spectrogram Reading
Structure of Spoken Language
Spoken Language Systems

Short Course

Computer Speech
Recognition: The State
of the Art

PROFESSIONAL SERVICE

Editor-in-chief of the international survey "*State of the Art in Speech and Natural Language Processing*" sponsored jointly by the Directorate General XIII of the European Commission and the National Science Foundation. The survey is online at <http://cslu.cse.ogi.edu/HLTsurvey/HLTsurvey.html>.

Founder and Editor-in-Chief, *Free Speech Journal*. (<http://www.cse.ogi.edu/CSLU/fsj/html/home.html>)

Workshop Organizer, *NSF Workshop on Spoken Language Understanding*, Washington DC, 1992.

Workshop Organizer, *NSF Interactive Systems Grantees Workshop*, Stevenson, WA, August 1997.

Workshop Organizer, *NSF Language Resources Workshop*, Stevenson, WA, August 1997.

Workshop Organizer, *NSF Workshop on International Collaboration in Computer Science*, Stevenson, WA, October 1997.

Workshop Organizer, *NSF Workshop on Western Hemisphere Collaboration in Computer Science*, Orlando, FL, February, 1999.

Workshop Organizer, *NSF-sponsored Workshop on Western Hemisphere Collaboration in Computer Science*, Sponsored by the National Science Foundation and Center for Spoken Language Understanding. Manzanillo, Colima, Mexico, August 1999.

Workshop Organizer (with Jose Fortes and Jaime Carbonell), *Workshop on US-Argentina and US-Chile Collaborative Research on Computer Science and Engineering*, Buenos Aires, Argentina and Santiago, Chile. Sponsored by the National Science Foundation. April, 2000).

Workshop Organizer, *Workshop on Perceptive Animated Interfaces and Virtual Humans*, San Diego, CA. Sponsored by the National Science Foundation. April, 2004.

Workshop Organizer (with Jean Michel-Mazaux), *Workshop on Virtual Therapists*, Bordeaux, France. Sponsored by the National Science Foundation. May 2007.
<http://www.colorado.edu/news/releases/2007/195.html>.

Associate Editor, *Journal of Experimental Psychology: Human Perception and Performance*. , 1976-1978.

Assistant Editor, *International Journal of Speech Technology*.

Associate Editor, *Speech Communication*.

Associate Editor, *Computer Speech & Language*.

Editor-in-chief and founder (with Nelson Morgan, Hynek Hermansky and Hervé Boulard), *Free Speech Journal* (An entirely online journal that was “merged” with *Speech Communication*)

HONORS / AWARDS:

Research Professor, Department of English, Adam Mickiewicz University, Poznan, Poland. November 2008- October, 2011. This is the first appointment of a research professor in the history of the university.

Fulbright Senior Specialist, 2007 - present.

Fulbright Fellowship (May 20-June 3 2008) to visit Adam Mickiewicz University in Poznan, Poland to work with Prof. Katarzyna Dziubalska-Kolaczyk and her colleagues and students. Dr. Dziubalska-Kolaczyk is Head of the School of English and Director of the Center for Speech and Language Processing.

Outstanding Lifetime Achievement Award presented by the InSTIL Special Interest Group for outstanding research in speech technology and language training. Presented at EUROCALL 2001, University of Nijmegen, The Netherlands.

A project I led using the animated agent Baldi to teach speech and language skills to profoundly deaf children was featured on ABC's Prime Time Thursday. ("Look Who's Talking" Prime Time Thursday, ABC Television Network, Jacqueline Payson (Producer), Aired March 15, 2002. This work was also featured on the National Science Foundation home page at <http://www.nsf.gov/od/lpa/news/press/01/pr0119.htm>.

CENTERS & STARTUPS:

I established the Center for Spoken Language Understanding at the Oregon Graduate Institute in 1990. CSLU was one of the largest and most active speech centers in the US between 1992- 1998 supporting approximately 25 researchers. CSLU developed over 20 speech corpora in 22 languages which were distributed free of charge to researchers worldwide to support research in speech recognition, speaker recognition and language identification. While at CSLU I directed development of the CSLU Toolkit, a platform for research and development of speech technologies and spoken dialog systems with lifelike computer characters. The CSLU Toolkit (<http://cslu.cse.ogi.edu/toolkit/>) has been distributed free of charge to over 30,000 laboratories worldwide and is used in colleges and universities around the world to support education and research. Support from an NSF Challenge grant (1997-2000; Ron Cole, Principal Investigator) incorporated the animated agent Baldi into the CSLU Toolkit for teaching speech and language skills to profoundly deaf children. This project, which produced dramatic results, was featured on ABC's Prime Time Thursday. ("Look Who's Talking" Prime Time Thursday, ABC Television Network, Jacqueline Payson (Producer), Aired March 15, 2002). This work was also featured on the National Science Foundation home page at <http://www.nsf.gov/od/lpa/news/press/01/pr0119.htm>. This work led to the founding of a company, Animated Speech (<http://www.animatedspeech.com/>) which licensed the CSLU Toolkit for use in developing learning applications for individuals with disabilities. In 1998, I established the Center for Spoken Language Research at the University of Colorado Boulder with Wayne Ward and John Hanson. From 2000-2007 (when I left CU) CSLR received over \$20 million in grants from DARPA, NSF, NIH and IES. These grants led to development of the CU Communicator system, the SONIC speech recognizer, the CU Animate system, the Conversational Agent Toolkit and speech corpora (CU Move, CU Kids' Speech Corpus) that have been distributed to researchers worldwide. The technologies and resources developed at CSLR during my tenure as Director were used to develop a number of programs designed to improve reading by children (Foundations to Literacy) and to help individuals with aphasia (Sentactics, ORLA, AphasiaScripts) or Parkinson disease (LSVT VT) regain speech and language skills. Each of the virtual programs produced positive outcomes in clinical trials. Descriptions of the tools, technologies, corpora and programs developed at CSLR can be found at the

archived CSLR Web site (<http://cslr.colorado.edu/beginweb/>). Development of the Virtual Human Toolkit, funded by the NSF, was initiated at CSLR; development of VH Toolkit continues at Boulder Language Technologies under the direction of Wayne Ward, where it serves as the platform for research and development of intelligent tutoring systems funded by grants from the NSF and IES that aim to improve science learning by elementary school children through natural spoken dialogs with a virtual tutor. I have founded 3 companies. While at CSLU, I founded Fluent Speech Technologies with Stephen Sutton and Pieter Vermeullen. The company was acquired by Sensory Systems (<http://www.sensoryinc.com/>), “a profitable, fast-growing private company that holds the largest market share for dedicated speech recognition and voice biometric ICs. It is also the first company to develop a Voice User Interface (VUI) for *Bluetooth*® headsets.” While at CSLR, Wayne Ward and I founded Mentor Interactive (<http://www.mentorinteractiveinc.com/>) to commercialize literacy and virtual therapy programs using speech and character animation technologies developed at CSLR. Mentor Interactive has received two SBIR Fast Track grants from the National Institutes of Health: A grant from NICHD to extend the Foundations to Literacy program to improve reading by English Language Learners, and a grant from NIDCD to develop and commercialize a program to improve speech communication skills for individuals with aphasia. In February 2007, Wayne Ward and I founded Boulder Language Technologies (<http://www.bltek.com/>). BLT has received over \$6 million in grants from NSF and IES to develop a new generation of intelligent tutoring systems to improve science learning by elementary school children.

