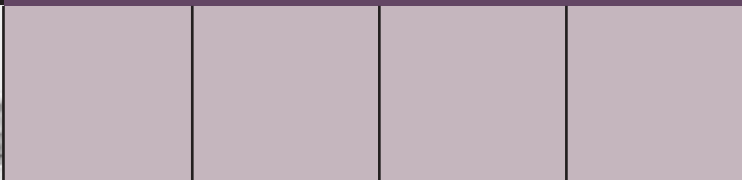
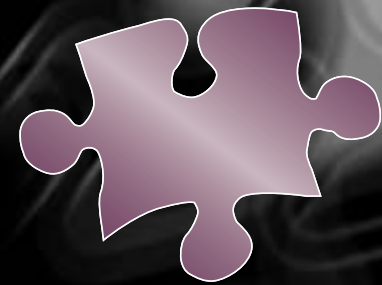




Institute for Logic,
Language and
Computation

Annual Report 2003



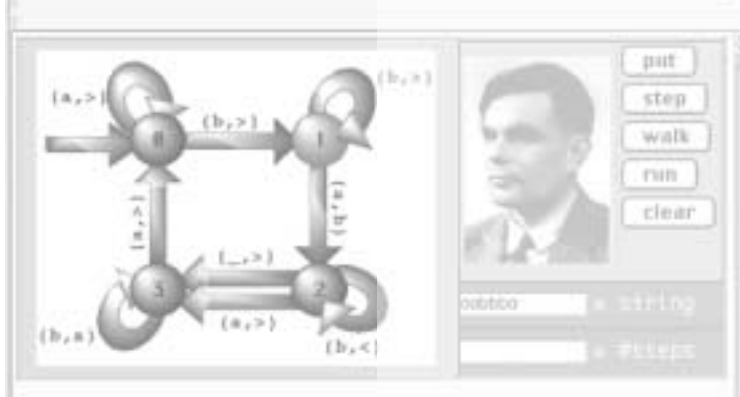
Rock, paper, scissors



	<i>Rock</i>	<i>Paper</i>	<i>Scissors</i>
<i>Rock</i>	0 0	1 -1	-1 1
<i>Paper</i>	-1 1	0 0	1 -1
<i>Scissors</i>	1 -1	-1 1	0 0



UNIVERSITEIT VAN AMSTERDAM



Institute for Logic, Language and Computation

Annual Report 2003

Amsterdam, April 2004

Plantage Muidergracht 24

1018 TV Amsterdam

Phone: +31 20 525 6051

Fax: +31 20 525 5206

E-mail: illc@illc.uva.nl

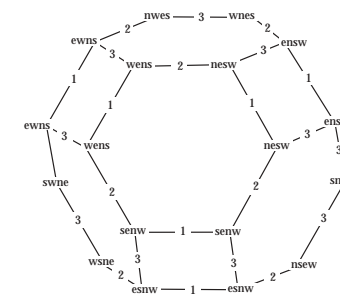
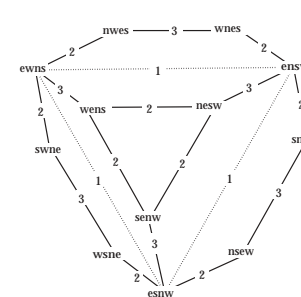
<http://www.illc.uva.nl>



INSTITUTE FOR LOGIC,
LANGUAGE AND COMPUTATION



UNIVERSITEIT VAN AMSTERDAM





Contents

Annual report 2003

5	General information
7	Scientific Staff, Students, Guests
10	ILLC in 2003: interdisciplinary and international
12	Fundamental Research
25	Feeling the mood
27	Education and communication
31	Feeling the mood
32	Facts, Figures and Thoughts
35	Appendices
35	1 Publications
43	2 Research Reports, Technical Notes and Master of Logic Theses
45	3 Workshops, Events
48	4 Other contributions
58	5 Contact information
60	6 Obtaining further information

General Information

Scientific mission

Information has become a crucial theme for scientific studies across many disciplines. Encoding, transmission and comprehension of information are the central topics of research at the Institute for Logic, Language and Computation (ILLC) of the Universiteit van Amsterdam. The broader context in which the ILLC sees itself is that of an information science that is concerned with information flow in natural and formal languages, as well as many other means of communication, including music and images of various kinds. Developing logical systems that can handle this rich variety of information, making use of insights across such disciplines as linguistics, computer science, cognitive science, artificial intelligence and philosophy are research aims at the ILLC. Whenever relevant, additional methods, ranging from statistics to argumentation theory, are actively pursued as well. In addition to its specific research goals, ILLC aims to overcome traditional borderlines between faculties and disciplines and serves as a rallying point for information scientists across computer science, linguistics, philosophy, and the social sciences. The resulting view of information science transcends the boundaries of the university. The ILLC is also committed to dissemination of its results into the broader world of general education, vocational training and industrial research.

Research projects

ILLC's research program is divided into projects oriented toward a particular subject matter. This division also reflects the way research is actually carried out. Projects cut across the various groups that make up ILLC. The 2003 project reports can be found in chapter 6.

1. Theory of Interpretation
2. Cognitive Systems and Information Processing
3. Constructive and Intensional Logic
4. Language and Inference Technology
5. Algorithmics and Complexity Theory

Participants in ILLC in 2003

Participating Faculties:

Faculty of Science
Faculty of Humanities
Faculty of Social and Behavioural Sciences

Scientific Advisory Board

Solomon Feferman (Stanford), Wilfrid Hodges (London), Hans Kamp (Stuttgart), Gordon Plotkin (Edinburgh), Jörg Siekmann (Saarbrücken)

Scientific director

Martin Stokhof

Deputy scientific director

Dick de Jongh

Managing director

Ingrid van Loon

Management support

Ria Rettob, Tanja Kassenaar, Marjan Veldhuisen, Marco Vervoort, Amanda Collins, Martijn Keeman

Graduate Program in Logic

Dick de Jongh (director), Benedikt Löwe (program coordinator), Peter Paul de Witte (program manager), Tanja Kassenaar (program manager)



Scientific Staff, Students, Guests

Annual report 2003

Faculty of Science

Senior Staff

Pieter Adriaans, Krzysztof Apt, Johan van Benthem, Reinhard Blutner, Rens Bod, Harry Buhrman, Peter van Emde Boas, Kees Doets, Theo Janssen, Dick de Jongh, Michiel van Lambalgen, Benedikt Löwe, Maarten de Rijke, Khalil Sima'an, Leen Torenvliet, Yde Venema, Paul Vitanyi

Postdocs

Massimo Franceschet, Lex Hendriks, Maarten Marx, Karin Müller, Detlef Prescher, Stefan Schlobach

PhD students

Nick Bezhanishvili, Boudewijn de Bruin, Caterina Caracciolo, Sjoerd Druiven, Juan Heguibehere, Aline Honingh, Gabriel Infante López, Valentin Jijkoun, Clemens Kupke, Troy Lee, Christof Monz, Brian Semmes, Yoav Seginer, Merlijn Sevenster, Börkur Sigurbjörnsson, Neta Spiro, Maarten Stol, Evangelos Tzanis

PhD students employed by CWI

Sebastian Brand, Willem Jan van Hoeve, Rudi Cilibrasi, Mart de Graaf, Steven de Rooij, Hein Röhrig, Robert Spalek

Associated researchers

Joop Niekus, Paul van Ulsen, Domenico Zambella, Jan van Eijck

Scientific Programmers

Loredana Afanasiev, Willem van Hage, Vera Hollink, Wouter Kuijper, Gilad Mishne, Breannán Ó Nualláin, Nanning Poelsma, Mark Theunissen

Emeritus

Anne Troelstra

Faculty of Humanities

Senior Staff

Renate Bartsch, Reinhard Blutner, Paul Dekker, Jeroen Groenendijk, Henkjan Honing, Karen Kwast, Michiel van Lambalgen, Remko Scha, Martin Stokhof, Frank Veltman, Henk Zeevat

Postdocs

Maria Aloni, Alastair Butler, Jaap Maat, Robert van Rooy

PhD students

Kata Balogh, Elsbeth Brouwer, Balder ten Cate, Marian Counihan, Hartmut Fitz, Darrin Hindsill, Rosja Mastop, Fabrice Nauze, Erik Rietveld, Marie Safarova, Katrin Schulz, Tine Wilde

Faculty of Social and Behavioural Sciences

Senior Staff

Michael Masuch

Postdocs

Jaap Kamps, Ivar Vermeulen

Emeritus

Rob Mokken

Graduate Program in Logic

Students 2001-2002 (completed the program in 2003)

MSc students

Fadillah Zulkarnaini Tala (Indonesia)

Students 2002-2003

MSc students

Loredana Afanasiev (Moldavia), Guillaume Aucher (France), Giosué Baggio (Italy), Be Birchall (Canada), Jill Cirasella (USA), Julia Grodel (USA), Tanja Hötte (Germany), Boaz Leskes (Israel), Gilad Mishne (Israel), Clive Nettey (United Kingdom), Thuy Linh Nguyen (Vietnam), Konstantinos Sarras (Greece), Oren Tsur (Israel), David Marc Wood (Canada/Netherlands), Chunlai Zhou (China), Andreas Zollmann (Germany)

Exchange students

Dirk Walther (Germany)

Students 2003-2004

MSc students

Ruben Boumans (Netherlands), Andrew Scott Buchan (USA), Ioanna Matilde Dimitriou (Greece), Jennifer Dorling (United Kingdom), Michael Franke (Germany), Spencer Gerhardt (USA), Brian Hagerty (USA), Jesse Aron Harris (USA), Samson Tikitu de Jager (New Zealand), Piotr Wojciech Labenz (Poland), Gustavo Lacerda de Melo (Brasil), Boaz Leskes, Fenrong Liu (China), Alexander Ma (Canada), Koen Martens (Netherlands), Teresita de Jesús Mijangos Martínez (Mexico), Henrik Lennart Nordmark (Mexico/Sweden), Brammert Ottens (Netherlands), Arjen Poutsma (Netherlands), Ji Ruan (China), Julie Anne Sleep (Australia), Charles David Spencer (USA), Reut Tsarfaty (United Kingdom), Reinier Zevenhuijzen (Netherlands)

Logic Year students

Inge Arnesen (Norway)

Exchange students

Jan Grue (Norway)

Contract Students

Caroline Foster

Guests/Guest PhD students

Stefan Bold (Germany), Felix Bou (Spain), Christine Foeldes (Germany), Evan Goris (Netherlands), Mary Hearne (Ireland), Ian Hodgkinson (United Kingdom), Rosalie Iemhoff (Austria), Joost Joosten (Netherlands), Barteld Kooi (Netherlands), Jori Mur (Netherlands), Fabio Paglieri (Italy), Marc Pauly (France), Darko Sarenac (USA), Jorge Petrucio Viana (Brasil), Guit-Jan Ridderbos (Netherlands), Joost Winter (Netherlands)



ILLC in 2003: interdisciplinary and international

Annual report 2003

The Universiteit van Amsterdam is not the only university employing many logicians, but it is unique in having them all work in one research institute. In other universities you may find logicians in institutes for Computer Science, Mathematics, Philosophy, and sometimes even in institutes for Linguistics. However, many of them work rather isolated and in the margin of their institutes, without much contact with logicians of other 'rival' departments. In the ILLC logicians with different backgrounds and orientations work together. All of them have strong ties with at least one other discipline. That is why, within the Universiteit van Amsterdam, the ILLC can serve as a bridge between the humanities, natural sciences and social sciences. It is also why the ILLC can take the lead in bringing researchers from different fields together to get new interdisciplinary activities off the ground. An example of the latter is supplied by the Cognitive Science initiative. Since 2002 the ILLC participates in the Centre for Cognitive Science (CSCA), a collaborative effort of biologists, psychologists, linguists, logicians and philosophers.

Teaching

The first target set by the CSCA was the development of an integrated master program in cognitive science, accessible for students with appropriate backgrounds in a variety of disciplines. In its first official year, 2003-2004, 22 students enrolled in the program.

The ILLC is not only active in the Master of Cognitive Science, but also in the Bachelor and/or Master tracks of Artificial Intelligence, Computer science, Mathematics, Philosophy, and Linguistics. On top of all this, the unique position of the ILLC, not just in the Netherlands but also in the world, makes it possible to offer a special Master program in Logic.

In the nation-wide transition to a bachelor-master system, the original one-year program had to be redefined and fitted into the new structure. The result is a curriculum of which ILLC has great expectations. We were all very curious to see how the extension from a one-year to a two-year program would influence the attractiveness for foreign students. In the summer of 2003 it became clear what the answer to this question was: positive! A record number of 26 students started the new master program in September 2003. Five students are from the Netherlands, five from the USA, two from China, two from Norway, and two from the United Kingdom, whereas Australia, Brazil, Canada, Germany, Greece, Israel, Mexico, New Zealand, Poland, and Sweden supply one student

each. Clearly, the wide range of courses in logic and its applications ILLC has to offer attracts students from all over the world.

Research

The two spearheads identified in ILLC's long term research program, namely relations with cognitive science and computation-oriented research, are by now firmly established as distinctive elements of ILLC's research profile. In the latter field the high level of second stream funding in 2003 was maintained. In NWO's open competition two three year post-doc projects were obtained by the Language and Inference Technology group, one on 'Inference for Temporal Question Answering', and one on 'Learning Stochastic Tree Grammars from Tree-Banks'. In cognitive science hopes are high for the final round in NWO's cognition program. Six applications with members from the ILLC as (co-)applicants made it to this round. In the spring of 2004 it will become clear how many of these will be funded. In NWO's vernieuwingsimpuls 2003 Maria Aloni was awarded a VENI grant for her project on 'Semantic Structure and Dynamics in Natural Language Interpretation', while Harry Buhrmann got a prestigious VICI grant to continue his work on 'Quantum Information Processing'. The NWO's Leraar in Onderzoek program has extended Joop Niekus's work on Choice Sequences in the work of Brouwer for two years. All in all, 2003 was a very successful year for the ILLC in second stream funding. More than 50% of the research carried out at the ILLC is now funded by outside sources. This means that a main ambition of the ILLC Research Plan 2001-2004 has been attained.

Third stream funding however remains at a modest level. As things stand now, we will not be able to reach the 10% set as a target for 2004. It remains very difficult for theoretically oriented research to find industrial partners. All we can hope for is that EU's 7PK program will offer more opportunities for basic research than 6PK or 5PK did.

The year 2003 was a year of awards. The two most prestigious ones were given to Paul Vitanyi and Johan van Benthem. Starting January 1st, Paul Vitanyi was appointed CWI Fellow. This enables him to concentrate full-time on his research. The Universiteit van Amsterdam honoured Johan van Benthem with an appointment as a University Professor on October 1st to 'further interdisciplinary research in the field of information science and cognitive science'. As will become clear in the following chapters, the numbers of refereed publications, invited talks and other types of scientific output continue to be at

high levels. ILLC researchers were engaged in the organization of a remarkably high number of international scientific events, another fact that testifies to the international reputation that many of them have.

Administration

As for administrative affairs, we can repeat most of what was said last year. Being part of three faculties, with three different types of financial organization, human resources management, employment regulations, and so on, creates a complicated and time-consuming environment in which ILLC's administrators have to operate. All parties have acknowledged that this situation needs to be remedied, as it hampers effective employment of resources. But very little has been done about it. This is a problem that needs to be solved, and it can be, if only the people responsible are willing to allow a few deviations of general rules and procedures here and there.

The year 2003 was the last full year of Martin Stokhof's directorship. This chapter is written by his successor, who is well aware of the fact that he still has a lot to learn before he can do this kind of thing as well as Martin did - and writing chapters in annual reports is just one of the many things Martin did very well.

Frank Veltman



Fundamental Research: Project reports

Annual report 2003

1. Theory of Interpretation

Project Leaders

Jeroen Groenendijk, Martin Stokhof

Characterization

The project investigates logical and philosophical foundations of theories of interpretation. Its main goal is the development of tools for adequate interpretation of natural language, testing these against both empirical data as well as methodological and philosophical constraints.

Main Themes

The three main themes in the project are: *interpretation in conversation; cognitive aspects; philosophical backgrounds.*

Research on *interpretation in conversation* focuses on interpretation as a dynamic process in actual conversation. It builds on earlier research on the dynamics of interpretation at sentence level, applying the results of that research to phenomena that play a key role in the structuring of discourse, in particular of conversations. To this end the scope of existing formalisms is extended to cover multi-speaker exchanges. Relevant empirical phenomena that are studied here include question-answering, the structure of information in conversational exchange, and the use of mood and intonation. Increasingly the research in this theme makes use of decision theory and game theory in the analysis of the procedures which are used by rational communicative agents in both production and interpretation. This research has strong links with ongoing work on game theory and dynamic logic in the project Constructive and Intensional Logic. Central in the second theme, *cognitive aspects*, is the framework of 'dynamic conceptual semantics' (DCS), a formal model of the way in which concepts arise from (relatively) unstructured data. This model is closely connected with the data-oriented approach towards information processing used in the projects Logic and Cognitive Systems and Language and Inference Technology. Within the context of DCS the role of consciousness vis-à-vis the possibility of language in general and semantics in particular is investigated, using both connectionist, neural network based models of learning as well as more traditional approaches in terms of rules and representations. Currently, research is directed towards the

role of memory (general and specific historical memory) in the understanding of situations and linguistic utterances. Another central topic within the cognitive aspects theme is the study of metaphor, which raises important questions concerning the origins and the transfer of meaning, its dependence on context and background, and its relation to general cognitive processes of analogy and imagery.

Research on *philosophical backgrounds* involves coming to grips with the presuppositions and limitations of the kind of theories developed in the first two themes. Historical and philosophical analyses of various key notions used there also bring out connections with different paradigms. Topics addressed within this theme include the historical origins and subsequent development and employment of the notion of an ideal language; the historical backgrounds of modern intensional semantics, in particular that of the central principle of compositionality; the relevance of contemporary approaches in philosophy of language for theoretical frameworks in linguistic semantics.

Researchers

Maria Aloni, Renate Bartsch, Alastair Butler, Paul Dekker, Jeroen Groenendijk, Theo Janssen, Jaap Maat, Robert van Rooy, Martin Stokhof.

PhD Students

Kata Balogh, Elsbeth Brouwer, Balder ten Cate, Erik Rietveld, Marie Safarova, Tine Wilde.

External Cooperation

In the Netherlands there is cooperation with researchers in Utrecht and Tilburg. Further cooperation involves researchers in Berlin, Bogota, Brussels, Frankfurt, Helsinki, Los Angeles, Nancy, New York, Osnabrück, Oxford, Stanford, and Stuttgart.

2003

Research within the first theme, interpretation in conversation, saw several interesting developments. In the NWO and KNAW projects 'Formal Language Games' and 'Games, Relevance and Meaning' questions, topicality, presupposition and contextual restriction have been studied further. Focus has

been on the particular ways in which such linguistic means guide linguistic agents in structuring information in context, and the way in which that fits in with their rational activities and decision making. Although the subjects themselves are relatively well-established, the approaches taken are new, in that they adopt a general perspective on both formal (syntactic, prosodic) and pragmatic (conversational) aspects, while paying due attention to the cognitive and social nature of rational agents. Methodologically, the connections between dynamic semantics, game theory, and decision theory have been furthered; empirically the scope of the work has been extended with a number of constructions, such as polar questions, question declaratives, exhaustification, free choice disjunctions, intentional reference, apparent scope island violations, and negative polarity items. One of the major successes was the publication of Butler and Mathieu's book on Split Constructions with Palgrave.

In the second theme, cognitive aspects, the general structure of memory (general memory and specific memory, including episodic memory) as a capacity of conceptualisation of new experiences and of reconstruction of previously experienced episodes has been modelled in the form of an architecture of neuronal fields. The formation of general and individual concept has been illustrated by examples from Proust's novel 'A la Recherche du Temps Perdu'. The work on metaphor, that has been concerned with an in-depth study of implications of current theories of concept formation for the role of imagination and imagery in the construction and understanding of metaphor, has been completed with a dissertation (Brouwer 2003).

In the third theme, philosophical backgrounds, the study of Leibniz's work on rational grammar has progressed. Furthermore, the collaboration with the University of Oxford in designing a web based resource for teaching and research in intellectual history ('Tulip') was continued. Research on Hintikka's logic for information independence has been broadened to other, related logics. Also, in collaboration with Caicedo (Bogota) and Dechesne (Tilburg) several results were obtained concerning a generalisation of Hintikka's original system: it was shown that the traditional prenex normal form theorems do not hold and that renaming of bound variables is allowed only under special conditions. Work on the relationship between contemporary approaches in philosophy of language and theoretical frameworks in linguistic semantics was continued. Some results concerning the philosophical presuppositions of the central role of compositionality will be published in 2004, as will be results concerning the role of Wittgenstein's concept of 'perspicuous representation' in his remarks on colour.

2004

Within the first theme, interpretation in conversation, research on the logical formalization of game-theoretic concepts is furthered. The integration of dynamic semantics and theories of question-answering and topic/focus will be pursued, and more in particular the structure of information and strategic inquiry will be investigated from both an internal (qualitative) and external (quantitative) perspective. Internally, we will apply the model of information structure and exchange developed in the previous year, which can be used to assess the rationality assumptions of inquisitive dialogues. Philosophical foundations of such theories are tested by investigating how and to what extent the evolution and use of natural language relies on a balance between cognitive (rationality) and social (conventional) aspects and these will be tested in collaboration with colleagues in Brussels. Apart from these more pragmatic aspects of the theory of interpretation and information exchange, prosodic issues such as intonational features of questions and declaratives remain high on the agenda.

Work in the second theme, cognitive aspects, will continue with an investigation of the special role of the episodic memory in experiencing new situations and in understanding and taking up linguistic utterances. Here, too, Proust's text will be used to provide exemplifications. A new project in this theme, that will get underway in 2004, will be concerned with the analysis of the phenomenon of 'situated expertise', specifically addressing the question how phenomenological analyses (such as those of Merleau-Ponty, Dreyfus and Wittgenstein) relate to experimental results obtained in the cognitive (neuro)sciences.

