

# ILIC Magazine

March 2004

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INTERVIEWS WITH DICK DE JONGH AND RENATE BARTSCH

## The Freedom That Lies Ahead

Dick de Jongh and Renate Bartsch have several things in common: both are graduates of the ILLC, albeit in different areas, both have interests that extend far beyond their immediate subjects, and both are living the major life-event of retirement retirement. However, their perceptions of retirement differ as greatly as their areas of expertise do.

The next prominent feature of Dick de Jongh's work is his research in the area of quantum mechanics. Dick de Jongh is well known for his work on quantum mechanics, particularly in the area of quantum entanglement. He has published several papers on this topic, and his work is highly cited in the field.

'I'm a bit of a late-bloomer.'



In 1982, Dick de Jongh published his first paper on quantum mechanics. He was then a graduate student at the University of Groningen. His work was highly cited and led to several publications in the field. He has since become a prominent figure in the area of quantum mechanics, with a focus on quantum entanglement and quantum information theory.

Interview with Dick de Jongh and Renate Bartsch

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Paul Vitányi's Giant Brains

The brain is the most complex structure in the known universe. It is a vast network of neurons, each with its own unique function. The brain is capable of processing information at a rate that is far beyond anything we are capable of. It is a true marvel of nature.

Paul Vitányi is a leading expert in the field of cognitive science. He has published several papers on the brain and its functions, and his work is highly cited in the field. He is currently a professor at the University of Groningen, where he continues to research the brain and its functions.



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In this issue amongst others:

Celebrated Professors: Johan van Benthem and Paul Vitányi  
Master students who enrolled in the PhD programme

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## Master students who enrolled in the PhD programme

What do Smith Abreu, Isabel and the United States have in common? Not much, perhaps - except that they are all represented at the ILLC by PhD students. Monica Couvreur (Smith Abreu), Boris Sperbermann (Isabel) and Brian Simons (United States) participated in the Master of Logic programme at the ILLC and are currently doing their PhD in Groningen. Although their reasons for choosing the ILLC vary, their studies are remarkably similar.



Monica Couvreur is a leading expert in the field of cognitive science. She has published several papers on the brain and its functions, and her work is highly cited in the field. She is currently a PhD student at the University of Groningen, where she continues to research the brain and its functions.



Brian Simons is a leading expert in the field of cognitive science. He has published several papers on the brain and its functions, and his work is highly cited in the field. He is currently a PhD student at the University of Groningen, where he continues to research the brain and its functions.



Dear alumna, alumnus, staff member, PhD student and relation,

You have just received the biggest ILLC Magazine ever. Although we live by the rule that less is more, we could not escape from enlarging the number of pages in order to cover the gamut of personal experiences of an ILLC alumnus: finding a PhD position, functioning as an ILLC alumnus outside academia, reflecting on the differences between academic systems, being honored as an outstanding scholar and finally retiring as a professor.

We would like to thank all writers for their contributions and their enthusiasm. We are sure that this has made the issue fun to read.

On behalf of the editors  
Merlijn Sevenster



## Announcements

### Staff changes February 2003- February 2004

#### New!

- Benedikt Löwe: assistant professor as of April 1, 2003
- Gilad Mishne, scientific programmer as of December 1, 2003
- David Ahn, postdoc as of February 1, 2004

The new PhD students: Fabrice Nauze, Sisay Fissaha Adafre, Kata Balogh, Brian Semmes, Erik Rietveld, and Evangelos Tzanis, introduce themselves on page 23

#### Left!

- Juan Heguibehere finished his PhD on December 4, 2003. He is going to work for the Free University of Bolzano, Italy
- Christof Monz finished his PhD on December 11, 2003, and is now working as a postdoc at University of Maryland.
- Breannan Ó Nualláin, works as a scientific programmer for the Instituut voor Informatica (UvA) as of October 2003
- Jaap Kamps works as assistant professor in the Nieuwe Generatie Offensief-programma of the Faculty of Humanities, as of July 1, 2003
- Ivar Vermeulen's postdoc position ended on September 1, 2003. He is still affiliated with ILLC and is writing project proposals for a new position.

The following people (supporting staff) also left us: Nanning Poelsma, Peter-Paul de Witte, and Vera Hollink.

### Prizes and Awards

**Paul Vitányi** has been appointed CWI Fellow from January 1st, 2003. This position is given to outstanding members of CWI's research staff, enabling them to concentrate completely on research. See page 16.

The Universiteit van Amsterdam appointed **Johan van Benthem** university professor on October 1, 2003, to "further interdisciplinary research in the field of information science and cognitive science." The position of university professor is a very prestigious one and is offered to a select number of scholars of international renown. See page 14.

**ESSLLI'03** awards for ILLC students:

**Willem Conradie** won the best paper award and **Wouter Kuijpers**, together with **Petrucio Viana**, won the best poster award.

**The LIT Group** (group leader Maarten de Rijke) obtained two NWO fundings, as part of NWO's annual "open competitie", for two three-year postdoc projects:

- Learning Stochastic Tree-Grammars from Tree-Banks
- Inference for Temporal Question Answering

### AixIA Dissertation Award

**Marco Aiello** won the prize for the best dissertation in the field of AI defended after January 2002 from the Italian Association for Artificial Intelligence (AixIA), a prize of € 1500.

### NWO Cognition program

Six applications (with members from the ILLC as (co-)applicants) for preparatory grants in the NWO Cognition program 2003 made it to the final round, see page 18.

The project by **Joop Niekus** in the NWO Leraar in Onderzoek programma on Choice sequences in the work of Brouwer (supervised by Dick de Jongh) has been extended for another two years.

**Professor Harry Bührman** (ILLC/CWI) has been awarded one of the 26 prestigious VICI grants (NWO Vernieuwingsimpuls 2003) for his project on "Quantum Information Processing"

**Dr Maria Aloni** has been awarded a VENI grant (NWO Vernieuwingsimpuls 2003), for her research on "Semantic Structure and Dynamics in Natural Language Interpretation"

**DFG Grant "Determinacy and Combinatorics"**  
**The Deutsche Forschungsgemeinschaft (DFG)**

approved the research project "Determinacy and Combinatorics" of Peter Koepke (RhFWU Bonn) and Benedikt Löwe (Universiteit van Amsterdam) from 2003 to 2006.

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## COLOPHON

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# Language Use and Language Structure



Robert van Rooy

Language is one of the most precious gifts history has given us. It enhances cooperation among individuals by enabling us (among others) to communicate useful information. What is it about language and our use of it that allows us to do so? The answer is linguistic rules and our reasoning heuristics.



On the one hand, what we intend to communicate - the meaning of the utterance - is to a large extent governed by commonly known linguistic rules (syntactic and semantic conventions) that we all make use of. On the other hand, we communicate more by the use of an expression than can be derived from these linguistic rules, and this depends on our use of reasoning heuristics.

It is natural to view communication as a kind of cooperative game between speakers and hearers. A hearer has the task to interpret the utterance in the way intended by the speaker, and a speaker has the task to give enough clues by his or her use of the utterance to enable the hearer to do so. This kind of game does not have winners and losers, because both agents win or lose at the same time. But a game it is, since we can determine exactly what the rules of the game are and when players win or lose. As noted above, although the communication problem central to the game is solved to a large extent by the use of linguistic rules, normally these rules do not fully determine what is actually meant by the speaker. For instance, what speakers want to refer to when they use such pronouns as 'he' or 'they' is highly underspecified by their conventional meaning and depends

heavily on contextual features, namely what the most salient male individual or group of individuals is. Underspecification is a virtue of natural languages, since it makes them flexible in the sense that a single message can convey different contents in different contexts. The use of context is also crucial to determine what is implicitly conveyed by means of conversational implicatures. In both cases, by relying on context, speakers do not have to be fully explicit and can use language in a more efficient and economical way. Not being fully explicit about what one intends to communicate is, however, also risky, since it threatens secure and reliable communication. The hearer might be unable to infer what the speaker meant to say. Successful information exchange therefore requires a sophisticated reasoning heuristics. In my work I use theories of rational behaviour (game and decision theory) and techniques from non-monotonic reasoning to state and formalize such heuristics. For instance, it seems natural to assume that speakers only want to convey information that is of relevance to the goals of the conversational participants, and I use decision theory to formalize this notion. In my work I show that this notion helps us to determine what is actually meant by the speaker's use of a sentence.



Let me illustrate the use of relevance with a simple example. Consider the Gricean (nonmonotonic) principle that everything is false that the speaker could have said but did not say. For instance, from a speaker's assertion that she has a child, we normally conclude that she does not have more than one child, otherwise she could and should have said so. This kind of inference, however, should obviously be related to the goals of, or to what is of relevance to, the speech participants. For instance, the inference typically does not go through if the assertion was given in answer to the question 'Who has a child?', which was asked in order to find out, for instance, who can be issued a ticket at a reduced price.