RESEARCH GRANTS

2008 – 2011	Ron Cole (PI) “A Broadly Accessible Reading Tutor,” \$850,000, NICHD Phase I and Phase II SBIR grant
2007 – 2012	Wayne Ward (PI), Ron Cole (co-PI), “Improving Science Learning in Inquiry-based Systems,” \$3,000,000, NSF, Division of Education and Human Resources
2007 – 2011	Wayne Ward (PI), Ron Cole, “Improving Science Learning Through Tutorial Dialogs,” \$3,130,043, Institute For Education Sciences, Department of Education
2006 – 2009	Ron Cole (PI), “A Broadly Accessible Reading Tutor,” \$750,000, National Institute of Child Health and Development
2006 - 2008	Ron Cole (PI), Wayne Ward (co-PI), “CISE CRI: Community Resources for Inventing the Next Generation of Human Computer Interfaces,” \$500,000
2005 - 2006	Thompson, C., Holland A., and Cole, R., “Development and Evaluation of a Virtual Aphasia Clinician,” \$347,750, NIDCD/NIH
2004 - 2008	Wise, B., Cole, R., Pellom, B., “ICARE: Independent Comprehensive Adaptive Reading Evaluation,” \$1,600,000, IES ED.
2004 - 2006	Hamilton, E., Cole, R., “ALASKA: Applet & Library Augmented Shared Knowledge Areas,” \$681,306, NSF.
2004 - 2006	Cole, R., Ramig, L., “Virtual Therapist Speech Treatment for Parkinson Disease,” \$354,332, NIH.
2004 - 2006	Cole, R., Movellan, J., Gratch J., Workshop on Perceptive Animated Interfaces and Virtual Humans, \$39,872, NSF.
2002 - 2004	Cole, R., “REU/ Cole, R., “REU/ITR: Creating the Next Generation of Intelligent Animated Conversational Agents (supplement to NSF 0086107),”

2002 - 2004 \$39,000, NSF.
Cole, R., Barker, L., Schwartz S., Snyder, L., Wise, B.,
"IERI: Scaling up Reading Tutors,"
\$1,000,000, NIH.

2002 - 2004 Cole, R., Pellom, B.,
"INTERNATIONAL: NSF-CONICYT: Advancing Human Language Technology in
the U.S. And Chile through Collaborative Research on Advanced Dialogue Systems,"
\$61,178, NSF.

2002 - 2003 Cole, R., "RET/ Cole, R.,
"REU/ITR: Creating the Next Generation of Intelligent Animated Conversational
Agents (supplement to NSF 0086107),"
\$45,500, NSF.

2002 - 2003 Cole, R., "REU/ Cole, R.,
"REU/ITR: Creating the Next Generation of Intelligent Animated Conversational
Agents (supplement to NSF 0086107),"
\$45,500, NSF.

2002 - 2003 Cole, R.,
"Enabling Natural Communication for Information Systems,"
\$180,000, NSF.

2002 - 2003 Cole, R.,
Extending Language Models,
\$180,000, NSF.

2002 - 2003 Cole, R., Ramig, L.,
"Coleman Foundation Grant: Animated Agent- Enhanced Voice Treatment for
Individuals with Parkinson Disease,"
\$30,000, Coleman

2002 - 2003 Cole, R., Schwartz, S., Wise, B., Doxas, I.,
"Coleman Foundation Grant: Participatory Design for Creating Computer Based
Learning Tools,"
\$8184, Coleman.

2001 - 2006 Kintsch, W., Landauer T., Caccamise, D., Cole, R.,
"ITR/PE: Latent Semantic Analysis Theory and Technology,"
\$2,400,000, NSF.

2001 - 2006 Kintsch, W., Caccamise, D., Cole, R., Olson, R., Snyder, L.,
"IERI: Scalable and Sustainable Technologies for Reading Instruction and
Assessment,"
\$5,997,404, NSF.

2000 - 2005 Cole, R., Massaro, D., van Santen, J., Movellan, J.,
"ITR: Creating the Next Generation of Intelligent Animated Conversational Agents,"
\$4,000,000, NSF.

1999 - 2002 Ward, W., Hansen, J., Cole, R.,
"DARPA Communicator: Developing the CU Conversational Agent Speech System,"
\$1,867,184.00, ONR/DARPA.

1999 - 2002 Cole, R.,
"CRCD: An Interactive Curriculum in Human Language Technology for
Undergraduate and Graduate Education and Research,"
\$400,000, NSF.

1999 - 2001 Cole, R.,
"Advancing Human Language Technology in Brazil and the United States Through
Collaborative Research on Portuguese Spoken Language Systems,"
\$199,481, NSF.

1998 - 2002 Cole, R.,
"CARE: Accessible Language Resources for Research and Education,"
\$1,200,000, NSF.

1998 - 2000 Cole, R.,
 "Accelerating Research Advances in Human Language Technology through Portable, Accessible Natural Dialogue Systems,"
 \$600,000, ONR/DARPA.

1998 Cole, R.,
 "Making Spoken Language Systems Ubiquitous: Long-Term Research Agenda,"
 \$150,000, Intel Corporation.

1997 - 1999 Cole, R., Y. Yan,
 "A Phonetic Knowledge-Guided Approach to Speaker Adaption for Large Vocabulary Continuous Speech Recognition,"
 \$94,375, Office of Naval Research.

1997 - 1998 Cole, R.,
 "Large Vocabulary Continuous Speech Recognition,"
 \$100,000, Fonix Corporation.

1997 - 1998 Cole, R.,
 "Speech Recognition Evaluation,"
 \$72,675, Nortel Corporation.

1997 - 1998 Fanty, M., R. Cole, Y. Yan,
 "CISE Research Instrumentation: File Server and Storage Server for Spoken Language Technologies,"
 \$50,000, National Science Foundation.

1997 - 2000 Cole, R., M. Macon, D. Massaro, A. Waibel,
 "Creating Conversational Agents for Language Training,"
 \$1,800,000, National Science Foundation.

1997 - 1998 Cole, R., J. de Villiers, D. Massaro,
 "Bringing Spoken Language Systems to the Classroom for Learning Language Training with Hearing Impaired People,"
 \$50,000, National Science Foundation.

1997 Cole R.,
 French, Italian, Mexican, and Caribbean Spanish Data Collection,
 \$199,906, AT&T.

1997 Cole, R.,
 "Understanding the role of International Collaboration in Computer Science and Engineering," (NSF Workshop),
 \$49,946, National Science Foundation.

1997 Cole, R.,
 Intel Equipment Grant,
 \$200,000, (40 Pentium computers).

1997 Cole, R.,
 "Proposal for the Second NSF Grantees Workshop in Interactive Systems,"
 \$120,925, National Science Foundation.

1996 - 1998 Cole, R., G. Whitney, D. Jonassen, B. Moeller, S. Carver,
 "Conceptualization of Flagship Center for Collaborative Research in Learning and Human Language Technologies,"
 \$50,000, National Science Foundation.

1996 - 1997 Cole R.,
 Basic Research/Education Support,
 \$45,913, Intel Corp.

1996 - 1997 Cole, R., S. Sutton,
 "Advancing Human Language Technology in Mexico and the U.S. Through Collaborative Research on Spoken Language Systems,"
 \$100,000, National Science Foundation.