In the third theme, philosophical backgrounds, the work on Leibniz and rational grammar will be completed. It is expected that the Tulip web site will be on line in the summer of 2004. Research concerning properties of logics for incomplete information will be continued and possible applications of such logics in linguistics and philosophy of science will be investigated. Work on contemporary philosophy of language will focus on the philosophical implications of reductionism as a research strategy in semantics.

2. Cognitive Systems and Information Processing

Project Leaders

Michiel van Lambalgen, Remko Scha

Theme-descriptions

Cognitive approaches to tense and aspect (CS)

The starting point of this project is the conviction that semantic explanations must be informed by cognitive considerations. In particular, the semantics of tense and aspect is studied from the point of view of human event-coding and time-perception (or rather construction).

Psychology of reasoning (CS)

The emphasis here is on cognitive-psychological investigations of logical reasoning, investigating the relation with mental functions such as long term memory, working memory and planning.

Discourse and Optimality Theory (CS)

Modelling semantic phenomena which involve discourse and context has always been an important strand within this project. Much of our recent work in this area is based on the tenets of the so-called 'radical pragmatics' school. Since linguistic meanings severely underdetermine the content (proposition) expressed by an utterance, there must be a pragmatic mechanism of completion; we conjecture that this mechanism is an optimization procedure, whose properties may be articulated in the general framework of bi-directional Optimality Theory.

Data-Oriented Parsing (IP)

A central theme in this project is the development of a performance model of natural-language processing, called Data-Oriented Parsing (DOP). This model de-emphasizes the problem of delimiting the class of 'grammatical' sentences. Instead, it assumes an overgenerating competence grammar, and focusses on the problem of statistical disambiguation. A data-oriented parsing system employs a large corpus of annotated utterances as a representation of its 'past language experience', and makes its parsing decisions on the basis of statistics about arbitrarily large subtrees from this corpus.

Gestalt Perception (IP)

Visual and musical Gestalt perception is often modelled on the analogy with the syntactic disambiguation of linguistic utterances: the class of possible structures is defined by a ‘grammar’, and a disambiguation criterion selects the structures that are actually perceived. Disambiguation criteria may be structural or statistical (‘simplicity’ or ‘likelihood’). Our work in this area expands the scope of this approach in various ways: new formalisms are developed to represent visual and musical structures; the statistical disambiguation methods of Data-Oriented Parsing are brought to bear on the perception of such structures; and new syntheses between probabilistic and simplicity-based approaches are explored.

Music Cognition (IP)

Not all properties of music are directly subsumed by general considerations of structural Gestalt perception. We treat some of these as research themes in their own right. An important ongoing topic, studied in collaboration with NICI in Nijmegen, is the perception and categorization of temporal properties of music, such as rhythm, timing and tempo. We also investigate the mathematical basis of tuning systems.

*Research in 2003**Cognitive approaches to tense and aspect (CS)*

Together with Fritz Hamm (Tübingen), van Lambalgen wrote a monograph entitled ‘The proper treatment of events’ (to appear with Blackwell, 2004) which provides a fully computational formalism for tense and aspect, based on the idea that the linguistic expression of tense is determined by the cognitive properties of the human planning system.

Psychology of reasoning (CS)

This is research performed in the context of the NWO-subsidized program ‘Logic meets psychology: nonmonotonicity’. Keith Stenning and van Lambalgen submitted an article to *Cognitive Science* on the relation between logical reasoning and working memory. Experimental research focussed on autistic patients, and yielded information about deviant reasoning patterns, most likely due to failures in executive function. Together with researchers at the F.C. Donders Institute in Nijmegen, an application was submitted to NWO to investigate brain correlates of reasoning, in both normal and autistic subjects.

Discourse and Optimality Theory (CS)

Continuing earlier research, the framework of bidirectional Optimality theory has been applied to the domain of semantics and pragmatics (conversational implicature). A book ‘Optimality Theory and Pragmatics’ (Blutner and Zeevat) has been published in 2003, and a second book project has been started. It has the working title *Optimal Forms and Meanings* and is joint work with Helen de Hoop (Nijmegen) and Petra Hendriks (Groningen). The book provides an overview of recent developments in applying Optimality Theory to the domain of natural language interpretation.

The ongoing work on discourse particles naturally led into an effort to come to terms with speech acts, the linguistic notion of markedness and the evolutionary formation of oppositions. Other investigations were concerned with the meaning of contrastive intonation, and with word order freezing. A new line of work on typology and semantics has been prepared.

Data-Oriented Parsing (IP)

In cooperation with the Language and Inference Technology project, Scha started to investigate the statistical foundations of probabilistic treebank-grammars such as Data-Oriented Parsing. At the same time, the work on non-probabilistic (‘simplicity-based’) DOP continued, and was integrated with the probabilistic approach, yielding satisfying results on benchmark-corpora. Work towards more efficient algorithms also continued. In particular, the use of Minimum Description Length criteria for compressing subtree-sets was investigated, with promising results. A DOP-based model for machine translation was successfully tested on two bilingual corpora (Homecentre and Verbmobil) and extended with a bootstrapping technique for inducing structure. We co-edited two books in this area: a comprehensive overview volume of Data-Oriented Parsing, and a general textbook on Probabilistic Linguistics.

Gestalt Perception (IP)

In the NWO innovation impulse project ‘Towards a Unifying Model of Linguistic, Musical and Visual Processing’, awarded to Bod, the Data-Oriented Parsing model was extended to melodic and metrical parsing (in music), linear pattern parsing (in vision), and scientific reasoning (in physics). Psychological experiments were carried out to investigate the role of various musical principles and their interaction with (probabilistic) memory in the perception of musical phrase structure. Our research on visual Gestalt perception took a turn towards real-world applications in a project on corporate style management, carried out in

cooperation with Premsele (Dutch Design Institute) and some large companies. This project aims at generative algorithms which support semi-automatic document generation and online definition of graphic styles and sub-styles.

Music Cognition (IP)

In 2003 Honing's research was concerned with the study of categorization in rhythm perception, and the influence of temporal context (such as meter or tempo). Furthermore, a project on the possible relation between music and motion was initiated. Is there a true perceptual experience of movement when listening to music, or is it merely a metaphorical one owing to associations with physical or human motion? The NWO-PIONIER project 'Music, Mind, Machine' (part of the KU Nijmegen and UvA) was finalized. A final report and CD-Rom were published.

Group theory was investigated as a general underlying model for just intonation in music. A new model of approximating consonant intervals was developed which improves over existing models.

Researchers

Remko Scha, Michiel van Lambalgen, Frank Veltman, Henk Zeevat, Reinhart Blutner, Rens Bod, Henkjan Honing, Karen Kwast

PhD students

Marian Counihan, Hartmut Fitz, Darrin Hindsill, Aline Honingh, Rosja Mastop, Fabrice Nauze, Arjen Poutsma, Katrien Schulz

External cooperation

NICI (Nijmegen), Max Planck Instituut (Nijmegen), Premsele Institute for Dutch Design (Amsterdam), CSLI (Stanford), Stanford University (Stanford), Xerox PARC (Palo Alto), FX PAL (Palo Alto), Potsdam University (Germany), Utrecht University, Tokyo University of Agriculture and Technology, Tübingen University (Germany), Edinburgh University.

Plans for 2004

(CS) In the area of tense and aspect, the main focus will be on an application of the model of 'The proper treatment of events' to Polish and Hebrew, to see

whether the proposed formalism is sufficiently universal. Concerning psychology of reasoning, the emphasis will be on finishing the monograph 'Human reasoning and cognitive science', co-authored by Keith Stenning (Edinburgh).

(IP) The existing lines of research will be continued, but some of them will be increasingly integrated. In particular, the time seems to be ripe for comparing and integrating Data-Oriented Parsing and Optimality Theory as alternative approaches to the overdetermined nature of syntactic structures in natural language. Also, the evolutionary approaches developed in our work on discourse particles may be extended to integrate concepts from Data-Oriented Parsing. There will be a new emphasis on the conceptual foundations of probabilistic approaches and the justification of estimation techniques. Also, the relation between probabilistic and deterministic memory-based approaches will be further investigated. We will continue to seek practical applications of our models, for instance, in machine translation, information extraction, and visual processing.

3. Constructive and Intensional Logic

Project Leaders

Johan van Benthem, Dick de Jongh

Characterization

This project continues a long-standing Amsterdam tradition in mathematical logic, going back to the chairs of Brouwer in the foundations of mathematics and of Beth in general logic. One major interest has always been constructivism, which is represented by research on intuitionistic logic and formal provability in theories of various kinds. These lines fit well with the second and third stream of the project, the mathematical theory of modal logic and the mathematical theory of games. Both technically and in their broader inspiration, the three main ‘trademarks’ of mathematical logic at Amsterdam meet in their efforts to create a general framework describing the logical fine-structure of reasoning and information flow.

Main Themes

Mathematical theory of modal logic

Our general goal is to obtain a deeper understanding of the properties of modal formalisms by embedding modal logic in its wider mathematical environment. Modal languages are designed to strike a balance between reasonable expressive power and manageable computational complexity. An in-depth study of this trade-off links modal logic with areas like automata theory, and (finite) model theory. Algebraic logic, the study of systematic connections between logic and classes of algebras, is another key perspective for understanding modal logic: our investigations center around questions of correspondence, duality and canonicity. And finally, a promising recent perspective on modal logic that we are taking on modal logic is that of coalgebra, the study of state-based systems in their most abstract form.

Dynamic logics of information and interaction

Modal logics are well-suited for analyzing knowledge, action and communication in systems with many agents. We study a wide range of modal systems for information update and interaction, aiming for a framework combining broad coverage with elegant mathematical foundations. This type of

research involves new connections between logic, process theories in computer science, and in particular, economic game theory. Signals in such processes can be symbolic, but also visual. As a subsidiary interest, we also study modal languages for spatial structures.

Mathematical foundation of the theory of games

It is well-known that the concept of a game is useful for social sciences and in economics, and it has been via game theory that mathematical methods have been strongly introduced to these sciences. But there has also been a strong interaction between foundational work in mathematical logic and the theory of games. Mathematical models have been used to get effective techniques to handle large classes of games, and in the other direction, games have also been used to understand the foundations of mathematics better. One important interest of recent years has been the analysis of more liberal game concepts: imperfect information games, many player games, games with uncertainty, and others.

Foundations of Mathematics

Historically, logic is strongly connected to philosophical questions about the foundations of mathematics. Philosophical questions about the nature of mathematics have been raised by Brouwer’s intuitionism in the early twentieth century, and are being raised in our time. Non-classical logics (including logics with intensional semantics) and set theory play an enormous role in the analysis of these philosophical questions, both as tools and examples.

Researchers

Johan van Benthem, Kees Doets, Jan van Eijck, Lex Hendriks, Dick de Jongh, Benedikt Löwe, Joop Niekus, Anne Troelstra, Yde Venema

PhD students

Nick Bezhanishvili, Boudewijn de Bruin, Clemens Kupke, Yoav Seginer, Brian Semmes, Evangelos Tzaniis

Support Staff

Paul van Ulsen

External cooperation

Academic external collaborations involved Abramsky (Oxford; England), Andreka (Budapest), Andretta (Torino; Italy), Artemov (Moscow), Baltag (Oxford), Beklemishev (Moscow), Béziau (Neuchâtel; Switzerland), Bezhanishvili (Las Cruces NM), Brendle (Kobe; Japan), Bromand (Bonn; Germany), Chikoidze (Tbilisi; Georgia), D'Agostino (Udine; Italy), van Ditmarsch (Otago; New Zealand), Esakia (Tbilisi), Gabbay (London), Gehrke (Las Cruces NM), Goldblatt (Wellington; New Zealand), Halbeisen (Belfast), Harding (Las Cruces NM), Hodkinson (London), van der Hoek (Liverpool; England), Huertas (Barcelona), Jackson (Denton TX), Jansana (Barcelona), Kanazawa (Tokyo), Koepke (Bonn), Kurz (Leicester; England), Manzano (Salamanca; Spain), McCarthy (Stanford CA), Mints (Stanford CA), Möllerfeld (Münster; Germany), Montagna (Siena; Italy), Moss (Bloomington IN), Müller (Bonn), Nemeti (Budapest; Hungary), Parikh (New York), Pauly (Toulouse; France), Pattinson (München; Germany), Pohlers (Münster; Germany), Policritti (Udine), Priestley (Oxford), Renardel de Lavalette (Groningen), Sandu (Helsinki), Shoham (Stanford CA), Siekmann (Saarbrücken; Germany), Stanley (San Jose CA), Schröder (Bonn); Väänänen (Helsinki; Finland), Verbrugge (Groningen), Visser (Utrecht), Weiermann (Münster), Welch (Bristol; England), Wolter (Liverpool) and Zambella (Torino).

Members of the group were involved with a large number of national and international initiatives, organizations and events, among them Advances in Modal Logic (AiML); the Association for Symbolic Logic (ASL) and its European Summer Meeting 'Logic Colloquium'; Foundations of the Formal Sciences (FoFS); Hybrid Logic (HyLo); the European Association for Logic, Language and Information (FoLLI); Methods for Modalities (M4M); the interdisciplinary research group 'Wissensformate' at the Rheinische Friedrich-Wilhelms-Universität Bonn; several handbook projects ('Handbook of Modal Logic' and 'Handbook of the Philosophy of Information').

*2003**Mathematical theory of modal logic*

Van Benthem gave a syntactic characterization of the class of first-order formulas that allow a natural mathematical notion of minimization with respect to a given predicate, and applied this result to find significant extensions of modal frame correspondences beyond Sahlqvist axioms to properties definable

in fixed-point logics. Van Benthem, Ten Cate and Sarenac worked on generalizing the idea of modal products to a setting of hybrid logic and geometrical modalities (e.g., betweenness and convexity). An international cooperation involving Patrick Blackburn, Maarten Marx, Petrucio Viana, Bezhanishvili, Sarenac and Ten Cate dealt with many issues in hybrid logic (interpolation, completeness, model-theoretic characterizations, complexity, satisfiability preserving translations from hybrid logic to modal logic).

De Jongh and Bezhanishvili studied the 2-universal model of intuitionistic propositional calculus IPC and characterized all exact formulas in two variables in this model. Together with Ian Hodkinson, Bezhanishvili proved that every normal extension of S5-squared is finitely axiomatizable and every proper normal extension is NP-complete.

A Master's student of De Jongh, Evan Goris, studied the extension of ILM with a predicate expressing Sigma-1-ness. He proved that the system does not have the interpolation property, which is surprising. He established modal and arithmetic completeness for the system.

In cooperation with Goldblatt and Hodkinson, Venema displayed examples of canonical modal logics that are not determined by any elementary class of Kripke frames. This result, the proof of which uses insights from graph theory, solved an outstanding open problem in modal logic, which was raised by K. Fine in 1973, when he proved that conversely, every elementary frame class determines a canonical logic. Goldblatt, Hodkinson and Venema in fact showed that there are continuum many canonical logics that are not elementarily determined, yet have the finite model property; and that some of them are even decidable. Related to this is a result that Venema obtained with Gehrke and Harding. They proved that the converse of Fine's theorem does hold for varieties of Boolean algebras with operators that are closed under taking MacNeille completions. This result is a corollary to another result of the same researchers, namely that any variety of lattice expansions that is closed under taking MacNeille completions, is also closed under taking canonical extensions.

In cooperation with Hansen, Kurz, Pattinson, Venema and others, Kupke further extended the scope of the coalgebraic perspective on modal logic by carrying earlier work on duality for Stone coalgebras far beyond the Vietoris polynomial case, and making a case study into neighborhood semantics. Venema clarified the coalgebraic nature of the link between fixpoint logics and parity automata.

Dynamic logics of information and interaction

Van Benthem gave a comparative analysis of the notions of information structure and flow in epistemic logic ('information as range') versus these same notions in situation theory ('information as correlation'), making them compatible in terms of various kinds of modal product operations. Together with Barteld Kooi (Groningen), he found a complete explicit axiomatization for the epistemic update logic of public announcement with common knowledge, using a new binary modality of relativized common knowledge. He also extended his earlier epistemic analysis of solution concepts for strategic games in terms of iterated update and inflationary fixed points to deal with extensive games. The resulting system was presented as an invited lecture at the third 'Logic, Games and Social Choice' conference in Siena. To obtain a more realistic account of multi-agent action planning, this analysis needs to be integrated with a similar account of belief revision, for which a promising proposal was made in the Master of Logic thesis of Guillaume Aucher, supervised by Van Benthem and van Ditmarsch (Otago). Meanwhile, contacts continue with the Inigma project at ILLC concerning computational complexity of game logics, while new contacts have been made with the experimental game theory centre CREED in Amsterdam to test logical systems against actual human performance.

Van Benthem also wrote several programmatic papers on the agenda of logical dynamics, discussing the trajectory from basic update logics and belief revision theory to game logics and dynamical systems. He also lectured on these topics in Los Angeles, Siena, Copenhagen, and Amsterdam.

As for modal logics of space, Van Benthem collaborated with Bezhanishvili, Ten Cate and Sarenac to show that $S4+S4$ is a complete axiomatization of modal logics for products of topologies, extending the analysis of modal frame products by Gabbay and Shehtman. This work was presented at two international workshops on spatial reasoning organized by these authors, in Bloomington and Amsterdam. A question incited by this work was recently solved by Löwe and Sarenac.

Van Benthem also started three new book projects related to ILLC research. One is a Handbook of Modal Logic with co-editors Patrick Blackburn (Nancy) and Frank Wolter (Liverpool), the second an anthology on Logics of Space with co-editors Marco Aiello (Trento) and Ian Pratt-Hartmann (Manchester), and the third project is a Handbook of the Philosophy of Information with co-editor Pieter Adriaans (ILLC).

Yoav Seginer studied a simple algorithm that learns context-free grammars from structured examples using the most frequent contexts of subtrees. This led to a characterization of new learnable classes of context-free grammars. He presented this work at a workshop on learning context-free grammars at ECML 2003 in Dubrovnik.

Mathematical foundation of the theory of games

One particular class of games whose logical strength has been investigated is the class of Blackwell games (the Axiom of Blackwell determinacy was introduced by Marco Vervoort in 1995). Building on work of Martin, Neeman and Vervoort, Löwe has continued the investigation of the Axiom of Blackwell determinacy and proved equivalence theorems for different versions of the axiom (thereby exactly computing the strength of the so-called 'Axiom of blindfolded Blackwell determinacy', a problem that has been open for several years), and proved the first global structural consequence of the axiom.

Other liberalizations of the game concept in the study of infinite games include the number of players: Löwe has proved several versions of Gale-Stewart theorems for open and closed games with more than two players, and found some interesting applications in the theory of graph games. During a visit in Torino, Löwe worked with Andretta on games with eraser moves, and he developed an algorithmic theory of higher set theory under the Axiom of Determinacy together with Jackson when he was visiting the University of North Texas in October 2003. This is in connection to the project 'Determinacy and Combinatorics', funded by the NWO and the DFG (Deutsche Forschungsgemeinschaft) in their international bilateral program (Principal Investigators: Van Benthem, Koepke [Bonn], and Löwe). The PhD student Stefan Bold is currently visiting Jackson in Texas for one year and working on applications of Jackson's description theory.

Games also play a role in the investigation of the non-monotonic procedures as Infinite Time Turing Machines or Revision Theory of Truth (with applications in philosophy). In joint work with Möllerfeld and Welch (in which some technical results on parameters are proved), Löwe also discussed the possibility of game semantics for these non-monotonic definability theories.

Boudewijn de Bruin continued his investigations on the epistemic and rationality assumptions of game theoretical solution concepts. He developed an axiomatic logical proof system for uniform representation of the major

mathematical characterization results for normal form games. As a result, he found a new version of Iterated Strong Weak Dominance. A similar logical analysis was given for extensive games. These formal results will be the technical core of the projected dissertation, which also underlies the next and final stage in 2004, viz. philosophical investigations into the applicability of game theory in the social sciences.

Foundations of Mathematics

As one of the corresponding members of the 'Wissensformate' research group in Bonn, Löwe has been dealing with the philosophical questions of changing the formats of mathematical knowledge: from informal knowledge as used in communication between mathematicians to formal and formalized knowledge as used in logic and computer science. This large and important complex of topics was discussed in Löwe's work from several angles: with the linguist Schröder, Löwe discussed linguistic questions about the usage of mathematical phrases in everyday mathematical language, with the philosophers Bromand and Müller, Löwe discussed general questions about mathematical knowledge and mathematical knowledge attribution. This research was also done in connection with Hubert Dreyfus' visit to the Amsterdam Philosophy Department.

In addition to this, Löwe has been working on naturalistic arguments for axiom systems in mathematics. He published a second note on this in the journal 'Philosophia Mathematica' and is working on technical problems connected to this with Mack Stanley (San Jose CA).

Some Project Highlights

Johan van Benthem was appointed University Professor at the University of Amsterdam, with the task of furthering interdisciplinary contacts in the area of information and cognition. He opened the Academic Year with a university-wide lecture on 'De Kunst van het Kennis Maken' ('The Art of Getting Acquainted').

The conference series 'Foundations of the Formal Sciences', an interdisciplinary series organized by Benedikt Löwe, had its fourth meeting in Bonn, in February 2003 (topic: 'The history of the concept of the formal sciences'). The highly valuable proceedings volume of the second conference appeared in February 2003 (Kluwer Academic Publishers).

2004

Van Benthem plans to complete his monograph on Logic in Games, which was delayed by several new paper projects and publications in 2003, as well as a popular book on mathematical methods 'Hoe Wiskunde Werkt' ('How Mathematics Works'; together with Robbert Dijkgraaf). With colleagues from Bonn, Van Benthem, De Bruin and Löwe will be organizing the fifth conference in the series 'Foundations of the Formal Sciences' with the highly relevant topic 'Infinite Games' (November 2004 in Bonn).

The work on games with more than two players and on Blackwell games is just the beginning of a large scale investigation of more general game concepts and their infinitary versions planned by Löwe. In 2004, he will continue this investigation with broader classes, involving the international cooperation (in particular Andretta in Torino, the logic group at the University of North Texas [Jackson and Tiftickjian], and the researchers in Bonn and Münster).

The investigation of the 2-universal and n-universal models model of IPC continues. The study of the intermediate logic of the Rieger-Nishimura ladder will be undertaken by Bezhanishvili aided by Hendriks. Hendriks is also studying adding new connectives to intuitionistic propositional logic in the line of anticipation. It turns out that there is a relation with logics developed by Kutsnetsov. Segerer is developing a parser that learns to parse incrementally using experiments on available corpora, this is in cooperation with Adriaans and linguists from the OTS. Sarenac intends to continue the research on geometrical modalities.