Where reasoning heuristics make it possible to use a sentence to communicate more than what we say explicitly, linguistic rules allow us to say something explicitly in the first place. But why do we make use of rules, and where do they come from? We are, of course, able to communicate information without the use of linguistic signs at all; for instance, we can point to something to make that thing salient. This means of communication is obviously rather limited, and if we want to communicate something more interesting in a reliable way, the use of linguistic rules is crucial. We therefore want to provide a functional motivation/explanation of why these linguistic rules emerged. This is what I try to do using evolutionary game theory (EGT). Obviously, not every aspect of our actual linguistic rules can be explained in such a way: the rule that says that we call a table a 'table' is completely arbitrary, because in Dutch we don't call it a table. Typological research, however, has shown that the languages of the world have a great deal in common, especially at a higher organizational level. I am interested to see to what extent these commonalities (linguistic universals) can be given a functional motivation within EGT.



## In Memoriam

On 1 December 2003 we received the sad and shocking news that our respected colleague Wim Blok had died in an accident. Wim Blok was a professor of mathematics at the University of Illinois at Chicago, and one of the world's leading researchers in the field of algebraic logic. This branch of mathematics dates back to the nineteenth century and seeks to understand and solve logical problems using tools from universal algebra.

Wim Blok studied at the UvA and obtained his PhD degree there. His primary interest was set-theoretic topology, which at the time was represented at the UvA by the well-known topologist J. de Groot. After the latter's untimely death, and inspired by Philip Dwinger's visit to Amsterdam, Blok's interest turned to algebraic logic. This resulted in his dissertation 'Varieties of Interior Algebras', which he wrote under the guidance of Dwinger and defended in 1976, with Anne Troelstra acting as second referee.

In this first phase as a researcher at the UvA during the 1970s, Wim Blok made seminal contributions to the field of modal and related logics. His dissertation and its follow-up publications transformed the study of completeness and incompleteness phenomena for modal and intuitionistic systems. More generally, his use of new powerful algebraic methods strongly influenced the Amsterdam modal semanticists of the period, leading to various publications and life-long contacts.

In the 1980s, Wim Blok moved to the US and initiated a new line of thought in abstract algebraic logic, and this too was to have a broad impact. In particular, he gave a lot of thought to the question what it could mean for a logic to have an algebraic semantics. With Don Pigozzi and others, he set up an entire framework for the study of logics by algebraic means. Their publications - notably 'Algebraizable Logics' (*Memoirs of the American Mathematical Society*, 1989; cf. the MathSciNet review by Hajnal Andréka) - have become classic sources.

Wim Blok was a regular visitor to the ILLC. When visiting his family and friends in the Netherlands he would usually spend some time at our institute and often give a presentation of his work. Only a few years ago, he spent a sabbatical in Amsterdam, during which he gave a much-appreciated course in abstract algebraic logic. When we heard the news of his death, we were in the middle of making plans to intensify this collaboration and, more particularly, preparing another extended visit.

It is with great sadness that we announce the loss of this respected colleague. No doubt the same will be felt by many in the international community, given Wim Blok's reputation and range of activities. At the same time, we have lost a good friend, as Wim was famous for his warmth and genuine interest in the work and lives of others. Our thoughts go to the family he leaves behind: his wife Mary and son Philip in Chicago, and his relatives here in the Netherlands.

Johan van Benthem  
Peter van Emde Boas  
Dick de Jongh  
Anne Troelstra  
Yde Venema  
(8 December 2003)  
<http://www.illc.uva.nl/Obituaries/Blok.html>

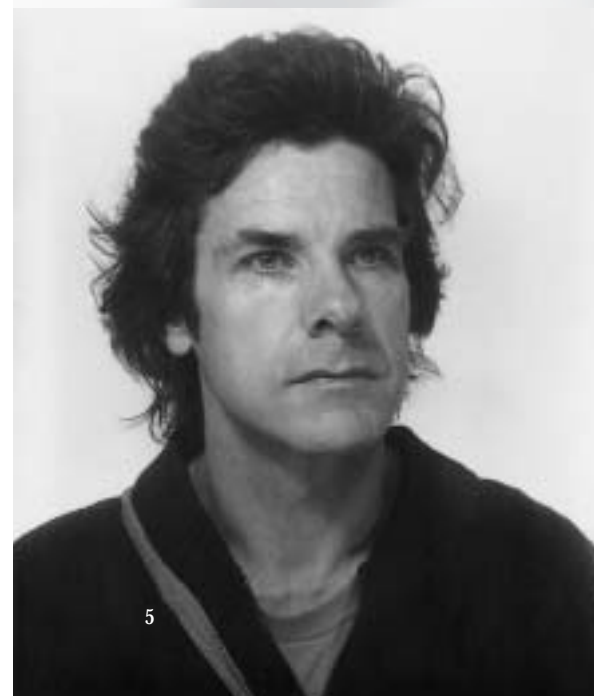
INTERVIEWS WITH DICK DE JONGH AND RENATE BARTSCH

# The Freedom That Lies Ahead

*Dick de Jongh and Renate Bartsch have several things in common: both are a professor at the ILLC, albeit in different areas, both have interests that extend far beyond their immediate subjects, and both are facing the major life-event of imminent retirement. However, their perception of retirement differs as greatly as their areas of expertise do.*

The most prominent feature in Dick de Jongh's study is one of those translucent i-Macs, with speakers that resemble designer candleholders. During the interview, Dick de Jongh spoke softly, as though he did not want to disturb the air in the room. Strings of deliberately spoken words, interspersed with silences, ended as unexpectedly as they started.

**'I'm a bit of a late-bloomer.'**



In 1961, Dick de Jongh embarked on a study of physics and chemistry. However, because life in a lab was not to his liking, he soon turned to mathematics - or, more accurately, to the foundations of mathematics. 'I liked the foundations of mathematics.

It was exciting, so I pursued it. But not because it seemed a good career step: I've always lived for the moment, and never planned much.'

With a *kandidaats* (Bachelor's) degree in his pocket, Dick de Jongh left Leiden for Amsterdam to obtain his MA in logic, philosophy and the foundations of mathematics. 'At the time, Amsterdam was the only place where one could study the foundations of mathematics. In those days, this study attracted a great deal of attention. Questions like 'What are numbers?' were the subject of significant dispute. The interest has now diminished somewhat, for one because, in spite of years of hard work, we don't seem to have come closer to solutions. As is often the case in philosophy, differences in opinions and different movements did not cease to exist despite what we then viewed as important developments and major breakthroughs. But at the time, the foundations of mathematics aroused my interest,

and after finishing my Master's in 1964, I went to Madison, Wisconsin, to write a thesis on intuitionistic logic (IL). IL arose from the work of the Dutch mathematician, Brouwer, who at the beginning of the 20th century took a very strict position on the foundations of mathematics. His viewpoints gave rise to a different type of logic than most mathematicians use. Brouwer's logic is much stricter, but its elegance lies in the fact that once it is proven that a certain number or object exists, the proof provides the method to construct it.'

**In 1968 Dick de Jongh returned from the US with a completed PhD thesis, and started to work at the UvA. Apart from another two-year visit to Buffalo (New York), he has continued to work at the UvA ever since. Nevertheless, he has held a professorship for only three years.**

'I'm a bit of a late-bloomer', Dick de Jongh said. 'For one because personal circumstances made it impossible for me to accept such an exacting position any sooner. At a critical stage in my life, I was raising my children single-handedly. I was able to retain a full-time job, but a professorship requires much more. Besides,

although I may have aspired to a professorship, I was never willing to move away from Amsterdam. I would perhaps have gone as far as Utrecht, but never so far afield as Australia, or even Bonn or Oslo. Actually, I once went to Twente for a job interview, but was relieved when I heard that someone else had got the job.

'I consider my current professorship mainly to be a tribute to the work that I had done as a staff member for so many years. At the time of my appointment - three years ago - I had no big plans for this department. I did not perceive the professorship as a license to shake things up. I already had many managerial responsibilities, including managing the ILLC Master Program, and so, apart from some extra representative duties, my professorship did not change much. You see, the ILLC is a very high-quality institute. The quality of the people is in many cases incommensurate with the position they hold. Our two professors at the logic department - Johan van Benthem and Anne Troelstra - are outstanding; however, many of the staff members would also make fine professors. Because of this overall high quality, the ILLC has never been much of a hierarchical institute. In so far as my professorship has not changed my work that much, I have no reason to regret bidding it farewell so soon.'

**Apart from intuitionistic logic, Dick de Jongh has been engaged in two other major subjects.**

'On the one hand, I have been concerned with Gödel's provability logic, which I find mathematically enchanting. Gödel proved that a certain arithmetical theory can never be complete, and that the theory cannot, in itself, prove that is inconsistent or internally contradictory. To prove this, other, more comprehensive theories are required. Provability logic thus captures exactly what theories have to say about their own provability predicates. It is not logic per se which has my interest, but this application of logic in, for example,



Dick de Jongh, 1999

## 'I did not perceive my professorship as a license to shake things up.'

foundational questions. The application of intuitionistic logic and provability logic, as such, results in the amalgamation of abstract denotation, philosophical interpretation and pure mathematics, which is so very appealing to me.

