

A Bibliography on Hybrid Reasoning

Alan M. Frisch and Richard B. Scherl

This bibliography was originally compiled for and distributed at the 1988 Workshop on Principles of Hybrid Reasoning. An informal proceedings was distributed to all participants prior to the workshop. Since the proceedings included previously-published papers and early drafts of work in progress, it was distributed no further. However, since most of the draft papers have subsequently appeared in published form, it is now possible to give a virtual proceedings. Published versions of the proceedings papers are indicated in this bibliography with an asterisk.

We make no claim about this completeness of this bibliography and solicit suggestions for additional entries. Please send suggestions, preferably in BibTeX format, to either author by electronic mail (frisch@cs.uiuc.edu or scherl@cs.uiuc.edu).

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[Ait-Kaci, 1983] Hassan Ait-Kaci. *A New Model of Computation Based on a Calculus of Type Subsumption*. Technical Report MIS-CIS-83-40, Dept. of Computer and Info. Science, Univ. of Pennsylvania, December 1983.

[Ait-Kaci, 1984] Hassan Ait-Kaci. *A Lattice-Theoretic Approach to Computation Based on a Calculus of Partially Ordered Type Structures*. PhD thesis, Dept. of Computer and Info. Science, Univ. of Pennsylvania, 1984.

* [Ait-Kaci and Lincoln, 1988] Hassan Ait-Kaci and Patrick Lincoln. *LIFE: A Natural Language for Natural Language*. MCC Technical Report ACA-ST-074-88, MCC, ACA Program, February 1988.

[Ait-Kaci and Nasr, 1986a] Hassan Ait-Kaci and Robert Nasr. LOGIN: A logic programming language with built-in inheritance. *Journal of Logic Programming*, 3(3):187-215,

October 1986.

[Ait-Kaci and Nasr, 1986b] Hassan Ait-Kaci and Robert Nasr. *Residuation: A Paradigm for Integrating Logic and Functional Programming*. MCC Technical Report AI/ISA Project AI-359-86, Microelectronics and Computer Technology Corporation, October 1986.

[Ait-Kaci et al., 1987] Hassan Ait-Kaci, P. Lincoln, and R. Nasr. Le Fun: Logic, equations, and functions. In *Proceedings of the ACM Symposium on Logic Programming*, pages 17-23, San Francisco, September 1987.

[Allen and Wright, 1983] Bradley P. Allen and J. Mark Wright. Integrating logic programs and schemata. In *Proceedings of the Eighth International Joint Conference on Artificial Intelligence*, pages 340-342, Karlsruhe, West Germany, August 1983.

* [Allen and Miller, 1988] James F. Allen and Bradford W. Miller. *The Rhetorical Knowledge Representation System: A User's Manual (for Rhet Version 14.0)*. Technical Report TR 238, University of Rochester, February 1988.

[Allen et al., 1984] James F. Allen, Mark Giuliano, and Alan M. Frisch. *The HORNE Reasoning System*. Technical Report TR126 revised, Computer Science Department, University of Rochester, September 1984.

[Balaban, 1986a] Mira Balaban. *The Generalized Concept (G-C) Formalism—An Object-Oriented, Logic Framework for Knowledge Representation*. Technical Report 86-27, Department of Computer Science, State University of New York at Albany, 1986.

[Balaban, 1986b] Mira Balaban. The generalized-concept formalism—a frames and logic based representation model. In *Proceedings CSCSI/SCEIO-86*, pages 215-219, Montreal, Quebec, Canadian Society for Computational Studies of Intelligence, May 1986.

[Bledsoe and Tyson, 1975] W.W. Bledsoe and M. Tyson. *The UT Interactive Prover*. Technical Report ATP-17A, Automated Theorem Proving Project, Univ. of Texas at Austin, May 1975.

[Borgida and Etherington, 1989] Alex Borgida and David W. Etherington. Hierarchical knowledge bases and efficient disjunctive reasoning. In Ronald J. Brachman, Hector J. Levesque, and Raymond Reiter, editors, *Proceedings of the First International Conference on Principles of Knowl-*

edge Representation and Reasoning, pages 33-43, Toronto, May 1989.