Venema will continue his investigations in the mathematical theory of modal logic. On the algebraic side, he will, with students and other collaborators, undertake a more comprehensive study of MacNeille completions of lattice expansions, and try to further exploit the new insights on canonicity. Venema's coalgebraic investigations will be aimed at bringing the existing links between (modal) fixpoint logics and automata theory at a more general level, and at exploiting the coalgebraic nature of these link; this research will be carried out in cooperation with Kupke and Rutten.

4. Language and Inference Technology

Project Leaders

Michael Masuch, Maarten de Rijke

Characterization

Research within the Language and Inference Technology (LIT) group is aimed at developing and studying the computational, linguistic, statistical and logical underpinnings of effective ways of providing intelligent information access. Addressing the latter task requires synergy between AI-research, IR-techniques, and natural language processing. Our leading methodology is to identify real-world scenarios that give rise to interesting research challenges. If possible we try to address such challenges from a broad spectrum of perspectives, ranging from foundational and theoretical to experimental.

Main Themes

The overall aim of the projects carried out within the Language and Inference Technology group is to put abstract theories to work with the aim of gaining insights in the algorithmic and representational aspects of language, information and communication.

Research activities within the Language and Inference Technology group fall under one or more of the following headings:

‘Information Retrieval’. Work under this heading covers topics such as spatial reasoning and image retrieval, semistructured data, cross-lingual retrieval, mono-lingual retrieval for European languages, question answering systems, knowledge representation, and the semantic web.

‘Applied Natural Language Processing’. This heading covers topics such as lexical semantics, parsing technologies, computational syntax and semantics, information extraction, robust generation of semantic representations, named entity tagging, and disambiguation.

Finally, work under the ‘Knowledge Representation and Reasoning’ heading includes semistructured data, constraint satisfaction problems, expressive power

and functionality of restricted description languages (including modal, description, and feature logic), proof and decision methods for modal-like logics, satisfiability testing for propositional and modal solvers; and automated reasoning.

Software: much of the research in the Language and Inference Technology group is aimed at understanding the computational behavior of language processing and inference techniques, especially in relation to their potential benefits for real world information processing tasks. As a consequence, there is a strong emphasis on implementation efforts. In 2003 we continued our development of the following software products:

- ETNA (Economische Toepassingen van Neurale Analyse), which is aimed at predicting economic features using neural networks.
 - FlexIR, a multi-lingual document retrieval system for Dutch, English, Finnish, French, German, Italian, Russian, Spanish, and Swedish. Various extensions have been created to address additional tasks such as question answering, domain-specific retrieval, web-retrieval, XML-retrieval, and novelty.
 - HyLoRes, an automated theorem prover for hybrid logics based on direct resolution.
 - The LoLaLi.net environment is a pilot aimed at exploring multiple ways of accessing online scientific resources.
 - MoTER, a testing environment for modal and modal-like logics that provides a convenient setting for the experimental analysis of modal provers, using a variety of test sets.
 - Tequesta, a corpus-based question answering system.
 - Webstraction, a tool for analyzing Internet discussion sites on a daily basis, attempting to measure general views, attitudes and opinions.
 - ‘WordNet Visualization Scripts’, a set of scripts for visualizing the structure of the WordNet lexical database.
- In addition, new development work started on
- Quartz, the new multi-stream incarnation of the group’s question answering system, available in Dutch and English language versions
 - Xcheck and XMChecker, tools that implement an approach to XPath query evaluation that is based on model checking.

Researchers

Krzysztof Apt, Massimo Franceschet, Jaap Kamps, Maarten Marx, Michael Masuch, Rob Mokken, Karin Müller, Detlef Prescher, Maarten de Rijke, Stefan Schlobach, Khalil Sima'an.

PhD students

Sebastian Brand, Caterina Caracciolo, Juan Heguiabehere, Willem Jan van Hove, Gabriel Infante-López, Valentin Jijkoun, Christof Monz, Börkur Sigurbjörnsson, Maarten Stol, Petrucio Jorge Viana, Ivar Vermeulen.

Support Staff

Loredana Afanasiev, Willem van Hage, Vera Hollink, Wouter Kuiper, Gilad Mishne, Breannán 'O Nualláin, Nanning Poelsma.

Grants

Research in the Language and Inference Technology group is largely funded by external sources. Continuing the stream of successful grant submissions of previous years, several project proposals were approved during 2003.

External cooperation

Academic external collaborations involved Alechina (Nottingham), Becher (Buenos Aires), Bernardi (Bolzano), Blackburn (Nancy), Demri (Paris), Fisher (Liverpool), Fundulaki (Bell Labs), Gabbay (London), Gardent (Nancy), Lutz (Dresden), Hiemstra (Enschede), Montanari (Udine), Moortgat (Utrecht), Muthukrishnan (Rutgers), de Nivelle (Saarbrücken), Ohlbach (München), Sattler (Dresden), Schlingloff (Berlin), Striegnitz (Saarbrücken), de Vries (CWI), UC Berkeley (Haas School of Business), Technion Haifa, Stanford University, IMS Stuttgart, University of Manchester, Liverpool University, and Imperial and King's College, London. Industrial collaborations involved Bolesian, Elsevier Science, IBM, IRION, Xerox Europe, Unilever.

Members of the group were involved with a large number of national and international initiatives, organizations and events, including the Association for Computational Linguistics (ACL); Association for Computing Machinery

(ACM); Advances in Modal Logic (AiML); the Association of Logic Programming (ALP); Belgian-Netherlands Artificial Intelligence Conference (BNAIC); Computer Aided Deduction (CADE); Cross-Language Evaluation Forum (CLEF); CologNET; Dutch Information Retrieval Workshop (DIR); the European Association for Computational Linguistics (EACL); the European Conference in Artificial Intelligence (ECAI); ERCIM; Hybrid Logic (HyLo); the European Association for Logic, Language and Information (FoLLI); Inference in Computational Semantics (ICoS); Initiative for the Evaluation of XML retrieval (INEX); Methods for Modalities (M4M); WOLLIC; and the ACM Special Interest Group in Information Retrieval (SIGIR).

2003

Within the 'Information Retrieval' theme, network analysis of data on the Internet search engine market was used to validate a formalization of the organizational theory of resource partitioning. Multidimensional scaling techniques were used to analyse the structure of lexical databases; this resulted in robust measures for extracting emotive or affective meaning, which have been put to use for Internet opinion polling. There was extensive work on retrieval methods for (non-English) European languages and on domain-specific collections, which was evaluated as part of the CLEF evaluation campaign, and which lead to a survey paper in the *Information Retrieval Journal*. Work on corpus-based question answering, web-based retrieval, and locating new information was evaluated as part of TREC. The research into retrieving XML-documents was evaluated within the INEX initiative. Finally, there was continued development work on the infrastructure of and content for a prototype implementation of a glossary based browser for the 'Handbook of Logic and Language'. At the 2003 edition of the Initiative for the Evaluation of XML Retrieval (INEX), the LIT group's submissions were the top scoring ones, for all tasks. Christof Monz defended his PhD thesis on document retrieval in the context of question answering.

The 'Applied Natural Language Processing' theme featured work on statistical models of natural language processing, as well as their application for question answering technologies. There were continued investigations into probabilistic parsing; there were investigations into machine learning of stochastic feature structure grammars from phrase-structure tree-banks. Further research went into dependency parsing and into robust extraction of semantic representation from phrase-structure tree-banks. There is an ongoing project on developing a

Hebrew Tree-Bank within a project on corpus-based analysis of Hebrew. Development of the Quartz question answering system lead to experiments with complementary methods, with a special focus on methods that exploit data redundancy; in addition, and still within the setting of question answering, there was work on named entity extraction, part-of-speech tagging, and question parsing, for both Dutch and English.

In the 'Knowledge Representation and Reasoning' line, there has been research on new modal languages, such as hybrid logics and description logics, and their applications to semantic web languages as well as languages for reasoning about semistructured data, telecommunications, medical terminologies, and mobile systems. In the area of logic and constraints there was work on a denotational semantics for first-order logic that captures the two-level view of the computation process typical for constraint programming, and on efficient schedulers for rules in the context of rule-based constraint programming. And in the area of semistructured data there was work on query evaluation, mediation, and expressive power. In collaboration with colleagues at the Academisch Medisch Centrum (AMC) work continued on support tools for developing terminologies, such as debugging, explanation, and summarization. In December, Juan Heguiabehere defended his PhD thesis on toolboxes for dynamic first-order logic and for modal logic.

2004

The principal research activities of the LIT-group in 2004 will continue to be driven by real-world problems and evaluation tasks that we will address in a multifaceted way. This will include developing, adapting and extending state-of-the-art technology from NLP, Semistructured data, and Information Retrieval, experimental evaluation and user-studies, as well as investigating the theoretical properties of the problems and the solutions at hand.

5. Algorithms and Complexity Theory

Project Leaders

Peter van Emde Boas, Leen Torenvliet

Characterization

The algorithmic approach is a unifying paradigm between alpha, beta and gamma disciplines. From this perspective the potential domains and application areas of research in complexity are numerous and range from fundamental issues in quantum computing to questions in biology, cognitive psychology and planning and scheduling. The main themes of the project are algorithmic methods, complexity analysis and programming methodology. Specific subjects are quantum information processing, computational learning (focusing on grammar induction, cognition and AI), network algorithms, computational complexity theory, descriptive complexity and its applications and computational game models.

Main Themes

Quantum coherent computation is a new field of research that has attracted an increasing number of computer scientists and physicists over the last 10 years. In the last years evidence has arisen that the proposed coherent quantum computers may be (and for some tasks are) intrinsically much faster than classical computing devices. Aside from this potential for technological development these models are also of theoretical interest as they may lead to the solution of open problems in complexity theory, but also to increased understanding of quantum phenomena in nature.

A central theme in machine learning is the so-called 'Minimum Description Length Principle', which states that any regularity in any given set of data can be used to compress these data. The more regularity, the more compression. A specific example investigated involves learning context free grammars from positive examples.

A main theme in the study of algorithms is Kolmogorov complexity. Research in complexity theory focuses on reductions and completeness notions. In distributed computations and network models problems like mutual search and naming conventions in networks are investigated.

The recent field of computational game models aims at bridging the conceptual gap between the anthropomorphic conceptions invoked in agent theory in AI and object technology on the one side and traditional computational models on the other. Modeling imperfect information of agents turns out to be the major bottleneck.

Researchers

Pieter Adriaans, Harry Buhrman, Peter van Emde Boas, Leen Torenvliet, Paul Vitanyi

PhD Students

Rudi Cilibrasi, Sjoerd Druiven, Troy Lee, Steven de Rooij, Hein Roehrig, Merlijn Sevenster, Robert Spalek

External Cooperation

The cooperation with CWI is at the core of this project. Furthermore the coordination of the 5th European framework project Quantum Algorithms and Information processing RESQ including the NWO sponsored projects QC and QIP is centered at CWI (Buhrman). This framework involves eight European partners, three Canadian and one American. Buhrman obtained a VICI award from NWO. Vitanyi is site manager in the EU Network of Excellence QUIPROCONE which includes 35 sites. Finally, there are many long-term research relations with numerous institutes.

2003

Hein Roehrig completed his PhD thesis on the subject of quantum information theory and quantum computing (algorithms) and quantum computation.

Buhrman, with Fortnow and Roehrig, extended the notion of property testing to the quantum domain. Quantum property testing can be exponentially more efficient in terms of the size of the required sample space.

Buhrman and Torenvliet obtained new results on the subject of separating complexity classes using structural properties. They show that information on robustness properties of complete sets for EXPSPACE will separate known complexity classes.

Buhrman and Lee with Van Melkebeek worked on the problem of language compression. The issue is to invent coding systems where strings can be encoded with a description close to the optimal length (Kolmogorov Complexity) and yet can be decoded in nondeterministic polynomial time. A positive solution has been accepted for Complexity 2004.

Vitanyi, in cooperation with N. Vereshchagin, extended his research in a reconstruction of Kolmogorov's proposal from 1974 to found statistical theory on finite combinatorial principles, independent of probabilistic assumptions, invoking Kolmogorov's structure function. The resulting interpretation of the concept of sufficient statistics complements the traditional concept from the probabilistic world and leads to numerous applications in pattern recognition and learning theory.

Vitanyi's proposal for classification of objects from an arbitrary domain using Normalized Compression Distance as a measure for closeness was implemented by Cilibrasi in a tool which was successfully applied to many samples of data with surprisingly accurate results, when applied to music fragments, texts in natural language or genomes of various species of animals. The resulting toolkit CompLearn is now available on the web.

Vitanyi and Tromp presented the first explicit and currently simplest randomized algorithm for two process wait-free test-and-set. With Halder he resolved an intricate question in interprocess communication.

Torenvliet together with van Best, Kaart and Vree (TU Delft) developed methods for reconstructing parts of the internet graph from incomplete data and implemented algorithms for computing link delays from end-to-end delay measurements. These investigations are done in the framework of the continuing UMEEPI project, which is a cooperation between the Universities of Amsterdam and Delft, TNO research and RIPE-NCC.

In the Inigma project Sevenster investigated van Rooyens Signaling Game for non-literal use of language, an imperfect information game applied to linguistic. He also investigated a game theoretic based alternative semantics for the existential fragment of IF propositional logic which should provide an alternative approach towards Janssen's Uniform strategy approach.

2004

In the Inigma project concrete imperfect information games will be investigated, including games related to the update problem as studied within the project Theory of Interpretation. In cooperation with IKAT (Maastricht) and CREED (UvA- Economical Science) we intend to extend our research into a more experimental direction (both involving simulations and human game playing).

The UMEEPI project on measuring and modeling data traffic on the Internet, started by Leen Torenvliet and Wim Vree (TUD), which is a cooperation between UvA, TUD, KPN-TNO research and RIPE-NCC, is continuing. Two PhD students in Delft are working on the project under the guidance of Leen Torenvliet and Wim Vree.

Buhrman will initiate his VICI project in 2004. The European Quantum project will be extended in the direction of experimental physics.

The main efforts in 2004 of the group based at CWI will be in the direction of quantum algorithmics and - communication research, in compression-based learning and applications, for example minimum description length and algorithmic statistics and the similarity metric applications, and in computational genomics.

Feeling the Mood

Khalil Sima'an

Brush Strokes of Language, Learning and Estimation

Now that the dust of the decade-long discussion on probabilistic vs. symbolic Computational Linguistics (CL) seems to have subsided, it is time to pose the question where does CL position itself among the neighboring fields. This challenging question triggers other specific questions such as: how does CL relate to Machine Learning (ML), and why has the former not become simply a tool-user from the latter?

And more radically, given that both fields seem to have moved towards statistical inference, what remains there to be explored beside mere statistics? And finally, what could these fields learn from one another? Rather than aiming at answering these questions, I aim here at drawing a picture, simply because pictures stimulate the imagination. This picture will definitely be static and represent the view from a specific angle. But aren't all pictures like that? So let us start with discussing ML and later come back to CL and the rest.

While initial work on ML explored primarily issues such as search strategies, logical resolution methods and neural network algorithms, nowadays ML is a field with better understood statistical foundations. Most recent learning algorithms, more often than not, rely directly on probability theory and statistics or are studied and scrutinized from such a perspective.

Despite the heavy import from Statistics, one issue remains inherent to ML: learners must operate in actual situations, where the amount of training material is always too small to justify the assumptions that underly statistical inference (e.g. convergence in the limit of the data). In fact, one could argue that the central problem for ML research is the problem of sparse-data (but isn't that true for most work on the automatic induction of predictive models?).

In the general learning setting, an instance model is selected from a space of hypotheses on the basis of its fit to the training data, and to prior expectations about future instances outside the training data. The latter element, i.e. expectation, necessarily involves prior knowledge of the nature of the problem, e.g. what representations and search strategies are suitable, and how future data deviates from the available data. Hence, it seems that, alongside statistical inference, ML mainly treats

two questions: (1) what a priori knowledge (heuristic representations and preferences) can be suitable for the task at hand, and (2) how to fit this knowledge in the best way into efficient learning algorithms.

In this general view, it is natural to think that statistical CL research should have developed within ML. As I argue next, from the outset, ML research did not put enough emphasis on complex cognitive problems, such as syntactic analysis (parsing). Therefore, its tools are too limited for this kind of problems.

Sometimes it seems that traditional CL research forever works on more advanced grammars, with all kinds of subtle variations, and moves farther away from building actual models of processing. From the ML perspective, one may claim that traditional, symbolic CL kept and keeps itself busy with inspecting, or even delimiting the space of grammars that are suitable for representing language. Only some will agree with this view. Yet, I believe that this view seems to echo part of the truth about the development of current research on probabilistic grammars in CL.

In any case, in recent years it became clearer that models of actual language processing will have to deal with two problems that traditional CL shied away from: the ambiguity and lack of robustness of grammatical formalisms. It is not a coincidence that both problems have kept more recent statistically-oriented research in CL busy. If language processing is observed within the learning viewpoint, both ambiguity and lack of robustness turn out symptoms of uncertainty: uncertainty with respect to the output and the input, respectively. To see this, observe that a grammar stands for prior knowledge which must deal with expectations of the future (unseen data) under incomplete knowledge (if only because of the lack of resources such as world knowledge). Probabilistic research in CL addresses these problems by taking the view that a language is a probability distribution (rather than simply a set) over utterances. From the learning perspective, the probabilistic approach, where probabilities are estimated using statistical inference, is a vehicle for expressing the kind of suitable learning methods, and for studying the kinds of probabilistic grammars, their statistical and empirical properties. In this view, as already mentioned, symbolic grammars can be taken to stand for important prior knowledge. The way these grammars are actually exploited within a learning approach is a completely different issue, which is beside the point here. It is intriguing that a simple shift from sets to distributions brings the issue of learning into the picture.

Let us now, finally, consider where probabilistic CL differs from ML research. Most ML research concentrated on learning classifiers that classify an instance into any of a finite set of classes. Markov Models notwithstanding, the development of proba-

bilistic grammars has largely been limited to CL research. I will argue here that the research in ML has been too constrained to provide suitable solutions to many, hard CL problems. At the conceptual level, ambiguity constitutes the main problem aimed at by probabilistic grammars in CL (as robustness demands similar mechanisms). In contrast, mainstream ML classification methods provide only an implicit, suboptimal treatment of ambiguity that occurs in the training data; ambiguity is often dealt with as if it were an unexpected/erroneous situation, and is resolved in multiple locally-informed, independent classification decisions. In addition to this conceptual difference, the majority of high level CL tasks pose technical problems that research on classifier learning completely ignores. What if the task involves classification into an infinite set of possible classes which is recursive in nature (e.g. parse-trees)? Current work on classifier learning, which assumes that instances are flat, fixed-length feature-vectors, and that classes constitute a finite (small) set of symbols, is far too limited to express problems such as parsing. The common view about parsing as recursive classification misses a crucial point: probabilistic parsing aims at optimizing the parse globally rather than making independent, local classification decisions.

It is of course for the sake of exercise that I confront CL and ML in this simplified manner. In recent years, various shallow tasks (involving small sets of classes like part-of-speech tagging) in CL have been solved, time and again, using classifier learning techniques borrowed from ML research. The issue here is to find out how the two fields differ, and how they can learn from one another. In my view, at this moment in time, the research in CL should establish the theoretical properties of its own developed learning algorithms. This is where ML, Speech Recognition and Statistics research may serve as a good resource. Whereas CL research needs to meditate over the sharp turn that it took more than a decade ago, the ML research faces the challenge of breaking the traditional constraints on the classification problems that are studied by mainstream work. There are interesting applications out there that demand this, and that are being studied in small, isolated fields. Just consider fields where prior knowledge can be expressed in complex formal systems such as language processing, bioinformatics, musical and visual modeling. Given the current discrepancy between ML and these related fields (especially CL), I feel that the following question is unavoidable: will ML research fully be consumed in applying existing methods to standard classification problems, or will it take the challenge that the new fields pose as a reason for possibly reconsidering what machine learning is about?



Education and Communication

Annual report 2003

Graduate Program in Logic

The Graduate Program in Logic is an international study program organized by the ILLC. It includes a PhD program, a MSc program, the 'Logic Year' program and the possibility for exchange or contract students to spend a semester/year at ILLC. It offers courses and research in foundations of mathematical and philosophical logic and their applications in computer science, linguistics and cognitive science.

After having had the same structure for 7 years, the program changed as of September 2003 as a result of general changes in the educational system in the Netherlands. This system is now fully compliant with the regular bachelor-master model used elsewhere in the world.

Master of Science program

The required background is at least a Bachelor's or equivalent degree in computer science, mathematics, philosophy or linguistics. All applicants require a strong academic record. Because the program is interdisciplinary, there is a lot of freedom in the students' choice of courses. Students receive a highly individualized program, developed in interaction with a personal study advisor, one of the ILLC faculty members.

Instead of a one year program (70 ECTS), in September 2003 the MSc program became a two-year curriculum. The full program, 120 ECTS, consists 90 ECTS course work and a MSc thesis (30 ECTS).

For advanced students, who obtained relevant qualifications in their earlier studies, it is possible to get exemptions for specific courses. Minimum requirements are the MSc-thesis (30 ECTS) and 30 ECTS of course-work. The better students should be able to do this in one year, following the so-called *advanced track*.

The 'Logic Year'

As of September 2003 the ILLC offers a one year program called the 'Logic Year'. The 'Logic Year' Program is 60 ECTS, and consists of course work (48 ECTS) and a short thesis (12 ECTS). It offers the same areas of specialization as

the MSc program. The program can be followed by advanced undergraduate students with at least two years of academic training in a relevant field, students who wish to earn extra credits abroad. After completion the student is awarded a certificate. Students in the 'Logic Year' program may, if they wish, switch to the MSc program after one year.

This program is the follow-up of the Certificate Program that was offered until September 2003.

Possibilities for contract/exchange students

Students with no intention of qualifying for a degree can also take courses for a shorter period of time, say for one course or one semester. This option can be of special interest to exchange and contract students.