'On the other hand, for many years now I have been interested in formal learning theory, which is about the learning of infinite objects such as language or grammar. However, it is only recently that this interest has given rise to cooperation with linguists, and with a medical team in Utrecht. We have just submitted a grant proposal to study how children with cochlear implants learn to use grammar. I think logic can contribute to this field of research by formalizing the issues within linguistic theories.'

**Apparently, so far as it concerns his scientific work, Dick de Jongh's imminent retirement is something of a formality.**

'I think I will spend at least two days a week at the Institute after my retirement, hopefully to work on this new study, but also to continue supervising several current PhD projects. But much will change. For example, for the last eight years, I have devoted much of my time to the ILLC Master Program, and, to my regret, this will come to an end. I have been involved in the organization of this programme from the start and I will certainly miss the contact with the students. This last year will thus be one of goodbyes for me. Although this is sad it is also a relief, because I'm finding it increasingly difficult to combine all these activities. In addition, I will be able to devote more time to my hobby, the Amsterdamse Fietsersbond (Amsterdam Cyclists' Association). The Fietsersbond champions the interests of cyclists, by, for instance, pursuing safer traffic conditions for cyclists. I have always found this to be a very amusing diversion. For one because it is not, as in science, about being

right, but about being put in the right. So far, we have achieved many good things, like separate paths for cyclists on Jan van Galenstraat and the Oud-Zuid ring, the central part of the tram line three ring, on which work is now progressing. I hope to devote more of my time to this when I'm retired. Will I be bored? No: there's never enough time.'

Whereas Dick de Jongh swiftly and unreservedly agreed to an interview, Renate Bartsch first seemed a bit disgruntled about the prospect. 'Why,' she asked in a dignified tone, 'should we talk about my retirement if it is not due for more than a year? The same

goes for Dick. Really, I don't see the point.' Of course, Renate Bartsch may be right. Yet, once the interview began, she seemed to forget her reservations. Renate Bartsch holds a professorship at the Philosophy Department, which is located in a former nunnery. Seated in a red office chair in one of the many boxlike rooms that overlook the courtyard, she talked easily and willingly.

'I was born in East Prussia, but my family fled to the Hanover area when I was five. Since then I've been back to Prussia only once, to visit the Russian and the Lithuanian parts, from whence my family hails. But I haven't seen the Polish part yet, and that's one of the things I want to do in my retirement. I no longer have the desire to make long trips. I've undertaken so many, to Japan, Hawaii, India, the USA, but now I want to discover... Well, my immediate surroundings, I guess. At the moment, I'm building a house near Hanover, so I can spend part of the year in the region where I grew up. I'd like to get to know the nearby mountains and forests.'

**Renate Bartsch has been living in Holland for almost 30 years now, first in Muiden, but for the last 15 years in Castricum.**

'No, I've never experienced my emigration to Holland as a huge step. It's all so close by. The similarities of the Dutch and German languages, and of the cultures, are large enough to feel at home here. However, my Dutch still sounds very German to Dutch ears, and my German is beginning to sound Dutch to German ears. I've always found it hard to handle the subtle differences between German and Dutch: the more words or expressions overlap, the more mistakes I make.'

**Renate Bartsch came to Holland in 1974 to take up a professorship in the philosophy of language.**

'I'd studied many subjects in Germany: sociology, mathematics, logics, philosophy, philology and literature. I did my MA in 1964 in mathematics, and German language

and literature. I had the opportunity to do a PhD thesis on Goethe's art theory, or on the foundations of mathematics. However, the former was too historical for me, and the latter I considered more a study of the structures and methods of mathematics than of mathematics itself. I didn't really want to just analyse a field, I wanted to contribute something new to it. I therefore chose to do my doctoral in philosophy, and went with my supervisor - Professor Henrich - to Heidelberg, where between 1964 and 1968 I obtained my PhD in the philosophy of language. During that time, I went to Harvard for a year, where I had the privilege of studying with people like Quine, Drebber and Putnam. After working at the Philosophical Seminar of Heidelberg, and also part time at a gymnasium in Mannheim, I worked in Berlin as an assistant professor of linguistics. During this period, I met Montague at a conference in the USA. I was very impressed by his ideas and afterwards I asked him whether I could come and work with him. He agreed and I went back to Berlin where, next to my work, I took part in a seminar by Professor Schnelle on Montague's universal grammar. At the same time, I organized the necessary funding from the Deutsche Forschungsgemeinschaft. Unfortunately, by the time I'd acquired the financial means and was ready to pack my bags, Montague had died. I went to Los Angeles anyway for a year, and took part in a seminar led by David Kaplan and Barbara Partee, in which we developed Montague's theory for various linguistic constructions. In the meantime, I did my habilitation - a second doctoral, which is a licence to become a full professor in Germany - about the semantics of adverbial constructions. When I returned to Germany in 1972, I accepted a professorship at Bielefeld University. The position was fine, but Bielefeld is a small town like Utrecht, and I really wanted a position in a metropolis. So when I learned about the vacancy in Amsterdam, I applied for the job.'



Renate Bartsch, 1977

## 'It all seems not much more than a chain of coincidences.'





Renate Bartsch

I asked what it was like to have this position in a new town in a foreign land.

'When I got to Amsterdam in 1974, a close cooperation soon developed between myself, Jeroen Groenendijk, Martin Stokhof, René Appel, Simon Dik and Teun van Dijk. We all were very involved in pragmatics at the time. Once a month, one of us would give a lecture, and then we'd have dinner together and discuss the lecture topic. Later, some colleagues from Nijmegen joined the group. They were very fruitful times. Of course, gradually we all developed our own specific interests and the group fell apart, but for me this was an excellent start at the UvA. With Jeroen Groenendijk, Martin Stokhof, Theo Janssen and Peter van Emde Boas, we formed a group that worked on Montague grammar and related topics.'

Over the course of 30 years, Renate Bartsch was involved in other matters besides Montague grammar.

'Apart from my long-lasting partiality for developing Montague grammar in the direction of more flexibility and dynamics, I've devoted my time to three other major subjects. First, I've studied the social development of language, and its standardization. By development I mean, on the one hand, the natural development of

'I've never experienced my emigration to Holland as a huge step.'

language in a changing society. On the other hand, I mean the more planned development, as one sees with the introduction of terminology, and styles or registers for new or changing professions, and in new social groups generally. Here I focussed on what makes communication between people possible. I was especially interested in the notion of "correctness", that is, in what people consider correct usage and how this is developed and reinforced from generation to generation. Correctness is the foundation of the intersubjectivity of language.'

'Secondly, I tried to find a way to think and reason about "concepts", whereby concepts are taken to be ever-changing and elusive. I studied the formation of concepts and how circumstances, context and experience can shape one's understanding and give rise to specific connotations. In a way, therefore, this study was complementary to the study on the standardization of language. Now, though, the focus was on the subjectivity of concepts and the influence that non-linguistic factors can have on the development of subjective rather than intersubjective meaning. Within this area I also tried to find ways to think about propositional attitudes - such as "X believes that p" - and how far we can or cannot understand each other's propositional attitude reports. In this study, the public notion of correctness, and especially truth, was taken as securing the objective and intersubjective aspects of concept formation, which still leaves room for the subjective aspects resulting from very personal experiences.'

'Recently, I've expanded this view of language as a system of conceptualisation. Lately, I have studied how consciousness interacts with language and can give rise to language, and how language can then give rise to higher forms of consciousness. I'm now especially

interested in the influence of episodic memory on the understanding of situations and linguistic utterances. I'm using Proust's work to illustrate and study the role of episodic memory.'

I asked Renate Bartsch whether she thinks that things could have turned out very differently.

'Of course, looking back, it all seems not much more than a chain of coincidences. When I was young, I wanted to be a doctor. However, I dreaded cutting up corpses, so I studied a wide variety of subjects hoping to find another calling. After my studies, I had the privilege to be able to choose between several thesis options. If I had not picked semantics, I would not have come to Amsterdam, etc. In the end, small choices can make large differences.'

Finally, I asked whether retirement was something Renate Bartsch looks forward to, after so many years of being a professor.

'I feel very ambiguous about it. On the one hand, I shall enjoy the freedom that comes with retirement. I've already reduced the number of hours I devote to work, and I really do enjoy the slower pace - not having to rush to catch the train, but being able to finish my coffee and the paper before I leave. Next year, I'll be able to do whatever I like - and that's an uncharted luxury. On the other hand, all these new privileges are just a diversion. I'm getting old, less fit. When I see people who are ten years my senior, I realize that this really is the last phase. But I'm sure I'll enjoy the limitless freedom that lies ahead of me. Will I continue to work after my retirement? I do not know. I don't think I'll be one of those seventy-year-old professors who still attend every lecture all over the country. But who knows?'