1996 - 1998 Cole, R., D. Novick, M. Fanty,
 "Rapid Prototyping of Spoken Language Systems,"
 \$1,300,000, Office of Naval Research.

1996 - 1998 Cole, R., M. Fanty, B. Oshika,
 "Human Language Resources for Research in Multilanguage Systems, Robust
 Recognition, and Speaker Identification,"
 \$746,890, National Science Foundation.

1996 Cole, R.,
 "Toward Robust Speech Recognition: Improved Measures of Confidence,"
 \$20,000, Texas Instruments.

1994 - 1995 Cole, R.,
 "Instrumentation for Research in Spoken Language Systems,"
 \$40,000, National Science Foundation.

1994 - 1996 Cole, R., M. Fanty, D. Novick, E. Barnard, H. Hermansky,
 "Spoken Dialogue Technology for Appointment Scheduling,"
 \$1,400,000, U S West

1994 - 1995 Cole, R., D. Novick, M. Fanty,
 "Rapid Prototyping and Deployment of Spoken Language Systems,"
 \$450,000, U.S. Office of Naval Research/U.S. Census Bureau.

1994 - 1995 Cole, R.,
 "Joint E.C.-U.S. Survey of the State of the Art in Human Language Technology,"
 \$58,000, National Science Foundation.

1994 - 1998 Cole, R.,
 "Toward Rapid Development and Deployment of Spoken Language Systems,"
 \$150,646, U.S. Office of Naval Research/AASERT.

1994 - 1995 Cole, R., D. Novick, M. Fanty, E. Barnard, H. Hermansky,
 "Toward Robust Spoken-Language Systems,"
 \$829,886, NSF/ARPA.

1993 - 1996 Cole, R., B. Oshika, E. Barnard,
 "Linguistic Units for Language Identification,"
 \$697,162, Department of Defense.

1993 - 1994 Cole, R.,
 "Digital Data Collection Platform and Software,"
 \$41,000, Linguistic Data Consortium.

1993 - 1995 Cole, R., E. Barnard, T. Leen,
 "Task-based Analysis and Stochastic Search in Neural Networks,"
 \$325,000, Office of Naval Research.

1993 - 1994 Cole, R.,
 "Telephone Data Collection,"
 \$65,325, Apple Computer Inc.

1993 - 1996 Cole, R.,
 "Automatic Language Identification: A Distinctive Feature Approach,"
 \$110,323, Office of Naval Research, AASERT Award.

1993 - 1994 Cole, R., D. Novick, M. Fanty,
 "Voice questionnaire for the Year 2000 Census,"
 \$125,000, U.S. Bureau of the Census,
 (Grant administered through the U.S. Office of Naval Research).

1993 - 1999 Cole, R., D. Novick,
 "Graduate Traineeships for Under-Represented Minorities for Research in Spoken-
 Language Interfaces,"
 \$557,500, National Science Foundation.

1993 - 1994 Cole, R., D. Novick,
 "Real Time Voice Response Questionnaire for the Year 2000 Census,"
 \$61,912, Digital Equipment Corporation.

1992 Cole, R., S. Zahorian, L. Hirschman,
 "Workshop on Spoken Language Understanding,"
 \$35,700, National Science Foundation.

1992 - 1995 Cole, R., M. Fanty,
 "Spoken Letter Recognition,"

- 1991 - 1993 \$360,000/3-year, National Science Foundation.
Cole, R., M. Fanty, T. Leen,
"Neural Network Approaches to Spoken Letter Recognition,"
\$230,000, Office of Naval Research.
- 1992 - 1993 Cole, R., M. Fanty, T. Leen,
"Instrumentation for the Center for Spoken Language Understanding,"
\$43,000, National Science Foundation.
- 1991 Fanty, M., R. Cole,
"A Portable Interactive Environment for Computer Speech Recognition,"
\$83,000, National Science Foundation.
- 1991 Cole R.,
Equipment donation,
\$108,000, Digital Equipment Corporation.
- 1991 - 1992 Cole, R., M. Fanty,
"English Alphabet Recognition Over Telephone Lines,"
\$230,000, US West Advanced Technologies.
- 1991 - 1992 Cole, R.,
"Speaker-Independent Recognition of Arbitrary Sets of Words,"
\$100,000, US West Technologies.
- 1990 - 1992 Cole, R., M. Fanty,
Cash donation, \$40,000, and equipment donation, \$43,000, Apple Computer.
- 1990 - 1992 Cole, R.,
"Phonetic Classification of Continuous Speech,"
\$50,000/year, National Science Foundation.
- 1990 Cole, R., M. Fanty,
"Feasibility of Speech Recognition on a VLSI Neurocomputer,"
Matching Funds Grant, \$20,000, OASIS.
- 1985 - 1987 Cole, R.,
"Phonetic Classification of Continuous Speech,"
\$580,000, National Science Foundation.
- 1982 - 1985 Cole, R.,
"Knowledge Engineering and Knowledge Acquisition in Speech Understanding
Research,"
\$480,000, National Science Foundation.
- 1972 - 1975 Cole, R.,
"What we hear during speech,"
\$30,000, National Research Council of Canada.
- 1972 Cole, R.,
"Hearing through the skin," Operating grant,
\$2000, University of Waterloo Research Grant.
- 1970 - 1971 Cole, R.,
Operating grant,
\$4000, National Research Council of Canada.
- 1970 - 1971 Cole, R.,
Computing grant,
\$1300, National Research Council of Canada.

JOURNAL PUBLICATIONS

- D. Bolanos, R. A. Cole, W. H. Ward, E. Borts and E. Svirsky. "FLORA, FLuent Oral Reading Assessment of Children's Speech", *ACM Transactions on Speech and Language Processing (TSLP), Special Issue on Speech and Language Processing of Children's Speech for Child-machine Interaction Applications*, 7, 4, Article 16, August 2011, 19 pages.
- W. H. Ward, R. A. Cole, D. Bolanos, C. Buchenroth-Martin, E. Svirsky, S. van Vuuren, T. Weston and J. Zheng. "My Science Tutor: A Conversational Multi-Media Virtual Tutor for Elementary School

