

# Table of Contents

## Session I: Keynote Address

The Impossibility of the Automation of Logical Reasoning (Abstract) <i>Larry Wos</i> .....	1
---	---

## Session II

Automatic Proofs in Mathematical Logic and Analysis <i>Kurt Ammon</i> .....	4
Proving Geometry Statements of Constructive Type <i>Shang-Ching Chou and Xiao-Shan Gao</i> .....	20
The Central Variable Strategy of Str+ve <i>L.M. Hines</i> .....	35

## Session III A

Unification in the Union of Disjoint Equational Theories: Combining Decision Procedures <i>Franz Baader and Klaus U. Schulz</i> .....	50
Reduction and Unification in Lambda Calculi with Subtypes <i>Tobias Nipkow and Zhenyu Qian</i> .....	66
A Combinatory Logic Approach to Higher-Order <i>E</i> -Unification <i>Daniel J. Dougherty and Patricia Johann</i> .....	79
Cycle Unification <i>Wolfgang Bibel, Steffen Hölldobler and Jörg Würtz</i> .....	94

## Session III B

A Parallel Completion Procedure for Term Rewriting Systems <i>Katherine A. Yelick and Stephen J. Garland</i> .....	109
Grammar Rewriting <i>David McAllester</i> .....	124
Polynomial Interpretations and the Complexity of Algorithms <i>Adam Cichon and Pierre Lescanne</i> .....	139
Uniform Traversal Combinators: Definition, Use and Properties <i>Leonidas Fegaras, Tim Sheard and David Stemple</i> .....	148

**Session IV**

Sorted Unification Using Set Constraints <i>Tomás E. Uribe</i> .....	163
An Abstract View of Sorted Unification <i>Alan M. Frisch and Anthony G. Cohn</i> .....	178
Unification in Order-Sorted Algebras with Overloading <i>Alexandre Boudet</i> .....	193

**Session V: Banquet Address**

Puzzles and Paradoxes <i>Raymond Smullyan</i> .....	208
--	-----

**Session VI**

Experiments in Automated Deduction with Condensed Detachment <i>William McCune and Larry Vos</i> .....	209
Caching and Lemmaizing in Model Elimination Theorem Provers <i>Owen L. Astrachan and Mark E. Stickel</i> .....	224
LIM+ Challenge Problems by RUE Hyper-Resolution <i>Vincent J. Digricoli and Eugene Kochendorfer</i> .....	239

**Session VII**

Computing Prime Implicates Incrementally <i>Peter Jackson</i> .....	253
Linear-Input Subset Analysis <i>Geoff Sutcliffe</i> .....	268
Theoretical Study of Symmetries in Propositional Calculus and Applications <i>Belaïd Benhamou and Lakhdar Sais</i> .....	281

**Session VIII A**

Difference Matching <i>David Basin and Toby Walsh</i> .....	295
--	-----

Using Middle-Out Reasoning to Control the Synthesis of Tail-Recursive Programs <i>Jane Hesketh, Alan Bundy and Alan Smaill</i> .....	310
---	-----

The Use of Proof Plans to Sum Series <i>Toby Walsh, Alex Nunes and Alan Bundy</i> .....	325
--	-----

Disproving Conjectures <i>Martin Protzen</i> .....	340
---	-----

**Session VIII B**

An Interval-Based Temporal Logic in a Multivalued Setting <i>Mathias Bauer</i> .....	355
---	-----

A Normal Form for First-Order Temporal Formulae <i>Michael Fisher</i> .....	370
--	-----

Semantic Entailment in Non Classical Logics Based on Proofs Found in Classical Logic <i>Ricardo Caferra and Stéphane Demri</i> .....	385
--	-----

Embedding Negation as Failure into a Model Generation Theorem Prover <i>Katsumi Inoue, Miyuki Koshimura and Ryuzo Hasegawa</i> .....	400
---	-----

**Session IX**

Automated Correctness Proofs of Machine Code Programs for a Commercial Microprocessor <i>Robert S. Boyer and Yuan Yu</i> .....	416
--	-----

Proving the Chinese Remainder Theorem by the Cover Set Induction <i>Hantao Zhang and Xin Hua</i> .....	431
---	-----

Automatic Program Optimization Through Proof Transformation <i>Peter Madden</i> .....	446
--	-----

**Session X: Invited Talk**

Proof Search Theory and Practice in the (former) USSR (tentative) <i>Grigori Mints</i> .....	461
---	-----

**Session XI**

Basic Paramodulation and Superposition <i>Leo Bachmair, Harald Ganzinger, Christopher Lynch and Wayne Snyder</i> .....	462
---	-----

Theorem Proving with Ordering Constrained Clauses <i>Robert Nieuwenhuis and Albert Rubio</i> .....	477
---	-----

The Special-Relation Rules Are Incomplete <i>Zohar Manna and Richard Waldinger</i> .....	492
---	-----

An Improved Method for Adding Equality to Free Variable Semantic Tableaux <i>Bernhard Beckert and Reiner Hähnle</i> .....	507
--	-----