PhD Program

As in most PhD programs, the work in the ILLC PhD program is divided into two parts. Firstly, the student acquires a fairly broad but rigorous working knowledge in the field of logic and its applications. The ILLC organizes this part of the PhD program in cooperation with the Dutch Graduate School in Logic (OZSL, see below). This school offers a national program of courses, colloquia, workshops and annual PhD conferences (all in English). Secondly, the student carries out original research and writes a dissertation under the guidance of two dissertation supervisors. During the first year of the program, the emphasis is on training. From the second year onwards, the emphasis is on research.

Results

On the whole of 2003 there were 40 MSc students. 17 students had started the program in 2002 or earlier. 23 students started September 2003. 7 students received their degree. In 2003 there were 2 exchange students. In 2003 ILLC had 40 PhD students. The following dissertations were successfully defended:

Barteld Kooi: *Knowledge, chance, and change.*

Elisabeth C. Brouwer: *Imagining Metaphors: Cognitive Representation in Interpretation and Understanding.*

Juan Heguibehere: *Building Logic Toolboxes*

Christof Monz: *From Document Retrieval to Question Answering*

PhD training and the OZSL

PhD training in the ILLC is organized in collaboration with the Dutch Graduate School in Logic (OZSL). After having been located in Amsterdam for more than 10 years, the seat of the OZSL was officially transferred to the Faculty of Philosophy of Utrecht University in 2003. Albert Visser, professor of logic at Utrecht University, is the OZSL's new scientific director. Under the guidance of the new director the OZSL has applied for a renewal of its status as an officially recognized 'onderzoeksschool' with the Royal Dutch Academy of Sciences (KNAW). A decision on this application is expected in the spring of 2004.

Partners in the Dutch Graduate School in Logic are:

- Tilburg University:
Faculty of Philosophy, Section Logic and Analysis of Language
Faculty of Arts, Section Computational Linguistics and Artificial Intelligence
- Rijksuniversiteit Groningen:
IWI, Institute for Mathematics and Computer Science
- Utrecht University:
OTS, Utrecht Institute of Linguistics
ZENO, Leiden-Utrecht Research Institute of Philosophy (chair)
- Universiteit van Amsterdam:
ILLC, Institute for Logic, Language and Computations
- Free University Amsterdam:
Faculty of Computer Science
- Universiteit Leiden:
ZENO, Leiden-Utrecht Research Institute of Philosophy (chair)

The National Research Institute for Mathematics and Computer Science in the Netherlands (CWI) is an associated institute. In addition there are individual associated members from various departments in mathematics, computer science, and philosophy of the universities of Nijmegen, Groningen, Eindhoven and Utrecht.

The Educational Program

The OZSL organizes one or two schoolweeks yearly, and a varying number of masterclasses throughout the year. These schoolweeks and masterclasses are attended by the majority of the PhD students associated with the school, and by a large number of the scientific staff.

The annual Schoolweek offers a broad range of tutorials on current topics, informal discussion sessions, up-to-date overviews of research carried out by PhD students and permanent staff, occasions for social interaction.

The OZSL is also involved in the organization of the European Summer Schools of Logic, Language and Information (ESSLLI), see below.

Due to administrative complications surrounding the transfer of the seat of the OZSL from Amsterdam to Utrecht, no schoolweek was organized in 2003. In 2004 the program will be back, with two schoolweeks: one in the spring of 2004 and one in the autumn. Further details about the OZSL can be found at <http://godot.phil.uu.nl/~pape/ozsl/about.php>

Communication and Contacts

Publications

The official publications of the institute encompass a series of research reports, a series of Master of Logic theses and a dissertation series. At the end of 2003, the ILLC dissertation series, which has been set up in 1993, contained 82 titles. In 2003 27 research reports (PP series) and 7 Master of Logic theses (MoL series) appeared. All theses and reports can be downloaded from <http://www.illc.uva.nl/Publications/> or ordered from the ILLC Bureau.

Communication and publicity

For internal and external communication and publicity, we use the following media:

- ILLC-list, a weekly electronic newslister
- The webpages of ILLC: <http://www.illc.uva.nl/>
- ILLC Magazine: a magazine for alumni
- Brochure MSc program in Logic

Colloquia

Regular meetings at which both ILLC-staff, students and visitors meet and exchange ideas and results, are one of the back-bones of the ILLC-community. The following series of colloquia, lectures and workshops, form the core of ILLC's activities in this area. Informal meetings on an ad-hoc basis complement them.

- The DIP Colloquium (semantics, discourse), bi-weekly
- Logic Tea
- Colloquium on Mathematical Logic
- The Language and Inference Technology Seminar

Workshops

In 2003, ILLC organized 28 local workshops and other conferences of which an overview can be found in appendix 3.

International Embedding

FoLLI

The Language and Inference Technology group at ILLC provides coordination for the European Association of Logic, Language and Information (FoLLI). During 2003 FoLLI's activities included:

- Organization of an Annual Summer School in Logic, Language and Information. The 15th Summer School was held in Vienna (Austria), in August.
- Publication of the FoLLI Newsletter, edited by Katrin Erk (newsletter@folli.org)
- Development of a FoLLI membership program (Raffaella Bernardi)
- Maintenance of the FoLLI and ESSLLI websites (Carlos Areces, Willemijn Vermaat)
- Development of long-term funding plans (Raffaella Bernardi, Maarten de Rijke, Hans Uszkoreit)
- Sponsoring of the Journal of Logic, Language and Information (JoLLI)
- Sponsoring of a series Studies in Logic, Language and Information (SiLLI) of lecture notes and monographs, published by CSLI

- Sponsoring of scientific events such as WoLLIC
- Sponsoring the ESSLLI Student Sessions (Malvina Nissim)
- Supporting the ESSLLI Standing Committee, and more generally, ensuring continuity of expertise concerning organisational aspects of ESSLLI (Willemijn Vermaat, Maarten de Rijke)
- Coordinating the E.W. Beth Best Dissertation Award (Natasha Alechina)

In 2003, the Executive Board of FoLLI had the following composition: Hans Uszkoreit (President), Phillippe Blache, Patrick Blackburn (editor-in-chief of the Journal), Dov M. Gabbay, John Nerbonne, Jörg Siekmann, Maarten de Rijke (managing editor of the book series and chair Standing Committee).

In 2003, the FoLLI bureau was run by Ria Rettob, while Maarten de Rijke served as Chief Executive Officer. In 2004 Raffaella Bernardi will take over as Chief Executive Officer, and the FoLLI Buro will move to Bolzano, Italy.

Feeling the Mood

Leen Torenvliet

Following the Footsteps of Post

Separating complexity classes is the holy grail of computational complexity theory. Ever since the first NP-completeness proof by Steve Cook in 1971, computer scientists have been trying to prove that P differs from NP, thus far without success. There is a hierarchy of complexity classes called the *fundamental hierarchy*, which is ordered by inclusion and whose members have cryptic names like $\text{LOGSPACE} \subseteq \text{NLOG} \subseteq \text{P} \subseteq \text{NP} \subseteq \text{PH} \subseteq \text{PSPACE} \subseteq \text{EXP} \subseteq \text{NEXP} \subseteq \text{EXPSpace} \subseteq \text{DEXP} \subseteq \text{DEXPH} \subseteq \text{DEXPSpace} \subseteq \dots \subseteq \text{ELEMENTARY}$. This hierarchy runs from classes of trivially solvable problems to classes consisting of problems whose most modest instances cannot be solved by any machine before the end of the universe. In this hierarchy there *must* be separations between classes that are some distance apart - so much we know, but very few adjacent classes are known to be different. All methods purporting to show a difference in complexity directly seem to be doomed to fail. This is so because there are almost always relativized worlds, extensions of the real world in which separations hold, and other extensions in which equalities hold. All methods that relativize in this manner are useless for proving separation, and most known methods relativize.

A similar situation occurred in computability theory in the previous century (1944). At the time every problem that was proven to be undecidable turned out to also be complete, i.e., as hard as the Halting problem. So, naturally, the question arose whether there exist problems of intermediate hardness.

This became known as Post's Problem, and it was solved in 1957 independently by Friedberg and Muchnik by explicit constructions of sets that are not reducible to each other and that can therefore neither be decidable nor complete. By that time it was more or less forgotten that Emil Post (1897-1954) had not only posed the problem, but also envisioned a way to solve it by structural means. This program, known as *Post's Program*, consisted of finding a property that all sets in one degree must have, whereas sets in another degree must lack it. If there exists such a property, the two degrees would be proved to be different, but not necessarily by explicit construction. In 1973, Degtev identified such a property. Unfortunately, Post never lived to see this solution. All his adult life he suffered from crippling manic-depressive disease, at a time when no drug therapy was available for this malady. Instead he was subjected to electric shock therapy, which at the time seemed to

help some of the patients suffering from this disease. Whether the electric shock therapy or the manic-depression influenced Post's scientific work can never be said with certainty. Fact is, that Post contributed many ideas to logic and mathematics. He proved Gödel's theorem in 1921 (10 years before Gödel did) and he invented a notion of a program called Post's machine in 1936 (10 years before von Neuman did). In 1944 he fathered the notion of *creative* sets whose existence justifies 'the generalization that every symbolic logic is incomplete and extendible relative to the class of propositions' which led to the much quoted remark: 'The conclusion is inescapable that even for such a fixed, well-defined body of mathematical propositions, mathematical thinking is, and must remain, essentially creative.' Quine, in 1954, attributed the concept of computable function to 'four mathematicians, one of which was Post.' At age of 57, Post died of a heart attack, which was almost certainly a direct consequence of the electric shock therapy he received. Post was at the time committed to a mental institution.

In the early nineties, we started a program similar to Post's program for the separation of complexity classes. We hope to identify structural properties that sets, in particular complete sets, in some complexity class have, and that complete sets in other complexity classes don't have. The properties we identified so far all have to do with the way in which information is stored in the set. These properties somehow give a measure of coherence of the set as a whole. They cannot be attributed to single members, but are spread throughout the set in a larger area. In a first paper, which appeared in 1993, we investigated the robustness of sets complete for exponential time. Robustness is a kind of redundancy in the structure of complete sets. The set remains complete if some parts of the complete set are left out. This robustness in some cases carries so far that a set might even be split into two or more sets, each of which stays complete under the given reduction. The latter property of complete sets was dubbed *mitoticity*. Both properties are strongly related to another property called *autoreducibility*. A set is autoreducible if membership for some string x can be decided by solving membership problems in the same set for strings *other* than x . This means that information about membership of x in the set is spread throughout the set and not just concentrated in this single string.

Over the years we discovered that classes high up in the hierarchy, around the double exponential levels behave *provably* different with respect to these properties than classes lower in the hierarchy. The complexity of these sets becomes so high, that individual members can carry a lot of information. Then sets can be constructed such that information about membership of a string in the set can no longer be found in the direct neighborhood of the string and thus a property like autoreduci-

bility is no longer a property of the set. This leaves interesting questions for the intermediate classes: if these classes behave the same as the classes higher up, then they must be different from the lower classes and if they behave the same as the classes below, then they must be different from the classes higher up. The proofs we gave all pass the test of non-relativizability. Moreover the results translate. The results obtained way up in the hierarchy have implications for complexity classes way down below and especially separations obtained way up imply separations down below between complexity classes that are central to our interest. Though the property itself (or the lack of it) does not translate to these lower classes, the separation *does*. A Post's program for complexity theory might be successful in proving complexity classes different and moreover give deeper understanding why they are. It might be quite a long program. We ourselves have already invested more than ten years in it, and we are not counting precursors of this program that encompass investigations into sparse sets. Thus the path is long and dark and hardly passable. However some light is shining on it, and we keep hoping that we will live to see the end of the journey. Structural properties that might, and in fact *must*, give the answer have been identified, and manic-depressive illness is no longer treated by electroshock therapy.

Facts, Figures and Thoughts

Input

The total ILLC staff grew during 2003 as much as 28%, from 49 to 63.5 FTE (=Full Time Equivalent). The increase in permanent staff (full, associate and assistant professors) is 12 %, from 15.5 to 17.5 FTE. This increase can be easily explained: in 2003 two assistant professors were appointed. The reasons for the considerable general increase are less unambiguous. Part of the reason lies in the fact that we have presented two categories of personnel that were not included in 2002. Firstly, there is a 4th category of funding; in this category you will find researchers and PhD students that do not receive a salary, or university scholarship, but fund their own research. Approximately three researchers/PhD students fall into this category. Secondly, we have also presented the five PhD students that are supervised by ILLC professors, will do their promotion at the ILLC, but are officially employed at the CWI (Centrum voor Wiskunde en Informatica). This leaves us with a growth of 4.5 FTE to be accounted for. An answer to this can be found in the number of PhD students (growth of 2.5 FTE) and other employees (growth of 2 FTE). Summarizing, the growth of 14.5 FTE is partly due to the fact of categories that were not presented last year (8 FTE) and partly due to a real increase in number of staff (6.5 FTE).

The relation of 1st, 2nd, 3rd and 4th 'geldstroom' is as follows: 1-1.2-0.04-0.13. Two things immediately catch the eye: the number of researchers funded by NWO is bigger than the number of researchers funded by the university. If we subtract the 5 PhD students employed by CWI the relation is exactly one on one! The second thing is that the number of staff funded by 3rd 'geldstroom' (industry, European funding etc) remains at the low level compared to previous years, despite the efforts to raise funding from the ICES-KIS program and 6th framework program of the European Commission.

Human Resource Input 2003							Research Input 2003						
	Funding	FGW	FMG	FNWI	CWI	Total		Funding	FGW	FMG	FNWI	CWI	Total
Full Professor	1	3.50		3.40		6.90	Full Professor	1	1.75		1.70		3.45
	2					0.00		2					0.00
	3			0.20		0.20		3			0.10		0.10
	4		0.20			0.20		4		0.20			0.20
Associate Professor	1	2.50	0.40	2.20		5.10	Associate Professor	1	1.25	0.30	1.10		2.65
	2					0.00		2					0.00
	3					0.00		3					0.00
	4					0.00		4					0.00
Assistant Professor	1	1.20		3.85		5.05	Assistant Professor						
	2					0.00		1	0.45		1.88		2.33
	3					0.00		2					0.00
	4					0.00		3					0.00
								4					0.00
Postdoc	1					0.00	Postdoc						
	2	4.93	0.67	5.77		11.37		1					0.00
	3					0.00		2	4.44	0.53	4.62		9.60
	4			0.20		0.20		3					0.00
								4			0.20		0.20
PhD student	1	3.92		4.83		8.75	PhD student	1	5.40		4.35		9.75
	2	4.00		9.75	5.83	19.58		2	3.60		8.85	5.83	18.28
	3			1.00		1.00		3			0.90		0.90
	4	1.00		0.87		1.87		4	1.00		0.87		1.87
Other	1		0.75	0.20		0.95	Other	1		0.00	0.00		0.00
	2			1.03		1.03		2			0.28		0.28
	3					0.00		3			1.33		1.33
	4			1.33		1.33		4					
		21.05	2.02	34.64	5.83	63.53			17.89	1.03	26.17	5.83	50.93

Output

The number of refereed publications (articles, books, edited volumes) decreased somewhat, from 151 to 133, making this an average of 2.6 of refereed publications per fte research. This figure is considerably lower than in 2002 (4.3) but we expect this to be a temporary drop, partly due to the fact that a high number of PhD students started their PhD studies in 2002 or were in the course of their first year. Also we had two PhD students who were out of the circulation for the full year due to illness. Another reason may be found in the fact that in previous years we have included the publications of the above described 'CWI PhD students' in our calculations, but did not include their research input.

The decrease in the number of refereed publications is also related to the considerable increase in non-refereed publications, such as technical reports, from 24 to 49. The number of dissertations shows a drop, but with the high number of PhD students present, this is expected to increase again in next years.

The number of talks grew slightly, from 157 in 2002 to 171 in 2003.

The number of editorships, program committee membership and scientific functions grew as well. The number of program committees is especially impressive (63 in 2003 compared to 39 in 2002). The number of international events organized shows a slight drop.

Scientific Output 2003

Refereed publications	125
Edited volumes	8
Technical Reports and other publications	49
Dissertations	3
Talks	171
Editorships	47
Program committee memberships	63
Scientific Functions	40
International Events Organized	28

Appendices

Annual report 2003

Appendix 1: Publications

ILLC Project: Theory of Interpretation

Refereed Publications

M.D. Aloni. Free choice in modal contexts. In *Arbeitspapiere des Fachbereichs Sprachwissenschaft*. University of Konstanz.

M.D. Aloni. On choice-offering imperatives. In P.J.E. Dekker and R.A.M. van Rooy, editors, *Proceedings of the 14th Amsterdam Colloquium*. ILLC-University of Amsterdam.

K. Balogh, J. Kleiber. Computational benefits of a totally lexicalist grammar. In Vaclav Pavel Mautner et al. Matousek, editor, *Text, Speech and Dialogue. Proceedings of the 6th International Conference TSD 2003*, number LNAI 2807 in Lecture Notes of Artificial Intelligence, Berlin, Springer-Verlag.

K. Balogh and G. Alberti. *Az eltűnt névelő' nyomában [After the disappeared determiner]*. In Márta Maleczki Büky, László, editor, *A mai magyar nyelv leírásának újabb módszerei 6. [New Methods in Description of Hungarian]*, volume VI, Szeged, University of Szeged.

K. Balogh, J. Kleiber, A. Viszket, G. Alberti. Total lexicalism and gasgrammars: A direct way to semantics. In Alexander Gelbukh, editor, *Proceedings of CICLing2003*, number N2588 in Lecture Notes in Computer Science, pages 37-48, Berlin, Springer-Verlag.

J.F.A.K. van Benthem and R.A.M. van Rooy. Connecting the different faces of information. *Journal of Logic, Language and Information*, 12(4): 1-4. Guest Editorial.

A.J. Butler. Predicate Logic with barriers and its locality effects. In M. Weisgerber, editor, *Proceedings of Sinn und Bedeutung 7, Arbeitspapier Nr. 114*, pages 70-80. Universität Konstanz, FB Sprachwissenschaft.

P.J.E. Dekker. Topical restriction and answerhood. In M. Weisgerber, editor, *Proceedings of the 7th Annual Meeting Sinn und Bedeutung*, pages 110-119, Konstanz, Universität Konstanz.

P.J.E. Dekker. Existential disclosure. In J. Gutiérrez-Rexach, editor, *Semantics: Critical Concepts in Linguistics, Volume VI*, pages 234-259. Routledge, London/New York.

P.J.E. Dekker. Meanwhile, within the Frege boundary. *Linguistics and Philosophy*, 26(5): 547-556.

J.A.G. Groenendijk. Questions and answers: Semantics and logic. In R. Bernardi and M. Moortgat, editors, *Proceedings of the 2nd CologNET-ElsET Symposium. Questions and Answers: Theoretical and Applied Perspectives*, pages 16-23. Utrecht Institute of Linguistics OTS.

T.M.V. Janssen. On the semantics of branching quantifier sentence. In P.J.E. Dekker and R.A.M. van Rooy, editors, *Proceedings of the 14th Amsterdam Colloquium*, pages 147-151, University of Amsterdam, ILLC.

R.A.M. van Rooy. Asserting to resolve decision problems. *Journal of Pragmatics*, 35:1161-1171.

R.A.M. van Rooy. Being polite is a handicap: Towards a game theoretic analysis of polite linguistic behavior. In M. Tenneholz, editor, *Tark 9: Theoretical Aspects of Rationality and Knowledge*.

R.A.M. van Rooy. Conversational implicatures and communication theory. In J. van Kuppevelt and R. Smith, editors, *Current and New Directions in Discourse and Dialogue*, pages 283-303. Kluwer.

R.A.M. van Rooy. Negative polarity items in questions. *Journal of Semantics*, 20:239-273.

R.A.M. van Rooy. Quality and quantity of information exchange. *Journal of Logic, Language and Information*, 12:423-451.

R.A.M. van Rooy. Questioning to resolve decision problems. *Linguistics and Philosophy*, 26:727-763.

R.A.M. van Rooy. Relevance and bidirectional OT. In K.R. Blutner and H.W. Zeevat, editors, *Pragmatics and Optimality Theory*, pages 173-210. Palgrave MacMillan.

R.A.M. van Rooy and M. Safarova. On polar questions. In R. Young and Y. Zhou, editors, *Proceedings of SALT 13*. CLC Publications, Cornell.

R.A.M. van Rooy and K. Schulz. Exhaustification. In H. Bunt et al., editor, *Proceedings of the 5th International Workshop on Computational Semantics*.

Edited Volumes and Books

B.D. ten Cate, editor. *Proceedings of the 8th ESSLLI Student Session*.

P.J.E. Dekker and R.A.M. van Rooij. *Proceedings of the 14th Amsterdam Colloquium*. ILLC/UvA, Amsterdam.

Dissertations

E.C. Brouwer *Imagining Metaphors: Cognitive Representation in Interpretation and Understanding*. PhD Thesis, ILLC, Dissertation Series DS-2003-02, Amsterdam.

Other Publications

K. Balogh. Közvetlen út a szemantikához [a direct way to semantics]. XXVI National Conference of Scientific Circles of Students, Hungary.

ILLC Project: Cognitive Systems and Information Processing

Refereed Publications

K.R. Blutner and G. Jaeger. Competition and interpretation: The german adverb wieder (again). In C. Maienborn, C. Fabricius-Hansen and E. Lang, editors, *Modifying Adjuncts*, pages 393-416. Mouton de Gruyter.

