

Stephen Beale

(i) Professional Preparation

Carnegie Mellon University	Computer Science (Language Technologies)	PhD	1997
Carnegie Mellon University	Computational Linguistics	MS	1994
University of Texas, Arlington	Linguistics	MS	1989
University of California, Davis	Electrical and Computer Engineering	BS	1984

(ii) Appointments

2011-2013	Honors College Faculty Fellow, University of Maryland, Baltimore County
2010-present	Secretary, Co-founder and Consultant, The Bible Translator's Assistant.
2007-present	Research Associate Professor, Department of Computer Science and Electrical Engineering, University of Maryland Baltimore County
2005-present	Adjunct faculty member, Department of Surgery, University of Maryland at Baltimore.
2002-2007	Research Assistant Professor, Department of Computer Science and Electrical Engineering, University of Maryland Baltimore County
2001-present	Chief Technology Officer, Onyx Consulting, Inc.
1994-2002	Research Analyst, Computing Research Laboratory, New Mexico State University
1993-1994	Research Assistant, Center for Machine Translation, Carnegie Mellon University
1990-92, 99-02	Linguistics Researcher (Thailand, Vanuatu), Summer Institute of Linguistics
1984-1987	Computer Engineer, McDonnell Douglas Corporation

(iii) Publications

A. Books

- Nirenburg, Sergei, Marjorie McShane and Stephen Beale. In preparation. **Ontological Semantics in Practice**.
- McShane M, Jarrell B, Nirenburg S, Fantry G, Beale S. 2010. Training clinical decision making using cognitively modeled virtual patients. In: Park A, Klein RV, editors. **Minimally invasive surgery training: theories, methods, outcomes**. Washington: Department of Health & Human Services (US), National Institutes of Health, National Library of Medicine.

B. Papers in Refereed Journals

- Beale, Stephen. Submitted March 2011. Documenting endangered languages using Linguist's Assistant. In *Language Documentation and Conservation*.
- McShane, M, S. Nirenburg, B. Jarrell, S. Beale, G. Fantry. 2009. Maryland Virtual Patient: A Knowledge-Based, Language-Enabled Simulation and Training System. *Bio-Algorithms and Med-Systems*: 5(9): 57-63.
- McShane, Marjorie, Sergei Nirenburg and Stephen Beale. 2005. Semantics-based resolution of fragments and underspecified structures. *Traitement Automatique des Langues* 46(1): 163-184.
- Allman, Tod and Stephen Beale. 2004. An environment for quick ramp-up multi-lingual authoring. In *International Journal of Translation*, Vol. 16, No. 1.
- McShane, Marjorie, Sergei Nirenburg and Stephen Beale. 2005. An NLP lexicon as a largely language independent resource. *Machine Translation* 19(2): 139-173.
- Y. Qu and S. Beale. Cooperative Resolution of Over-Constrained Information Requests. *Constraint Journal*, vol 7, no. 1, pages 29-47, 2002.