Sophie van der Sluis  
SvdSluis@writersblock.net

# A Spectrum of Higher Education

Benedikt Löwe works as Assistant Professor at the ILLC on the project 'Constructive and Intensional Logic'. He studied at Universität Hamburg, Eberhard-Karls-Universität Tübingen, Humboldt-Universität zu Berlin and UC Berkeley. In 1999-2003, he worked at the Rheinische Friedrich-Wilhelms-Universität Bonn and during this time held visiting appointments at UCLA and UC Irvine.



Benedikt Löwe

I joined the ILLC staff in April 2003. Before that, I was at the Rheinische Friedrich-Wilhelms-Universität (Rheinische Friedrich-Wilhelms-Universität (RhFWU) Bonn, one of Germany's *Traditionsuniversitäten*. The tradition that is being upheld in these universities is a blend of the traditions of the 1960s/1970s and the Humboldtian tradition of unity of research and higher education. The prime characteristics of this are the principle of *Akademische Selbstverwaltung* (administration by the academic staff without full-time administrative appointments), *Freiheit von Forschung und Lehre* (freedom of research and teaching) and the primacy of research in practice and motivation: the implicit goal of teaching is to educate the future generations of researchers.

THIS has some consequences for student life and studying in the Humboldtian system. For students, there are almost no obligations - no obligatory courses and to a certain extent not even obligatory credits (after the first two years you can continue your studies without ever attending a lecture). In general, student tutoring is frowned upon as an unwanted means of restricting the self-determination of the students: the general assumption is that students are fully responsible adults, and if they decide to idle, that's their own decision. The *Diplom* thesis (roughly equivalent to a Master's thesis) tends to be a research project with sometimes publishable results (and more than two years of work put into it). There is not even a serious attempt

at evaluating the quality of education: *Freiheit der Forschung und Lehre* is a sacrosanct principle of the system and any attempt at evaluation is seen as infringing the essence of academia. Since many students cannot cope with this amount of liberty, a comparatively small percentage graduate. However, those students who can deal with this system usually profit greatly from it, learning the material as well as a lot about organizing their lives and work, and about making independent decisions.

I also spent a not insignificant portion of my academic life at American universities, mostly in the system of the University of California (UC) - which has been described to me, in half jest, as 'the strictest bureaucracy on earth'. Coming from the German system, this was a different world: teaching is not seen as a submerged part of research, but as a topic of academic identity in its own right and with its own rules. This coupled with the power of the non-academic administration in American institutions results in a rather different type of student life: students formally enrol in classes (the concept of enrolling in courses is utterly alien to German students - as it is to Dutch students, as I have learned), success and failure in class is recorded in official transcripts, a large majority of students take courses seriously, and there is both supervision of students and considerable evaluation pressure on faculty members.

OF course, these brief descriptions of what I called the 'Humboldtian' and the 'US' system are very coarse caricatures of life at the named institutions, but although I simplified the description by overemphasizing the dissimilarities, it cannot be denied that the systems are markedly different, and that both have their share of advantages and disadvantages. The strict bureaucracy of the US system and the deliberate lack of it in the Humboldtian system are two extremes in a spectrum of higher education, which has many shades between the two extremes. Since I came to Amsterdam, I have seen the current situation of our system here as a rather sensible *μέτρον ἄριστον*: while the underlying principle of the system is academic freedom, it is neither hostile to administrative measures and external quality assessment nor oblivious to the non-research-related viewpoints of academic education.

IN general, the Humboldtian system is very good at dealing with research-oriented students, whereas the US system is very good at dealing with large numbers of students who have to acquire basic skills: students with no interest in research are, in general, ill-served at German *Traditionsuniversitäten*, and the strict administrative measures of the US system make it very hard to arrange exceptions and independence for exceptional students who might become the researchers of the future.

IN the past five years, we have seen a forceful political attempt to shift the European academic life towards the Anglo-Saxon system (Bologna Agreement). The introduction of Bachelor's and Master's degrees is the most visible consequence of this. This is one way to deal with the problems mentioned, that is by giving all students (including those not interested in research) the chance to receive a basic academic education and a university degree (at the Bachelor's level), whilst keeping a research degree for those interested in continuing (the Master's degree). It also gives us the chance to introduce measures with a positive effect on the organization of teaching in the Bachelor's phase: a strict enrolment system for courses, stringent evaluation criteria, less freedom for the students to choose, etc. These measures seem to make our life as instructors tougher (in the long run, though, they might not), but as they serve a good purpose in Bachelor's programmes, we should be happy to embrace these novelties. These measures are more problematic for research-oriented Master's programmes, such as the MSc in Logic where they have the potential to create unnatural and unintended constraints. To quote another aphorism of the Seven Sages, while absorbing some of the positive aspects of US academic policy, we should work towards a Solonic *μηδὲν ἄγαν* and make sure that the restrictive administrative measures stay limited to the Bachelor's programmes where they can do a lot of good, and keep some freedom for staff members and students alike at the research-oriented Master's level. After all, how are students going to learn the skills of independent research if the system stifles independence?



## Interview with

## Eva Hoogland



Eva Hoogland was awarded her PhD from the ILLC in 2001 for her dissertation 'Definability and Interpolation: Model-theoretic Investigations', which she wrote under the supervision of Dick de Jongh and Yde Venema. Eva is now coordinator of the Cognition Programme of the NWO. *ILLC Magazine* spoke with her.

### *What was it like doing your PhD at the ILLC?*

'I had a great time. The research itself was a lot of fun: looking at one subject so closely and figuring it out completely was a great experience. The aim of the project was to develop a feel for the relationship between the notion of "definability" and that of "interpolation". In the end it turned out to be difficult to make general statements about it. When I look back, I realize it was a very limited subject on which only I and a few other people at the ILLC worked. What I really mean is that it was a very limited subject to me: I don't doubt that you could work on it for another 20 years. However, to me the subject was exhausted. Afterwards, I wanted to apply methods other than mathematical analysis to reach insights. I mean that in a broad sense. I didn't want to spend any

more days sitting back to back in a room: I'd rather go out and talk to people and learn that way. If I'd wanted to continue as a post-doc, the subject would have had to be broader. Anyway, shortly after getting my PhD, I applied for the position of coordinator of the Cognition Programme - and I got it.'

### *What exactly do you do at NWO?*

'The most important job of NWO is to organize the allocation of subsidies in a precise manner. However, that's not my work. My function has a dual nature. I must stimulate research into cognition *and* create a broader societal framework for cognition research.

To stimulate cognition research one first has to realize that a lot of research on cognition is already being done. However, this is mainly



done within a single discipline. My job is to establish contacts between people who might be able to cooperate. An example of this is last summer's symposium in Amsterdam, about the origin of language. This is a good example of a meeting where biologists, psychologists and linguists speak from their own perspective about one subject. During the poster session, I noticed that these researchers were very interested in talking to each other. I know of a biologist investigating facial expressions who came into contact with someone who studied drama, and of a musicologist who was able to talk with someone who was investigating rhythm and structure in the singing of birds.

We must be realistic, though. For many guests, talking and listening to speeches was all that happened. For them it was just an enjoyable day, after which they went back to their own research. To me such an afternoon is a success if a few people turn out to be bridge-builders between the disciplines. So I try to develop the facilities to engender bridge-builders within science. These people may enable colleagues within their fields to talk to researchers in other fields. Of course, the questions of one group are not necessarily of interest to the other group, but then they should adapt them. This process in itself is

highly educational. Through these bridge-builders - or "translators", as I sometimes call them - both fields can achieve new insights.

All in all, it's not easy to set targets. Because when are you satisfied? Are you satisfied with a certain number of collaborative projects or a certain number of interdisciplinary articles? It's more about a transformation that needs to take place. You must bring people together and motivate them to do joint research. But you also need to create structures to enable this. For instance, if a biologist and a linguist write a good article together, where should it be published? Most magazines in the field of biology or linguistics won't accept such submissions, because they don't fall within their scope. You need to create channels through which multidisciplinary research can be published.

Another aspect of my work is that I must explain to the outside world why it is fun and exciting to do cognition research. It's very important to explain what cognition means, because many think that cognition is dull, expensive and boring. However, if you spend some time talking about cognition with, for instance, a journalist, he or she will start to see the challenges of the discipline and become enthusiastic. That's why we presented ourselves to a broader

audience at the Cognition Open Day at the RAI. In the months leading up to it, I suddenly found out that we needed to deal with science in a completely different way. If I read an article now I try to gain a general understanding of what the problem is and what solutions the authors provide. And, of course, I always look to see whether an author could be an interesting speaker for one of our events.

My tenure as coordinator at NWO is for five years, and in that period I have to establish a certain public and scientific interest in cognition. Of course, there must be an incentive to continue after that period. It's very important that the project doesn't suddenly come to an end, but is continued. We're doing very useful work.'