R. Bod. Do all fragments count? In *Natural Language Engineering*, 9(4): 307-323.

R. Bod. An efficient implementation of a new DOP model. In *Proceedings EACL'03*, pages 19-26.

- R. Bod. Extracting stochastic grammars from treebanks. In A. Abeille, editor, *Treebanks*, pages 333-350. Kluwer Academic Publishers.
- R. Bod. Introduction to probability theory and formal stochastic language theory. In R. Bod, J. Hay and S. Jannedy, editors, *Probabilistic Linguistic* pages 11-39. The MIT Press.
- R. Bod. Stochastic analysis of music. In *Proceedings UCM'2003*.
- R. Bod and R.J.H. Scha. A DOP model for phrase structure trees. In R.J.H. Scha, R. Bod and K. Sima'an, editors, *Data-Oriented Parsing*, pages 13-23. Stanford: CSLI Publications.
- R. Bod, M. van Zaanen and H. Honing. A memory-based approach to meter induction. In *Proceedings of the ESCOM*, pages 250-253. European Society for the Cognitive Sciences of Music (ESCOM).
- R. Bonnema and R.J.H. Scha. Reconsidering the probability model for DOP. In R.J.H. Scha, R. Bod and K. Sima'an, editors, *Data-Oriented Parsing*, pages 25-41. Stanford: CSLI Publications.
- M. Dastani and R.J.H. Scha. Languages for gestalts of line patterns. *Journal of Mathematical Psychology*, 47: 429-449.
- P. Desain and H. Honing. The formation of rhythmic categories and metric priming. *Perception*, 32(3): 341-365.
- P. Desain and H. Honing. Single trial erp allows detection of perceived and imagined rhythm. In *Proceedings of the RENCON workshop*, pages 1-4, Acapulco, Mexico.
- P. Desain, H. Honing, C.M. van Rijn and M.L.A. Jongsma, Evoked potentials to test rhythm perception theories. *Annals of the New York Academy of Sciences*, 999:180-183.
- P. Desain, H. Honing, C.M. van Rijn, K.M. Jenks, A.M.L. Coenen and M.L.A. Jongsma, AEP P300 modulation by two different temporal contexts in both rhythmically trained and nontrained subjects. *Journal of Cognitive Neuroscience*, A94(Suppl. S).
- H. Honing. The final ritard: on music, motion, and kinematic models. *Computer Music Journal*, 27(3): 66-72.
- H. Honing. Some comments on the relation between music and motion. *Music Theory Online*, 9(1).
- H. Honing, A. Patel, M. Sadakata, P. Desain and J.R. Iversen. An analysis of rhythm in japanese and english popular music. In *Proceedings of the Annual meeting of the Japanese Society for Music Perception and Cognition*, pages 1-4, Fukuoka. Japanese Society for Music Perception and Cognition (JSMPC).
- H. Honing, P. Desain and R. Timmers. Music performance panel: Nici / mmm position statement. In *Proceedings of the MOSART Midterm Meeting*, 03/12, pages 318-322, Copenhagen, Denmark. DIKU.
- A.K. Honingh. Measures of consonance in a goodness-of-fit model for equal tempered scales. In SuviSoft Oy Ltd, editor, *ICMC 2003: Boundaryless music*, pages 435-438.
- B. Indurkha, M. Dastani and R.J.H. Scha. Modeling analogical projection in pattern perception. *Journal of Experimental and Theoretical Artificial Intelligence*, 15(4).
- M.L.A. Jongsma, P. Desain, H. Honing, C.M. van Rijn and K.M. Jenks, Omission evoked potentials (OEPS) in rhythmically trained and non-trained subjects. *Journal of Cognitive Neuroscience*, B90(Suppl. S).
- R. Kaplan and R. Bod. A DOP model for lexical-functional grammar, pages 211-233. CSLI Publications.
- M van Lambalgen and F. Hamm. Event calculus, nominalisation and the progressive. *Linguistics and Philosophy*, 26:381-458.
- R.J. Mastop. Imperatives and tense. In P. Dekker and R. van Rooy, editors, *Proceedings of the 14th Amsterdam Colloquium*, number 14, pages 49-54.

M.J.B. Stokhof, F.J.M.M. Veltman and J. Groenendijk. Coreference and contextually restricted quantification. In J. Gutiérrez-Rexach, editor, *Semantics: Critical Concepts in Linguistics*, pages 283-302. Routledge Publishing Co., London. New York.

H.W. Zeevat. Particles: Presupposition triggers, context markers or speech act markers. In H.W. Zeevat and K.R. Blutner, editors, *Optimality Theory and Pragmatics*, pages 91-112. Palgrave MacMillan.

H.W. Zeevat. Markedness and economy on signs. In J. Spenader, editor, *Proceedings of Variation in Optimality Theories*. University of Stockholm, Linguistics Department.

H.W. Zeevat. The syntax semantics interface of speech act markers. In I. Kruyff-Korbayova, editor, *Proceedings of the Diabruck Workshop on Dialogue Semantics*. University of Saarbruecken, Saarbruecken.

H.W. Zeevat and K.R. Blutner. Editor's introduction: pragmatics in optimality theory. In H.W. Zeevat and K.R. Blutner, editors, *Optimality Theory and Pragmatics*, pages 1-24. Palgrave MacMillan.

Edited Volumes and Books

K.R. Blutner and H.W. Zeevat. *Optimality Theory and Pragmatics*. Palgrave/Macmillan.

S. Jannedy, R. Bod and J. Hay. *Probabilistic Linguistics*. The MIT Press.

R.J.H. Scha, R. Bod and K. Sima'an (eds.). *Data-Oriented Parsing*, Stanford: CSLI Publications.

Other Publications

J. de Bruin and R.J.H. Scha. Algoritmische architectuur is toegepaste toevalskunst. *Automatisering Gids*, April 2003.

J. de Bruin and R.J.H. Scha. Algoritmische kunst spot met museale waarden. In C. de Boer, editor, *Concrete Kunst & Mathematiek*. Mondriaanhuis, Amersfoort, October 2003.

J. de Bruin and R.J.H. Scha. Iedereen zijn eigen dj. *Automatisering Gids*, June 2003.

A.K. Honingh. Group theoretic description of just intonation. In *Creativity and science*. Seconda Universita degli Studi di Napoli, CD rom.

ILLC Project: Constructive and Intensional Logic

Refereed Publications

M. Aiello and J.F.A.K. van Benthem. A modal walk through space. *Journal of Applied Non-Classical Logic*, 12(3 & 4): 319-363.

J.F.A.K. van Benthem, G. Bezhanishvili, M. Aiello. Reasoning about space: The modal way. *Logic and Computation*, 13(6): 889-920.

J.F.A.K. van Benthem. *Categorical Grammar at a Cross-Roads*, volume Resource-Sensitivity, Binding, and Anaphora, pages 3-21. Kluwer Academic Publishers.

J.F.A.K. van Benthem. Conditional probability meets update logic. *Journal of Logic, Language and Information*, 12(4): 409-421.

J.F.A.K. van Benthem. Fifty years: Changes and constants in logic. In V. Hendricks and J. Malinowski, editors, *50 Years of Studia Logica*, *Trends in Logic*, pages 35-56. Kluwer Academic Publishers.

J.F.A.K. van Benthem. *Is there still Logic in Bolzano's Key?*, volume Bernard Bolzanos Leistungen in Logik, Mathematik und Physik, pages 11-34. Academia Verlag.

J.F.A.K. van Benthem. Logic and the dynamics of information. *Minds and Machines*, 13(4):503-519.

J.F.A.K. van Benthem. Logic games are complete for game logics. *Studia Logica*, 73:183-203.

- J.F.A.K. van Benthem. Structural properties of dynamic reasoning. In J. Peregrin, editor, *Meaning, the Dynamic Turn*, pages 15-31. Kluwer.
- J.F.A.K. van Benthem and R.A.M. van Rooy. Connecting the different faces of information. *Journal of Logic, Language and Information*, 12(4): 1-4. Guest Editorial.
- G. Bezhanishvili, M. Gehrke and J.F.A.K. van Benthem. Euclidean hierarchy in modal logic. *Studia Logica*, 75:327-344.
- N. Bezhanishvili and M.J. Marx. All proper normal extensions of s_5 -squared have the polynomial size model property. *Studia Logica*, 73:367-382.
- A. Kurz, C.A. Kupke and Y. Venema. Stone coalgebras. *Electronic Notes in Theoretical Computer Science*, 82.
- B. Löwe. A second glance at non-restrictiveness. *Philosophia Mathematica (III)*, 11:323-331.
- A. Mancini and D. Zambella. Recursive models of set theory. *Notre Dame J. Formal Logic*, 42(2):109-115, 2001.
- C. Piazza, G. Goguadze and Y. Venema. Simulating polyadic modal logics by monadic ones. *Journal of Symbolic Logic*, 68:419-462.
- T. Räscher, B. Löwe and W. Malzkorn, editors. *Foundations of the Formal Sciences II, Applications of Mathematical Logic to Philosophy and Linguistics, Papers of a Conference held in Bonn, November 10-13, 2000*, Trends in Logic 17. Kluwer.
- Y. Seginer. Learning context free grammars in the limit aided by the sample distribution. In M. van Zaanen, C. de la Higuera, P. Adriaans and J. Oncina, editors, *Proceedings of the Workshop and Tutorial on Learning Context Free grammars ECML/PKDD 2003*.
- E. Tzani, Collatz Conjecture: Properties and Algorithms. In *Proceedings of the 9th Panhellenic Conference & 1st Balcanic Conference in Informatics*.
- Y. Venema. Atomless varieties. *Journal of Symbolic Logic*, 68:607-614.
- Y. Venema. Representation of game algebras. *Studia Logica*, 75:239-257.

Other Publications

- J.F.A.K. van Benthem. *De kunst van het kennis maken*. brochure, Amsterdam University Press, September 2003.
- J.F.A.K. van Benthem. *Het abc van communicatie*. Verslag KNAW, Afdeling Natuurkunde, September 2003.
- J.F.A.K. van Benthem. *Wat drijft informatica onderzoekers?* NWO booklet National ICT Congress, September 2003.

ILLC Project: Language and Inference Technology

Refereed Publications

- K.R. Apt and S. Brand. Schedulers for rule-based constraint programming. In *Proceedings of ACM Symposium on Applied Computing (SAC)*, pages 14-21. ACM.
- K.R. Apt and P. Zoetewij. A comparative study of arithmetic constraints on integer intervals. In *Proceedings of the 2003 ERCIM/Colognet Workshop on Constraints*, MTA SZTAKI, Budapest, Hungary.
- C.E. Areces, P. Blackburn, B. Martinez Hernandez and M.J. Marx. Handling Boolean ABoxes. In D. Calvanese, G. de Giacomo, and E. Franconi, editors, *Proceedings of the 2003 Workshop on Description Logics (DL2003)*, pages 48-55.
- C.E. Areces, P. Blackburn, and M.J. Marx. Repairing the interpolation lemma in quantified modal logic. *Annals of Pure and Applied Logic*, 124:287-299.
- C.E. Areces and J. Heguiabehere. hGen: A random CNF formula generator for hybrid languages. In *Proceedings of Methods for Modalities 3*, September. Toulouse, France.
- R. Bernardi, V. Jijkoun, G.A. Mishne, and M. de Rijke. Selectively using linguistic resources throughout the question answering pipeline. In *2nd CoLogNET-ElsNET Symposium*.
- N. Bezhanishvili and M.J. Marx. All proper normal extensions of s_5 -square have the polynomial size model property. *Studia Logica*, 73:367-382.

- P. Blackburn, B. Gaiffe, and M.J. Marx. Variable free reasoning on finite trees. In *Proceedings of Mathematics of Language (MOL-8)*, Bloomington.
- P. Blackburn and M.J. Marx. Constructive interpolation in hybrid logic. *Journal of Symbolic Logic*, 68(2):463-480.
- J. Bruggeman, G. Carnabuci, and I.E. Vermeulen. A note on structural holes theory and niche overlap. *Social Networks*, 25:97-101.
- S. Brand, R. Gennari, and M. de Rijke. Constraint programming for modelling and solving modal satisfiability. In Francesca Rossi, editor, *Proceedings of Principles and Practice of Constraint Programming (CP)*, volume 2833 of LNCS, pages 795-800. Springer-Verlag.
- S. Brand and E. Monfroy. Deductive generation of constraint propagation rules. In J.L. Giavitto and P.E. Moreau, editors, *Electronic Notes in Theoretical Computer Science (ENTCS)*, volume 86. Elsevier.
- S. Brand. A note on redundant rules in rule-based constraint programming. In B. O'Sullivan, editor, *Recent Advances in Constraints*, volume 2627 of LNAI, pages 109-120. Springer-Verlag.
- S. Brand, R. Gennari and M. de Rijke. Modelling modal satisfiability in constraint logic programming. In *Proceedings of 8th ERCIM WGC Workshop*.
- L. Buratto and K. Sima'an. Backoff DOP: Parameter Estimation by Backoff. In V. Matousek and P. Mautner, editors, *Proceedings of the International Conference on Text, Speech and Dialogue (TSD'03)*, *Lecture Notes in Artificial Intelligence (LNAI 2807)*, pages 35-42, Ceske Budjovice, Czech Republic.
- M. Franceschet and M. de Rijke. Model checking for hybrid logics. In *Proceedings of the Workshop Methods for Modalities*, pages 109-124.
- M. Franceschet, M. de Rijke, and B.H. Schlingloff. Hybrid logics on linear structures: expressivity and complexity. In *Proceedings of the International Symposium on temporal representation and reasoning - International Conference on Temporal Logic*. IEEE Computer Society Press.
- I. Fundulaki and M.J. Marx. Mediation of XML Data through Entity Relationship Models. In *Proceedings of the 1st International Workshop on Semantic Web and Databases*, Berlin, Germany, September 2003.
- S. Fissaha, D. Olejnik, R. Kornberger, K. Müller, and D. Prescher. Experiments in German treebank parsing. In *Proceedings of the 6th International Conference on Text, Speech and Dialogue (TSD-03)*, Ceske Budejovice, Czech Republic.
- M. Hearne and K. Sima'an. Structured parameter estimation for lfg-DOP by backoff. In R. Mitkov and N. Nicolov, editors, *Proceedings of the International Conference on Recent Advances in Natural Language Processing, Tzigov Chark, Bulgaria*.
- E.M. Heemskerk, R.J. Mokken and M. Fennema. From Stakeholders to Shareholders. Corporate Governance Networks in The Netherlands 1976-1996. *SSRN Electronic Paper Collection*.
- W.J. van Hoeve. A hybrid constraint programming and semidefinite programming approach for the stable set problem. In *9th International Conference on Principles and Practice of Constraint Programming (CP'03)*, volume 2833 of LNCS, pages 407-421. Springer Verlag.
- W.J. van Hoeve. A hybrid constraint programming and semidefinite programming approach for the stable set problem. In *5th International Workshop on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems (CP-AI-OR'03)*, pages 3-16.
- V. Jijkoun. Finding non-local dependencies: Beyond pattern matching. In Sandra Kübler Kotaro~Funakoshi and Jahna Otterbacher, editors, *Proceedings of the ACL-2003 Student Research Workshop*, pages 37-43.
- V. Jijkoun, J. Kamps, G.A. Mishne, C. Monz, M. de Rijke, S. Schlobach and O. Tsur. The University of Amsterdam at TREC 2003. In *TREC 2003 Working Notes*. National Institute for Standards and Technology.
- V. Jijkoun, G.A. Mishne and M. de Rijke. Building infrastructure for Dutch question answering. In A.P. de Vries, editor, *Proceedings DIR2003*.

V. Jijkoun, G.A. Mishne and M. de Rijke. Preprocessing documents to answer Dutch questions. In *Proceedings BNAIC'03*.

V. Jijkoun, G.A. Mishne and M. de Rijke. The University of Amsterdam at qa@clef 2003. In C. Peters, editor, *Working Notes for the CLEF 2003 Workshop*.

J. Kamps, M. de Rijke and B. Sigurbjörnsson. The University of Amsterdam at INEX 2003. In *INEX 2003 Workshop Proceedings*.

J. Kamps, M. de Rijke and B. Sigurbjörnsson. Topic Field Selection and Smoothing for XML Retrieval. In A. P. de Vries, editor, *Proceedings of the 4th Dutch-Belgian Information Retrieval Workshop*, pages 69-75. ILLC.

J. Kamps, C. Monz and M. de Rijke. Combining evidence for cross-language information retrieval. In C. Peters, M. Braschler, J. Gonzalo and M. Kluck, editors, *Advances in Cross-Language Information Retrieval*, volume 2785 of *Lecture Notes in Computer Science*, pages 111-126. Springer.

J. Kamps, M.J. Marx, M. de Rijke, and B. Sigurbjörnsson. The Importance of Morphological Normalization for XML Retrieval. In N. Fuhr, N. Gövert, G. Kazai and M. Lalmas, editors, *Proceedings of the 1st Workshop of the Initiative for the Evaluation of XML Retrieval (INEX)*, pages 41-48. ERCIM Publications.

J. Kamps, M.J. Marx, M. de Rijke and B. Sigurbjörnsson. XML retrieval: What to retrieve? In C. Clarke, G. Cormack, J. Callan, D. Hawking and A. Smeaton, editors, *Proceedings of the 26th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval*, pages 409-410. ACM Press, New York NY.

J. Kamps, C. Monz, M. de Rijke and B. Sigurbjörnsson. Monolingual document retrieval: English versus other European languages. In A.P. de Vries, editor, *Proceedings of the 4th Dutch-Belgian Information Retrieval Workshop (DIR 2003)*, pages 35-39.

J. Kamps, C. Monz, M. de Rijke and B. Sigurbjörnsson. The University of Amsterdam at CLEF-2003. In C. Peters, editor, *Results of the CLEF 2003 Cross-Language System Evaluation Campaign*, pages 71-78.

W. Kuijper and P. Viana. An application of sahlqvist theory to bisorted modal logic. In B.D. ten Cate, editor, *Proceedings of the 8th ESSLLI Student Section*, pages 149-158. ESSLLI.

M.J. Marx. XPath and modal logics of finite DAG's. In M. Mayer and F. Pirri, editors, *Automated Reasoning with Analytic Tableaux and Related Methods (Proc. TABLEUX 2003)*, volume 2796 of LNAI, pages 150-164. Springer.

M.J. Marx and J.M.F. Masuch. Regular equivalence and dynamic logic. *Social Networks*, 25:51-65.

C. Monz. Document retrieval in the context of question answering. In F. Sebastiani, editor, *Proceedings of the 25th European Conference on Information Retrieval Research (ECIR-03)*, Lecture Notes in Computer Science 2633, pages 571-579. Springer.

R.J. Mokken. Splitting the Image: Nonparametric Feature Detection in Remote Sensing Imagery, Invited Opening Keynote Lecture *IMVIP 2003*. In J. Morrow, J. Philip and B.W. Scotney, *IMVIP2003. Proceedings of the Irish Machine Vision and Image Processing Conference 2003*.

K. Sima'an. On maximizing metrics for syntactic disambiguation. In *Proceedings of the International Workshop on Parsing Technologies*, pages 183-194, Inria, Loria, Nancy, France.

K. Sima'an. Robust data oriented speech understanding. In H. Bunt, J. Carroll and G. Satta, editors, *New Developments in Parsing Technologies*, pages 323-383. Kluwer Publishers, Amsterdam.

K. Sima'an. *Empirical validity and technological viability: Probabilistic models of Natural Language Processing*. In R. Bernardi and M. Moortgat, editors, *Proceedings of the 1st CoLogNET ElsNET workshop on 'Linguistic Corpora and Logic Based grammar Formalism'*, pages 95-111.

K. Sima'an and L. Buratto. Backoff Parameter Estimation for the DOP Model. In H. Blockeel N. Lavrac, D. Gamberger and L. Todorovski, editors, *Proceedings of the 14th European Conference on Machine Learning (ECML'03)*, *Lecture Notes in Artificial Intelligence (LNAI 2837)*, pages 373-384, Cavtat-Dubrovnik, Croatia. Springer.

- S. Schlobach. Optimal interpolation. In *Methods for Modalities 3*.
- S. Schlobach and R. Cornet. Explanation of terminological reasoning; a preliminary report. In *Proceedings of the Description Logics Workshop*.
- S. Schlobach and R. Cornet. Non-standard reasoning services for the debugging of description logic terminologies. In *Proceedings of the 18th International Joint Conference on Artificial Intelligence, IJCAI'03*. M. Kaufmann.
- S. Schlobach and R. Cornet. Non-standard reasoning services for the debugging of description logic terminologies. In *Proceedings of the 15th Belgium-Netherlands Conference on Artificial Intelligence*.

Edited Volumes and Books

- K.R. Apt, *Principles of Constraint Programming*, Cambridge University Press, 407 + xIV pages.
- R. Bod, R.J.H. Scha and K. Sima'an, editors. *Data Oriented Parsing*. CSLI Publications, Stanford University, Stanford, California, USA.

Dissertations

- J.M. Heguiabehere. *Building Logical Toolboxes*. PhD Thesis, ILLC, Dissertation Series, DS-2003-03, Amsterdam.
- C. Monz *From Document Retrieval to Question Answering*. PhD Thesis, ILLC, Dissertation Series, DS-2003-04, Amsterdam.

Other Publications

- W.J. van Hove and M. Milano. Decomposition Based Search - A theoretical and experimental evaluation. *Technical Report LIA00203*, University of Bologna.
- V. Jijkoun, J. Kamps, G.A. Mishne, C. Monz, M. de Rijke, S. Schlobach and O. Tsur. The University of Amsterdam at *TREC 2003*. In *TREC 2003 Notebook Papers*.
- I. E. Vermeulen and J. Bruggeman. Market dimensionality and competitive dynamics. *Technical report, CCSOM*, University of Amsterdam.

- R.J. Mokken and N. Caarls. HORUS. *A Platform for Spatial Feature Detection in Multispectral Images from Remote Sensing. Final Technical Report*. Amsterdam: University of Amsterdam, ILLC/LIT and London: European Research Office of the U.S. Army.

- R.J. Mokken and N. Caarls, Nico. *Adaptive Spectral Sampling for Remote Sensing Images*. Technical Report. Amsterdam: University of Amsterdam, ILLC/LIT, Papers.

ILLC Project: Algorithms and Complexity Theory

Refereed Publications

- H.M. Buhrman, R. Chang, and L. Fortnow. One bit of advice. In *Proceedings of the 20th symposium on Theoretical Aspects of Computer Science*, Berlin. Springer-Verlag.
- H.M. Buhrman and R. de Wolf. Quantum zero error algorithms cannot be composed. *Information Processing Letters*, 87(2):79-84.
- H.M. Buhrman, L. Fortnow, I. Newman, and H.P. Roehrig. Quantum property testing. In *Proceedings of Symposium on Discrete Algorithms*, pages 480-488.
- H.M. Buhrman, L. Fortnow, and A. Pavan. Some results on derandomization. In *Proceedings of the 20th symposium on Theoretical Aspects of Computer Science*, Springer Lecture Notes in Computer Science.
- H.M. Buhrman, P. Hoyer, S. Massar, and H.P. Roehrig. Combinatorics and quantum nonlocality. *Physical Reviews Letters*, 91(4).
- H.M. Buhrman and H.P. Roehrig. Distributed quantum computing. In *Proceedings of Mathematical Foundations of Computer Science*, volume 2747, pages 1-20.
- N. Chater and P.M.B. Vitanyi. The generalized universal law of generalization. In *Journal of Mathematical Psychology*, volume 47-3, pages 346-369.

