

# Ronald Allan Cole

## PERSONAL DATA

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

Email: rcole@boulderlearning.com

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

## ACADEMIC TRAINING

<b>Institution Degree</b>	<b>Date</b>
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

Jan 2016 – Present	President, Boulder Learning Inc.
Feb 2007- Jan 2016	President, Boulder Language Technologies
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 electroencephalogram; 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  
Biofeedback

### **Graduate**

Spoken Dialogue Systems  
Perception

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

## **PROFESSIONAL SERVICE**

### ***NSF Workshops***

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.

Workshop Organizer, [NSF Workshop on Spoken Language Understanding](#), Washington DC, 1992.

Workshop Organizer, [NSF Interactive Systems Grantees Workshop, Stevenson, WA](#), August 1997.

Workshop Organizer, (with Mark Liberman) [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), [NSF-sponsored Workshop on Virtual Therapists, Workshop on Virtual Therapists](#). Bordeaux, France. Sponsored by the National Science Foundation. May 2007.

## **Journals**

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 Elsevier “merged” with the Speech Communication Journal, then buried it)

## **HONORS / AWARDS:**

Honorary Professor, Faculty 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, Netherlands.

Outstanding Teacher Medal presented by Poland’s Minister of Education in recognition of contributions to education in Poland. These included helping establish the Center for Speech and Language Processing at [Adam Mickiewicz University](#), which has received several millions dollars in EU grants to develop tutoring systems for use in Polish elementary and middle schools.)

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](#).

## **CENTERS & STARTUPS:**

CSLU. I founded the Center for Spoken Language Understanding at the Oregon Graduate Institute in 1990. CSLU became 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 free platform for research and development of speech technologies and spoken dialog systems with lifelike computer characters. The [CSLU Toolkit](#) has had over 30,000 downloads worldwide and has been 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](#). This work led to the founding of a company, Animated Speech which licensed the CSLU Toolkit for use in developing learning applications for individuals with disabilities. Baldi was subsequently replaced in the CSLU toolkit with a set of more expressive 3-D models using the CU Animate system, developed at the Center for Spoken Language Research by Drs. Jiyong Ma, Jessican Yan, Ron Cole and Wayne Ward.

CSLR. 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.

Development of the Virtual Human Toolkit, funded by the NSF, was initiated at CSLR; development of VH Toolkit continues at Boulder Language Technologies (BLI) 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. Since 2017, the main focus of R&D at BLI is integration of Deep Learning algorithms, with the goal of approaching human levels of speech recognition and natural language processing for use in cloud-based assessment and tutoring systems in reading, math and science.

Start-ups. I have founded 3 companies. While at CSLU, I founded Fluent Speech Technologies with Noam Stampfer, Stephen Sutton and Pieter Vermuellen. The company was acquired by [Sensory Systems](#), "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](#), to commercialize literacy and virtual therapy programs using speech and character animation technologies developed at CSLR. Mentor Interactive was awarded two SBIR grant from the National Institutes of Health: A grant from NICHD to develop a commercial version of the Foundations to Literacy K-2 reading program, and a grant from NIDCD to develop and commercialize a program to improve speech communication skills for individuals with aphasia. The My Virtual Tutor reading program was released as a Nintendo DS program with three offerings (K, 1<sup>st</sup> and 2<sup>nd</sup> grades). It received excellent reviews and was the best-selling learning program on Amazon.com in 2007.

In February 2007, Wayne Ward and I founded [Boulder Language Technologies](#). BLT has

received approximately \$12 million in grants from NSF and IES to develop a new generation of intelligent tutoring systems to improve science learning by elementary school children, and \$2M in contracts to develop tutoring applications for companies. In January, 2016, BLT merged with Digital Directions International, to become [Boulder Learning Inc.](#)