*There's a strong emphasis on formal methods within the ILLC. How can the ILLC play a role in an empirical discipline such as cognition?*

'What we really want is an answer to the question how people reason. Thinking as an ILLC'er, I understand that you would see cognition empirically and ask what the ILLC could contribute to this. But within the NWO we see cognition as a very broad field and realize that a multidisciplinary approach to it is necessary. Anyone

## 'From MRI scanner to completeness proof, it's all cognition.'

who has something to say about formal reasoning, for example, or thinking, making decisions, processing information, etc. is welcome to join in. The ILLC primarily uses logical systems for this and is mad about them. However, this is not the only way: from MRI scanner to completeness proof, it's all cognition. It happens to be a property of the subject of cognition that it is approached through different methods. All I want to say is that logical, formal reasoning and human reasoning are in a sense only one small step removed from each other. That's why it's not so strange for logicians to try to make contact with psychologists, and vice versa. Remember, the ILLC plays a major role in Dutch cognition research. Even though we don't see ourselves as- Pardon me: even though the ILLC doesn't see itself primarily as a cognition institute.

I remember that when I got my PhD, I didn't know a single psychologist at the UvA. Although I had nothing to do with the philosophers at the ILLC, I did keep in touch with them. An institute creates a framework within which researchers can more easily make and maintain contact. On the other hand, they also shield themselves from what's happening on the outside. From a scientific

point of view, it can be worthwhile for linguists and philosophers of language at the ILLC to talk to development psychologists.

You shouldn't take this as a call for the reorganization of the ILLC. On the contrary, I have high expectations of the Cognitive Science Center Amsterdam, in which the ILLC participates. Just as the ILLC offers the opportunity, I hope that the CSCA will become a platform to encourage more biologists, psychologists, linguists and logicians to make contact.'

*One of the motivations of mathematics and logic is the beauty of the subject matter. Do you encounter such beauty in cognition research?*

'In mathematics, problems are clearly defined, and some problems have proofs that are so beautiful that they have to be "by the book", to quote Erdős. In most cognition problems, however, you don't find that kind of beauty. Nevertheless, the problems are so interesting and so much fun that it stirs one's scientific interest: human beings are so much fun, and can do such surprising things.

I remember an investigation in which test subjects were asked to fill out a form and hand it in at the

counter. A test subject would fill it in and hand it to desk assistant A, who would draw the test subject's attention to a number of omissions. While the test subject completed the form, desk assistant A would hide under the counter and desk assistant B would pop up from under it. The subject would then return to the counter and hand over the completed form to the new assistant - and only 25% of participants noticed the switch. They'd talk about a plant they found remarkable or a pen that didn't write well, but they missed the fact that the desk assistant had changed. That makes you want to know what causes this.'

*If you were to go back to doing research yourself, would you opt for a cognition project?*

'Yes. I'd opt for a broad cognition investigation, in which attention is paid to empirical results. First I'd have to find out more about empirical methods, but then I'd use my formal capacities and find the connection with formal research. But at the moment this is not something I'm considering. I'm enjoying myself far too much for that.'

*Merlijn Sevenster*

## 'Human beings are so much fun.'

*During the past year Johan van Benthem and Paul Vitányi have been honoured with appointments as a University Professor at the UvA and a Fellow at the CWI, respectively. These posts give their occupants the opportunity to do research work on a full-time basis.*

*Johan van Benthem and Paul Vitányi describe the research they intend to devote themselves to in the coming years.*

# Celebrated Professors

*Johan van Benthem*

## What a university professor wants

ILLC Magazine asks for the guiding purpose of my next life cycle, now that I have become a university professor here in Amsterdam. To me, such a request raises profound Socratic questions of “Who am I?” – or if you dislike high culture, just Peggy Lee’s “Que Sera?”. Either way, the sad fact is that I am not particularly good at predicting my own future, or even just finding out what I want. As it happens, I am much better at making sense of my past, and pretending that it was neat and planned. I am currently writing an autobiographical entry for the new series “Who’s Who in Logic”, and that question I find easier to answer, since one can nicely re-invent oneself in such a format.

Enough of these doubts and evasions! My academic ambitions, past and present, have always been a mix of private and public goals. Let me start with the latter. They fit well with a university professor appointed as a Freischwebende Intelligenz across disciplines. The very job title takes the word ‘university’ seriously in its true meaning, beyond the melee of specialist milieus. As a matter of personality, I have always wanted to live at a confluence of intellectual influences: mathematics, philosophy, linguistics, computer science, and what not. And logic as I practice it proves an excellent vantage point for observing these confluences – and sometimes even making them happen. This is how my major interests have run so far in modal logic, the semantics of



natural language, and the foundations of information and action. I justify my life’s purpose in part in the research programs and communities which I have had a share in shaping. And I hope to help shape more in the years to come, for instance, drawing social sciences like economics, and empirical cognitive sciences into that logical circle. But how do you measure success on such a general score, sitting by the fire-side when you’re 64, many years from now? It’s like walking through a garden and enjoying beautiful things you’ve planted that have survived the initial rigours, and now started thriving.

But purely unselfish motives are boring. In his once famous book “Ombres Chinoises”, Simon Leys tells about the question he always asked of the Chinese guides/guardians assigned to him in the days of the Cultural Revolution. “What do you like better: mountains, or flat country?”. If the person answered: “I like it everywhere where I can be 2 of most service to my Country and my Party”, Leys dismissed him as no use. But if the person had a preference, there was hope for genuine contact. Well, I do have personal preferences, and they have been reasonably constant over time. On the whole, I prefer general issues to modelling of concrete phenomena. I just cannot get excited over donkey sentences or specific programming tasks – while I do worry about stratospheric issues like the expressive power of natural and formal languages. And as for favourite methods, modal logic was the love of my youth, and it still colours most things I have done since on information and dynamics. One concrete ambition along this personal line in the coming years is the design, out of many pieces lying around that do not quite fit yet, of a modal system for understanding and designing games that will make a natural merge between logic and game theory. Particular mathematical results about such a logic should provide the same sort of fine-structure that logical methods have

achieved in other areas, identifying the natural ‘joints’ of expressiveness and complexity in communication, planning and action. For this purpose, I am thinking of new types of properties of logical systems that would address various sorts of ‘communicative completeness’.

Actually, I also need some of my new future to do a better job on understanding my past. What have I really been doing all that time? Modal logic is a mathematical methodology, not a particular subject matter in reasoning or communication. It does seem true, however, that my interests have shifted from pure formal systems analysis to a more descriptive topic, viz. understanding actual ‘logical activities’ of manipulating information. Inference is just one of these, but so are interpretation, communication, belief revision, or planning. And all these relate to real phenomena, not artefacts of formal systems, the latter of equal importance to the former, with new issues of manyagent interaction. I see this as a major shift in defining logic, and my broader ambition would be to live long enough to see the day when this new perspective starts yielding major technical insights comparable in depth and scope to those of the Golden Age in the 1930s by Gödel, Tarski, and Turing. Contributing just a bit here seems a lot of ambition!

And there are further changes in perspective as I look at the present. Karl Marx once said, “Philosophers have merely interpreted the world, but now it is time to change it.”. Logic is not just a tool for analysis, 3 but also for synthesis. It can be a way of changing the world. It has already introduced new styles of proof and computation. On the larger conception of logic stated just now, I would like to design new games, communication protocols, and other forms of human behaviour. The radical reading of ‘Logic in Action’! In my opening lecture for the Academic Year on September 1st, I mentioned the example of email, with its epistemic action buttons ‘to’, ‘from’,

‘cc’, or the mysterious semi-secret ‘bcc’. People have difficulty grasping what these do precisely – and logic can help improve that. But it would also be an eminently logical task to design richer and better communication media than existing email. In this December issue of HP/De Tijd, IBM advertizes with the headline “Hoe vertel je iemand iets, zonder dat iedereen het meteen weet?” (How do you tell something to a person, without everyone knowing it at once?) To solve this, they recommend their ‘Security Event Management Service’. What a great definition for a broader logic! If our milieu were to start functioning in this activist mode, too: I would have realized another longer-term ambition.

Whichever way you look at it, my goals are a mix of private and public ambitions. This is sometimes called ‘leadership’ – but it mainly points at an interfering personality, who somehow ties up his own happiness with trying to influence what other people do. Friends keep telling me that now is the time to stop all this, and let Things go their own way. Well, I am trying to let go as far as ILLC is concerned. But alas, I have set my sights on an even broader front. Why do we teach logic at all? Is it just a form of artistic self-expression? Is it the desire to lure other young people into the trap that we ourselves once walked into, set by our own teachers? I would like to think that logic is a broad cultural asset which is good for everybody, comparable to mathematics or philosophy. But then it should be possible to make the results of modern logic accessible to a general public, and I intend to devote the time I save on routine activities on new actions toward this goal.

If you think the total of external ambitions in this column is over-reach: at least, it may happen further away from home, saving you from being press-ganged into the n+1-st new venture inside ILLC!