N. Chater and P.M.B. Vitanyi. A unifying principle in cognitive science?. In *Trends in Cognitive Sciences*, volume 7, pages 19-22.

H. Diederik, P.P.H. le Brun, H.W. Frijlink, P.M.B. Vitanyi, M. Weda and D.M. Barends. Drug output of unvented jet nebulizers as a function of time. In *International Journal of Pharmaceutics*, volume 257, 1, pages 33-39.

P. van Emde Boas. Games, complexity and interaction; the role of games in computer science. In Haim Kilov and Kenneth Baclawski, editors, *Practical Foundations of Business System Specifications*, pages 313-327. Kluwer.

P. Hoyer and R. Spalek. Quantum circuits with unbounded fan-out. In *Symposium on Theoretical Aspects of Computer Science*.

T.J. Lee. Arithmetical definability over finite structures. *Mathematical Logic Quarterly*, 49(3).

M. Li, J. Tromp and P.M.B. Vitanyi. Sharpening Occam's Razor. In *Information Processing Letters*, volume 85-2, pages 267-274.

M. Li, X. Chen, X. Lie, B. Ma and P.M.B. Vitanyi. The similarity metric, In *Proceedings 14th ACM-SIAM symposium on discrete algorithms*.

M. Li, X. Chen, X. Lie, B. Ma and P.M.B. Vitanyi. Clustering by compression. In *Proceedings international symposium on information theory*.

N. Verschaging and P.M.B. Vitanyi. Kolmogorov's structure functions, nonprobabilistic statistics and the foundation of model selection. In *Proceedings IEEE International symposium on information theory*.

Edited Volumes and Books

P.W. Adriaans. From knowledge-based to skill-based systems, sailing as a machine learning challenge. *Proceedings of the ECML/PKDD*.

Other Publications

P.W. Adriaans. *Robot op zee. Boom*.

Appendix 2: Research reports, Eechnical notes and Master of Logic theses

MoL = Master of Logic Thesis

PP = Prepublication Series

X = Technical Notes;

MoL-2003-01:
Chunlai Zhou *Some Intuitionistic Provability and Preservativity Logics (and their interrelations)*.

MoL-2003-02:
Fadillah Tala *A Study of Stemming Effects on Information Retrieval in Bahasa Indonesi*.

MoL-2003-03:
Guillaume Aucher *A Combined System for Update Logic and Belief Revision*.

MoL-2003-04:
Gilad Mishne *Source Code Retrieval using Conceptual Graphs*.

MoL-2003-05:
Tanja Hötte *A Model for Epistemic Games*.

MoL-2003-06:
Oren Tsur *Definitional Question Answering Using Trainable Classifiers*.

MoL-2003-07:
Loredana Afanasiev *XML Query Evaluation via CTL Model Checking*.

PP-2003-01:
Johan van Benthem *A Note on Modeling Theories*.

PP-2003-02:
Johan van Benthem *Structural Properties of Dynamic Reasoning*.

PP-2003-03:
Johan van Benthem *Is There Still Logic in Bolzano's Key?*

- PP-2003-04:
Johan van Benthem *The Epistemic Logic of IF Games.*
- PP-2003-05:
Johan van Benthem *What Logic Games are Trying to Tell Us.*
- PP-2003-06:
Johan van Benthem *Rational Dynamics and Epistemic Logic in Games.*
- PP-2003-07:
Johan van Benthem *'One is a Lonely Number': on the Logic of Communication.*
- PP-2003-08:
Johan van Benthem *Categorial Grammar at a Cross-Roads.*
- PP-2003-09:
Johan van Benthem *Conditional Probability and Update Logic.*
- PP-2003-10:
Patrick Blackburn, Maarten Marx *Tableaux for Quantified Hybrid Logic.*
- PP-2003-11:
Jörg Brendle, Lorenz Halbeisen, Benedikt Löwe *Silver Measurability and its Relation to other Regularity Properties.*
- PP-2003-12:
Benedikt Löwe *The Pointwise View of Determinacy: Arboreal Forcings, Measurability and Weak Measurability.*
- PP-2003-13:
Ian Hodkinson, Yde Venema *Canonical varieties with no canonical axiomatisation.*
- PP-2003-14:
Benedikt Löwe *A Hierarchy of norms defined via Blackwell games.*
- PP-2003-15:
Clemens Kupke, Alexander Kurz, Yde Venema *Stone Coalgebras.*
- PP-2003-16:
Paul Dekker *The Pragmatic Dimension of Indefinites.*
- PP-2003-17:
Evan Goris *Extending ILM with an operator for Σ_1 -ness.*
- PP-2003-18:
Benedikt Löwe *The Simulation Technique and its Consequences for Infinitary Combinatorics under the Axiom of Blackwell Determinacy.*
- PP-2003-19:
Benedikt Löwe *Determinacy for infinite games with more than two players with preferences.*
- PP-2003-20:
Johan van Benthem *The Categorial Fine-Structure of Natural Language.*
- PP-2003-21:
Johan van Benthem *Logic and the Dynamics of Information.*
- PP-2003-22:
Johan van Benthem *What One May Come to Know.*
- PP-2003-23:
Stefan Schlobach *Optimal Interpolation in ALC.*
- PP-2003-24:
Helle Hvid Hansen *Monotonic Modal Logics.*
- PP-2003-25:
Nick Bezhanishvili, Ian Hodkinson *All normal extensions of $S5$ -squared are finitely axiomatizable.*
- PP-2003-26:
R. Goldblatt, I. Hodkinson, Y. Venema *Erdős graphs resolve Fine's canonicity problem.*
- PP-2003-27:
Rens Bod *Explaining New Phenomena in Terms of Previous Phenomena.*
- X-2003-01
Paul van Ulsen *Index of the Troelstra Archive.*

Appendix 3: Workshop, Events

Workshops

LSA-workshop Probability Theory in Linguistics

Date: 2-5 January

Place: Atlanta

Organization: Rens Bod

Kickof meeting RESQ

Date: 9-11 January

Place: Amsterdam

Organization: Harry Buhrman, Hein Roehrig, Ronald de Wolf

ACLC-ILLC Workshop

Date: 28 February

Place: Amsterdam

Organization: Marie Safarova

Szklarska Poreba Workshop on Syntax, Semantics, Pragmatics and their Evolution

Date: 28 February-4 March

Place: Szklarska Poreba

Organization: Alastair Butler, Darrin Hindsill, Anna Pilatova

Third ILLC Alumni Event

Date: 6 March

Place: Amsterdam

Organization: Maarten Marx, Marie Safarova

Centennial Seminar of Kolmogorov Complexity and Application

Date: 27 April-2 May

Place: Wadern

Organization: Leonid Leving, Wolfgang Merkle, Alexander Shen, Paul Vitanyi

Introductory meeting Cochlear Implants and their effect on first language acquisition

Date: 22-23 May

Place: Utrecht

Organization: Pieter Adriaans, Dick de Jongh, Yoav Seginer, Guido Smoorenburg

DIMACS workshop on complexity and inference

Date 2-5 June

Place: Piscataway

Organization: Paul Vitanyi

Workshop on Spatial Reasoning, NASSLLI 2

Date: 26-29 June

Place: Bloomington

Organization: Marco Aiello, Johan van Benthem, Darko Sarenac

Quantum Computing Workshop

Date: 29 June

Place: Eindhoven

Organization: Harry Buhrman, Hein Roehrig, Ronald de Wolf

LiB-Day in Amsterdam

Date: 30 June 2003

Place: Amsterdam

Organization: Benedikt Löwe

International conference on algebraic and topological methods in non-classical logics

Date: 7-11 July

Place: Tbilisi

Organisation: Nick Bezhanishvili

Summer Workshop in Fine Structure Theory

Date: 7-11 July

Place: Bonn

Organization: Stefan Bold, Bernhard Irrgang, Benedikt Löwe, Peter Koepke, Michael Möllerfeld

International Workshop Logic, Neural Networks and Optimality Theory

Date: 23-25 July

Place: Berlin

Organization: Anton Benz, Reinhard Blutner, Helen de Hoop

Logic Colloquium 2004

Date: 25-31 July

Place: Torino

Organization: Alessandro Andretta, Domenico Zambella

ESSLLI-2003: 15th European Summer School in Logic, Language and Information

Date: 18-29 August

Place: Vienna, Austria

The Evolution of Meaning

Date: 4-5 September

Place: Amsterdam

Organization: Paul Dekker, Robert van Rooy, Frank Veltman

Preparatory conference Cochlear Implants and their effect on first language acquisition

Date: 17-18 September

Place: Beekbergen

Organization: Pieter Adriaans, Dick de Jongh, Yoav Seginer, Guido Smoorenburg

Learning Context-free grammars

Date: 23 September

Place: Dubrovnik

Organization: Pieter Adriaans, Colin de La Higuera, Menno van Zaanen, Jose Oncina

The 5th International Tbilisi Symposium on Language, Logic and Computation, Tbilisi, Georgia

Date: 6-10 October

Place: Tbilisi, Georgia

Organization: (at ILLC)Maarten Marx, Nick Bezhanishvili, Kata Balogh

Workshop: Connecting the Different Faces on Information

Date: 30 October

Place: Amsterdam

Organization: Balder ten Cate, Barteld Kooi, Rick Nouwen

The Origin of Novelty

Date: 31 October

Place: Amsterdam

Organization: Jaap Kamps, Maartje Raijmakers, Maarten van Someren

Special ILLC Lecture, Mark Steedman

Date: 7 November

Place: Amsterdam

Organization: Remko Scha

ILLC-Day in Bonn

Date: 30 November

Place: Bonn

Organization: Benedikt Löwe

2003 5th Hybrid Logic Meeting

Date: 5 December

Place: Amsterdam

Organization: Balder ten Cate, Maarten Marx, Darko Sarenac and Petrucio Viana.

Dir 2003, 4th Dutch-Belgian Workshop on Information Retrieval

Date: 8-9 December

Place: Amsterdam

Organization: Anne Diekema, Theo Huibers, Jaap Kamps, Maarten de Rijke Erik Tjong Kim Sang, Arjen de Vries

Questions and Answers: Theoretical and Applied Perspectives (2nd CoLogNET-ElsNET Symposium)

Location: Amsterdam

Date: 18 December

Place: Amsterdam

Organization: Raffaella Bernardi

14th Amsterdam Colloquium

Date: 19-21 December

Place: Amsterdam

Organization: Alastair Butler, Paul Dekker, Robert van Rooy, Martin Stokhof

Workshop on Logics of Space

Date: 23 December 2003

Place: Amsterdam

Organization: Johan van Benthem, Darko Sarenac

Regular Events

Amsterdam-Utrecht Workshops

The Amsterdam-Utrecht Workshops are organized (irregularly) under the auspices of the Utrecht Institute of Linguistics (UiL OTS) at the Utrecht University and ILLC. The initiative was proposed in 2001 by Johan van Benthem and Michael Moortgat with the intent of increasing the collaboration between the ILLC and OTS researchers. Since then this proposal has been materialized in a growing number of jointly organized and successful workshops.

For more information, see <http://www-uilots.let.uu.nl/~ctl/workshops/am-ut.html>.

The Colloquium on Mathematical Logic

Starting in the Academic Year 2003/2004, the ILLC and the Mathematics and Philosophy Departments of the Universiteit Utrecht jointly organize a bi-weekly Colloquium on Mathematical Logic. This joint colloquium revives the tradition of the InterCity seminar of the 1970s and 1980s and will be a venue for talks by external guests, researchers from Amsterdam and Utrecht, and last but definitely not least, students from Amsterdam and Utrecht.

For more information, see <http://staff.science.uva.nl/~bloewe/CML.html> or <http://www.math.uu.nl/people/jvoosten/seminar.html>

Organization: Lev Beklemishev, Benedikt Löwe, Jaap van Oosten

The DIP (Discourse Processing) Colloquium

The Discourse Colloquium (DIP) is held every two weeks at the University of Amsterdam, Departments of Philosophy and Linguistics. The colloquium aims to bring together researchers and students who are interested in discourse analysis and to encourage discussion, collaboration and cross-fertilization of

ideas. The main topic is the interpretation of utterances in their (textual) context. The orientation of the colloquium is quite broad: the talks may focus on semantics, pragmatics, prosody, or even syntax.

The DIP homepage can be found at <http://www.illc.uva.nl/dip/>
Organization: Marie Sarafova, Marian Counihan, Fabrice Nauze

The Logic Tea

The Logic Tea, a series of one-hour talks designed for students of mathematics, computer science, artificial intelligence, and philosophy, and the students of the Master of Logic program of the ILLC, with discussion, tea and cookies afterwards.

The Logic Tea homepage can be found at http://www.illc.uva.nl/logic_tea/.
Organization: Boudewijn de Bruin, Mark Theunissen

The Language and Inference Technology Seminar

An almost bi-weekly series of talks that focuses on a wide variety of themes in computational logic and computational linguistics. The LIT Seminar homepage can be found at <http://lit.science.uva.nl/News/seminar.html>.

Organization: Jaap Kamps, Maarten de Rijke

Appendix 4: Other contributions

ILLC Project: Theory of Interpretation

Lectures

M.D. Aloni, *On choice-offering imperatives*, Amsterdam Colloquium, 21 December, Amsterdam.

K. Balogh, *Az eltűnt névelő' nyomában [After the disappeared determiner, A mai magyar nyelv leírásának újabb módszerei 6. [New Methods in Description of Hungarian]*, 17 October, University of Szeged, Hungary; *A Morphology Driven Parser for Hungarian*, 5th. International Tbilisi Symposium on Language, Logic and Computation, 5 October, Tbilisi, Georgia; *Computational Benefits of a Totally Lexicalist Grammar*, International Conference on Text, Speech and Dialogue (TSD 2003), 9 September, Ceske Budejovice, Czech Republic; *Közvetlen út a szemantikához [Direct Way to Semantics]*, XXVI. National Conference of Scientific Circles of Students, 22 April, Veszprém, Hungary; *Total Lexicalism and GASGrammars: A Direct Way to Semantics*, 4th International Conference on Intelligent Text Processing and Computational Linguistics, 16 February, Mexico City, Mexico.

R.I. Bartsch, *Concept Formation, Memory, and Understanding*, International Conference on Concepts, Language and Cognition, 27 September, Pisa; *Concept Formation and Understanding, and the Conscious and Unconscious in Proust' A la Recherche du Temps Perdu*, The 3rd Annual Conference on the Philosophy of Consciousness of the UA 'Philosophy of Mind' Research Group, 11 October, Antwerpen; *How can something be new and at the same time be understood? A view from concept formation*, The Origin of Novelty, 31 October, Amsterdam.

A.J. Butler, *Split-DPs, the EPP and the visibility requirement: a case study on the nature of displacement*, Workshop on EPP and Phases, 17 January, MIT; *Binding Variation*, LAGB Autumn 2003 Meeting, 5 September, Oxford; *Predicate Logic with Barriers: a semantics for covaluation and binding relations*, 5th Tbilisi International Symposium, 6 October, Tbilisi.

B.D. ten Cate, *Epistemic actions*, GroLog seminar, 17 February, Groningen; *Logical investigations into the partition semantics of questions*, PARC seminar, 16 June, Palo Alto; *Logical investigations into the partition semantics of questions*, 4th workshop on Inference in Computational Semantics, 26 September, Nancy.

P.J.E. Dekker, *Logic and Language Use*, Paris 1 University (DEA d'Histoire et de Philosophie des Sciences), 14 March, Paris; *A Proper Architecture for Presupposition and Quantification*, Institut Jean Nicod, 17 March, Paris; *Multi-Dimensional Meaning*, UCLA Linguistics Department, 25 April, Los Angeles; *Satisfying Questions*, UCLA Linguistics Department, 30 April, Los Angeles; *Satisfying Questions*, Sinn und Bedeutung VIII, 31 September, Frankfurt; *From Anaphora to Strategic Inquiry*, 5th Tbilisi Symposium on Language, Logic and Computation, 6 October, Tbilisi; *Presupposition and Quantification in Extraordinary English*, Semantics Colloquium, 9 December, Nijmegen.

J.A.G. Groenendijk, *DPL12.5: An Update on Dynamic predicate Logic*, 1st order logic 75, 19 September, Berlin; *Questions and Answers: Semantics and Logic*, Questions and Answers: Theoretical and Applied Perspectives, 18 December, Amsterdam.

T.M.V. Janssen, *Would Frege accept Frege's principle?*, Philosophy and Cognitive Science: the composition of meaning, 31 July, Düsseldorf; *On the semantics of Branching Quantifier sentences*, 14th Amsterdam Colloquium, 21 December, Amsterdam.

J. Maat, *The Status of Logic in the 17th Century*, Foundations of the Formal Sciences IV, 16 February, Bonn; *The Tulip Project: A Novel Approach to the History of Linguistics*, Symposium of the Henry Sweet Society for the History of Linguistic Ideas, 28 August, Dublin; *Leibniz and the English Language-Planners*, *Leibniz and the English-speaking World*, 3 September, Liverpool; *Het Tulip project: een 17e eeuwse kunsttaal op internet*, *Hoe natuurlijk is taal?*, 16 December, Amsterdam.

R.A.M. van Rooij, *Exhaustification*, 5th International Workshop on Computational Semantics, 16 January, Tilburg; *On polar questions*, SALT 13: Semantics and Linguistic Theory, 10 May, Seattle, USA; *Negative Polarity Items in Questions: Strength as Relevance*, ACLC-ILLC Colloquium, 10 February, Amsterdam; *Language and Games*, The Mathematics of Language, 20 June, Bloomington, USA; *Being polite is a handicap*, TARK 9: Theoretical Aspects of Rationality, 21 June, Bloomington, USA; *A modal analysis of modal subordination*, Sinn und Bedeutung, 29 September, Frankfurt; *Games and Meaning: Exhaustive Interpretation*, Games and Decisions in Pragmatics, 25 October, Berlin; *On useful and credible information exchange*, Connecting the different faces of Information, 30 October, Amsterdam; *Cooperative Information Exchange*, Annual Meeting Vereniging voor Logici, 31 October, Utrecht.

M. Safarova, *Object Marking in Modern Western Armenian*, AIEA Workshop on Armenian Linguistics, 30 March, Leiden; Safarova, *On Different Types of Declaratives in English*, Prague Student Linguistic Club, 16 April, Prague; *Polar Questions and Decision Theory*, Department of Czech Language, Charles University, 17 April, Prague; *On Polar Questions, Semantic and Linguistic Theory*, 10 May, Seattle; *Problemes de l'analyse de signification de l'intonation*, JETOU, 7 November, Toulouse.

Scientific Functions

M. Safarova, *Association for Computational Linguistics - Special Interest Group on Computational Semantics*, Member.

B.D. ten Cate, *Vereniging voor Logica en Filosofie van de Exacte Wetenschappen*, Member of the Board since 2002.

R.I. Bartsch, *KNAW*, member; *Bestuur van de Raad van de Geesteswetenschappen*, member.

M.J.B. Stokhof, *Onderzoekschool Logica OZSL*, Chairman of the board; *NWO Gebiedsbestuur Geesteswetenschappen*, Member.

Editorships

P.J.E. Dekker, *Journal of Semantics*, Editorial board; *Linguistics and Philosophy*, Associate Editor.

R.A.M. van Rooij, *Journal of Semantics*, Member Editorial board since august 2003.

M.J.B. Stokhof, *Linguistics and Philosophy*, Associate Editor semantics; *Natural Language Semantics*, Member Editorial board; *Logic and Computation*, Member Editorial board; *Current research on the semantics pragmatics interface*, Member Editorial board.

J.A.G. Groenendijk, *Natural Language Semantics*, Editorial Board.

Program Committees

P.J.E. Dekker, *5th Tbilisi Symposium on Language, Logic and Computation*, Member of the PC, 6 October-10 October, Tbilisi, Georgia; *Sinn und Bedeutung VIII*, Member of the PC, 29 September-1 October, Frankfurt.

B.D. ten Cate, *ESSLLI 2003 student session*, Chair, 18 August-29 August, Vienna.

R.A.M. van Rooij, *Sinn und Bedeutung*, Reviewer abstracts, 3 October-5 October, Frankfurt.

J.A.G. Groenendijk, *Amsterdam Colloquium*, Program Committee, 19 December-22 December, Amsterdam.

Scientific Events Organized

P.J.E. Dekker, *5th Tbilisi Symposium on Language, Logic and Computation* (with D. de Jongh, M. Marx, H. W. Zeevat), 6 October-10 October, Tbilisi; *14th Amsterdam Colloquium* (with A.J. Butler, R. van Rooij, M.J.B. Stokhof), 19 December-21 December, Amsterdam.

B.D. ten Cate, *Connecting the different faces of information* (with Barteld Kooi and Rick Nouwen), 30 October, Amsterdam; *5th workshop on hybrid logic* (with Maarten Marx, Petrucio Viana and Darko Sarenac), 5 December, Amsterdam.

R.A.M. van Rooij, *14th Amsterdam Colloquium* (with A.J. Butler, P.J.E. Dekker, M.J.B. Stokhof), 19 December-21 December, Amsterdam; *The Evolution of Meaning* (with P.J.E. Dekker, F.J.M.M. Veltman), 4 September-5 September, Amsterdam.

M.J.B. Stokhof, *14th Amsterdam Colloquium* (with A.J. Butler, P.J.E. Dekker, R.A.M. van Rooy), 19 December-21 December, Amsterdam.

A.J. Butler, *Szklarska Poreba Workshop on Syntax, Semantics, Pragmatics and their Evolution* (with D. Hindsill and A. Pilatova), 28 February-4 March, Szklarska Poreba; *14th Amsterdam Colloquium* (with P.J.E. Dekker, R.A.M. van Rooy, M.J.B. Stokhof), 19 December-21 December, Amsterdam.