## **RESEARCH GRANTS**

- 2014 – 2017** Mahoor, M., Wayne Ward, W. & Ron Cole, R. [MRI Development: Enabling Research in Natural Communication with Virtual Tutors, Therapists, and Robotic Companions.](#) \$1,332,000.00. National Science Foundation, Division of Computer and Network Systems.
- 2014 – 2017** Baker, D., Al Qtaiba, S., Cole, R., & Ward, W. [“English Learner Vocabulary Acquisition \(ELVA\): Promoting the Vocabulary and Language Proficiency of Spanish Speaking English Learners in Second Grade.”](#) \$1,499, 586. Institute of Education Sciences, English Learners Program.
- 2014 – 2014** Cole, R. [SBIR Phase I: Improving Children's Motivation, Self-Efficacy, Science Learning and Reading Proficiency.](#) \$150,000. National Science Foundation. Division of Industrial Innovation and partnerships.
- 2013 – 2015** Ward, W., & Cole, R. [EXP: Collaborative Research: A cyber-ensemble of inversion, immersion, collaborative workspaces, query and media-making in mathematics classrooms.](#) \$100,000. National Science Foundation. Division of Research on Learning in Formal and Informal Settings. (This is a Collaborative Research Project. Primary PI is Eric Hamilton, Pepperdine University.)
- 2013 – 2017** Ward, W., Ronald Cole, R., & Holding, B. [“My Science Tutor: Improving Science Learning through Tutorial Dialogs \(MyST\).”](#) \$3,499,713. Institute of Education Sciences, Cognition and Student Learning Program.
- 2012 – 2013** Cole, R. Doris Baker, D. “GROMINDS: Graphogame and MindStars Books: Global Cyber Tools for Improving Young Learner's Reading Comprehension, Scientific Discourse and STEM Learning.” \$300,000. National Science Foundation. Program: Science Across Virtual Institutions (SAVI).
- 2012 – 2014** Wayne Ward, Ronald Cole, Brandon Holding (Boulder Language Technologies). [“EXP: Understanding the Transformative Potential of Spoken Assessments of Science Understanding for Young Learners.”](#) \$249,567. National Science Foundation. Division of Research on Learning in Formal and Informal Settings.
- 2008 – 2011** Cole, R. [A Broadly Accessible Virtual Reading Tutor.](#) \$845,157. National Institutes of Health (NICHD), Phase I and Phase II SBIR grant.
- 2008** Cole, R. [An Accessible, Effective Treatment for Sentence Deficit in Agrammatic Aphasia.](#) National Institutes of Health (NIDCD SBIR grant). \$99, 956.
- 2007 – 2011** Wayne Ward, & Cole, R. [Improving Science Learning in Inquiry-based Programs.](#) \$3,130,043, Institute for Education Sciences, Department of

Education.

- 2007** Cole, R. [Virtual Therapist - U.S.-France Workshop May 2-3, 2007 in Bordeaux, France](#). National Science Foundation. \$37,542.
- 2006 - 2008** Cole, R. & Ward, W. [CISE CRI: Community Resources for Inventing the Next Generation of Human Computer Interfaces](#). \$500,000. National Science Foundation.  
[https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=0551723](https://www.nsf.gov/awardsearch/showAward?AWD_ID=0551723)
- 2005 - 2006** Thompson, C., Holland A., and Cole, R., "Development and Evaluation of a Virtual Aphasia Clinician," \$347,750, National Institutes of Health, (NIDCD).
- 2005** Cole, R. [Speech Therapy for Individuals with Parkinson Disease](#). National Institutes of Health, \$99,750.
- 2004 - 2008** Wise, B., Cole, R., Pellom, B., ["ICARE: Independent Comprehensive Adaptive Reading Evaluation,"](#) \$1,600,000, Institute for Education Sciences, Department of Education.
- 2004 - 2006** Hamilton, E., Cole, R., [CRCD/EI: ALASKA: Applet and Library Augmented Shared Knowledge Areas](#). \$681,306. National Science Foundation.
- 2004 - 2006** Cole, R., Ramig, L., [Virtual Therapist Speech Treatment for Parkinson Disease](#). \$354,332, National Institutes of Health (NIDCD).
- 2004 - 2006** Cole, R., Movellan, J., Gratch J., [Workshop on Perceptive Animated Interfaces and Virtual Humans](#). \$39,872, National Science Foundation.
- 2002 – 2007** Fortes, J., S. Su, H. Lam, J. Carbonell, R. Cole, D. Towsley. Transnational Digital Government. National Science Foundation, National Science Foundation, Grant Number EIA-0131886 , \$1,806,014.
- 2002 - 2004** Cole, R., "REU/ Cole, R., REU/ITR: Creating the Next Generation of Intelligent Animated Conversational Agents (supplement to NSF 0086107)," \$39,000. National Science Foundation.
- 2002 - 2004** Cole, R., Barker, L., Schwartz S., Snyder, L., Wise, B., [IERI: Scaling Up Reading Tutors](#). \$1,000,000. National Institutes of Health (NICHD R01 HD)..
- 2002 - 2004** Cole, R., Pellom, B. [U.S.-Chile Program: Advancing Human Language Technology in the U.S. and Chile through Collaborative Research on Advanced Dialogue Systems](#) \$61,178. National Science Foundation.
- 2002 - 2003** Cole, R., "REU/ITR: Creating the Next Generation of Intelligent Animated Conversational Agents (supplement to NSF 0086107)," \$45,500. National Science Foundation.
- 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. National Science Foundation.