C. Papers in Refereed Proceedings

- Beale, Stephen and Tod Allman. Submitted. Using Linguist's Assistant to describe linguistic phenomena. In Proceedings of The 5th International Joint Conference on Natural Language Processing (IJCNLP-11), Chiang Mai, Thailand.
- Beale, Stephen, Sergei Nirenburg, Marjorie McShane and Tod Allman. Submitted. Engineering a semantic dependency engine. In Proceedings of Fifth IEEE International Conference on Semantic Computing, September 18-21, 2011, Stanford University, Palo Alto, California.
- Nirenburg, Sergei, Marjorie McShane, Stephen Beale, Bruce Jarrell and George Fantry. 2011. Intelligent agents in support of clinical medicine. Proceedings of MMVR18, February 9 - 12, 2011, Newport Beach, California.
- Nirenburg, Sergei, Marjorie McShane and Stephen Beale. 2010. Hybrid methods of knowledge elicitation within a unified representational knowledge scheme. Proceedings of the International Conference on Knowledge Engineering and Ontology Development, October 25-28, Valencia, Spain.
- Nirenburg, Sergei, Marjorie McShane, Stephen Beale and Roberta Catizone. 2010. An overview of a cognitive architecture for simulating bodies and minds. Proceedings of the 10th International Conference on Intelligent Virtual Agents, Sept. 20-22, Philadelphia, Pennsylvania.
- Nirenburg, Sergei, Marjorie McShane and Stephen Beale. 2010. Aspects of metacognitive self-awareness in Maryland Virtual Patient. Proceedings of the AAI Fall Symposium on Cognitive and Metacognitive Educational Systems, Nov. 11-13, Arlington, VA.
- Nirenburg, Sergei, Marjorie McShane, Stephen Beale, Jesse English and Roberta Catizone. 2010. Four kinds of learning in one agent-oriented environment. Proceedings of the First International Conference on Biologically Inspired Cognitive Architectures (BICA), Arlington, VA, Nov. 13-14.
- McShane, Marjorie, Stephen Beale and Sergei Nirenburg. 2010. Reference resolution supporting lexical disambiguation. Proceedings of the Fourth IEEE International Conference on Semantic Computing, Carnegie Mellon University, Pittsburgh, PA, Sept. 22-24.
- Nirenburg, Sergei, Marjorie McShane and Stephen Beale. 2009. A unified ontological-semantic substrate for physiological simulation and cognitive modeling. In Proceedings of the International Conference on Biomedical Ontology, University at Buffalo, NY, July 24-26, 2009.
- McShane, Marjorie, Bruce Jarrell, George Fantry, Sergei Nirenburg, Stephen Beale and Ben Johnson. 2008. Revealing the conceptual substrate of biomedical cognitive models to the wider community. *Medicine Meets Virtual Reality 16*, ed. J. D. Westwood, R. S. Haluck, H. M. Hoffman, G. T. Mogel, R. Phillips, R. A. Robb, K. G. Vosburgh, 281 – 286.
- McShane, Marjorie, Sergei Nirenburg, Stephen Beale, Bruce Jarrell and George Fantry. Forthcoming. Knowledge-based modeling and simulation of diseases with highly differentiated clinical manifestations. 11th Conference on Artificial Intelligence in Medicine (AIME 07), Amsterdam, The Netherlands, July 7-11, 2007
- Jarrell, Bruce, Sergei Nirenburg, Marjorie McShane, George Fantry, Stephen Beale, David Mallott and John Razcek. 2007. An interactive, cognitive simulation of gastroesophageal reflux disease. Proceedings of Medicine Meets Virtual Reality 15, Feb. 6-9, 2007, Long Beach, California.
- Fantry G , McShane M, Beale S, Forman J, Raczek J, Nirenburg S , Jarrell B. 2006. The virtual esophagus: An interactive model of esophageal physiology, pathophysiology, and simulation of esophageal motility disorders. *Gastroenterology* 2006; 130: A736.
- McShane, Marjorie, Stephen Beale and Sergei Nirenburg. 2006. The semantics of *backing up*: or what to do with prepositions and particles. In proceedings of the 19th International FLAIRS Conference, Melbourne Beach, Florida, May 11-13, 2006.
- Nirenburg, Sergei, Marjorie McShane, Stephen Beale, Thomas O'Hara, Bruce Jarrell, George Fantry and John RacZek. 2006. Cognitive simulation in virtual patients. In proceedings of the 19th International FLAIRS Conference, Melbourne Beach, Florida, May 11-13, 2006.
- Beale, Stephen, Sergei Nirenburg, Marjorie McShane and Tod Allman. 2005. Document Authoring the Bible for Minority Language Translation. In Proceedings of MT-Summit. Phuket, Thailand.
- Nirenburg, Sergei, Marjorie McShane and Stephen Beale. 2005. Increasing understanding: interpreting events of change. *Proceedings of the OntoLex Workshop at IJCNLP-05*, Jeju Island, South Korea, October 15, 2005.

