

# CONTENTS

## Invited Talk

P. B. Andrews (Carnegie Mellon University) "Connections and Higher-Order Logic" .....	1
--	---

## Term Rewriting Systems

L. Bachmair, N. Dershowitz (Univ. of Illinois, USA) "Commutation, transformation, and termination" .....	5
S. Porat, N. Francez (Inst. of Tech., Israel) "Full-commutation and fair-termination in equational (and combined) term-rewriting systems" .....	21
A. B. Cherifa, P. Lescanne (CRIN, France) "An actual implementation of a procedure that mechanically proves termination of rewriting systems based on inequalities between polynomial interpretations" .....	42
I. Gnaedig, P. Lescanne (CRIN, France) "Proving termination of associative commutative rewriting systems by rewriting" .....	52
R. Dietrich (GMD, W. Germany) "Relating resolution and algebraic completion for Horn logic" .....	62
D.A. Plaisted (Univ. of North Carolina, USA) "A simple non-termination test for the Knuth-Bendix method" .....	79
R.D.Lins (Univ. at Canterbury, GB) "A new formula for the execution of categorical combinators" .....	89
D. Kapur, P. Narendran, H. Zhang (General Electric, USA), (Rensselaer Poly. Inst. USA) "Proof by induction using test sets" .....	99
Y. Toyama (NTT, Japan) "How to prove equivalence of term rewriting systems without induction" .....	118
H. Comon (LIFIA, France) "Sufficient completeness, term rewriting systems and "anti-unification" .....	128
J. Hsiang, M. Rusinowitch (SUNY, USA, CRIN, France) "A new method for establishing refutational completeness in theorem proving" .....	141

## Invited Talk

R. Reiter (Toronto University, Canada) "A Theory Of Diagnosis From First Principles" .....	153
---	-----

## Nonclassical Deduction

G. Jäger (ETH, Switzerland) "Some contributions to the logical analysis of circumscription" .....	154
--	-----

M. Abadi, Z. Manna (Stanford Univ., USA)	
"Modal theorem proving" .....	172
P. H. Schmitt (IBM, W. Germany)	
"Computational aspects of three-valued logic" .....	190
K. Konolige (SRI International, USA)	
"Resolution and quantified epistemic logics" .....	199
F.M. Brown (Univ. of Kansas, USA)	
"A commonsense theory of nonmonotonic reasoning" .....	209

### *Equality Reasoning*

L. Wos, W. McCune (Argonne National Lab., USA)	
"Negative paramodulation" .....	229
Y. Lim (Dept. of Comp. Tech., Korea)	
"The heuristics and experimental results of a new hyperparamodulation: HL-resolution" .....	240
T. Ch. Wang (Univ. of Texas, USA)	
"ECR: An equality conditional resolution proof procedure" .....	254
A. J. I. Dick, R. J. Cunningham (Imperial College, GB)	
"Using narrowing to do isolation in symbolic equation solving - an experiment in automated reasoning" .....	272

### *Program Verification*

T. Kanamori, H. Fujita (Mitsubishi Electric Corporation, Japan)	
"Formulation of induction formulas in verification of PROLOG programs" .....	281
Th. Käufel (Univ. of Karlsruhe, W. Germany)	
"Program verifier 'Tatzelwurm': Reasoning about systems of linear inequalities" .....	300
R. Hähnle, M. Heisel, W. Reif, W. Stephan (Univ. of Karlsruhe, W. Germany)	
"An interactive verification system based on dynamic logic" .....	306

### *Graph Based Deduction*

N. Eisinger (Univ. Kaiserslautern, W. Germany)	
"What you always wanted to know about clause graph resolution" .....	316
R. Loganathanaraj, R. A. Mueller (USL, USA), (Colorado State University)	
"Parallel theorem proving with connection graphs" .....	337
N.V. Murray, E. Rosenthal (Univ. of New York, USA)	
"Theory links in semantic graphs" .....	353

### *Special Deduction Systems*

D.A. Plaisted (Univ. of North Carolina, USA)	
"Abstraction using generalization functions" .....	365
H.-A. Schneider (Univ. Kaiserslautern, W. Germany)	
"An improvement of deduction plans: refutation plans" .....	377

F. Oppacher, E. Suen (Univ. of Carleton, Canada)	
"Controlling deduction with proof condensation and heuristics"	384
J. Traugott (Stanford Univ.)	
"Nested resolution"	394