- 2001 - 2006** Kintsch, W., Caccamise, D., Cole, R., Olson, R., Snyder, L., [Scalable and Sustainable Technologies for Reading Instruction and Assessment](#). \$6,136,395. National Science Foundation.
- 2000 - 2005** Cole, R., Massaro, D., van Santen, J., Movellan, J. [ITR: Creating the Next Generation of Intelligent Animated Conversational Agents](#). \$4,000,000. National Science Foundation.
- 2000 – 2001** Fortes, J., Cole, R., Carbonell, J. “US-Argentina and US-Chile Collaborative Research on Computer Science and Engineering,” May 1, 2000 – April 30, 2001, National Science Foundation, \$101,000.
- 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. National Science Foundation.
- 1999 - 2001** Cole, R., [NSF-CNPq Collaborative Research: Advancing Human Language Technology in Brazil and the United States Through Collaborative Research on Spoken Language Systems](#). \$199,480. National Science Foundation.
- 1998 - 2002** Cole, R., [CARE: Accessible Language Resources for Research and Education](#). \$1,222,810. National Science Foundation.
- 2000** Kintsch, W., L. Snyder, R. Olsen, R. Cole, D. Caccamise. “[Scalable and Sustainable Technologies for Reading Instruction and Assessment](#).” \$103,609.
- 1998 - 2000** Cole, R., "Accelerating Research Advances in Human Language Technology through Portable, Accessible Natural Dialogue Systems," \$600,000, ONR/DARPA.
- 1999** **Cole, R.** [Workshop: Western Hemisphere Collaboration in Computer Science and Engineering](#). \$103,609. National Science Foundation.
- 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 for Spoken Language Technologies](#) \$50,000. National Science Foundation.