[Brachman and Schmolze, 1985] R.J. Brachman and J.G. Schmolze. An overview of the KL-ONE knowledge representation system. *Cognitive Science*, (9):171-216, August 1985.

[Brachman and Levesque, 1982] Ronald J. Brachman and Hector J. Levesque. Competence in knowledge representation. In *Proceedings of the Second National Conference on Artificial Intelligence*, pages 189-192, Pittsburgh, Pennsylvania, American Association for Artificial Intelligence, August 1982.

[Brachman et al., 1983a] Ronald J. Brachman, Richard E. Fikes, and Hector J. Levesque. KRYPTON: A functional approach to knowledge representation. *IEEE Computer*, 16(10, Special Issue on Knowledge Representation):67-73, October 1983.

[Brachman et al., 1983b] Ronald J. Brachman, Richard E. Fikes, and Hector J. Levesque. KRYPTON: Integrating terminology and assertion. In *Proceedings of the Third National Conference on Artificial Intelligence*, pages 31-35, Washington, D. C., American Association for Artificial Intelligence, August 1983.

* [Brachman et al., 1985] Ronald J. Brachman, Victoria Pigman Gilbert, and Hector J. Levesque. An essential hybrid reasoning system: Knowledge and symbol level accounts of KRYPTON. In *Proceedings of the Ninth International Joint Conference on Artificial Intelligence*, pages 532-539, Los Angeles, California, August 1985.

* [Brotsky and Rich, 1985] Daniel C. Brotsky and Charles Rich. Issues in the design of hybrid knowledge representation and reasoning systems. In *Proceedings of the Workshop on Theoretical Issues in Natural Language Understanding*, Halifax, Nova Scotia, May 1985.

[Brown and Burton, 1975] John Seely Brown and Richard R. Burton. Multiple representations of knowledge for tutorial reasoning. In Daniel G. Bobrow and Alan M. Collins, editors, *Representation and Understanding: Studies in Cognitive Science*, pages 311-349, Academic Press, New York, 1975.

[Bundy et al., 1985] Alan Bundy, Lawrence Byrd, and Chris S. Mellish. Special-purpose, but domain-independent, inference mechanisms. In L. Steels and J. A. Campbell, editors, *Progress in Artificial Intelligence*, pages 93-111, Ellis Horwood Limited, London, 1985.

[Cohn, 1983a] Anthony G. Cohn. Improving the expressiveness of many sorted logic. In *Proceedings of the Third National Conference on Artificial Intelligence*, pages 84-87, August 1983.

[Cohn, 1983b] Anthony G. Cohn. *Mechanising a Particularly Expressive Many Sorted Logic*. PhD thesis, Department of Computer Science, University of Essex, 1983.