- McShane, Marjorie, Sergei Nirenburg, Stephen Beale and Thomas O'Hara. 2005. Semantically Rich Human-Aided Machine Annotation. In Proceedings of ACL Workshop, Frontiers in Corpus Annotation II: Pie in the Sky. Ann Arbor, Michigan.
- Beale, Stephen, Benoit Lavoie, Marjorie McShane, Sergei Nirenburg and Tanya Korelsky. 2004. Question answering using ontological semantics. In Proceedings of ACL-2004 Workshop on Text Meaning and Interpretation, Barcelona.
- Cowie, Jim, Sergei Nirenburg, Tanya Korelsky, Stephen Helmreich, Benoit Lavoie, Valeriy Sibirtsev, Stephen Beale and Ted Caldwell. 2004. MOQA: Meaning-Oriented Question-Answering. In Proceedings RIAO-04, Vaucluse, France.
- McShane, Marjorie, Margalit Zabludowski, Sergei Nirenburg and Stephen Beale. 2004. OntoSem and SIMPLE. In Proceedings of ACL-2004 Workshop on Text Meaning and Interpretation, Barcelona.
- McShane, Marjorie, Stephen Beale and Sergei Nirenburg. 2004. Some meaning procedures of Ontological Semantics. In Proceedings of LREC-2004.
- McShane, M., S. Beale and S. Nirenburg. 2004. OntoSem Methods for Processing Semantic Ellipsis. Proceedings of the Workshop on Computational Lexical Semantics at HLT-NAACL 2004, Boston, May.
- Nirenburg, Sergei, Stephen Beale and Marjorie McShane. 2004. Evaluating the performance of the Ontosem Semantic Analyzer. In Proceedings of ACL-2004 Workshop on Text Meaning and Interpretation, Barcelona.
- Nirenburg, S., M. McShane, and S. Beale. 2004. The Rationale for Building Resources Expressly for NLP. In Proceedings of LREC-2004.
- Beale, Stephen, Sergei Nirenburg and Marjorie McShane. 2003. Just-in-time grammar. In Proceedings 2003 International Multiconference in Computer Science and Computer Engineering, Las Vegas, Nevada.
- Nirenburg, Sergei, Marjorie McShane, and Stephen Beale. 2003. Enhancing recall in information extraction through ontological semantics. Proceedings of the Workshop on Ontologies and Information Extraction. Bucharest, Romania, August 2003.
- Nirenburg, Sergei, Marjorie McShane and Stephen Beale. 2003. Operative strategies in ontological Semantics. 2003. In Proceedings of the Text Meaning Workshop of the Human Language Technology Conference (HLT-NAACL-2003), Edmonton, Canada.
- Y. Qu and S. Beale. 1999. A Constraint-Based Model for Cooperative Response Generation in Information Dialogues. In *Proceedings of AAI-99*, Orlando, FL, July 1999.
- Beale, Stephen, Sergei Nirenburg, Evelyne Viegas and Leo Wanner. 1998. De-Constraining text generation. In Proceedings International Workshop on Natural Language Generation (INLG98), Ontario, Canada.
- Beale, Stephen. 1997. Using branch-and-bound with constraint satisfaction in optimization problems. In Proc. AAI-97. Providence, Rhode Island.
- Beale, Stephen, Evelyne Viegas and Sergei Nirenburg. 1997. Breaking down barriers: The Mikrokosmos generator. In Proc. NLPRS97, Phuket, Thailand.
- Beale, Stephen, Sergei Nirenburg and Kavi Mahesh. 1996. Hunter-Gatherer: Three search techniques integrated for natural language semantics. In Proceedings of AAI-96, Portland, Oregon.
- Beale, Stephen and Sergei Nirenburg. 1996. PICARD: The next generator. In Proc. 8th International Workshop on Natural Language Generation, Poster Session. June 13-15, 1996. Sussex, UK.
- Beale, Stephen and Evelyne Viegas. 1996. Intelligent planning meets intelligent planners. In Proceedings of ECAI-96, Budapest, Hungary.
- Mahesh, Kavi, Stephen Beale and Sergei Nirenburg. 1996. Ontology-Based Ambiguity Resolution and Non-Literal Interpretation. Proceedings of the International Conference on Knowledge Based Computer Systems (KBCS-96), Dec 16-18, 1996, Bombay, India.
- Nirenburg, Sergei, Kavi Mahesh and Stephen Beale. 1996. Measuring Semantic Coverage. In Proc. COLING-96, Copenhagen.
- Nirenburg, Sergei, Kavi Mahesh, Evelyne Viegas, Stephen Beale, Victor Raskin and Boyan Onyshkevych. 1996. Technological and conceptual tools for lexical knowledge acquisition. In Proceedings of DIALOGUE-96, Puschino, Russia.

- Nirenburg, Sergei, Stephen Beale, Kavi Mahesh, Boyan Onyshkevych, Victor Raskin, Evelyne Viegas, Yorick Wilks and Remi Zajac. 1996. Lexicons in the MikroKosmos Project. In Proc. AISB96 Workshop on Multilinguality in the Lexicon. Brighton, UK.
- Viegas, Evelyne and Stephen Beale. 1996. Multilinguality and reversibility in computational semantic lexicons. In Proceedings of the 8th International Workshop on Natural Language Generation Poster Session, Sussex, UK.
- Beale, Stephen, Sergei Nirenberg and Kavi Mahesh. 1995. Semantic analysis in the Mikrokosmos machine translation project. In Proceedings of Symposium on Natural Language Processing, Kasetsart University, Bangkok, Thailand.
- Beale, Stephen and Sergei Nirenburg. 1995. Dependency-directed text planning. In Proceedings of IJCAI-95 Workshop on Multilingual Text Generation, Montreal, Canada.
- Nirenburg, Sergei, Stephen Beale and C. Domashnev. 1994. A Full-text Experiment in EBMT. In Proc. New Methodologies in Language Process (NeMLaP), Manchester, England.
- Beale, Stephen. 1992. Machine Translation in South-east asian minority languages. In Proc. Pan-Asiatic Linguistics, Chulalongkorn University, Bangkok, Thailand.
- Beale, Stephen. 1991. A New Approach to Machine Translation: the TU-SIL Machine Translation System. In Proc. International Conference on Current Issues in computational Linguistics. University of Sains Malaysia, Penang Malaysia.