Scientific Awards

M. Aloni, VENI grant for: Semantic Structure and Dynamics in Natural Language Interpretation, NWO Vernieuwingsimpuls.

Miscellaneous Scientific Functions or Activities

M. Safarova, Co-organizer of the DIP colloquium.

M.C. Wilde, exchange project Universiteit van Amsterdam, Philosophy of Language and Gerrit Rietveld Academie, visual art. Title of the project 'Installation Art and the Quest for Meaning'.

J. Maat, Co-author of the Tulip website, in cooperation with the Academic Computing Development Team, University of Oxford.

ILLC Project: Cognitive Systems and Information Processing

Lectures

K.R. Blutner, *Pragmatics in Optimality Theory*, Jahrestagung der DGfS 2003, 28 February, Munich; *Binding phenomena, pragmatics, and grammaticalization*, Szklarska Poreba Workshop 4, 2 March, Szklarska Poreba; *A new hypothesis on compositionality*, Joint International Conference on Cognitive Science, 16 July, Sydney.

H. Honing, *The final ritard: on music and motion*, Researching Musical Understanding, 25 October, Keele University; *On rhythm, timing and tempo*, International Association of Schools of Jazz (IASJ), 1 November, Den Haag; *Rhythm perception and categorization*, Institute for Research in Cognitive Science (IRCS), 24 January, Pennsylvania, USA; *Rhythm perception and categorization*, School of Informatics, City University (ISMS), 3 April, London, UK.

A.K. Honingh, *Measures of consonance in a goodness-of-fit model for equal tempered scales*, International computer music conference (ICMC), 3 October, Singapore; *Group theoretic description of just intonation*, Understanding and creating music (UCM), 13 December, Caserta, Italy.

M. van Lambalgen, *A marriage made in heaven: linguistics and robotics*, 5th International Workshop on Computational Semantics, January, Tilburg; *A little logic goes a long way*, 8th International Workshop on Cognitive Science, May, Donostia/San Sebastian; *Planning, time and tense*, CSCA Symposium 'Human reasoning and cognitive science', July, Amsterdam; *Evolutionary considerations on logical reasoning*, 12th International Conference on Logic Methodology and Philosophy of Science, August, Oviedo.

R.J. Mastop, *Imperatives in time*, Amsterdam Colloquium, 21 December, Amsterdam

R.J.H. Scha, *A Computational Perspective on Human Emotions*, user_mode, 11 May, Tate Modern, London, UK; *Growth and Construction as Process*, Concrete Art and Mathematics, 25 October, Mondriaanhuis, Amersfoort.

H.W. Zeevat, *Freezing and Marking*, WOTS7, 27 October, Nijmegen; *The Syntax Semantics Interface of Speech Act Markers*, Diabruck, 5 September, Saarbruecken; *Obligatory versus Optional Discourse Marking*, SPR 03, 8 November, San Sebastian; *Towards Evolutionary Foundations for Word Order, Logic, Neural Networks, and Optimality Theory*, 26 July, Berlin; *Markedness and Economy on Signs*, Variations within Optimality Theory, 27 April, Stockholm; *Markedness*, The 5th International Tbilisi Symposium on Language, Logic and Computation, 9 October, Tbilisi.

Scientific Functions

R. Bod, *Association of Computational Linguistics (ACL2003)*, Member of Reviewing Committee; *EPSRC (Engineering and Physical Sciences Research Council)*, Member of peer review college.

Editorships

K.R. Blutner, *Linguistics and Philosophy*, Editorial Board.

H. Honing, *Journal of New Music Research*, Advisory Editor.

M. van Lambalgen, *Journal of Logic Language and Information*, Editor.

F.J.M.M. Veltman, *Argumentation*, Editorial Board; *Journal of Applied Non-Classical Logics*, Editorial Board.

H.W. Zeevat, *Journal of semantics*, Editorial board.

Program Committees

K.R. Blutner, *14th Amsterdam Colloquium*, Member Program Committee, 19 December-21 December, Amsterdam.

H.W. Zeevat, *Diabrueck*. Member Program Committee, 1 September-4 September, Saarbruecken; *ESSLLI Particle Workshop*, Chair, 16 August-20 August, Vienna.

R. Bod, *LSA-workshop Probability Theory in Linguistics*, Member of Program Committee, 2 January-5 January, Atlanta.

H. Honing, *Journées d'Informatique Musicale (JIM)*, Member Program Committee; *International Conference of Music and Artificial Intelligence (ICMAI)*, Member Program Committee; *Workshop Constraint Programming and Music (CP)*, Member Program Committee; *Brazilian Symposium on Computer Music (SBCM)*, Member Program Committee; *Computer Music Modeling and Retrieval (CMMR)*, Member Program Committee.

F.J.M.M. Veltman, *TARK IX, Theoretical Aspects of Rationality and Knowledge*, Member Program Committee, 22 June-24 June, Bloomington; *BNAIC 2003, Belgian-Dutch Conference on Artificial Intelligence*, Member Program Committee, 23 October-24 October, Nijmegen; *AC '03, Workshop on Mood and Modality*, Chairman, 21 December-21 December, Amsterdam.

Scientific Events Organized

K.R. Blutner, *International Workshop Logic, Neural Networks, and Optimality Theory*, (with Anton Benz, Helen de Hoop), 23 July-25 July, Berlin.

R. Bod, *LSA-workshop Probability Theory in Linguistics*, 2 January-5 January, Atlanta.

F.J.M.M. Veltman, *ESSLLI workshop on Conditional and Unconditional Modality*, (with Cleo Condoravdi, Stefan Kaufmann, Jan Nuyts), 25 August-29 August, Vienna.

H.W. Zeevat, *ESSLLI Particle Workshop*, (with Manfred Stede), 16 August-20 August, Vienna.

Visiting Professorships

H. Honing, *New York University*, December 2002-January 2003.

R.J.H. Scha, *Frank Mohr Institute*, Groningen, May-June.

Miscellaneous Scientific Functions or Activities

R. Bod, Invited Keynote speaker of 2nd Computational Linguistics fall school, Osnabrueck, September; Invited Keynote speaker of 4th Conference on Understanding and Creating Music, Caserta, 12-15 December.

ILLC Project: Constructive and Intensional Logic

Lectures

J.F.A.K. van Benthem, *Logic in Games*, Logic Colloquium UCLA, 25 April, Los Angeles; *Conceptual Modeling as a Task of Logic*, Conceptual Structures, 9 July, Dresden; *Open Problems in Logic and Philosophy*, World Congress of Philosophy, 16 August, Istanbul; *De Kunst van het Kennis Maken*, Opening Academic Year, 1 September, Amsterdam; *Rational Dynamics*, Logic, Games, and Social Choice III, 13 September, Sienna; *Het ABC van Communicatie*, Algemene Vergadering Afdeling Natuurkunde, KNAW, 17 November, Amsterdam; *Trends in Logic*, Studia Logica 50 Years, 29 November, Copenhagen; *Modal Logics for Product Topologies*, Workshop on Spatial Reasoning, 23 December, Amsterdam.

N. Bezhanishvili, *n-universal models*, Logic Tea, 25 March, Amsterdam; *Exact and extendible formulas in intuitionistic propositional calculus*, International conference on algebraic and topological methods in non-classical logics, 8 July, Tbilisi, Georgia; *Extensions of $S5^2$ and better-quasi-orderings*, ILLC-day in Bonn, 30 November, Bonn, Germany; *Transfer results for hybrid logic*, HyLo-V, 5 December, Amsterdam.

B.P. de Bruin, *An Application of Epistemic Logic to Some Questions in Game Theory*, Oberseminar Mathematische Logik, 6 June, Bonn; *On Two Theorems About the Nash Equilibrium*, Eighth Workshop on Games in Logic, Languages and Computation, 5 September, Groningen.

D.H.J. de Jongh, *Intuitionistic logic: results of the last decade*, ILLC-day in Bonn, 30 November, Bonn

C.A. Kupke, *Stone coalgebras*, Coalgebraic Methods in Computer Science 2003, 5 April, Warszawa.

B. Löwe, *Silver-measurability of Δ_1^1 and Σ_1^1 Sets*, VIG 2003, 25 January, Los Angeles CA, USA; *The Blackwell Hierarchy of Norms*, SWIFT 2003, 7 July, Bonn, Germany; *Determinacy for infinite perfect information games with more than two players with preferences*, GLLC 8, 5 September, Groningen, The Netherlands; *Large Cardinals and Foundations of Mathematics*, General Mathematics Colloquium, 1 October, Amsterdam; *Deterministic and nondeterministic supertask computations*, MPLA Seminar, 10 October, Athens, Greece; *Blindfolding stochastic opponents in infinite games*, R. McLeod Millican Memorial Lecture, 23 October, Denton TX; *Blindfolding stochastic opponents in infinite games*, Mathematical Logic Seminar, 7 November, Torino, Italy.

J.M. Niekus, *Individual choice sequences in the work of L.E.J. Brouwer*, PILM 2003, 1 October, Nancy; *Individual choice sequences in the work of L.E.J. Brouwer*, ZIC, 17 June, Eindhoven.

G. Sarenac, *Modal Logic, Topology, and Space*, International Workshop on Universal Logic, 7 October, Neuchatel, Switzerland; *Products of Hybrid Logics*, HyLo V, 5 December, Amsterdam; *Modal Logic and Spatial Reasoning*, Logic Tea, 19 October, Amsterdam; *Modal Logics for product topologies*, Society for Exact Philosophy meeting, 29 May, Vancouver, Canada; *Modal Logic and Topological Products*, Workshop on reasoning about space at NASSLLI, 18 June, Bloomington, Indiana, USA.

Y. Seginer, *Learning Context Free Grammars in the Limit Aided by the Sample Distribution*, ECML/PKDD 2003 Workshop on Learning of Context Free Grammars, 22 September, Cavtat-Dubrovnik.

A.S. Troelstra, *The theory of intuitionistic apartness and equality*, Workshop on Proof Theory 2003, 10 October, Muenster i.Wf., Germany.

E. Tzani, *Collatz Conjecture: Algorithms and Properties*, 9th Panchelonic Conference and 1st Balcan Conference in Informatics, 21 November, Thessaloniki, Greece

Y. Venema, *Modal simulations*, Computing Laboratory Lunch Talk, Computer Science Department, Oxford University, 6 May, Oxford; *Unifying the field of modal logics*, GroLog talk, University of Groningen, 25 June, Groningen; *Unifying the field of modal logics*, ACG Colloquium, CWI, 2 July, Amsterdam; *Modal simulations*, International conference on algebraic and topological methods in non-classical logics, 7 July, Tbilisi (Georgia); *An algebraic perspective on modal logic*, ILLC Day, Mathematisches Institut, Universitaet Bonn, 30 November, Bonn.

D. Zambella, *Generic computably enumerable sets*, Workshop on computability and logic, 24 June, Heidelberg.

Scientific Functions

J.F.A.K. van Benthem, *Vienna Circle Archive*, Chairman since 1999; *Beth Foundation*, Treasurer since 2002; *NWO Cognitive Science Program*, Chairman Program Committee since 2001; *TARK*, Board of Directors since 1994; *International Federation for Computational Logic*, Vice-President since 1999; *Academia Europaea*, Member since 1991; *KNAW*, Royal Dutch Academy of Arts and Sciences, Member since 1992; *Institut International de Philosophie*, Member since 2001; *Hollandse Maatschappij van Wetenschappen*, Member since 2002; *University of Amsterdam*, University Professor, since 2003.

Editorships

J.F.A.K. van Benthem, *Studies in Logic and Foundations of Practical Reasoning*, Managing Editor since 2002; *Who's Who in Logic*, Nominating Editor since 2002; *The Philosopher's Annual*, Nominating Editor since 1988; *Journal of Philosophical Logic*, Member Editorial Board; *Studia Logica*, Member Editorial Board; *Studies in Linguistics and Philosophy*, Member Editorial Board; *Logic Journal of the Interest Group in Pure and Applied Logics*, Member Editorial Board; *Logic and Computation*, Member Editorial Board; *Language and Computation*, Member Editorial Board.

B. Löwe, *ILLC Publications*, Scientific Editor.

A.S. Troelstra, *Indagationes mathematicae*, Editor.

Zambella, *Rendiconti del seminario matematico di Torino*, Assistant Managing Editor since 2002.

Program Committees

J.F.A.K. van Benthem, TIME, Member Program Committee, 8 July-10 July, Melbourne; *Context*, Member Program Committee, 23 June-25 June, Stanford.

D.H.J. de Jongh, *5th Tbilisi Symposium*, Chair Program Committee, 6 October-10 October, Tbilisi, Georgia.

B. Löwe, *Foundations of the Formal Sciences IV*, Chair of the Scientific Committee, 14 February-17 February, Bonn, Germany; *Summer Workshop in Finestructure Theory*, Member of the Scientific Committee, 7 July-11 July, Bonn, Germany.

G. Sarenac, *Workshop on Reasoning about Space*, Organizer, 22 December-21 December, Amsterdam; *2003 Hybrid Logic Meeting*, Co-organizer, 5 December, Amsterdam; *3rd World Congress on Paraconsistency*, Organizing Committee, 28 July-31 July, Toulouse, France.

Y. Venema, *TIME-ICTL 2003*, Member of program committee, 8 July-10 July, Cairns, Australia.

Scientific Events Organized

J.F.A.K. van Benthem, *Workshop on Spatial Reasoning*, NASSLLI 2, (with D. Sarenac, M. Aiello), 26 June-29 June, Bloomington; *Workshop on Logics of Space*, (with D. Sarenac), 23 December, Amsterdam.

N. Bezhanishvili, *International conference on algebraic and topological methods in non-classical logics*, (with New Mexico State University, Tbilisi State University), 7 July-11 July, Tbilisi, Georgia; *The 5th international symposium on Language, Logic and Computation*, (Tbilisi State University), 6 October-10 October, Tbilisi, Georgia.

D.H.J. de Jongh, *Introductory meeting Cochlear Implants and their effect on first language acquisition*, (with P. Adriaans, Y. Seginer, G. Smoorenburg), 22 May-23 May, UMC, Utrecht; *Preparatory conference Cochlear Implants and their effect on first language acquisition*, (with P. Adriaans, Y. Seginer, G. Smoorenburg), 17 September-18 September, de Wippselberg, Beekbergen.

B. Löwe, *Foundations of the Formal Sciences IV*, (with Volker Peckhaus (Paderborn), Thoralf Räscher (Potsdam)), 14 February-17 February, Bonn; *Summer Workshop in Fine Structure Theory* (with S. Bold), B. Irrgang, P. Koepke, M. Möllerfeld, 7 July-11 July, Bonn; *LiB-Day in Amsterdam*, 30 June, Amsterdam; *ILLC-Day in Bonn*, 30 November, Bonn.

D. Zambella, *Logic Colloquium 2004*, (with Alessandro Andretta (Chair)), 25 July-31 July, Torino.

Scientific Awards

P. Koepke and B. Löwe, *Deutsche Forschungsgemeinschaft Grant for Determinacy and Combinatorics*.

J.F.A.K. van Benthem *Appointed University Professor of the University of Amsterdam*, October

Visiting Professorships

J.F.A.K. van Benthem, *Stanford University, philosophy department, Bonsall Visiting Chair*, April-June.

ILLC Project: Language and Inference Technology

Lectures

C. Caracciolo, *Participation in European Summer School on Information Retrieval (ESSIR 2003)* Aussois, France. 31.08.03 till 05.09.03; *Poster presented at European Conference on Digital Library (ECDL 2003)*.

G.A. Mishne, *Preprocessing documents to answer Dutch questions*, 15th Belgian-Dutch Conference on Artificial Intelligence (BNAIC'03), 23 October, Nijmegen; *Building Infrastructure for Dutch Question Answering*, 4th Dutch-

Belgian Information Retrieval Workshop (DIR 2003), 8 December, CWI, Amsterdam.

M.J. Marx, *XML and modal logics of finite trees*, M4M, September, Nancy; *XML and finite trees*, ILLC Bonn logic day, May, Amsterdam; *Reasoning on finite trees*, Tbilisi symposium, October, Tbilisi.

W.J. van Hoeve, *A hybrid constraint programming and semidefinite programming approach for the stable set problem*, Optimization Days, 7 May, Montreal, Canada; *A hybrid constraint programming and semidefinite programming approach for the stable set problem*, 5th International Workshop on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems (CP-AI-OR '03), 8 May, Montreal, Canada; *A hybrid constraint programming and semidefinite programming approach for the stable set problem*, 9th International Conference on Principles and Practice of Constraint Programming (CP'03), 3 October, Kinsale, Ireland.

S. Brand, *Schedulers for Rule-Based Constraint Programming*, ACM Symposium on Applied Computing (SAC), 10 March, Melbourne, FL, USA; *Deductive Generation of Constraint Propagation Rules*, International Workshop on Rule-Based Programming (RULE), 9 June, Valencia, Spain; *Modelling Modal Satisfiability in Constraint Logic Programming*, Workshop of the ERCIM Working Group on Constraints, 30 June, Budapest, Hungary; [POSTER:] *Constraint Programming for Modelling and Solving Modal Satisfiability*, Principles and Practice of Constraint Programming (CP), 30 September, Cork, Ireland.

C. Caracciolo, *Dalle ontologie al semantic web e ritorno*, invited talk given at the University of Pisa, Dept. Philosophy, 15 May, Pisa, Italy.

R.J. Mokken, *Lecture and workshop on HORUS-A Platform for Spatial Feature Detection in Multispectral Images from Remote Sensing*, lecture and Workshop, May 26th-June 1st, 2003 (with N. Caarls). US Army ERDC Topographic Engineering Center, Alexandria VA, USA; *Splitting the Image: Nonparametric Feature Detection in Remote Sensing Imagery*, Invited Opening Keynote Lecture IMVIP 2003. *Proceedings of the Irish Machine Vision and Image Processing Conference 2003*. 3rd-5th September. Coleraine: University of Ulster

B. Sigurbjörnsson, *Topic Field Selection and Smoothing for XML Retrieval*, Dutch-Belgian Information Retrieval Conference, 9 December, Amsterdam;

XML Retrieval: *From elements to relevant elements*, Initiative for the Evaluation of XML Retrieval, 15 December, Schloss Dagstuhl.

M. Franceschet, *Model Checking for Hybrid Logics*, Workshop Methods for Modalities, 23 September, Nancy, France; *Definability and decidability of binary predicates for time granularity*, International Symposium on temporal representation and reasoning - International Conference on Temporal Logic, 10 July, Cairns, Australia; *Hybrid Logics on Linear Structures: Expressivity and Complexity*, International Symposium on temporal representation and reasoning - International Conference on Temporal Logic, 10 July, Cairns, Australia.

E. Müller, *Experiments in Parsing German*, 6th International Conference on Text, Speech and Dialog (TSD-03), 10 September, Ceske Budejovice, Czech; *Grammatical Functions and Parsing the German Negra Treebank*, 14th Meeting of Computational Linguistics in the Netherlands, 19 December, Antwerp, Belgium.

D. Prescher, *Probabilistic Models of NLP*, ESSLLI-03, August, Vienna, Austria; *Probabilistic Parsing*, ESSLLI-03, August, Vienna, Austria; *Basic hybrid logic and some of its extensions*, International Workshop on Universal Logic, 6 October, Neuchatel; *On the expressiv power of B2ML*, HyLo'03, 5 December, Amsterdam.

K.S. Schlobach, *Non-Standard Reasoning Services for Debugging of Description Logic Terminologies*, IJCAI 2003, 15 August, Acapulco (Mexico); *Explanation of Terminological Reasoning: A Preliminary Report*, DL 2003, 6 September, Rome (Italy); *Non-standard reasoning services for the debugging of description logic terminologies*, BNAIC 2003, 24 October, Nijmegen.

K. Sima'an, *Backoff Parameter Estimation for the DOP Model*, European Conference on Machine Learning (ECML'03), 23 September, Dubrovnik, Croatia; *Backoff DOP: Parameter Estimation by Backoff*, International Conference on Text, Speech and Dialogue, 11 September, České Budejovice, Czech Republic; *On Maximizing Metrics for Syntactic Disambiguation*, International Workshop on Parsing Technologies, 24 April, Nancy, France; *A New Parameter Estimation Method for DOP*, Dublin Computational Linguistics Research Seminar Series (DCLRS): Dublin City University, University College Dublin and Trinity College Dublin, 29 November, Dublin, Ireland.

J. Kamps, *Words with Attitude: Extracting Subjective Meaning from Texts*, Dublin Computational Linguistics Research Seminars, 28 March, UCD Dublin, Ireland; *Language-dependent and Language-independent Approaches to Document Retrieval*, Cross-Language Evaluation Forum (CLEF 2003), 21 August, Trondheim, Norway.

I.E. Vermeulen, *A Logical Approach to Competition in Industries*, CLLI seminar, 31 January, Amsterdam.

M. de Rijke, *Information Retrieval and Much More*, Seminar, January, Utrecht; *Intelligent Information Access*, LIT Seminar, February, Amsterdam; *From Frege to Google*, Departmental Seminar, February, Liverpool, UK; *Beyond Document Retrieval*, IRST Seminar, February, Trento, Italy; *Towards Temporal Question Answering*, Departmental Seminar, February, Bolzano, Italy; *Intelligent Information Access*, NVTI-Dag, March, Amsterdam; *QA — What's Next?*, Departmental Seminar, May, Edinburgh; *Learning and Reasoning for Question Answering*, SIKS Day, June, Nunspeet; *Intelligent Information Access*, Seminar, June, Amsterdam.

Scientific Functions

K.R. Apt, Association for Logic Programming, Member of the Executive Committee; International Federation for Computational Logic (IFCoLoG), Member of the Board; *Constraint Programming Organizing Committee*, Member.

M. de Rijke, *AiML Steering Committee*, Chair; *ESSLLI Standing Committee*, Chair; *European Association for Logic, Language, and Computation*, Chief Executive Officer; *Dutch QA task CLEF*, Coordinator; *CLEF Steering Committee*, Member; *IfCoLog Executive Board*, Member; *Evaluation committee NWO-VIDI*, Member.

Editorships

K.R. Apt, *Journal of Logic and Computation*, Editor; *Theory and Practice of Logic Programming (TPLP)*, Editor; *ACM Transactions on Computational Logic (TOCL)*, Founder and Editor-in-chief.