- 1997 - 2000** Cole, R., M. Macon, D. Massaro, A. Waibel, [Challenges in CISE: Creating Conversational Agents for Language Training: Technologies for the Next Generation of Interactive Systems](#) \$1,800,000. National Science Foundation.
- 1997 – 1998** Cole, R., J. de Villiers, D. Massaro. [Bringing Spoken Language Systems to the Classroom for Learning and Language Training with Hearing-Impaired People](#). National Science Foundation. \$50,000.
- 1997** Cole R., French, Italian, Mexican, and Caribbean Spanish Data Collection, \$199,906, AT&T.
- 1997** Cole, R., [CISE Special Project: Understanding the Role of International Collaboration in Computer Science and Engineering](#) (NSF Workshop), \$65,379. National Science Foundation.
- 1997** Cole, R., Intel Equipment Grant, \$200,000, (40 Pentium computers).
- 1997** Cole, R., [The Second Workshop in Interactive Systems](#) \$131,710. National Science Foundation.
- 1997** Hook, J., A. Black, . Pu., P. Cohen, R. Cole. [CISE Research Infrastructure: A Wide-Spectrum Infrastructure for Software Research](#). . \$1,201,310. 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, [CONAcYt: Advancing Human Language Technology in Mexico and the United States Through Collaborative Research on Spoken Language Systems](#) \$130,197 National Science Foundation.
- 1996 - 1998** Cole, R., D. Novick, M. Fenty, "Rapid Prototyping of Spoken Language Systems," \$1,300,000, Office of Naval Research.
- 1996 - 1998** Cole, R., M. Fenty, 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., ["CISE Research Instrumentation: Instrumentation for Research in Spoken Language Systems."](#) \$40,000, National Science Foundation.
- 1994 - 1996** Cole, R., M. Fenty, 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. Fenty, "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 Survey of Speech and Natural Language Processing in the European Community and United States](#). \$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 - 1998** Cole, R., D. Novick, M. Fanty, E. Barnard, H. Hermansky, [Toward Robust Spoken-Language Systems](#). \$829,886. National Science Foundation.
- 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.
- 1994** **Novick, D., M. Fanty, R.Cole.** "[Spoken-Language Access to Multimedia \(SLAM\): A Multimodal Interface to the World-Wide Web](#)," \$49,996. National Science Foundation.
- 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 \(Human-Computer Interface\)](#)." \$559,800, 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](#)," \$360,000. National Science Foundation.
- 1991 - 1993** 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. Fenty, Cash donation, \$40,000, and equipment donation, \$43,000, Apple Computer.
- 1990** Cole, R., M. Fenty, "Feasibility of Speech Recognition on a VLSI Neurocomputer," Matching Funds Grant, \$20,000, OASIS.
- 1985 - 1987** Cole, R., R. Stern. "[Phonetic Classification of Continuous Speech](#)," \$580,000, National Science Foundation.
- 1986-1988** Cole, R. [A Programming Environment to Support Parallel Processing on Supercomputers](#), \$210,000. National Science Foundation.
- 1982 - 1985** Reddy, R. R. Cole, O. Akin, "[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**

- Ward, W., Cole, R., Bolanos, D., Buchenroth-Martin, C., Svirsky, E., & Weston, T. (2013). My science tutor: A conversational multimedia virtual tutor. *Journal of Educational Psychology, (Special Issue on Advanced Learning Technologies)*.
- Ward, W., Cole, R., Bolanos, D., Buchenroth-Martin, C., Svirsky, E., Vuuren, S. V. (2011). My science tutor: A conversational multimedia virtual tutor for elementary school science. *ACM Transactions on Speech and Language Processing (TSLP), Special Issue on Speech and Language Processing of Children's Speech for Child-machine Interaction, 7(4)*.
- D. Bolaños, R. A. Cole, W. H. Ward, E. Borts and E. Svirsky. (2011). "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, 7(4)*.
- 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., Hacıoglu, 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. Rudnicky, "Sound and spelling in spoken word recognition," *Journal of Verbal Learning and Verbal Behavior*, pp. 165-178, (1985).
- Cole, R., A. I. Rudnicky, "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. 105-115, (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 context-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 76<sup>th</sup> 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 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." 36<sup>th</sup> 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](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**

- Ward, W. & Cole R. Developing Conversational Multimedia Tutorial Dialogs. Design Recommendations for Intelligent Tutoring Systems. Volume 3: Authoring Tools & Expert Modeling Techniques. Edited by Robert Sottilare, Arthur Graesser, Xiangen Hu, Keith Brawne. Chapter 20, pp. 243 – 254. Published by US Army Research Laboratory.
- Baker, D.L., Al Otaiba, S., Ortiz, M., Correa, V., & Cole, R. (2014). Vocabulary development and intervention for English Language Learners in the early grades. In J. Benson (Ed.), *Advances in Child Development and Behavior*, vol. 46, San Diego, CA: Elsevier.



- Wise, R., Cole, R., Van Vuuren, S., Schwartz, S., Snyder, L., Ngampatipatpong, N., Tuantranont, J., & Pellom, B. "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).
- Kim, J.Y., Na, S., & Cole, R. "Lip Detection Using Confidence-Based Adaptive Thresholding." [Advances in Visual Computing Lecture Notes in Computer Science](#) Volume 4291, 2006, pp 731-740
- 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. Rudnick, 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**

Wayne Ward, Daniel Bolaños, Ronald A. Cole: **Spoken Dialogs With a Virtual Science Tutor**, INTERSPEECH 2012, 13th Annual Conference of the International Speech Communication Association, Portland, Oregon, USA, September 9-13, 2012.

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., & Struempfl, 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. Bourlard, 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).