D. Technical Reports

- McShane, Marjorie, Stephen Beale and Sergei Nirenburg (2005) Disambiguating homographous prepositions and verbal particles in an implemented Ontological Semantic analyzer. Working Paper #01-05, Institute for Language and Information Technologies, University of Maryland Baltimore County.
- Sergei Nirenburg, Stephen Beale and Marjorie McShane (2005) Heuristics for recovery from residual ambiguity and incongruity in the semantic interpretations of texts. Working Paper #02-05, Institute for Language and Information Technologies, University of Maryland Baltimore County.
- Sergei Nirenburg, Marjorie McShane, Margalit Zabludowski, Stephen Beale, Craig Pfeifer (2005) Ontological Semantic text processing in the biomedical domain. Working Paper #03-05, Institute for Language and Information Technologies, University of Maryland Baltimore County.
- McShane, Marjorie, Sergei Nirenburg and Stephen Beale (2005) An implemented, integrative approach to ontology-based NLP and interlingua . Working Paper #06-05, Institute for Language and Information Technologies, University of Maryland Baltimore County.
- McShane, Marjorie, Sergei Nirenburg and Stephen Beale (2005) The description and processing of multiword expressions in OntoSem. Working Paper #07-05, Institute for Language and Information Technologies, University of Maryland Baltimore County.
- McShane, Marjorie, Ron Zacharski, Stephen Beale and Sergei Nirenburg (2005) The Boas II named entity elicitation system. Working Paper #08-05, Institute for Language and Information Technologies, University of Maryland Baltimore County.
- Beale, Stephen. 1997. Hunter-Gatherer: applying constraint satisfaction, branch-and-bound and solution synthesis to computational semantics. Ph.D. Dissertation, Language and Information Technologies Program, School of Computer Science, Carnegie Mellon University. 1997.
- Beale, Stephen. 1996. Hunter-Gatherer: Applying constraint satisfaction, branch-and-bound and solution synthesis to computational semantics. Technical Report MCCS-96-289, Computing Research Lab, New Mexico State University, Las Cruces, New Mexico.
- Beale, Stephen. 1994. Dependency-Directed text generation. Technical Report MCCS-94-272, Computing Research Lab, New Mexico State University, Las Cruces, New Mexico.

(iv) Committees

Program Committee Co-Chair, The 10th International Conference on Theoretical and Methodological Issues in Machine Translation, Baltimore, MD, October, 2004.

(v) Overview of Work

A. OntoSem text analyzer.

Currently leading effort for a complete re-implementation of OntoSem in java.

The OntoSem text analyzer is a knowledge-based system that produces semantic representations of input text. The analyzer can be divided into four stages:

1. preprocessing: morphological analysis and detection and interpretation of named entities, dates and numbers
2. syntactic parsing
3. basic semantic analysis in which the core meaning of the input text is determined and semantic dependencies established
4. advanced semantic analysis through various meaning procedures to determine, for example, textual coreference and detailed time information

B. Medical Simulation and Tutoring

The Maryland Virtual Patient (MVP) project is developing an agent-oriented environment for automating certain facets of medical education and certification. This environment is effectively a network of human and software agents, at whose core is a virtual patient – a knowledge-based model of a person with a disease. This model is implemented in a computer simulation. The virtual patient undergoes both normal and pathological processes in response to internal and external stimuli. Cognitively, it experiences symptoms, has lifestyle preferences, has memory (many of whose details fade with time), and communicates with the human user about its personal history and symptoms.

Trainees can use the MVP simulation environment to interview a virtual patient, order lab tests, receive the results of lab tests from technician agents, receive interpretations of lab tests from consulting physician agents, posit hypotheses, clinical diagnoses and definitive diagnoses, prescribe treatments, follow-up after those treatments to judge their efficacy, and follow a patient's condition over an extended period of time.

C. Linguistic Description, Document Authoring and Translation for Minority Languages

Co-developed theory and computational tools to simplify and streamline the linguistic description of minority languages. Co-developed a document authoring system whereby authors may accurately prepare a semantic representation of a text for translation into minority languages. The Linguist's Assistant (LA) and The Bible Translator's Assistant (TBTA) have been used to produce extensive grammars and lexicons for English, Korean, Jula (a Niger-Congo language) and Kewa (Papua New Guinea). Work continues in two languages of Vanuatu, with additional languages planned in the near future. The resulting computational resources have been used to produce a significant amount of high-quality translations in each of these languages.