- [Cohn, 1985] Anthony G. Cohn. On the solution of Schubert's Steamroller in many sorted logic. In *Proceedings of the Ninth International Joint Conference on Artificial Intelligence*, pages 1169-1174, Los Angeles, California, August 1985.
- [Cohn, 1986] Anthony G. Cohn. Many sorted logic = unsorted logic + control? In M. Bramer, editor, *Research and Development in Expert Systems III*, pages 184-194, Cambridge University Press, Cambridge, England, 1986.
- [Cohn, 1987] Anthony G. Cohn. A more expressive formulation of many sorted logic. *Journal of Automated Reasoning*, 3(2):113-200, 1987.
- [Cohn, 1989a] Anthony G. Cohn. On the appearance of sortal literals: A non substitutional framework for hybrid reasoning. In Ronald J. Brachman, Hector J. Levesque, and Raymond Reiter, editors, *Proceedings of the First International Conference on Principles of Knowledge Representation and Reasoning*, pages 55-66, Toronto, May 1989.
- * [Cohn, 1989b] Anthony G. Cohn. Taxonomic reasoning with many-sorted logics. *Artificial Intelligence Review*, 3:89-128, 1989.
- [de Haan and Schubert, 1986] Johannes de Haan and Lenhart K. Schubert. Inference in a topically organized semantic net. In *Proceedings of the Fifth National Conference on Artificial Intelligence*, pages 334-338, Philadelphia, Pennsylvania, American Association for Artificial Intelligence, August 1986.
- [de Champeaux, 1978] D. de Champeaux. A theorem-prover dating a semantic network. In *AISB/GI Conference on Artificial Intelligence*, July 1978.
- [Deransart and Maluszynski, 1985] P. Deransart and J. Maluszynski. *Relating Logic Programs and Attribute Grammars*. Technical Report Lith-IDA-R-85-08, Dept. of Computer and Info. Science, Linköping University, April 1985.
- [Dixon, 1973] John K. Dixon. Z-resolution: Theorem-Proving with compiled axioms. *Journal of the Association for Computing Machinery*, 20(1):127-147, January 1973.
- [Edelmann and Owsnicki, 1986] J. Edelmann and B. Owsnicki. Data models in knowledge representation systems: A case study. In C.R. Rollinger and W. Horn, editors, *Proceedings of the Tenth German Workshop on Artificial Intelligence*, pages 69-74, Springer, 1986.
- * [Etherington et al., 1989] David W. Etherington, Alex Borgida, Ronald J. Brachman, and Henry Kautz. Vivid knowledge and tractable reasoning: Preliminary report. In *Proceedings of the Eleventh International Joint Conference on Artificial Intelligence*, pages 1146-1152, August 1989.
- [Feferman, 1974] S. Feferman. Applications of many sorted interpolation theorems. In *Proceedings of the Symposium on Pure Mathematics*, pages 102-148, American Mathematical Society, 1974.
- [Feldman and Rich, 1988] Y. A. Feldman and C. Rich. *Pattern-Directed Invocation with Changing Equalities*. memo 1017, MIT Artificial Intelligence Lab., May 1988.
- [Frisch, 1985] Alan M. Frisch. An investigation into inference with restricted quantification and a taxonomic representation. *SIGART Newsletter*, (91):28-31, 1985.
- [Frisch, 1986a] Alan M. Frisch. *Knowledge Retrieval as Specialized Inference*. PhD thesis, Computer Science Department, University of Rochester, August 1986.
- [Frisch, 1986b] Alan M. Frisch. Parsing with restricted quantification: An initial demonstration. *Computational Intelligence*, 2(3):142-150, 1986.
- * [Frisch, 1989] Alan M. Frisch. A general framework for sorted deduction: Fundamental results on hybrid reasoning. In Ronald J. Brachman, Hector J. Levesque, and Raymond Reiter, editors, *Proceedings of the First International Conference on Principles of Knowledge Representation and Reasoning*, Toronto, May 1989.
- [Frisch et al., 1983] Alan M. Frisch, James F. Allen, and Mark Giuliano. An overview of the HORNE logic programming system. *SIGART Newsletter*, (84):27-29, 1983.