M. de Rijke, *ACM Transactions on Computational Logic*, Editor; *Research in Language and Computation*, Editor; *Journal of Logic, Language and*

Information, Book review Editor, *Studies in Logic, Language and Information*, Managing Editor.

J.M.F. Masuch, *Computational and Mathematical Organization Theory*, Area Editor.

Program Committees

K.R. Apt, *Joint Annual Workshop of the ERCIM Working Group on Constraints and the CoLogNET area on Constraint and Logic Programming*, 30 June-2 July, Budapest, Hungary; *9th International Conference on Principles and Practice of Constraint Programming*, September 29-October 3, Kinsale, Ireland; *Workshop on Software Verification and Validation (SVV 2003)*, Mumbai, December, India.

G. Infante-Lopez, *ESSLLI Student Session*, Co-chair, 18 August-29 August, Vienna.

J. Kamps, *Dutch IR Workshop 2003*, Program Committee, 8 December-9 December, Amsterdam.

M.J. Marx, *WOLLIC 2003*, PC member, July, Brazil; *LPAR 2003*, PC member, September, Kazakstan.

E. Müller, *ESSLLI*, reviewer, 18 August-29 September, Vienna.

D. Prescher, *ESSLLI-2004*, PC Language and Computation, 9 August-20 August, Nancy, France.

K. Sima'an, *EACL'03 (section: research notes and demos)*, Program Committee Member, 12 April-17 April, Budapest, Hungary; *The 5th International Tbilisi Symposium on Language, Logic and Computation*, Reviewer for Proceedings, October, Tbilisi, Georgia; *Computational Linguistics in The Netherlands (CLIN)*, Reviewer for Proceedings, April, Groningen, The Netherlands; *Traitement Automatique des Langues Naturelles (Journal)*, Reviewer, March, Paris, France.

M. de Rijke, *Dutch-Belgian Workshop on Information Retrieval*, Member of the PC, December, Amsterdam; *EACL 2003 Workshop on NLP for Question Answering*, Co-chair, June, Budapest; *BNAIC 2003*, Member of the PC,

October, Nijmegen; CSL, Member of the PC, August, Vienna; *Formal Grammar*, Member of the PC, August, Vienna; *ICoS-4* Member of the PC, October, Nancy; *ISWC 2003*, Member of the PC, June, Sanibel, FL, USA; *2nd CologNET/ELSNET Workshop*, Member of the PC, December, Amsterdam; *TIME-ICTL 2003*, Member of the PC, June, Brisbane, Australia.

Scientific Events Organized

J. Kamps, *The Origin of Novelty* (with M. Raijmakers; M. van Someren), 31 October, Amsterdam.

M.J. Marx, *Tbilisi symposium 2003*, (with OC chair), October, Tbilisi Georgia; *HyLo 5 2003*, December, Amsterdam.

J.P. Viana, *HyLo 2003* (with B.D. ten Cate, M.J. Marx, D. Sarenac), 5 December, Amsterdam.

M. de Rijke, *Dutch-Belgian Workshop on Information Retrieval* (with J. Kamps, A. de Vries), December, Amsterdam.

Scientific Awards

M. de Rijke, *Inference for Temporal Question Answering*, NWO Open Competitie, July, Den Haag.

K. Sima'an, *Open Competitie Subsidies: Project Learning Stochastic Tree Grammars (LeStoGram)*: NWO Open Competitie, June, Den Haag.

J.P. Viana, *Best poster presented at ESSLLI'03 Student Session*, Technische Universitat Wien, 29 August, Wien.

Miscellaneous Scientific Functions or Activities

R.J. Mokken, Project reviews European Commission. MISSION (IST-1999-10655); 5th Framework Programme European Union, expert reviews: 5-7 March, Helsinki (StatFin), 18 June, Final Report.

K. Sima'an, Lid reductie DIXIT Tijdschrift voor Toegepaste Taal en Spraak technologie. Dialogo Uitgevers b.v. in opdracht van Stichting NOTaS.

ILLC Project: Algorithms and Complexity Theory

Lectures

P.W. Adriaans, *From knowledge based to skill based systems*, ECML/PKDD, 25 September, Dubrovnik; *Grammar induction and semantic Learning*, Portugese Conference on AI, 5 September, Beja.

H.M. Buhrman, *Distributed quantum computing*, Mathematical Foundations of Computer Science, 15 June, Prague; *Distributed quantum computing*, Spatial Stochastics Seminar, 28 October, Amsterdam; *Quantum Fingerprinting*, Aachen University Colloquium, 27 November, Aachen; QIP, NWO VICI presentation, 12 November, Den Haag; *Quantum communication complexity*, 2nd RESQ meeting, 12 May, Garching; *Introduction to quantum computing*, ICALP workshop on quantum computing, 29 June, Eindhoven; *Kolmogorov Complexity and Computational Complexity*, Conference on Computational Complexity, 7 July, Aarhus; *Increasing Complexity*, Centennial Seminar on Kolmogorov Complexity and Applications, 27 April, Wadern.

R.L.C. Cilibrasi, *Universal Clustering*, Centennial Seminar on Kolmogorov Complexity and Applications, 27 April, Wadern.

H.P. Roehrig, *Quantum Property Testing*, Symposium on Discrete Algorithms, 1 January, Baltimore; *Nonlocality with Imperfections*, LRI, 1 April, Paris; *Introduction to quantum computing*, Vrije Universiteit colloquium, 1 May, Amsterdam; *Quantum Property Testing*, 2nd RESQ meeting, 12 May, Garching.

S. de Rooij, *Online Suffix Trees with Counts*, CWI INS4 Colloquium, 18 December, Amsterdam.

R.S. Spalek, *Quantum Computation and Quantum Circuits*, Fall School of Logic, 1 August, Pec. p. Snezkou.

P.M.B. Vitanyi, *Kolmogorov's structure functions and model selection*, Statistical Learning in Classification and Model Selection, 15 January, Eindhoven; *The similarity metric*, CS Colloquium University of Utrecht, 24 January, Utrecht; *Kolmogorov's structure function and model selection*, Complexity Theory Day, 20 February, Amsterdam; *The similarity metric*, Graduate School SIKS Lectures, 23 February, Zeist; *Universal Clustering*, Centennial Seminar on Kolmogorov

Complexity and Applications, 27 April, Wadern; *Similarity metric and algorithmic music clustering*, DIMACS Workshop on Complexity and Inference, 2 June, Piscataway; *Kolmogorov's structure functions with an application to the foundations of model selection*, International conference Kolmogorov and contemporary mathematics, 16 June, Moscow; *Music clustering*, TLO meeting, 27 June, Amsterdam; *Clustering by Compression*, IEEE International Symposium on information theory, 29 June, Yokohama.

Scientific Functions

P.W. Adriaans, CWI, Chairman of the board; ICGI, Board member; SIKS, Advisory Board; *Cognition program NWO*, Member Advisory Committee; HPCN, Member of the Board.

P.M.B. Vitanyi, *Encyclopedia of Mathematics*, Member of the scientific board; *EU Project RESQ IST*, Member; *EU Project Universal Learning*, Coordinator; *NWO Project Quantum Computing*, Coordinator; *NWO Project Average Case Analysis of Algorithms*, Coordinator; NoE QUIPROCONE, Member; *ESF Qit Programme*, Member; *Network of Excellence PASCAL*, Member.

L. Torenvliet, *Dutch Association for Theoretical Computer Science*, Member of the board.

Editorships

P.W. Adriaans, *Grammar*, Guest Editor GI volume; *Machine Learning Journal*, Guest Editor DM volume.

H.M. Buhrman, *Journal of Computer and System Sciences*, Guest Editor; *Theory of Computing Systems*, Editor; *Computational Complexity*, Editor.

P. van Emde Boas, *Information and Computation*, Editor; *Rairo Informatique theorique*, Editor.

P.M.B. Vitanyi, *International Journal of Foundations of Computer Science*, Editor; *Distributed Computing*, Editor; *Theory of Computing Systems*, Editor; *Information Processing Letters*, Editor; *Parallel Processing Letters*, Editor; *New Generation Computer Systems*, Editor; *Frontiers in Computing Systems Research*, Editor.

Program Committees

H.M. Buhrman, *Steering committee conference on computational complexity*, Member; *Steering committee quantum information processing*, Member; *ESF steering committee*, Member; *Lorentz Center*, Member of the program board for computer science; *CWI*, Member of the library committee; *NWO*, Member of the VENI evaluation committee; *RESQ*, Member of the steering committee.

P.W. Adriaans, *ECML/PKDD 2003*, Member, 22 September-26 September, Dubrovnik; *Portugese Conference on AI*, Member, 4 December-7 December, Beja.

H.M. Buhrman, *Conference on Computational Complexity*, Chair, 7 July-10 July, Amsterdam; *International colloquium on automata, languages and programming*, Member, 30 June-4 July, Amsterdam; *Quantum information processing*, Member, 15 December-18 December, Amsterdam.

P.M.B. Vitanyi, *14th Annual International Symposium on Algorithms and Computation*, Member, 15 December-17 December, Kyoto; *Workshop on Complexity and Inference*, Member, 2 June-5 June, Berkeley; *European Conference on Machine Learning*, Member, 20 September-24 September, Pisa; *Distributed Computing Conference*, Member, 4 October-8 October, Amsterdam; *International Symposium on Mathematical Foundations of Computer Science*, Member, 22 August-27 August, Prague.

Scientific Events Organized

P.W. Adriaans, *Learning Context-free grammars (with de la Higuera, van Zaanen, Oncina)*, 23 September, Dubrovnik; *Cochlear Implants and language acquisition (with Van Olphen)*, 17 September-18 September, Beekbergen.

H.P. Roehrig, *Kickoff meeting RESQ (with H. Buhrman and R. de Wolf)*, 9 January-11 January, Amsterdam; *Quantum Computing Workshop (with H. Buhrman and R. de Wolf)*, 29 June, Eindhoven.

P.M.B. Vitanyi, *Centenial Seminar of Kolmogorov Complexity and Application (with L. Leving, W. Merkle, A. Shen)*, 27 April-2 May, Wadern; *DIMACS workshop on complexity and inference*, 2 June-5 June, Piscataway.

Scientific Awards

H.M. Buhrman, *VICI grant for Quantum Information Processing*, NWO Vernieuwingsimpuls, December, Amsterdam.

P.M.B. Vitanyi, *Appointed CWI Fellow*

Miscellaneous Scientific Functions or Activities

P.W. Adriaans, Project Leader Adaptive Information Disclosure project in Virtual Lab; Senior Research advisor Perot Systems Corporation; Member ICT Forum.

P.M.B. Vitanyi, Publiciteitscommissie van het wiskundig genootschap Member of the Dutch Robosoccer Committee; Advisor Monash Key Center for Computational Data Analysis Project Leader various SION projects in Machine Learning, Multiple Computing Agents, Cryptography and Randomness, Quantum Computing; Advisor and Evaluator of the Japanese Discovery of Science Project.

Appendix 5 Contact information

Last Name	Initials	First Name	E-mail	Phone	Project	Work Location
Adriaans	P.W.	Pieter	pieter.adriaans@ps.net	06-54234459	ACT	PM24
Ahn	D.D.	David	ahn@science.uva.nl	020-525 5357	LIT	NA166
Aloni	M.D.	Maria	M.D.Aloni@uva.nl	020-525 4556	ToI	ND15
Apt	K.R.	Krzysztof	apt@science.uva.nl	020-525 5358	LIT	CWI
Balogh	K.	Kata	K.Balogh@uva.nl	020-525 4544	ToI	ND15
Bartsch	R.I.	Renate	R.I.Bartsch@uva.nl	020 525 4537	ToI	ND15
Bentham van	J.F.A.K.	Johan	johan@science.uva.nl	020-525 5807	CIL	PM24
Bezhanishvili	N.	Nick	nbezhani@science.uva.nl	020-525 6925	CIL	PM24
Blutner	K.R.	Reinhard	K.R.Blutner@uva.nl	020 525 4528	CSIP	ND15
Bod	L.W.M.	Rens	rens@science.uva.nl	020-525 5360	CSIP	NA166
Brand	S.	Sebastian	Sebastian.Brand@cw.nl	020-592 4170	LIT	CWI
Bruin de	B.P.	Boudewijn	debruin@science.uva.nl	020-525 6508	CIL	ND15
Buhrman	H.M.	Harry	buhrman@cw.nl	020-592 4076	ACT	CWI
Butler	A.J.	Alastair	A.J.Butler@uva.nl	020-525 4510	ToI	ND15
Caracciolo	C.	Caterina	caterina@science.uva.nl	020-525 5355	LIT	NA166
Cate ten	B. D.	Balder	Balder.tenCate@uva.nl	020-525 4552	ToI	ND15
Cilibrasi	R.	Rudi	cilibras@cw.nl	020 592 4232	ACT	CWI
Collins		Amanda	collins@science.uva.nl	020-525 6519		
Counihan	M.E.	Marian	M.E.Counihan@uva.nl	020-525 4531	CSIP	ND15
Dekker	P.J.E.	Paul	P.J.E.Dekker@uva.nl	020-525 4541	ToI	ND15
Druiven	S.	Sjoerd	sdruiven@science.uva.nl	020-525 6054	ACT	PM24
Eijck van		Jan	Jan.van.Eijck@cw.nl	020-592 4052	CIL	CWI
Emde Boas van	P.	Peter	peter@science.uva.nl	020-525 6065	ACT	PM24
Fissaha Adafre	S.	Sisay	sfissaha@science.uva.nl	020-525 5359	LIT	NA166
Fitz	H.	Hartmut	hartmut.fitz@rz.hu-berlin.de	020-525 4531	CSIP	ND15
Franceschet	M.	Massimo	francesc@science.uva.nl	020-525 5357	LIT	NA166
Groenendijk	J.A.G.	Jeroen	J.A.G.Groenendijk@uva.nl	020-525 4535	ToI	ND15
Hendriks	A.	Lex	lhendrik@science.uva.nl	020-525 6511	CIL	PM24
Hindsill	D.	Darrin	D.L.Hindsill@uva.nl	020-525 4510	CSIP	ND15
Hoeve van	W.J.	Willem Jan	wjvh@cw.nl	020-592 4170	LIT	CWI
Honing	H.J.	Henkjan	H.J.Honing@uva.nl	020-525 4698	CSIP	S134
Honingh	A.K.	Aline	ahoningh@science.uva.nl	020-525 5356	CSIP	NA166
Infante López	G.G.	Gabriel	infante@science.uva.nl	020 525 5359	LIT	NA166
Janssen	T.M.V.	Theo	theo@science.uva.nl	020-525 5361	ToI	PM24
Jijkoun	V.	Valentin	jijkoun@science.uva.nl	020-525 6730	LIT	NA166

Last Name	Initials	First Name	E-mail	Phone	Project	Work Location	Last Name	Initials	First Name	E-mail	Phone	Project	Work Location
Jongh de	D.H.J.	Dick	dickdj@science.uva.nl	020-525 6061	CIL	PM24	Torenvliet	L.	Leen	leen@science.uva.nl	020-525 6065	ACT	PM24
Kamps	J.	Jaap	kamps@science.uva.nl	020-525 2538	LIT	NA166	Troelsta	A.S.	Anne	anne@science.uva.nl	020-525 5206	CIL	PM24
Kassenaar	T.	Tanja	tkassena@science.uva.nl	020-525 6519		PM24	Tzanis	E.	Evangelos	etzanis@science.uva.nl	020-525 6508	CIL	PM24
Kupke	C.A.	Clemens	ckupke@science.uva.nl	020-525 6925	CIL	PM24	Ulsen	P.	Paul	paulvu@science.uva.nl	020-525 5208	CIL	PM24
Kwast	K. L.	Karen	K.L.Kwast@uva.nl	020-525 4556	CSIP	ND15	Veldhuisen	M.	Marjan	marjanv@science.uva.nl	020-5256051		PM24
Lambalgen van	M.	Michiel	M.vanLambalgen@uva.nl	020 525 4523	CSIP	ND15	Veltman	F.J.	Frank	F.J.M.M.Veltman@uva.nl	020-525 4564	CSIP	ND15
Lee	T.J.	Troy	troy.lee@cwi.nl	020 592 4051	ACT	CWI	Venema	Y.	Yde	yde@science.uva.nl	020-525 5299	CIL	PM24
Loon van	I. M.	Ingrid	ingrid@science.uva.nl	020-525 6090		PM24	Vervoort	M.R.	Marco	vervoort@science.uva.nl			
Löwe	B.	Benedikt	bloewe@science.uva.nl	020-525 6071	CIL	PM24	Vitanyi	P.M.B.	Paul	Paul.Vitanyi@cwi.nl	020-592 4124	ACT	CWI
Maat	J.	Jaap	j.maat@uva.nl	020-525 4536	ToI	ND15	Wilde	M.C.	Tine	m.wilde@uva.nl	020-525 4503	ToI	
Marx	M.J.	Maarten	marx@science.uva.nl	020-525 2888	LIT	NA166	Zambella	D.	Domenico	domenico@dm.unito.it	020-525 5208	CIL	PM24
Mastop	R.J.	Rosja	R.J.Mastop@uva.nl	020-525 4552	CSIP	ND15	Zeevat	H.W.	Henk	henk.zeevat@hum.uva.nl	020-525 4539	CSIP	ND15
Masuch	J.M.F.	Michael	michael@ccsom.uva.nl	020-525 2586	LIT	NA166							
Mishne	G.A.	Gilad	gilad@science.uva.nl	020 525 6731	LIT	NA166							
Mokken	R.J.	Rob	mokken@ccsom.uva.nl	020-525 2887	LIT	NA166							
Müller	K.E.	Karin	kmuller@science.uva.nl	020-525 5355	LIT	NA166							
Nauze	F.D.	Fabrice	f.d.nauze@uva.nl	020-525 4544	CSIP	ND15							
Niekus	J.M.	Joop	jniekus@science.uva.nl	020-525 5361	CIL	PM24							
Prescher	D.	Detlef	prescher@science.uva.nl	020-525 6730	LIT	NA166							
Rettob	X.	Ria	xrettob@science.uva.nl	020-525 2852		NA166							
Rietveld	D.W.	Erik	D.W.Rietveld@uva.nl		ToI	ND15							
Rijke de	M.	Maarten	mdr@science.uva.nl	020-525 5358	LIT	NA166							
Rooij de	S.	Steven	S.de.Rooij@cwi.nl	020-592 4227	ACT	CWI							
Rooy van	R.A.M.	Robert	R.A.M.vanRooij@uva.nl	020-525 4551	ToI	ND15							
Safarova	M.	Marie	M.Safarova@uva.nl	020-525 4552	ToI	ND15							
Scha	R.J.H.	Remko	scha@hum.uva.nl	020-525 2075	CSIP	PM24							
Schlobach	K.S.	Stefan	schlobac@science.uva.nl	020-525 5357	LIT	NA166							
Schulz	K.	Katrin	K.Schulz@uva.nl	020-525 4531	CSIP	ND15							
Seginer	Y.	Yoav	yseginer@science.uva.nl	020-525 6508	CIL	PM24							
Semmes	B.T.	Brian	bsemmes@science.uva.nl	020-525 6508	CIL	PM24							
Sevenster	M.	Merlijn	sevenstr@science.uva.nl	020-525 6054	ACT	PM24							
Sigurbjörnsson	B.	Börkur	borkur@science.uva.nl	020-525 6731	LIT	NA166							
Sima'an	K.	Khalil	simaan@science.uva.nl	020-525 6573	CSIP	NA166							
Spalek	R.	Robert	Robert.Spalek@cwi.nl	020-592 4272	ACT	CWI							
Spiro	N.	Neta	nspiro@science.uva.nl	020-525 5356	CSIP	NA166							
Stokhof	M.J.B.	Martin	M.J.B.Stokhof@uva.nl	020-525 4540	ToI	ND15							
Stol	M.C.	Maarten	mstol@science.uva.nl	020-525 2598	LIT	NA166							

Projects

ACT = Algorithms and Complexity Theory

CSIP = Cognitive Systems and Information Processing

CIL = Constructive and Intensional Logic

LIT = Language and Inference Technology

TI = Theory of Interpretation

Worklocations

ND15 = Nieuwe Doelenstraat 15; 1012 CP Amsterdam; fax 020-525 4503

PM24 = Plantage Muidergracht 24; 1018 TV Amsterdam; fax 020-525 5206

CWI = Centrum voor Wiskunde en Informatica; Kruislaan 403; 1098 SJ Amsterdam; fax 020-592 4199

NA166 = Nieuwe Achtergracht 166; 1018 WV Amsterdam; fax 020-525 2800

S134 = Spuistraat 134; 1012 VT Amsterdam; fax 020-525 4429

Appendix 6: Obtaining further information

All information concerning the institute can be obtained from the ILLC Bureau:

ILLC Bureau
Plantage Muidersgracht 24
NL-1018 TV Amsterdam
The Netherlands
e-mail: illc@science.uva.nl
phone: +31 20 525 6051
fax: +31 20 525 5206
www: <http://www.illc.uva.nl/>

Please contact the bureau if you would like to obtain one of the following (series) of documents:

- ILLC Research Reports and Master theses
- ILLC Dissertations
- ILLC Research plan 2001-2004
- ILLC Annual Report
- Brochure MSc program in Logic
- Proceedings of scientific events (such as the Amsterdam Colloquia) organized by ILLC
- Other documentation, e.g. concerning visits or scholarships

Information about activities based at or represented by ILLC can be obtained from the following persons or www-addresses:

Graduate Program in Logic: Amanda Collins
gpil@science.uva.nl
<http://www.illc.uva.nl/gpil>

ILLC publications:
Benedikt Löwe (editor), bloewe@science.uva.nl
Marco Vervoort (executive editor), vervoort@science.uva.nl
Marjan Veldhuisen and Tanja Kassenaar (distribution, orders),
illc@science.uva.nl
<http://www.illc.uva.nl/>



Institute for Logic, Language and Computation

Plantage Muidergracht 24
1018 TV Amsterdam
Phone: +31 20-525 6051
Fax: +31 20-525 5206
Email: illc@illc.uva.nl
URL: <http://www.illc.uva.nl>

UNIVERSITEIT VAN AMSTERDAM