- Science”, *ACM Transactions on Speech and Language Processing, Special Issue on Speech and Language Processing of Children’s Speech for Child-machine Interaction Applications*, 7, 4, Article 18, August 2011, 29 pages.
- Cherney, L., Halper, A., Holand, A., Cole, R. “Computerized Script Training for Aphasia: Preliminary Results.” *American Journal of Speech-Language Pathology*, 2008, 17, pp. 19-34.
- Cherney, L. Halper, A., Holland, A., Lee, J., Babbitt, E., & Cole, R. “Improving Conversational Script Production in Aphasia with Virtual Therapist Computer Treatment.” *Brain and Language*, 2007, Vol. 103, pp. 246-247.
- Cole, R., Wise, B., Van Vuuren, S. “How Marni teaches children to read”, *Journal of Educational Technology* 2007, V 47 (1), pp. 14-18.
- Hagen, A., Pellom, B., & Cole, R. Highly accurate children’s speech recognition for interactive reading tutors using subword units, *Speech Communication*, 2007, Vol. 49 (12), pp. 861-873.
- Cole R., Halpern, A., Ramig, L., van Vuuren, S., Ngampatipatpong, N. & Yan, J. “A Virtual Speech Therapist for Individuals with Parkinson Disease”, *Journal of Educational Technology* 2007, V 47 (1), pp. 51-55.
- Su, Stanley Y. W., Fortes, Jose, Cole Ron, et al., “Transnational Information Sharing, Event Notification, Rule Enforcement and Process Coordination,” *International Journal of Electronic Government Research*, 1(2), April-June, 2005, Idea-group Publishing, pp. 1- 26.
- Cole, R.A., Van Vuuren, S., Pellom, B., Hacioglu, K., Ma, J., Movellan, J., Schwartz, S., Wade-Stein, D., Ward, W. and Yan, J. “Perceptive Animated Interfaces: First Steps Toward a New Paradigm for Human–Computer Interaction.” *Proceedings of the IEEE: Special Issue on Human-Computer Multimodal Interface*, 91 (9), pp. 1391-1405, Sept., 2003.
- Ma, J. and Cole, R.A., “Animating Visible Speech and Facial Expressions.” *The Visual Computer*, Volume 20, Numbers 2-3, pp 86-105, 2004.
- Ma, J., Cole, R.A., Pellom, B., Ward, W. and Wise, B. “Accurate Automatic Visible Speech Synthesis of Arbitrary 3D Models Based on Concatenation of Di-Viseme Motion Capture Data.” *Journal of Computer Animation and Virtual Worlds*, Vol. 15:485-500, 2004.
- Cole, R., D. G. Novick, M. Fanty, P. Vermeulen and S. Sutton, "Experiments with a Spoken Dialogue System for Taking the U.S. Census," *Special Edition: Speech Communications*, Volume 23 , Issue 3, Pages: 243 – 260, 1997.
- Yan Y., E. Barnard, R. Cole, “Development of an approach to automatic language identification based on phone recognition,” *Computer, Speech & Language*, Vol. 10(1), pp. 37-54, January, (1996).
- Cole, R., L. Hirschman et al., "The challenge of spoken language systems: Research directions for the nineties," *IEEE Transactions on Speech and Audio Processing*, 1, pp. 1-21, (1995).
- Atlas, L., R. Cole, Y. Muthusamy, A. Lippman, G. Connor, D. Park, M. El-Sharkawi, R. Marks II, “A performance comparison of trained multi-layer perceptrons and trained classification trees,” *Proceedings of the IEEE (Special Issue on Neural Networks)* (1990).
- Barnard, E., R. Cole, M. P. Veal, F. Alleva, “Pitch detection with a neural-net classifier,” *IEEE Transactions on Acoustics, Speech & Signal Processing*, (1991).
- Jakimik, J. A., R. Cole, A. I. Rudnicki, “Sound and spelling in spoken word recognition,” *Journal of Verbal Learning and Verbal Behavior*, pp. 165-178, (1985).
- Cole, R., A. I. Rudnicki, “What's new in speech perception: The research and ideas of William handler Bagley 1874-1946,” *Psychological Review*, (1983).
- Haber, R. N., R. Cole, “Evidence for direct visual access to letter identities,” *Acta Psychologica*, 46, pp. 181-192, (1980).
- Cole, R., “Perception of fluent speech by children and adults,” in *Annals of the New York Academy of Sciences*, 379, pp. 92-102, (1981).
- Cole, R., C. A. Perfetti, “Listening for mispronunciations in a children's story: The use of context by children and adults,” *Journal of Verbal Learning and Verbal Behavior*, 19, pp. 297-315, (1980).
- Cole, R., R. N. Haber, “Reaction time to letter name or letter case,” *Acta Psychologica*, 44, pp. 281-285, (1980).
- Cole, R., J. Jakimik, W. E. Cooper, “Segmenting speech into words,” *Journal of the Acoustical Society of*

- America*, 67, pp. 1323-1332, (1980).
- Cole, R., J. Jakimik, "How are syllables used to recognize words?," *Journal of the Acoustical Society of America*, 67, pp. 965-970, (1980).
- Cole, R. A., "Navigating the slippery stream of speech," *Psychology Today*, (1979).
- Rudnicky, A. I., & R. Cole, "The effect of subsequent context on syllable perception," *Journal of Experimental Psychology: Human Perception and Performance*, 4, pp. 638-647, (1978).
- Cole, R., J. Jakimik, W. E. Cooper, "Perceptibility of phonetic features in fluent speech," *Journal of the Acoustical Society of America*, 64, pp. 44-56, (1978).
- Rudnicky, A. I., & R. Cole, "Adaptation produced by connected speech," *Journal of Experimental Psychology: Human Perception and Performance*, 3, pp. 51-61, (1977).
- Cooper, W. E., D. Billings, R. Cole, "Articulatory effects on speech perception: A second report," *Journal of Phonetics*, 4, pp. 219-232, (1976).
- Cole, R., W. E. Cooper, "Properties of frication analyzers for /j/," *Journal of the Acoustical Society of America*, 62, pp. 177-182, (1977).
- Cooper, W. E., R. R. Ebert, R. Cole, "Perceptual analysis of stop consonants and glides," *Journal of Experimental Psychology: Human Perception and Performance*, 2, pp. 92-104, (1976).
- Cooper, W. E., R. R. Ebert, R. Cole, "Speech perception and production of the consonant cluster /st/," *Journal of Experimental Psychology: Human Perception and Performance*, 2, pp. 105-1154, (1976).
- Cole, R., W. E. Cooper, "Perception of voicing in English affricates and fricatives," *Journal of the Acoustical Society of America*, 58, pp. 1280-1287, (1975).
- Cole, R., W. E. Cooper, J. Singer, F. Allard, "Selective adaptation of English consonants using real speech," *Perception and Psychophysics*, 18, pp. 227-244, (1975).
- Cole, R., M. Young, "Effect of subvocalization on memory for speech sounds," *Journal of Experimental Psychology: Human Learning and Memory*, 1, pp. 772-779, (1975).
- Cole, R., B. Scott, "Toward a theory of speech perception," *Psychological Review*, 81, pp. 348-374, (1974).
- Cole, R., B. Scott, "The phantom in the phoneme: Invariant cues for stop consonants," *Perception and Psychophysics*, 15, pp. 101-107, (1974).
- Cole, R., M. Coltheart, F. Allard, "Memory of a speaker's voice: Reaction time to same and different-voiced letters," *Quarterly Journal of Experimental Psychology*, 24, pp. 1-7, (1974).
- Sales, B. D., R. Cole, R. N. Haber, "Mechanisms of aural encoding: VIII. Phonetic interference and contest-sensitive coding in short-term memory," *Memory and Cognition*, 2, pp. 596-600, (1974).
- Cole, R., B. D. Sales, R. N. Haber, "Mechanisms of aural encoding: VII. Differential decay of consonants and vowels in a Petersen and Petersen STM task," *Memory and Cognition*, 2, pp. 211-214, (1974).
- Cole, R., B. Scott, "Perception of temporal order in speech. The role of vowel transitions," *Canadian Journal of Psychology*, 27, pp. 441-449, (1973).
- Cole, R., "Different memory functions for consonants and vowels," *Cognitive Psychology*, 4, pp. 39-54, (1973).
- Cole, R., "Listening for mispronunciations: A measure of what we hear during speech," *Perception and Psychophysics*, 13, pp. 153-156, (1973).
- Cole, R., "Perceiving syllables and remembering phonemes," *Journal of Speech and Hearing Research*, 16, pp. 37-47, (1973).
- Cole, R., R. Haber, B. Sales, "Mechanisms of aural encoding: VI. Consonants and vowels are remembered as subsets of distinctive features," *Perception and Psychophysics*, 13, pp. 87-92, (1973).
- Cole, R., B. Scott, "Distinctive feature control of decision time: Same-different judgments of simultaneously heard phonemes," *Perception and Psychophysics*, 12, pp. 91-94, (1972).
- Sales, B. D., R. N. Haber, R. Cole, "Mechanisms of aural encoding: V. Environmental effects of consonants on vowel encoding," *Perception and Psychophysics*, 6, pp. 361-365, (1969).
- Harley, W. F., Jr., C. C. Wilson, R. Cole, "The influence of perceptual organizing responses on recall," *Psychonomic Science*, 11, pp. 135-136, (1968).