*Johan van Benthem*



## Paul Vitányi Giant Brains

In a famous passage on the archetypal deterministic world view, Laplace's all-powerful demon, given all the positions and movements of every particle at one given point in time, is able to see all of the past and future spread out before him crystal clear - nothing remains hidden from him. Here I can only approximate this giant feat, using fallible memory and prediction. The past serves as a basis for the future.

Studying at the HBS (short for 'Hogere BurgerSchool', a now obsolete type of grammar school), the excellent Canisius College in Nijmegen, under the watchful tutelage of the members of the Society of Jesus, I lapped up Tolkien and more scientific fiction, as well as non-fiction. One of the books I read was *Cybernetica* [Cybernetics] by Professor S.T. Bok, Professor of Biology at the UvA, who maintained that human memory was contained in some mysterious globules that he had discovered in the brain. Another book, *De Leermatrix* [The Learning Matrix], by the German engineer K. Steinbuch, developed a kind of reinforcement model for hierarchical memory based on the newly invented 'core memory' of computers - in effect the first usable, applicable neural network. E.C. Berkeley's *Giant Brains or Machines that Think* (1949) was a gripping read, and had fascinating photos. Inquiries revealed that a sixteen-year-old aspiring student of cybernetics, as I was at the time, could study the subject - or an approximation - with Professor Bok at the UvA, taking a biological approach, or in Delft, from an electronic point of view. As I did not believe in memory globules I opted for the latter, changing to mathematics (partly out of laziness, to avoid electronics practicals). The upshot was that I graduated in the new subject of Theoretical Informatics, specializing in aspects

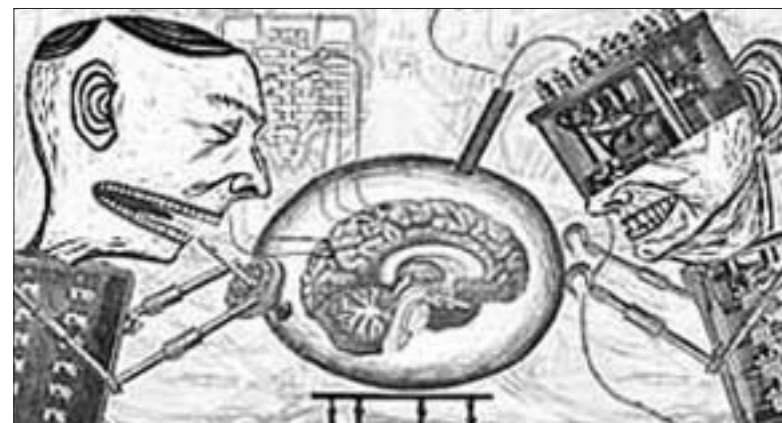
of cellular automaton theory (including reproduction and the genetics of reproduction). In the broader sense, then, I was studying the theoretical side of those 'giant brains', as I have subsequently been doing at the CWI and the UvA in Amsterdam. For me these 'brains' are a metaphor for the essence of information science, which is concerned with objects that behave dynamically in time and space - for example, processes and algorithms - rather than purely mathematical or logical objects that tend to be static - as in number theory and symbolic logic (while not forgetting that the one can be applied to the other, and vice versa, of course). Theoretical Informatics notions of the 'brain' have become popular, including superficial and incorrect analogies with the biological brain and how it works in the cognitive sciences, logic and philosophy. The only similarity between the human brain and a computer brain is that the signals are transmitted electrically; otherwise we do not really know anything about it. Less popular, and more difficult, are interdisciplinary combinations that make sense technically.

Scientific research based on a plan, of the kind our governments and managers would like to see, is reserved for the chosen few, and to some extent it is a contradiction in terms: if a result can be 'planned', it has already been found and no research is necessary. A priori 'utility' is equally far-fetched: as Hermann von Helmholtz said in his inaugural address in 1862, "*Whoever in the pursuit of science, seeks after immediate practical utility may rest assured that he seeks in vain*". Like so many other more or less successful scientists, for me research is a combination of serendipity (the making of pleasant discoveries by accident), sleep-walking (in the sense of Arthur Koestler's masterly book *The Sleepwalkers*), while at the time



following a clearly perceptible path (in the sense of Goethe's *Faust* Part I: "*Ein guter Mensch in seinem dunklen Drange ist sich des rechten Weges wohl bewusst*" [A good man is still aware of the right path in his dark urges]).

Research has to be justified, and for me the justification is finding the definitive solution to a particular technical detail that has remained



unsolved for years, that is technically difficult, and that in itself has no consequences for the welfare of humanity (proving Fermat's final theorem, for example); or defining and working on a problem that may not be so difficult technically but the successful solution of which does have an effect on human welfare. Let me give a few illustrations from my own case (so as to shed light on the past and present). As regards the first kind of research, I have solved various problems of Turing Machine Complexity that have remained unsolved for thirty or forty years, and for example major sorting problems in algorithmics that capable people had worked on long and frequently without success. A problem that combines technical difficulty and relevance is that of constructing theoretical communication mechanisms between asynchronous processes in distributed computations. As regards the second kind of research, I have demonstrated that fine-grained parallel computers inherently entail insuperable problems. A long-term project, one that is still going on today, is developing Kolmogorov Complexity - previously a concept of only theoretical interest - into a field with a wealth of applications. This is a type of information theory: Shannon's classic concept is concerned with the entropy of a

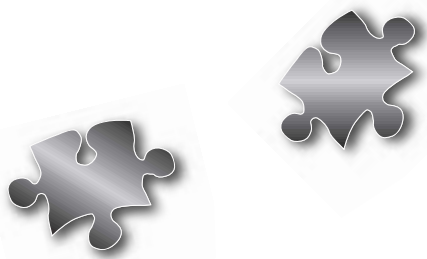
random variable (the number of bits needed on average to send a message), whereas Kolmogorov Complexity is concerned with the number of bits of information in the message itself. For example, if we pass a file through a compression programme (e.g. gzip) we end up with a smaller file; by decompressing the small file we obtain the original again. The number of bits of information in the original file, then, is no more than the number of bits in the compressed file (broadly speaking). Most files (strings) cannot be compressed - they are incompressible. This realization led to the development of a new method of proof in mathematics and information science (and elsewhere), which we have christened the 'incompressibility method'. The newcomer is comparable, in terms of general applicability, with the counting method or the probabilistic method, and its fecundity has been shown in countless applications. Conversely, the following holds true: although relatively few data files (of all possible files) can be compressed substantially, 'natural' data files, containing data on meaningful phenomena, are usually compressible, especially if we have unscrambled the phenomenon in question (cf. the gargantuan astronomical data tables that can be replaced with brief Newtonian

laws). Starting from the realization that anything that has meaning can be compressed, we can apply Kolmogorov Complexity to a whole range of real-world problems presented to us by medics, cognitive psychologists, biologists, etc. From our background we analyse the data supplied and develop a theory to explain it.

I hesitate to call this kind of research 'multidisciplinary', despite the current multidisciplinary trend. They contribute their expertise, we contribute ours, without any desire on our part to become psychologists, for instance, or on theirs to become information theorists. My experience has been that collaboration is often a question of synchronicity, pragmatics, communication, personalities and chance interests, which is why my research often involves working together with scientists (or on subjects) outside the ILLC. Examples of recent research we have been doing that crosses disciplinary boundaries are publications on cognition science (e.g. on the Universal Law of Generalization); developing a new complementary form of statistics and learning theory geared more to the current practical problems of analysing complex data (video and speech); and our universal clustering and classification algorithm, for identifying music by composers, literature by authors, biological species by biological families (based on genome analysis) and handwritten characters.

As the history above illustrates, the path the scientific sleep-walker follows in his dark urges often runs from the particular to the general - in my case via information science, statistics, mathematics, combinatorics and information theory, and other areas I enter while sleep-walking in serendipity.

Paul Vitányi

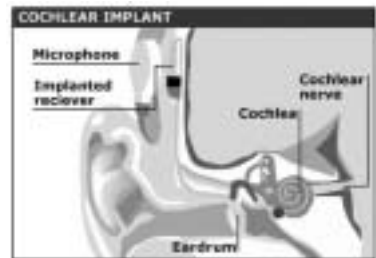


# NWO

Six applications involving the ILLC as applicant or co-applicant have made it to the final round in the award of NWO Cognition Grants. Roughly a third of all applications submitted will be approved. [Here is a summary of the six proposals:](#)

## Cochlear Implants and their Effect on First Language Acquisition

From the ILLC: Pieter Adriaans and Dick de Jongh

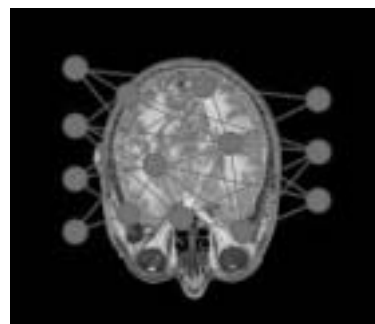


The aim of this project is to integrate fundamental research in grammar induction and linguistics in order to develop new diagnostic tools for the assessment of language development in clinical situations. In the project, first language acquisition by children with cochlear implants will be compared with language acquisition by children with normal hearing. Researchers in various fields - ranging from audiology, speech and language, through linguistic approaches to language acquisition, to information theoretic approaches to formal learning theory - will participate in this project. We hope to make a major breakthrough in the field of cognition by gaining a deeper understanding of formal issues in language acquisition related to good linguistic models with applications in diagnostic contexts.