**Session XII A**

Proof Search in the Intuitionistic Sequent Calculus <i>N. Shankar</i> .....	522
--	-----

Implementing the Meta-Theory of Deductive Systems <i>Frank Pfenning and Ekkehard Rohwedder</i> .....	537
---	-----

Tactic-Based Theorem Proving and Knowledge-Based Forward Chaining: An Experiment with Nuprl and Ontic <i>Wilfred Z. Chen</i> .....	552
--	-----

Little Theories <i>William M. Farmer, Joshua D. Guttman and F. Javier Thayer</i> .....	567
---	-----

**Session XII B**

Some Termination Criteria for Narrowing and E-Narrowing <i>Jim Christian</i> .....	582
---	-----

Decidable Matching for Convergent Systems <i>Nachum Dershowitz, Subrata Mitra and G. Sivakumar</i> .....	589
---	-----

Free Sequentiality in Orthogonal Order-Sorted Rewriting Systems with Constructors <i>Delia Kesner</i> .....	603
--	-----

Programming with Equations: A Framework for Lazy Parallel Evaluation <i>R.C. Sekar and I.V. Ramakrishnan</i> .....	618
---	-----

**Session XIII**

<b>A Many Sorted Logic with Possibly Empty Sorts</b>	
<i>Anthony G. Cohn</i> .....	633
<b>Theorem Proving in Non-Standard Logics Based on the Inverse Method</b>	
<i>Andrei Voronkov</i> .....	648
<b>One More Logic with Uncertainty and Resolution Principle for it</b>	
<i>Konstantine Vershinin and Igor Romanenko</i> .....	663

**System Abstracts**

<b>A Natural Deduction Automated Theorem Proving System</b>	
<i>Li Dafa</i> .....	668
<b>Isabelle-91</b>	
<i>Tobias Nipkow and Lawrence C. Paulson</i> .....	673
<b>The Semantically Guided Linear Deduction System</b>	
<i>Geoff Sutcliffe</i> .....	677
<b>The SHUNYATA System</b>	
<i>Kurt Ammon</i> .....	681
<b>A Geometry Theorem Prover for Macintoshes</b>	
<i>Shang-Ching Chou</i> .....	686
<b>FRI: Failure-Resistant Induction in RRL</b>	
<i>Xin Hua and Hantao Zhang</i> .....	691
<b>Herky: High Performance Rewriting in RRL</b>	
<i>Hantao Zhang</i> .....	696
<b>IMPS: System Description</b>	
<i>William M. Farmer, Joshua D. Guttman and F. Javier Thayer</i> .....	701
<b>Proving Equality Theorems with Hyper-Linking</b>	
<i>Geoffrey D. Alexander and David A. Plaisted</i> .....	706

Xpnet: A Graphical Interface to Proof Nets with an Efficient Proof Checker <i>Jawahar Chirimar, Carl A. Gunter and Myra VanInwegen</i> .....	711
&: Automated Natural Deduction <i>Dave Barker-Plummer, Sidney C. Bailin and Andrew S. Merrill</i> .....	716
An Overview of FRAPPS 2.0: A Framework for Resolution-Based Automated Proof Procedure Systems <i>Tomás E. Uribe, Alan M. Frisch and Michael K. Mitchell</i> .....	721
The GAZER Theorem Prover <i>Dave Barker-Plummer and Alex Rothenberg</i> .....	726
ROO: A Parallel Theorem Prover <i>Ewing L. Lusk, William W. McCune and John Slaney</i> .....	731
RVF: An Automated Formal Verification System <i>T.C. Wang and Allen Goldberg</i> .....	735
KPROP - An AND-Parallel Theorem Prover for Propositional Logic Implemented in KL1 <i>Johann M.Ph. Schumann</i> .....	740
A Report on ICL HOL <i>K. Blackburn</i> .....	743
PVS: A Prototype Verification System <i>S. Owre, J.M. Rushby and N. Shankar</i> .....	748
The KIV System: Systematic Construction of Verified Software <i>Wolfgang Reif</i> .....	753
The Tableau-Based Theorem Prover $3T^AP$ for Multiple-Valued Logics <i>Bernhard Beckert, Stefan Gerberding, Reiner Hähnle and Werner Kernig</i> .....	758
Analytica - A Theorem Prover in Mathematica <i>Edmund Clarke and Xudong Zhao</i> .....	761
The FAUST-Prover <i>Klaus Schneider, Ramayya Kumar and Thomas Kropf</i> .....	766

**Eves System Description**

*Dan Craigen, Sentot Kromodimoeljo, Irwin Meisels, Bill Pase and Mark Saaltink* .... 771

**MGTP: A Parallel Theorem Prover Based on Lazy Model Generation**

*Ryuzo Hasegawa, Miyuki Koshimura and Hiroshi Fujita* .....776

**Problem Sets**

**Benchmark Problems in Which Equality Plays the Major Role**

*Ewing L. Lusk and Larry Vos* ..... 781

**Computing Transitivity Tables: A Challenge for Automated Theorem Provers**

*D.A. Randell, A.G. Cohn and Z. Cui* .....786

**Author Index** ..... 791