- Cole, R., B. D. Sales, R. N. Haber, "Mechanisms of encoding the speech sound," *Proceedings of the 76th Annual APA Convention*, (1968).
- Cole, R., B. D. Sales, R. N. Haber, "Mechanisms of aural encoding: II. The role of distinctive features in articulation and rehearsal," *Perception and Psychophysics*, 6, pp. 343-348, (1969).
- Sales, B. D., R. N. Haber, R. Cole, "Mechanisms of aural encoding: III. Distinctive features for vowels," *Perception and Psychophysics*, 4, pp. 321-327, (1968).
- Cole, R., R. N. Haber, B. D. Sales, "Mechanisms of aural encoding: I. Distinctive features for consonants," *Perception and Psychophysics*, 3, pp. 281-327, (1968).

EDITED BOOKS

Cole, R.A. (Ed.), "*Perception and Production of Fluent Speech*," Lawrence Erlbaum Associates, Hillsdale, NJ, (1980).

Cole, R. A., J. Mariani, H. Uszkoriet, A. Zaenen and V. Zue (Ed.), "*Survey of the State of the Art in Human Language Technology*," Cambridge University Press, Cambridge, MA.

FILM

I have produced, along with Alex Rudnicky and Raj Reddy, a professional 16mm sound film entitled "Speech as Eyes See It." The movie shows the performance of an expert spectrogram reader, Dr. Victor Zue, who is able to determine the phonetic content of unknown utterances from a speech spectrogram.

SELECTED INVITED TALKS

- Cole, R. "Tutorial dialogs to improve science learning." Poznan Linguistic Meeting, September 2007, Gniezno, Poland.
- Cole, R. "PLM Progress Report 4: Inventing Virtual Humans that Teach and Conduct Therapy." 36th Poznan Linguistic Meeting. Poznan, Poland, April, 2006.
- Cole, R., & Baylor, A. "Inventing Virtual Humans that Teach and Conduct Therapy." Chinese Academy of Sciences, Beijing, China, June, 2006.
- Cole, R., & Baylor, A. "Distributed learning and collaboration with virtual humans." Distributed Learning and Collaboration Workshop, Shanghai, China, June, 2006.
- Cole, R., van Vuuren, S., & Connolly, C. "A 'Heads Up' on Inventing the Future," Presentation to California Superintendent of Education Jack O'Connell and his staff, Sacramento CA, August 2, 2006.
- Cole, R. "Inventing Virtual Teachers and Therapists." SPACE Project Meeting, Leuven Belgium, September 2, 2005
- Cole, R., & Ward, W. "Inventing Virtual Humans that Teach and Conduct Therapy: Promises, Systems & Challenges." Invited talk, Microsoft Corporation, September 14, 2005.
- Cole, R. "Intelligent Tutoring System Research in Tasmania," University of Memphis, November 16, 2005.
- Cole, R. "Perceptive Animated Interfaces: A New Generation of Interactive Learning Tools." National Science Foundation Distinguished Lecture Series: April 17, 2003.
http://www.nsf.gov/events/event_summ.jsp?cntn_id=100514&org=CISE.
- Cole, R. Keynote Talks at: *EUROCALL 2000*: The University of Abertay Dundee, Dundee, Scotland, August 29-30, 2000; ESCA/SOCRATES Workshop. University College, London, April, 1999.
<http://www.isca-speech.org/archive/matisse/index.html> and Poznan Linguistic Meetings, 2003-2007.

BOOK CHAPTERS

- Wise, B.; Cole, R., et al. "Learning to Read with a Virtual Tutor: Foundational exercises and interactive books." In Kinzer, C., & Verhoeven, L. (Eds). *Interactive Literacy Education*. Mahwah, NJ: Lawrence Erlbaum (2007).
- Massaro, D. W., Cohen, M. M., Daniel, S., & Cole, R. A. "Developing and evaluating conversational agents." In P. A. Hancock (Ed.) *Human Factors and Ergonomics: Perceptual and Cognitive Principles*. (Handbook of Perception & Cognition, 2nd Edition). (pp. 173-194). San Diego, CA: Academic Press, (1999).
- Cole, R., & V. Zue. "Spoken Language Input." In Cole, R.A., J. Mariani, H. Uszkoriet, A. Zaenen, & V. Zue (eds.), *Survey of the State of the Art in Human Language Technology*, (1, pp. 1-49), Cambridge University Press (1997).
- Cole, R. "Language Resources." In Cole, R.A., J. Mariani, H. Uszkoriet, A. Zaenen, & V. Zue (eds.), *Survey of the State of the Art in Human Language Technology*, (12, pp. 381- 403), Cambridge University Press, (1997).
- Cole, R. "Spoken Language Technology" Computer Science and Telecommunications Board, National Research Council, *More Than Screen Deep: Toward Every-Citizen Interfaces to the Nation's Information Infrastructure*, National Academy Press, Washington, D.C., (1997).
- Fanty, M., E. Barnard, R. Cole, "Alphabet recognition," by invitation to the *Handbook of Neural Computation*, (1995).
- Muthusamy, Y.K., R. Cole, "A segment-based automatic language identification system," in J.E. Moody, S. J. Hanson, R.P. Lippmann, editors, *Advances in Neural Information Processing Systems 4*, San Mateo, CA, Morgan Kaufmann Publish, (1992).
- Cole, R., K. Roginski, M. Fanty, "English alphabet recognition with telephone speech," in J.E. Moody, S. J. Hanson, R.P. Lippmann, editors, *Advances in Neural Information Processing Systems 4*, San Mateo, CA, (1992). Morgan Kaufmann Publishers.
- Fanty, M., R. Cole, "Spoken letter recognition," in R. Lippmann, J. Moody, D. Touretzky (Ed.), *Advances in Neural Information Processing Systems*, San Mateo, CA: Morgan Kaufmann Publishers, (1991).
- Cole, R., R. M. Stern, M. J. Lasry, "Performing fine phonetic distinctions: templates vs. features," in *Invariance and Variability of Speech Processes*, ed. J. Perkell and D. Klatt, Lawrence Erlbaum, New York, (1984).
- Cole, R., V. W. Zue, "Speech as eyes see it," in *Attention and Performance*, ed. S. Nickerson, Lawrence Erlbaum Associates, Hillsdale, N.J., (1980).
- Winitz, H., D. Ingram, R. Cole, J. Folkins, "Articulation," in *Annual Abstracts of Speech, Voice, Language and Hearing*, ed. I. Goldstein, Little, Brown & Co., Boston, (1979).
- Cole, R., A. I. Rudnicky, V. Zue, D. R. Reddy, "Speech as patterns on paper," in *Perception and Production of Fluent Speech*, ed. R. A. Cole, Lawrence Erlbaum Associates, Hillsdale, NJ, (1980).
- Cole, R., J. Jakimik, "A model of speech perception," in *Perception and Production of Fluent Speech*, ed. R. A. Cole, Lawrence Erlbaum Associates, Hillsdale, NJ, (1980).
- Cole, R., J. Jakimik, "Understanding speech: How words are heard," in *Information Processing Strategies*, ed. G. Underwood, Academic Press, London, (1978).
- Cole, R., N. Cummings, "Bilateral alpha rhythm in children during listening and looking," in *Language development and neurological theory*, eds. S. Segolowitz & F. Gruber, Academic Press, New York, (1977).
- Cole, R., "Invariant features and feature detectors," in *Language development and neurological theory*, ed. S. Segolowitz & F. Gruber, Academic Press, New York, (1977).