## Logic, Neural Networks and Optimality Theory

From the ILLC: Reinhard Blutner and Henk Zeevat

Ever since the discovery of neural networks, there has been a controversy between two models of information processing. On the one hand symbolic systems have proven indispensable for our understanding of higher intelligence, essentially when cognitive domains like language and reasoning are examined. On the other hand we believe that intelligence resides in the brain, where computation appears to be numerical, not symbolic; parallel, not serial; distributed and not as highly localized as in symbolic systems. We claim that this controversy can be resolved by a unifying theory of cognition only - one that integrates both aspects of cognition and assigns the proper roles to symbolic computation and numerical neural computation. The overall goal of this project is to develop and study formal systems suitable for grounding the formal basis for such a unified theory.



## The Evolution of Meaning in a Game-Theoretical Setting: Cognitive Constraints and Experimental Architecture

From the ILLC: Paul Dekker, Robert van Rooij and Frank Veltman

The project is concerned with how meaningful communication can emerge. This question is approached from a theoretical, an empirical and an experimental angle. The starting point is recent experiments within AI in which simple meaning conventions evolve in a group of robotic agents. Our goal is twofold, namely to provide the necessary theoretical underpinning of these experiments, and to enhance the coverage of these experiments from purely descriptive language to the use of non-descriptive logical expressions. As for the latter goal, psycholinguistic investigations have shown that a particular way of communication will only emerge in a context in which agents are engaged in a suitable joint 'project'. As for the former, the main challenge is to develop a notion of meaning that suits the needs of both the psycholinguist and the experimenter in AI.

# Cognition Grants

## The Origin of Novelty

ILLC is co-applicant. From the ILLC: Jaap Kamps and Michiel van Lambalgen

The origin of novelty is a hotly debated issue in many scientific disciplines. The central question in these debates is about the origin of new structures not contained in existing structures. Our project will address this research question head-on. As yet there are no satisfactory detailed explanations of the origin of novelty. The aim of the proposal is to combine current approaches to novelty in human cognition, as they are now independently pursued in various disciplines. In the project we will explore biological insights into evolutionary key innovations, analyse novelty in the context of domain theories axiomatized in formal logic, and explain the origin of novel knowledge and skills from cognitive mechanisms and experience. These three approaches will be applied to novelty in cognitive learning tasks, such as the balance scale task.

## What Makes Cognitive Tasks Hard?

From the ILLC: Johan van Benthem and Peter van Emde Boas

Intuitively, humans and computers 'feel' differently when performing complex tasks like playing strategic games. Computers undergo the complexity of a game, while humans experience its difficulty. Understanding the relation between complexity and difficulty is an important step towards bridging the gap between understanding artificial and human intelligence. This proposal brings together the fields of mathematical logic, AI, and experimental economics and psychology in a combined effort to understand how humans and computers reason in related tasks of different complexity, particularly when uncertainty is involved. More specifically we will investigate, using a series of newly invented games, whether significant changes in the complexity of games as measured by mathematical models or algorithmic measures match up with changes in strategy and representation when human subjects play these games. The project is the first joint effort of ILLC with CREED (Center for Research in Experimental Economics and Political Decision-Making, Amsterdam) and IKAT (Institute for Knowledge and Agent Technology, Maastricht).

## Reasoning and the Brain

ILLC is co-applicant. From the ILLC: Michiel van Lambalgen



Our objective is to broaden the scope of research in the psychology of reasoning by investigating the connection of reasoning to other cognitive capabilities, notably memory. We will focus particularly on defeasible inference (in the area of conditionals, implicatures, tense and aspect), which we intend to study with brain imaging techniques in normal subjects and autistic patients. These aims are motivated by several considerations: defeasible inference plays an essential role in everyday life; there are many different types of defeasible inference; and well-developed logical and semantic theories are available. Furthermore, one of the characteristics of autistic spectrum disorders is a lack of cognitive flexibility, and it seems reasonable to expect that autistic patients will experience difficulties with at least some types of defeasible inference.



# Master students who enrolled in the PhD programme

What do South Africa, Iceland and the United States have in common? Not much, perhaps - except that they are all represented at the ILLC by PhD students. *Marian Counihan* (South Africa), *Börkur Sigurbjörnsson* (Iceland) and *Brian Semmes* (United States) participated in the Master of Logic programme at the ILLC and are currently doing their PhD in Amsterdam. Although their reasons for choosing the ILLC may differ, their stories are remarkably similar.



'I just can't get used to the Dutch lunch.'



Marian Counihan

Marian Counihan thinks that being in an academic environment is challenging not only because of the mental stimulation but also because of the social environment. 'I don't want to be intimidated by academics, nor to believe words simply because they're on paper,' she said. 'I don't want to take myself too seriously - although that's not always easy in an academic environment, since I feel I should be on my best behaviour all the time.'

Counihan studied mathematics at Wits University in Johannesburg and at the University of Cape Town. She first found out about the Master of Logic programme while attending a summer school in Johannesburg, where she met some Dutch logicians who did not fit the image she had of scientists. 'I was pleasantly surprised by their enthusiasm and sociability,' Counihan recalled. 'I remember thinking: if I'm going to be in an academic environment, I want it to be the one *they* are in.'

Two years ago, Counihan packed her bags and left for Amsterdam. She is now a member of the logic and cognition group at the ILLC. Amsterdam turned out to be a more inspiring academic environment than South Africa in several respects. 'In South Africa, universities are low on the national priorities list, since a lot of people are not even getting a good primary education,' Counihan said. Consequently, priorities within universities are totally different. 'In South Africa, education has to be directly relevant to the economic and social state of the country. Departments like classics and comparative literature have largely disappeared in the last few years. Even philosophy is under pressure to justify its existence. So that creates a whole different atmosphere. Reading Aristotle is a lot more of an arcane thing to do there than it is here.'

In this respect, there is probably no greater difference imaginable than that between South Africa and the United States - a country

considered by many to be the Valhalla of university training. It's also the country where Brian Semmes received his education, notably at the illustrious Massachusetts Institute of Technology (MIT).

'I was particularly interested in the interdisciplinary programme that MIT offered,' Semmes said. 'As my principle interests were theoretical computer science and, subsequently, logic, it would've been difficult to choose between a traditional mathematics and a traditional computer science degree. Going to MIT meant that I didn't have to make that decision.'

Of course, avoiding this decision was in itself a decision. And as it turned out, there were both advantages and disadvantages to the path Semmes chose. 'I'd decided to go to graduate school, but I was still unsure whether to study computer science or mathematics.' In the end he applied mostly to PhD programmes in computer science. However, the results of his

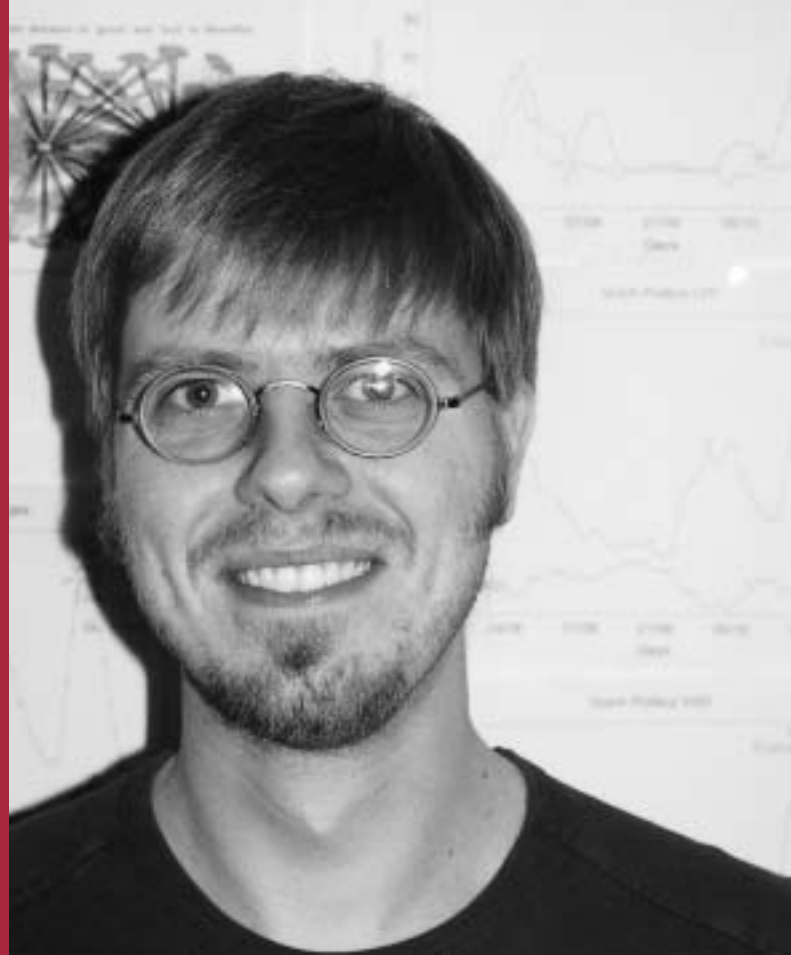
applications were, as he put it, 'less than spectacular', perhaps partly because he had not followed a traditional computer science programme. 'In retrospect', he admitted, 'I didn't plan very well what I was doing - partly because I wasn't sure what I wanted to do.'