- [Gelernter, 1963] H. Gelernter. Realization of a geometry-theorem proving machine. In Edward A. Feigenbaum and Julian Feldman, editors, *Computers and Thought*, pages 134-152, McGraw-Hill, New York, 1963.
- [Gelernter et al., 1963] H. Gelernter, J.R. Hansen, and D.W. Loveland. Empirical explorations of the geometry-theorem proving machine. In Edward A. Feigenbaum and Julian Feldman, editors, *Computers and Thought*, pages 153-63, McGraw-Hill, New York, 1963.
- [Goebel, 1984] R. Goebel. Dlog: A logic-based data model for the machine representation of knowledge. *SIGART Newsletter*, (87):45-46, 1984.
- [Goebel, 1985a] R. Goebel. Interpreting descriptions in a prolog-based knowledge representation system. In *Ninth International Joint Conference on Artificial Intelligence*, pages 711-716, August 1985.
- [Goebel, 1985b] R. Goebel. *A Logic-Based Model for the Machine Representation of Knowledge*. PhD thesis, Computer Science Dept., Univ. of British Columbia, 1985.
- [Goguen and Meseguer, 1986] Joseph Goguen and José Meseguer. Eqllog: Equality, types, and generic modules for logic programming. In Douglas DeGroot and Gary Lindstrom, editors, *Logic Programming: Functions, Relations, and Equations*, pages 295-363, Prentice-Hall, 1986.
- [Henschen, 1972] L.J. Henschen. N-sorted logic for automatic theorem proving in higher-order logic. In *ACM Conference*, Boston, 1972.
- * [Hines, 1988] Larry M. Hines. Hyper-chaining and knowledge-based theorem proving. In E. Lusk and R. Overbeek, editors, *9th International Conference on Automated Deduction*, pages 469-486, Argonne, Illinois, May 1988.
- [Höhfeld and Smolka, 1988] Markus Höhfeld and G. Smolka. *Definite Relations over Constraint Languages*. Lilog-Report 53, IBM Deutschland, October 1988.
- * [Horty and Thomason, 1988] John F. Horty and Richmond H. Thomason. Mixing strict and defeasible inheritance. In *Proceedings of the Seventh National Conference on Artificial Intelligence*, pages 427-432, St. Paul, Minnesota, August 1988.
- [Irani and Shin, 1985] K. B. Irani and D. G. Shin. A many-sorted resolution based on an extension of a first-order language. In *Proceedings of the Ninth International Joint Conference on Artificial Intelligence*, pages 1175-1177, Los Angeles, California, August 1985.
- [Jaffar and Lassez, 1987] Joxan Jaffar and Jean-Louis Lassez. Constraint logic programming. In *Proceedings of the 14th ACM Principles of Programming Languages Conference*, pages 111-119, Munich, January 1987.
- * [Jaffar et al., 1988] Joxan Jaffar, Spiro Michaylov, Peter J. Stuckey, and Roland H. C. Yap. The CLP(R) language and system. April 1988.
- [Levesque, 1986] Hector J. Levesque. Making believers out of computers. *Artificial Intelligence*, 30(1):81-108, October 1986.
- * [Mac Gregor, 1988] Robert M. Mac Gregor. A deductive pattern matcher. In *Proceedings of the Seventh National Conference on Artificial Intelligence*, pages 403-408, Saint Paul, Minnesota, August 1988.
- [Maluszynski and Nilsson, 1982a] J. Maluszynski and J.F. Nilsson. A comparison of the logic programming language prolog with two-level grammars. In *First International Logic Programming Conference*, Marseilles, 1982.
- [Maluszynski and Nilsson, 1982b] J. Maluszynski and J.F. Nilsson. *Grammatical Unification*. Technical Report LiTH-MAT-R-82-26, Software Systems Research Center, Linköping Institute of Technology, August 1982.
- [Manna and Waldinger, 1986] Z. Manna and R. Waldinger. Special relations in automated deduction. *Journal of the ACM*, 33:1-59, 1986.
- [McSkimin and Minker, 1979] James R. McSkimin and Jack Minker. A predicate calculus based semantic network for deductive searching. In Nicholas V. Findler, editor, *Associative Networks: Representation and Use of Knowledge by Computers*, pages 205-238, Academic Press, New York, 1979.
- [Meseguer et al., 1987] José Meseguer,