CONFERENCE ARTICLES AND PRESENTATIONS

- Cole, R. Inventing Virtual Tutors and Therapists. Keynote talk at Speech and Hearing Workshop, Leuven Belgium, May 2-3, 2007.
- Thompson, C.K. Choy, J., Holland, A., & Cole, R. Theory, research and presentation of Virtual Therapy treatments in aphasia: The program Sentactics. Workshop on Virtual Reality and Cognitive Disability, Bordeaux, France, May 2-3, 2007.

- Halpern, A. "Theory, research and presentation of virtual therapy treatments for Parkinson disease." Virtual Reality and Cognitive Disability Conference, May 2-3, 2007, Bordeaux, France.
- Cherney, L., Halper, A., Holland, A., Babbitt, E., Cole, R., & van Vuuren, S. Creating and "Implementing Conversational Script Training for Aphasia." Seminar presented at the Annual Conference of the American Speech-Language Hearing Association. Miami, FL, November, 2006.
- Cherney, L., Babbitt, E., Cole, R., van Vuuren, S., Hurwitz, R., & Ngampatipatpong, N. "Computer Treatment for Aphasia: Efficacy and Treatment Intensity." Poster presented at the Annual Education Conference of the American Congress of Rehabilitation Medicine, Boston MA, September, 2006.
- Cherney, L. R., Halper, A., Babbitt, E., Holland, A., Cole, R., van Vuuren, S. & Ngampatipatpong, N. "Learning to Converse: Script Training, Virtual Tutors, and Aphasia Therapy." Seminar presented at the Annual Convention of the American Speech-Language Hearing Association, San Diego, November, 2005.
- Cherney, L. R., Cole, R., Holland, A., Thompson, C., Ramig, L., Halper, A., & Halpern, A. "Virtual Therapist Technology: Application to Neurologic Communication Disorders." Seminar presented at the Annual Convention of the American Speech-Language Hearing Association, San Diego, November, 2005.
- Cole, R. "Inventing Virtual Therapists." American Speech and Hearing Society Meeting, San Diego, CA, November 18, 2005.
- Thompson, C., Holland, A., Cole, R., van Vuuren, S., Ngampatipatpong, N., & Choy, J. "Treatment of Sentence Deficits: Using a Virtual Therapist for Delivery of Treatment of Underlying Forms (TUF)." American Speech and Hearing Society Meeting, San Diego, CA, Nov 18, 2005.
- Cole, R., Schwartz, S., van Vuuren, S., Ngampatipatpong, N., & Tuantranont, J. "Learning to Read with a Virtual Tutor." Poster at Coleman Institute Conference, Boulder Colorado, October 24, 2005.
- Cole, R., Halpern, A., Petska, J., Ramig, L., Ngampatipatpong, N., van Vuuren, S., Yan, J. "A Virtual Speech Therapist for Individuals with Parkinson Disease." Poster at Coleman Institute Conference, Boulder Colorado, October 24, 2005.
- Cole, R., van Vuuren, S., Wise, B., Ngampatipatpong, N., Tuantranont, J., & Struempf, T. "Foundations to Literacy." Special Session at International Dyslexia Association, Denver Colorado, November 12, 2005.
- Halpern, A., Matos, C., Ramig, L., Petska, J., Spielman, J., Cole, R., Yan, J., & Will, L. Technology Supported Speech Treatment for Parkinson's Disease. Poster presented at the 9th International Congress of Parkinson disease and Movement disorders, New Orleans, Louisiana, March 5-8, 2005.
- Su, Stanley Y. W., Fortes, Jose, Cole, Ron, et al. "A Prototype System for Transnational Information Sharing and Process Coordination," Proceedings of the National Conference on Digital Government Research, Seattle, Washington, May 24-26, 2004, pp. 199-208.
- Su, Stanley Y. W., Fortes, Jose, Cole, Ron, et al. "A Prototype System for Transnational Information Sharing and Process Coordination: System Demonstration," Proceedings of the National Conference on Digital Government Research, Seattle, Washington, May 24-26, 2004, pp. 287-288.
- Cosi P., Delmonte R., Biscetti S., Cole R. A., Pellom B., van Vuuren S., "ITALIAN LITERACY TUTOR, tools and technologies for individuals with cognitive disabilities", Proceedings of InSTIL/ICALL Symposium 2004, 17-19 June 2004 - Venice, Italy, pp. 207- 215.
- Hagen, A., Pellom, B., Van Vuuren, S and Cole, R. "Advances in Children's Speech Recognition within an Interactive Literacy Tutor," HLT-NAACL, Boston, May 2004.
- Hagen, A., Pellom, B., and Cole R.A., "Children's Speech Recognition with Application to Interactive Books and Tutors." Proceedings IEEE Workshop on Automatic Speech Recognition and Understanding (ASRU), St. Thomas, November 2003
- Ma, J, Yan, J., and Cole, R.A., "CU Animate: Tools for Enabling Conversations with Animated Characters." ICSLP-2002, Vol.1, pp 197-200, Sept. 2002, USA, Sept. 2002.
- Hosom, J.P., Cole, R.A., "Burst Detection Based on Measurements of Intensity Discrimination." Proceedings of ICSLP 2000. (pp. IV-564 -- IV-567). Beijing, China 2000.
- Shobaki, K., Hosom, J.P., Cole, R., "The OGI Kids' Speech Corpus and Recognizers." Proceedings of ICSLP 2000. (pp. IV-564 -- IV-567). Beijing China 2000.