He finally decided on the Master of Logic programme in Amsterdam. 'It suited my background better and there was less danger of being pigeon-holed. I needed flexibility, and I wasn't going to get as much flexibility at other places.'

At the ILLC, Semmes became interested in set theory. Since Amsterdam is traditionally not as strong in this area of logic, he applied for a PhD programme in mathematics at UCLA. 'I was accepted, but for various reasons it didn't work out. So I left UCLA and returned to Amsterdam. It was a particularly difficult decision, because the US is thought of as the place to go to graduate school. There were possibilities for me in the US, and some people thought it strange that I was going to Amsterdam to study.'

One of these 'some people' is Börkur Sigurbjörnsson, who smiled when he said that his own stay in Amsterdam is a result of a 'misunderstanding'. Having grown up in Iceland, Sigurbjörnsson had to go abroad in order to have a future in science. 'The University of Iceland is too small to offer a wide variety of courses. The undergraduate education is quite broad, but when it comes to graduate education there are fewer opportunities.'

But even as an undergraduate he couldn't get what he wanted in Reykjavik. Sigurbjörnsson's dream was to study applied mathematics and theoretical computer sciences, but he had to settle for the other way round: theoretical mathematics and applied computer sciences. 'Although neither of the subjects satisfied my interest, I somehow managed to graduate with a BSc in both,' he said, again with a smile.



## 'In a way, information retrieval brought me to Amsterdam.'

After graduating, Sigurbjörnsson planned to go to the States to do his PhD. But he could not get into the schools he wanted - and that led to the 'misunderstanding' that brought him to Amsterdam, where he now works on information retrieval in semi-structured documents. 'While trying to think up plan B,' Sigurbjörnsson explained, 'I was reading a computer science book published in the Netherlands. For some obscure reason I got the idea to type "university Netherlands" into Google, and up came the University of Amsterdam. I looked at the page and found a link saying 'Programmes in English': I clicked it and saw a link to the graduate programme in logic. I occurred to me that logic was perhaps something to combine my two undergraduate degrees. So, in a way, information retrieval brought me to Amsterdam.'

Although he ended up here as a result of a misunderstanding, Sigurbjörnsson certainly doesn't regret his decision. 'I like my job. I'm eager to go to work when I wake up in the morning. What

more can I ask? I very much enjoy the interplay between theory and practice. My work at the ILLC involves a mixture of theoretical investigation and system building.'

'Working here gives you the opportunity to cross disciplinary borders,' Counihan interjected. 'Even if you don't do that yourself, you're at the very least aware of the differences that exist across different academic fields: you frequently get a glimpse across the border.'

That's something Semmes can agree with. 'In general, there's a good interaction between researchers in the logic and those in the mathematics groups,' he said. 'Although, of course, it's sometimes difficult to keep up with what others are doing. For me, however, the advantage of this institute is that logic is the principle focus. I'm not aware of a similar place in the US to pursue such a doctoral study. Of course, there're many excellent places to study logic, but generally you do it in a mathematics, philosophy or computer science department. And then as a student you're pigeon-

holed as a mathematician, a philosopher or a computer scientist.'

As a former PhD student at UCLA, Semmes certainly knows what he is talking about. 'Academic life in the US can be rough sometimes. The archetype of a "suffering graduate student" exists in the US, and I'm not sure that it exists here. In general, it seems that graduate students in America have to endure some not-so-wonderful treatment in order to get their degree. I'd say there's more of a status division in the States between graduate students and the establishment.'

Life in Amsterdam, however, also has its disadvantages. 'I just can't get used to the Dutch lunch,' Semmes confessed. 'I mean, I like sandwiches - and here you do have nice bread and nice ham and cheese - but it's hard to eat them every day. Also, I don't drink milk, and sandwiches by themselves aren't very filling.'

'And you need to carry cash here,' Sigurbjörnsson added. 'In Iceland I used to use plastic almost everywhere.' Not to mention the dark summer nights and the terrible weather in the Netherlands... 'As a Nordic person, I need to cool down every now and then. So I go to Iceland every winter to get my dose of snow. There's nothing like sitting inside in the warmth, drinking hot cocoa and watching the snowstorm outside.'

That brought Counihan to the complete lack of nature in the Netherlands. 'When you go on the train through the Netherlands the whole landscape is just countryside - I mean, none of it's just nature. In South Africa you can drive for hours through land in which people don't feature at all. That's something I really miss.' Then she laughed. 'And I *still* can't get used to how blunt you people can be with each other. I think that's a real Dutch asset - bluntness. I love it, though: I think everyone should be more like that.'

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# New PhD students

## New PhD students

### New PhD students February 2003 - 2004



My name is **Sisay Fissaha Adafre** and I am Ethiopian. I took my first degree in Statistics with a minor in Computer Science at the Addis Ababa University where I also finished my MSc degree in Information Science. Currently I am a PhD student at the University of Amsterdam. The topic of my PhD thesis is robust extraction of logical relation from an open domain corpora. I will be working in the area of question answering.



My name is **Kata Balogh**, I am from Hungary. I graduated at University of Pécs in

Hungary. I finished two programs there, (1) Literature and Hungarian Linguistics and (2) Theoretical Linguistics with interest in computational applications. My MA thesis was about lexicalism and computation. From 2000 to 2003 I worked in the GeLeXi project on a Generative Lexicon where we developed a Prolog parser (mainly) for Hungarian sentences. I was working on the syntactic and semantic part of the program. I am a PhD student at ILLC since September 2003 on the "Questions" project, my supervisor is Jeroen Groenendijk.



My name is **Fabrice Nauze**, I joined the ILLC (Department of Philosophy) as a PhD

student last summer (01/07/2003) after having obtained a master of logic at the same institution under the supervision of Prof. Michiel van Lambalgen.

The main theme of my PhD is the semantics of modality and my supervisor is now Prof. Frank Veltman.

My research topic is more specifically to investigate the relevance of formal semantic theories with respect to the typological diversity within the domain of modality and see if any valuable lessons can be concluded from the gathered data.

The second part of my research will be to design/refine a formal theory (on the basis of current theories) to explain those typological phenomena's.

I'm also coorganising the DIP colloquium at the department of Philosophy.



Name: **Evangelos Tzani**

I graduated from the department of

Electrical and Computer Engineering of National Technical University of Athens in the summer 2003. In the last two years of studies I showed an interest in the field of theoretical computer science and algorithms. My Master thesis was entitled "Hybrid Logic".

In September 2003 I started my PhD studies at ILLC under the supervision of Yde Venema. According to me, the central aim of computer science is to put the development of hardware and software systems on a mathematical basis which is both firm and practical. ILLC's study program is based on this philosophy. Besides, studying logic is a very good choice when you want to establish a mathematical background. Kolmogorov Complexity, Quantum Computing, Game Theory for Information Sciences it is a sample of courses that you can study in Amsterdam.



Since December 2003 I, **Erik Rietveld**, have been working for ILLC's project

"philosophical foundations of the theory of interpretation". The subject of my PhD studies is the background of know-how (or immediate understanding) against which interpretation takes place.

My starting point is the observation that in many situations in our daily lives we act without deliberation or interpretation. We get in or out of the tram, immediately understand a traffic sign, and without deliberation stop someone who, while trying to cross the street, did not notice a car coming. Often we just act and normally this immediate coping is adequate. To find out what the characteristics of situated know-how are, I will try to integrate the work of philosophers that have been writing on embodiment and know-how, and lessons from dynamic systems theory and the cognitive (neuro)sciences. The main sources of inspiration for my research project are (the late) L. Wittgenstein, (early) M. Merleau-Ponty and neuroscientist F. Varela. The latter was a leading theorist in the recent field of embodied and situated cognition. At the moment I am doing the UvA research master in cognitive science in order to obtain the necessary background in neuroscience.

I am 34. Before starting my studies in philosophy at the University of Amsterdam in 2000, I worked as an economist with various international companies for five years. I lived in Brazil for a year and enjoy returning to that country for holidays.





'Vultus est index animi' – Cicero

(The face is the index to the mind)