#### *Invited Talk*

G. Huet (INRIA, France)	
"Mechanizing constructive proofs" (paper not submitted)	403

#### *Constructive ATP*

D. J. Howe (Cornell Univ., USA)	
"Implementing number theory: an experiment with Nuprl"	404

#### *Unification Theory*

C. Dwork, P. Kanellakis, L. Stockmeyer (IBM Research Lab., USA)	
"Parallel algorithms for term matching"	416
E. Tidén (Royal Inst. of Tech., Sweden)	
"Unification in combinations of collapse-free theories with disjoint sets of function symbols"	431
A. Herold (Univ. Kaiserslautern, W. Germany)	
"Combination of unification algorithms"	450
W. Büttner (Siemens, W. Germany)	
"Unification in the data structure sets"	470
D. Kapur, P. Narendran (GE, USA)	
"NP-completeness of the set unification and matching problems"	489
J. Mzali (CRIN, France)	
"Matching with distributivity"	496
U. Martin, T. Nipkow (Univ. of Manchester, GB)	
"Unification in boolean rings"	506
H.-J. Bürckert (Univ. Kaiserslautern, W. Germany)	
"Some relationships between unification, restricted unification, and matching"	514
Ch. Walther (Univ. Karlsruhe, W. Germany)	
"A classification of many-sorted unification problems"	525
M. Schmidt-Schauss (Univ. Kaiserslautern, W. Germany)	
"Unification in many-sorted equational theories"	538

#### *Theoretical Issues*

H. Kleine Büning, T. Lettmann (Univ. Karlsruhe, W. Germany)	
"Classes of first order formulas under various satisfiability definitions"	553
V. Weispfenning (Univ. Heidelberg, W. Germany)	
"Diamond formulas in the dynamic logic of recursively enumerable programs"	564

*Invited Talk*

D. Warren (Univ. of Manchester) "A PROLOG Machine" (paper not submitted)	572
---	-----

*Logic Programming Oriented Deduction Systems*

M. E. Stickel (SRI International, USA) "A PROLOG technology theorem prover: implementation by an extended PROLOG compiler"	573
R. Butler, E. Lusk, W. McCune, R. Overbeek (Argonne National Lab, USA) "Paths to high-performance automated theorem proving"	588
F. K. Hanna, N. Daeche (Univ. of Kent, GB) "Purely functional implementation of a logic"	598

*Deductive Databases, Planning, Synthesis*

P. T. Cox, T. Pietrzykowski (Univ. Nova Scotia, Canada) "Causes for events: their computation and applications"	608
Z. Manna, R. Waldinger (Stanford Univ., USA) "How to clear a block: plan formation in situational logic"	622
J. Traugott (Stanford Univ., USA) "Deductive synthesis of sorting programs"	641

*Extended Abstracts of Current Deduction Systems* 661

P.B. Andrews, F. Pfenning, S. Issar, C.P. Klapper: (Carnegie Mellon University, USA) The TPS Theorem Proving System	664
J. Avenhaus, B. Benninghofen, R. Göbel, K. Madlener: (University of Kaiserslautern, West Germany) TRSPEC: A Term Rewriting Based System for Algebraic Specifications	666
M. Bayerl: (TU München, West Germany) Highly Parallel Inference Machine	669
C. Beierle, W. Olthoff, A. Voss: (University of Kaiserslautern, West Germany) Automatic Theorem Proving in the ISDV System	671
S. Biundo, B. Hummel, D. Hutter, C. Walther: (University of Karlsruhe, West Germany) The Karlsruhe Induction Theorem Proving System	673
R.S. Boyer, J.S. Moore: (University of Texas at Austin, USA) Overview of a Theorem-Prover for a Computational Logic	676
S.-C. Chou: (University of Texas at Austin, USA) GEO-Prover - A Geometry Theorem Prover Developed at UT	680

N.Eisinger, H.J.Ohlbach: (University of Kaiserslautern, West Germany) <b>The Markgraf Karl Refutation Procedure (MKRP)</b>	682
J.Gibert: (University of Melbourne, Australia) <b>The J-Machine: Functional Programming with Combinators</b>	684
S.Greenbaum, D.A.Plaisted: (University of Illinois, University of North Carolina at Chapel Hill, USA) <b>The Illinois Prover: A General Purpose Resolution Theorem Prover</b>	686
G.Huet: (INRIA, France) <b>Theorem Proving Systems of the Formel Project</b>	688
H.Husmann: (University of Passau, West Germany) <b>The Passau RAP System: Prototyping Algebraic Specifications Using Conditional Narrowing</b>	690
D.Kapur, G.Sivakumar, H.Zhang: (General Electric, University of Illinois, Rensselaer Polytechnic Institute, USA) <b>RRL: A Rewrite Rule Laboratory</b>	692
B.Kutzler, S.Stifter: (Universität Linz, Austria) <b>A Geometry Theorem Prover Based on Buchberger's Algorithm</b>	694
P.Lescanne: (Centre de Recherche en Informatique de Nancy, France) <b>REVE A Rewrite Rule Laboratory</b>	696
E.Lusk, W.McCune, R.Overbeek (Argonne National Laboratory, USA): <b>ITP at Argonne National Laboratory</b>	698
C.G.Morgan: (University of Victoria, Canada) <b>AUTOLOGIC at University of Victoria</b>	670
F.J.Pelletier: (University of Alberta, Canada) <b>THINKER</b>	672
M.E.Stickel: (SRI International, USA) <b>The KLAUS Automated Deduction System</b>	674
P.B.Thistlewaite, M.A.McRobbie, R.K.Meyer: (Australian National University, Australia) <b>The KRIPKE Automated Theorem Proving System</b>	676
T.C. Wang: (University of Texas at Austin, USA) <b>SHD-Prover at University of Texas at Austin</b>	678