- Cole, R.A., Serridge, B., Hosom, J.P., Cronk, A., and Kaiser, E., "A Platform for Multilingual Research in Spoken Dialogue Systems." Workshop on Multi-lingual Interoperability in Speech Technology (MIST), The Netherlands, September 1999.
- Cole, R. A., "Tools for research and education in speech science," In Proceedings of the International Conference of Phonetic Sciences, San Francisco, CA, Aug 1999.
- T. Carmell, J.P. Hosom, and R. Cole. A computer-based course in spectrogram reading. In Proceedings of ESCA/SOCRATES Workshop on Method and Tool Innovations for Speech Science Education, London, UK, Apr 1999.
- Ron Cole, Dominic W. Massaro, Jacques de Villiers, Brian Rundle, Khaldoun Shobaki, Johan Wouters, Michael Cohen, Jonas Beskow, Patrick Stone, Pamela Connors, Alice Tarachow, and Daniel Solcher. New tools for interactive speech and language training: Using animated conversational agents in the classrooms of profoundly deaf children. In Proceedings of ESCA/SOCRATES Workshop on Method and Tool Innovations for Speech Science Education, London, UK, Apr 1999.
- Massaro, D., Cohen, M. M., Beskow, J., Daniel, S., Cole, R., "Developing and Evaluating Conversational Agents," Workshop on Embodied Conversation Characters (WECC), Lake Tahoe, 1998.
- Cosi, P., J.P. Hosom, J. Schalkwyk, S. Sutton, and R. A. Cole, "Connected Digit Recognition Experiments with the OGI Toolkit's Neural Network and HMM-Based recognizers," In Proceedings, 4th IEEE Workshop on Interactive Voice Technology for Telecommunications Applications (IVTTA-ETWR98), Turin, Italy, (September 1998).
- Cole, R.A., M. Noel, and V. Noel. The CSLU Speaker Recognition Corpus. In Proceedings of the International Conference on Spoken Language Processing (ICSLP), Sydney, Australia, 1998.
- Hosom, J. P., R. A. Cole, P. Cosi, "Evaluation and Integration of Neural-Network Training Techniques for Continuous Digit Recognition," In Proceedings of the International Conference on Spoken Language Processing (ICSLP), Sydney, Australia, (November 1998).
- Serridge, B., R. A. Cole, A. Barbosa, N. Munive, A. Vargas, "Creating a Mexican Spanish Version of the CSLU Toolkit," In Proceedings of the International Conference on Spoken Language Processing (ICSLP), Sydney, Australia, (November 1998).
- Sutton, S., R. A. Cole, J. deVilliers, J. Schalkwyk, P. Vermeulen, M. Macon, Y. Yan, E. Kaiser, B. Rundle, K. Shobaki, P. Hosom, A. Kain, J. Wouters, D. Massaro, M. Cohen, "Universal Speech Tools: The CSLU Toolkit," In Proceedings of the International Conference on Spoken Language Processing (ICSLP), Sydney, Australia, (November 1998).
- Cole, R., T. Carmell, P. Connors, M. Macon, J. Wouters, J. de Villiers, A. Tarachow, D. Massaro, M.Cohen, J. Beskow, J. Yang, U. Meier, A. Waibel, P. Stone, G. Fortier, A. Davis, C. Soland, "Intelligent Animated Agents for Interactive Language Training," presented at InSTILL '98, Stockholm, Sweden, May 1998.
- Yan, Y., X. Wu, J. Schalkwyk, R. A. Cole, "Development of CLSU LVCSR: The 1997 DARPA HUB4 Evaluation System," In DARPA Broadcast News Transcription and Understanding Workshop, (1998).
- Cole, R., S. Sutton, Y. Yan, P. Vermeulen, M. Fanty, "Accessible technology for interactive systems: A new approach to spoken language research," In Proceedings of the International Conference on Acoustics, Speech and Signal Processing, Seattle, WA., 1998.
- Sutton, S., E. Kaiser, A. Cronk, and R. Cole, "Bringing spoken language systems to the classroom", *EUROSPEECH'97*, Rhodes, Greece, (1997).
- Tu X., Y. Yan, R. Cole, "Matching training and testing criteria in hybrid speech recognition systems", *EUROSPEECH'97*, Rhodes, Greece (1997).
- Cole R., S. Sutton, M. Fanty, E. Kaiser, J. Schalkwyk, J. de Villiers, A. Cronk, Colton, "Cyberspeech: Password to Cyberspace," DAIC Workshop, Seattle, WA, (1997).
- Yan, Y., M. Fanty, R. Cole, "Speech recognition using neural networks with forward- backward probability generated targets," Proceedings of the International Conference on Acoustics Speech and Signal Processing, Munich, (1997).
- Hosom, J.P., R. Cole, "A diphone-based digit recognition system using neural networks," Proceedings of the International Conference on Acoustics Speech and Signal Processing, Munich, (1997).

- Sutton, S., D. Novick, R. Cole, M. Fanty, "Building 10,000 spoken-dialogue systems," Proceedings of the International Conference on Spoken Language Processing, Philadelphia, PA, (1996).
- Hu, Z., J. Schalkwyk, E. Barnard, R. Cole, "Speech recognition using syllable-like units," Proceedings of the International Conference on Spoken Language Processing, Philadelphia, PA, (1996).
- Cole, R., Y. Yan, T. Bailey, "The influence of bigram constraints on word recognition by humans: Implications for computer speech recognition," Proceedings of International Conference on Spoken Language Processing, Philadelphia, PA, (1996).
- Cole, R., Y. Yan, B. Mak, M. Fanty, T. Bailey, "The contribution of consonants versus vowels in word recognition of fluent speech," Proceedings of the International Conference on Acoustics, Speech and Signal Processing, Atlanta, Georgia, (1996).
- Jain, N., R. Cole, E. Barnard, "Creating speaker-specific phonetic templates with a speaker-independent phonetic recognizer: Implications for voice dialing," Proceedings of the International Conference on Acoustics, Speech and Signal Processing, Atlanta, Georgia, (1996).
- Colton, L. D., R. Cole, D. G. Novick, S. Sutton, "A laboratory course for designing and testing spoken dialogue systems," Proceedings of the International Conference on Acoustics, Speech and Signal Processing, Atlanta, Georgia, (1996).
- Hu, Z., E. Barnard, R. Cole, "Transition-based feature extraction within frame-based recognition," Proceedings of the Fourth European Conference on Speech Communication and Technology, Madrid, Spain, (1995).
- Colton, L. D., M. Fanty, R. Cole, "Second pass verification improves N-Way forced choice recognition and out-of-vocabulary rejection," Proceedings of the Fourth European Conference on Speech Communication and Technology, Madrid, Spain, (1995).
- Noel, M., R. Cole, T. Durham, T. L. Lander, "New telephone speech corpora at CSLU," Proceedings of the Fourth European Conference on Speech Communication and Technology, Madrid, Spain, (1995).
- Lander, T., R. Cole, B. Oshika, M. Noel, "The OGI 22 language telephone speech corpus," Proceedings of the Fourth European Conference on Speech Communication and Technology, Madrid, Spain, (1995).
- Lander, T., B. T. Oshika, R. Cole, M. Fanty, "Multi-language speech database: creation and phonetic labeling agreement," Proceedings of the International Congress of Phonetic Science, Stockholm, Sweden, (1995).
- Barnard, E., R. Cole, M. Fanty, P. Vermeulen, "Real-world speech recognition with neural networks," (invited paper), Proceedings of the International Symposium on Aerospace/Defense Sensing & Control and Dual-Use Photonics, International Society for Optical Engineering, Technical Conference no. 2492, Orlando, FL, (1995).
- Sutton, S., B. Hansen, T. Lander, D. G. Novick, R. Cole, "Evaluating the effectiveness of dialogue for an automated spoken questionnaire," AAAI 1995 Spring Symposium Series, Stanford University, (1995).
- Cole, R., B. T. Oshika, M. Noel, T. Lander, M. Fanty, "Labeler agreement in phonetic labeling of continuous speech," Proceedings of the 1994 International Conference on Spoken Language Processing, Yokohama, Japan, (1994).
- Cole, R., M. Fanty, M. Noel, T. Lander, "Telephone speech corpus development at CSLU," Proceedings of the 1994 International Conference on Spoken Language Processing, Yokohama, (1994).
- Cole, R., D. G. Novick, M. Fanty, P. Vermeulen, S. Sutton, D. Burnett and J. Schalkwyk, "A prototype voice-response questionnaire for the U.S. census," Proceedings of the 1994 International Conference on Spoken Language Processing, Yokohama, Japan, (1994).
- Schalkwyk, J., E. Barnard, R. Cole, J. R. Sachs, "Detecting an imposter in telephone speech," Workshop on Automatic Speaker Recognition, Identification and Verification, Martigny, Switzerland, (1994).
- Cole, R., M. Noel, D. C. Burnett, M. Fanty, T. Lander, B. Oshika, S. Sutton, "Corpus development activities at the Center for Spoken Language Understanding," Proceedings of the ARPA Workshop on Human Language Technology, April 7-11, (1994).
- Muthusamy, Y.K., N. Jain, R. Cole, "Perceptual benchmarks for automatic language identification," Proceedings of the 1994 International Conference on Acoustics, Speech and Signal Processing,