Joseph A. Goguen, and Gert Smolka. *Order-Sorted Unification*. Technical Report CSLI-87-86, Center for the Study of Language and Information, March 1987.

[Miller, 1988] S. A. Miller. *Time Revisited*. Master's thesis, Department of Computer Science, The University of Alberta, Spring 1988.

[Miller and Schubert, 1988] Stephanie A. Miller and Lenhart K. Schubert. Using specialists to accelerate general reasoning. In *Proceedings of the Seventh National Conference on Artificial Intelligence*, pages 161-165, Saint Paul, Minnesota, August 1988.

[Nakashima, 1985] H. Nakashima. Term description: A simple powerful extension to prolog data structures. In *Proceedings of the Ninth International Joint Conference on Artificial Intelligence*, August 1985.

[Nebel, 1988] Bernhard Nebel. Computational complexity of terminological reasoning in BACK. *Artificial Intelligence*, 34(3):371-383, April 1988.

[Nebel and von Luck, 1987] Bernhard Nebel and Kai von Luck. Issues of integration and balancing in hybrid knowledge representation systems. In K. Morik, editor, *Proceedings of the Eleventh German Workshop on Artificial Intelligence*, Springer Verlag, 1987.

* [Nebel and von Luck, 1988] Bernhard Nebel and Kai von Luck. Hybrid reasoning in BACK. In Zbigniew W. Ras and Lorenza Saitta, editors, *Methodologies for Intelligent Systems*, pages 260-269, North-Holland, New York, 1988.

* [Neches et al., 1985] Robert Neches, William R. Swartout, and Johanna D. Moore. Enhanced maintenance and explanation of expert systems through explicit models of their development. *IEEE Transactions on Software Engineering*, SE-11(11):1337-1351, November 1985.

[Nelson and Oppen, 1979] G. Nelson and D. Oppen. Simplification by cooperating decision procedures. *ACM Transactions on Programming Languages and Systems*, (1):245-257, 1979.

[Ohlbach and Schmidt-Schauss, 1985] H.J. Ohlbach and M. Schmidt-Schauss. The lion and the unicorn. *Journal of Automated Reasoning*, (1):327-332, 1985.

[Papalaskaris and Schubert, 1982] Mary Angela Papalaskaris and Lenhart K. Schubert. Inference, incompatible predicates and colours. In *Proceedings CSCSI/SCEIO-82*, pages 97-102, Saskatoon, Saskatchewan, Canadian Society for Computational Studies of Intelligence, May 1982.

[Patel-Schneider, 1987a] Peter Patel-Schneider. *Decidable First-Order Logic for Knowledge Representation*. PhD thesis, University of Toronto, May 1987.

* [Patel-Schneider, 1987b] Peter F. Patel-Schneider. A hybrid, decidable, logic-based knowledge representation system. *Computational Intelligence*, 3(2):64-77, May 1987.

[Pigman, 1984a] Victoria Pigman. The interaction between assertional and terminological knowledge in KRYPTON. In *Proceedings IEEE Workshop on Principles of Knowledge-Based Systems*, pages 3-10, Denver, Colorado, IEEE Computer Society, December 1984.

[Pigman, 1984b] Victoria Pigman. KRYPTON: *Description of an Implementation, Volume 1*. AI Technical Report 40, Schlumberger Palo Alto Research, November 1984.

[Pigman, 1984c] Victoria Pigman. KRYPTON: *Description of an Implementation, Volume 2*. AI Technical Report 41, Schlumberger Palo Alto Research, November 1984.

[Plaisted, 1986] D.A. Plaisted. A decision procedure for combinations of propositional temporal logic and other specialized theories. *Journal of Automated Reasoning*, (2):171-190, 1986.

[Plummer, 1985] David Plummer. *Gazing: Using the Structure of the Theory in Theorem Proving*. Working Paper 180, Department of Artificial Intelligence, Edinburgh, May 1985.

[Plummer, 1988a] David Plummer. *Gazing: A Technique for Controlling the Use of Rewrite Rules*. PhD thesis, Department of Artificial Intelligence, University of Edinburgh, May 1988.

* [Plummer, 1988b] David Plummer. *Gazing: Controlling the Use of Rewrite Rules*. Research Paper 412, University of Edinburgh, 1988.

[Reiter, 1977] Raymond Reiter. *An Approach to Deductive Question-answering*. BBN Technical Report 3649, Bolt Beranek and Newman, Inc., 1977.

[Reiter, 1981] R. Reiter. On the integrity of typed first-order data bases. In H. Gallaire, J. Minker, and J.M. Nicolas, editors, *Advances in Data Base Theory*, Volume 1, Plenum Press, 1981.