- (1994).
- Berkling, K.M., T. Arai, E. Barnard, R. Cole, "Analysis of phoneme-based features for language identification," Proceedings of the 1994 International Conference on Acoustics, Speech and Signal Processing, (1994).
- Cole, R., D. G. Novick, D. Burnett, B. Hansen, S. Sutton, M. Fanty, "Towards automatic collection of the U.S. census," Proceedings of the 1994 International Conference on Acoustics, Speech and Signal Processing, (1994).
- Cole, R., D. G. Novick, M. Fanty, S. Sutton, B. Hansen, D. Burnett, "Rapid prototyping of spoken language systems: The year 2000 census project," Proceedings of the International Symposium on Spoken Dialogue, Tokyo, Japan, (1993).
- Muthusamy Y., K. Berkling, T. Arai, R. Cole, E. Barnard, "A comparison of approaches to automatic language identification using telephone speech," EUROSPEECH '93, Berlin, Germany, (1993).
- Schmid, P., R. Cole, M. Fanty, H. Boulard, M. Haessen, "Real-time, neural network-based, French alphabet recognition with telephone speech," EUROSPEECH '93, Berlin, Germany, (1993).
- Cole, R., Y. K. Muthusamy, "Perceptual studies on vowels excised from continuous speech," Proceedings of the International Conference on Spoken Language Processing, Banff, Alberta, (1992).
- Muthusamy, Y. K., R. Cole, "Automatic segmentation and identification of ten languages using telephone speech," Proceedings of the International Conference on Spoken Language Processing, Banff, Alberta, (1992).
- Fanty, M., J. Pochmara, R. Cole, "An interactive environment for speech recognition research," Proceedings of the International Conference on Spoken Language Processing, Banff, Alberta, (1992).
- Muthusamy, Y. K., R. Cole, B. T. Oshika, "The OGI multi-language telephone speech corpus," Proceedings of the International Conference on Spoken Language Processing, Banff, Alberta, (1992).
- Cole, R., M. Fanty, K. Roginski, "A telephone speech database of spelled and spoken names," Proceedings of the International Conference on Spoken Language Processing, Banff, Alberta, (1992).
- Muthusamy, Y. K., R. Cole, B. T. Oshika, "Automatic language identification," Voice Systems Worldwide Speech Tech '92 Conference, New York, NY, (1992).
- Cole, R., M. Fanty, K. Roginski, "Recognizing spelled names with telephone speech," Voice Systems Worldwide Speech Tech '92 Conference, New York, NY, (1992).
- Creekmore, J., M. Fanty, R. Cole, "A comparative study of five spectral representations for speaker-independent phonetic recognition," presented at 25th Annual Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, (1991).
- Fanty, M., R. Cole, M. Slaney, "A comparison of DFT, PLP and Cochleagram for alphabet recognition," 25th Annual Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, (1991).
- Fanty, M., R. Cole, "Speaker-independent English alphabet recognition: Experiments with the E-Set," Proceedings of the 1990 International Conference on Spoken Language Processing, Kobe, Japan, (1990).
- Cole, R., M. Fanty, "Spoken letter recognition," Proceedings of the DARPA Workshop on Speech and Natural Language Processing, Hidden Valley, PA, (1990).
- Cole, R., M. Fanty, Y. K. Muthusamy, M. Gopalakrishnan, "Speaker-independent recognition of spoken English letters," Proceedings of the International Joint Conference on Neural Networks '90, San Diego, CA, (1990).
- Muthusamy, Y. K., R. Cole, M. Slaney, "Speaker-independent vowel recognition: spectrograms versus cochleagrams," Proceedings of the IEEE 1990 International Conference on Acoustics, Speech and Signal Processing, Albuquerque, New Mexico, (1990).
- Atlas, L., W. Kooiman, P. Loughlin, R. Cole, "New nonstationary techniques for the analysis and display of speech transients," Proceedings of the IEEE 1990 International Conference on Acoustics, Speech and Signal Processing, Albuquerque, New Mexico, (1990).
- Cole, R., Y. K. Muthusamy, L. Atlas, "Speaker-independent vowel recognition: Comparison of back propagation and trained classification trees," Proceedings of the IEEE Hawaii International

- Conference on System Sciences No. 23, Kona-Kailua, Hawaii, (1990).
- Atlas, L., R. Cole, Y. K. Muthusamy, J. Taylor, E. Barnard, "Performance comparisons between back propagation networks and classification trees on three real-world applications," Proceedings of the Conference on Neural Information Processing Systems, Denver, CO, (1989).
- Atlas, L. E., J. Connor, D. Park, M. El-Sharkawi, R. Marks II, A. Lippman, R. Cole, Y. K. Muthusamy, "A performance comparison of trained multi-layer perceptrons and trained classification trees," Proceedings of the IEEE Systems, Man and Cybernetics Society Conference, Cambridge, MA, (1989).
- Cole, R., J. W. T. Inouye, Y. K. Muthusamy, M. Gopalakrishnan, "Language identification with neural networks: a feasibility study," Proceedings of the IEEE Pacific Rim Conference on Communications, Computers and Signal Processing, Victoria B.C., (1989).
- Cole, R., L. Hou, "Segmentation and broad classification of continuous speech," Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing, New York, (1988).
- Cole, R., "Phonetic classification in new generation speech recognition systems," Speech Tech 86, pp. 43-46, New York, (1986).
- Cole, R., M. P. Phillips, R. A. Brennan, B. Chigier, "The CMU phonetic classification system," Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing, Tokyo, (1986).
- Cole, R., R. M. Stern, M. S. Phillips, S. M. Brill, A. P. Pilant, P. Specker, "Feature-based speaker-independent recognition of isolated English letters," Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing, pp. 731-734, (1983).
- Bradshaw, G. L., R. Cole, Z. D. Li, "Comparison of learning techniques in speech recognition," Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing, pp. 554-57, (1982).
- Zue, V., R. Cole, "Experiments on spectrogram reading," Proceedings of the IEEE Conference on Acoustics, Speech and Signal Processing, pp. 116-119, Washington, D.C., (1979).