[Rich, 1982] C. Rich. Knowledge representation languages and predicate calculus: How to have your cake and eat it too. In *Proceedings of the Second National Conference on Artificial Intelligence*, pages 193-196, Pittsburgh, PA, August 1982.

[Rich, 1985] C. Rich. The layered architecture of a system for reasoning about programs. In *Proceedings of the Ninth International Joint Conference on Artificial Intelligence*, pages 540-546, August 1985.

[Rowley et al., 1987] S. Rowley, H. E. Shrobe, and R. Cassels. Joshua: Uniform access to heterogeneous knowledge structures or why joshing is better than coniving or planning. In *Proceedings of the Sixth National Conference on Artificial Intelligence*, pages 48-52, Seattle, WN, August 1987.

[Saffiotti and Sebastiani, 1988] Alessandro Saffiotti and Fabrizio Sebastiani. Dialogue modelling in M-KRYPTON, a hybrid language for multiple believers. In *Proceedings*

The Fourth Conference on Artificial Intelligence Applications, pages 56-61, The Computer Society of the IEEE, March 1988.

[Schmidt-Schauss, 1985a] M. Schmidt-Schauss. *A Many-Sorted Calculus With Polymorphic Functions Based on Resolution and Paramodulation*. Seki Memo 85-II-KL, Universität Kaiserslautern, 1985.

[Schmidt-Schauss, 1985b] M. Schmidt-Schauss. A many-sorted calculus with polymorphic functions based on resolution and paramodulation. In *Ninth International Joint Conference on Artificial Intelligence*, August 1985.

[Schmidt-Schauss, 1985c] M. Schmidt-Schauss. Unification in many-sorted calculus with declarations. In *Proceedings of the Ninth German Workshop on Artificial Intelligence*, pages 118-132, Dassel/Solling, 1985.

[Schmidt-Schauss, 1986] M. Schmidt-Schauss. Unification in many sorted equational theories. In H. Stoyan, editor, *8th International Conference on Automated Deduction*, pages 538-552, Springer Verlag, 1986.

[Schmidt-Schauss, 1988] M. Schmidt-Schauss. *Computational Aspects of an Order Sorted Logic with Term Declarations*. SEKI Report SR-88-10, Universität Kaiserslautern, 1988.

[Schubert et al., 1983] Lenhart K. Schubert, Mary Angela Papalaskaris, and Jay Taugher. Determining type, part, color, and time relationships. *IEEE Computer*, 16(10, Special Issue on Knowledge Representation):53-60, October 1983.

[Shin, 1985] D.G. Shin. *An Extension of a Many-Sorted Language*. PhD thesis, Univ. of Michigan, 1985.

[Shin and Irani, 1984] D. G. Shin and K. B. Irani. Knowledge representation using an extension of many-sorted logic. In *Proceedings of The First Conference on Artificial Intelligence Applications*, pages 404-409, Denver, Colorado, IEEE Computer Society, December 1984.

[Shostak, 1982] R. Shostak. Deciding combinations of theories. In *Sixth Conference on Automated Deduction*, pages 209-222, 1982.

[Smolka, 1986] Gert Smolka. *Order-Sorted Horn Logic: Semantics and Deduction*. Seki Report SR-86-17, Universität Kaiserslautern, October 1986.

[Smolka, 1988a] Gert Smolka. *A Feature Logic with Subsorts*. Seki Report LILOG 33, IBM Deutschland, May 1988.

[Smolka, 1988b] Gert Smolka. *Logic Programming with Polymorphically Order-Sorted Types*. Lilog-Report 55, IBM Deutschland, October 1988.

[Smolka and Ait-Kaci, 1986] G. Smolka and H. Ait-Kaci. *Inheritance Hierarchies: Semantics and Unification*. MCC Technical Report AI-057-86, AI/ISA Project. Microelectronics and Computer Technology Corporation, July 1986.

* [Srinivasan, 1984] C. V. Srinivasan. *CK-LOG, A Calculus for Knowledge Processing in Logic*. Department of Computer Science Technical Report DCS-TR-153, Rutgers University, September 1984.

[Stickel, 1983] Mark E. Stickel. Theory resolution: Building-in nonequational theories. In *Proceedings of the Third National Conference on Artificial Intelligence*, pages 391-397, Washington, D. C., American Association for Artificial Intelligence, August 1983.

* [Stickel, 1985a] Mark E. Stickel. Automated deduction by theory resolution. *Journal of Automated Reasoning*, 1(4):333-355, 1985.

[Stickel, 1985b] Mark E. Stickel. Automated deduction by theory resolution. In *Proceedings of the Ninth International Joint Conference on Artificial Intelligence*, pages 455-458, Los Angeles, California, August 1985.

[Thomason and Aronis, 1989] Richmond H. Thomason and John M. Aronis. Hybridizing nonmonotonic inheritance with theorem proving. 1989.

[Turner, 1983] S.J. Turner. *W-Grammars for Logic Programming*. Technical Report Working Paper W-113, Dept. of Computer Science, Univ. of Exeter, 1983.

* [Vilain, 1985] Marc Vilain. The restricted language architecture of a hybrid representation system. In *Proceedings of the Ninth International Joint Conference on Artificial Intelligence*, pages 547-551, Los Angeles, California, August 1985.

[Vilain and McAllester, 1983] Marc Vilain and David A. McAllester. Assertions in NIKL. In *Research in Knowledge Representation for Natural Language Understanding—Annual Report, 1 September 1982-31 August 1983*, pages 45-80, Technical Report 5421, BBN Laboratories, 1983.

[von Luck and Owsnicki-Klewe, 1987] Kai von Luck and Bernd Owsnicki-Klewe. *New AI Formalisms for Knowledge Representation: A Case Study*. Kit Back 57, Technische Universität Berlin, October 1987.

[von Luck et al., 1985] Kai von Luck, Bernhard Nebel, Christof Peltason, and Albrecht Schmiedel. *The BACK-System*. Kit Report 29, Technische Universität Berlin, 1985.

[von Luck et al., 1987] Kai von Luck, Christof Peltason, Bernhard Nebel, and Albrecht Schmiedel. *The Anatomy of the BACK System*. KIT-Report 41, Fachbereich Informatik, Technische Universität Berlin, January 1987.

[Walther, 1983] Christoph Walther. A many-sorted calculus based on resolution and paramodulation. In *Proceedings of the Eighth International Joint Conference on Artificial Intelligence*, pages 882-891, August 1983.

[Walther, 1985] Christoph Walther. A mechanical solution of Schubert's Steamroller by many-sorted resolution. *Artificial*

Intelligence, 26(2):217-224, 1985.

[Walther, 1987] Christoph Walther. *A Many-Sorted Calculus Based on Resolution and Paramodulation*. Morgan Kaufman, Los Altos, CA, 1987.

[Walther, 1988] Christoph Walther. Many-sorted unification. *Journal of the ACM*, 35(1):1-17, January 1988.

About the Authors

Alan M. Frisch is an assistant professor in the Department of Computer Science and the Beckman Institute for Advanced Science and Technology at the University of Illinois (405 N. Mathews Ave., Urbana, IL 61801). He was awarded a Ph.D. in computer science by the University of Rochester in 1986 and has taught artificial intelligence at Rochester and the Univer-

sity of Sussex. His dissertation work on knowledge retrieval as specialized inference led him to other investigations of specialized deduction and hybrid reasoning, and resulted in his development of the substitutional framework for hybrid reasoning.

Richard Scherl is a doctoral candidate in the Department of Computer Science at the University of Illinois (405 N. Mathews Ave., Urbana, IL 61801). He received his B.A. from Columbia University and M.A. from the University of Chicago. His primary research interests are in the areas of logic-based knowledge representation and automated deduction. The topic of his Ph.D. dissertation is a general method for the construction of modal deductive systems, based on principles of hybrid deduction.

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